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COMBATING DESERTIFICATION IN THE BAWKU WEST DISTRICT OF GHANA: FARMERS' PERCEPTION ON DESERTIFICATION AND PROJECT INTERVENTIONS

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ABSTRACT

Land degradation together with desertification is a growing threat in Ghana because of socio-economic and climate factors. The Government of Ghana with the support of international development partners has since the 1980s designed and implemented a number of programmes and projects in the desert-prone areas of the country to reverse land degradation and combat desertification. The Bawku area in Northern Ghana is the most desert-prone region of the country and has therefore attracted extensive attention and development interventions. Yet the land in the area is continuously being degraded by the same causative factors the projects are trying to halt such as deforestation, unsustainable cultivation practices and bush fires. The study emphasizes the need to understand farmers' perception of project interventions in reversing desertification and to shed more light on why the farmers still follow practices that are driving land degradation. The data were collected through semi-structured interviews with local farmers in two (2) communities within the Bawku West District. The study's results revealed that the great majority of the farmers are aware of land degradation and threats of desertification in their communities. They are also aware of the benefits of the desertification control projects to their farms and communities, and the responses from the farmers suggested that the projects have led to greater awareness against bush burning and tree felling. Yet, the study's findings support the proposition that people's perceptions and attitudes do not always lead to behavioural change/action. The study concludes that it is important for project interventions to incorporate the needs and preferences of the target population at all stages of decision making and particularly to give special attention to people's perceptions.

Key Words: Desertification, land degradation, combating desertification, farmers' perception, Ghana.

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1. INTRODUCTION

The over-exploitation of land resources to meet the socio-economic needs of people results in land degradation (EPA 2003). Due to the continuous pressure on land resources, desertification and land degradation remain as major environmental problems affecting the livelihoods of affected people (Agyemang & Abdul-Korah 2014). According to Scherr and Yadav (1996) land, including the soil resource, water, vegetation, and landscape, is degraded when various forms of human-generated factors such as overgrazing, inappropriate farming methods and overcutting of wood together with bio-physical conditions lower its productive capacity temporarily or permanently.

By definition, “desertification means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities” (UNCCD 1994, p. 4). Another viewpoint is that desertification occurs everywhere, even in places which receive significant amounts of seasonal rainfall (Annorbah-Sarpei et al. 1993; Imeson 2012). However, it has been most severe in the arid and semi-arid regions of Africa (Annorbah-Sarpei et al. 1993; Nicholson et al. 1998). About 12 million hectares of land are lost every year through land degradation, an area of land that is equivalent to the size of Benin (UNCCD 2011). In Africa desertification is strongly linked to famine, poverty, migration and conflicts over limited water and natural resources, as reported by Ouma and Ogallo of the University of Nairobi.

Land degradation together with desertification is a growing threat in Ghana (Gyasi et al. 2006). Socio-economic factors including population pressure, deforestation, overgrazing, unsustainable farming practices, bush fires and poverty are the culprits of desertification, exacerbated by extreme climatic events like drought (EPA 2003). The consequences are often soil erosion, soil nutrient depletion, pollution, surface and ground water depletion (Diao & Sarpong 2007). Diao and Sarpong (2007) argue that soil degradation could severely cause a slowing of poverty reduction over time in northern Ghana.

The fight against desertification in Africa remains one of the most important and enduring challenges in recent times of climate change (UNCCD 1994). African governments recognize the strong link between environmental resource degradation, particularly land and water, and poverty in the region. The region-wide effective implementation of the United Nations Convention to Combat Desertification (UNCCD) holds promise for addressing the land degradation/desertification-poverty nexus in Africa, even though there are only a few examples of successful national programmes to deal with the phenomenon (UNU 2007). It was earlier reported by Annorbah-Sarpei et al. (1993) that some countries in the African region, for example Burkina Faso, Ghana, Kenya and Zimbabwe, have seen some successes in their quest to combat desertification; meanwhile other efforts have been less successful despite significant investment of resources. Combating desertification includes interventions such as seeding, tree planting and protection, the use of soil amendments, education and awareness raising, and alternative livelihood development (Bainbridge 2007).

Land degradation reflects the cultural and socio-economic situation of people and therefore people’s perception, lifestyles, values and attitudes are key components to land restoration actions (Imeson 2012). In view of this, farmers’ perception and response to land degradation problems often differ from those of scientists and government officials, and this kind of perception gap can impede successful implementation of land restoration projects (Dejene et al. 1997). According to Ólafsdóttir and Júlíusson (2000), people with different backgrounds often assess land degradation in a different way in terms of its severity or magnitude. Schach

(2009) postulates that farmers' perceptions and attitude dimensions must be given due consideration in restoration efforts as they respond to their environment according to the way they interpret it. Another proposition is that desertification can be successfully reversed if farmers change their behaviour towards the land and adopt alternative positive practices (Imeson 2012). A similar declaration was made in the National Capacity Self-Assessment Report of Ghana in 2005, saying that restoration efforts in the country have suffered setbacks because farmers are reluctant to change their attitudes towards the land (MES 2005).

This study emphasizes the need to understand the farmers' perception of land degradation and project interventions for reversing desertification, and to shed more light on why farmers are reluctant to change their attitudes from the practices causing land degradation. The study was carried out in the Bawku West District of the Upper East Region (UER) of Ghana. Its aim was to examine the impact of desertification control projects on farmers' perceptions, with particular regards to their understanding and interpretation of indicators of desertification. The report is structured as follows: The remaining part of this section covers background information, the research problem, objectives and the study area. Section 2 contains the literature review focusing on the perception of farmers of desertification control projects. Section 3 outlines the methods of study and short discussions on ethical issues and gender effects related to the study. Section 4 presents the results while section 5 interprets and discusses the results of the study in light of relevant literature. The conclusion and recommendations are presented in Section 6.

1.1 Definition of key terms

The term *land degradation* means any process that results in loss of biological or economic productivity from the soil-vegetation-water system (Imeson 2012, p. 61).

The term *desertification* refers to land degradation in arid, semi-arid and sub-humid areas resulting from various factors, including climatic variations and human activities (UNCCD 1994, p. 4).

The notion of *combating desertification* includes activities which are part of the integrated development of land in arid, semi-arid and dry sub-humid areas for sustainable development which are aimed at:

- i. prevention and/or reduction of land degradation;
- ii. rehabilitation of partly degraded land; and
- iii. reclamation of desertified land (UNCCD 1994, p. 4).

Following Bainbridge (2007, p. 348), *reclamation* refers to the effort to repair a severely damaged site to a minimal level of stability; *rehabilitation* refers to the effort to return a degraded site to better ecosystem function; and *restoration* refers to the effort to return a site to its original ecosystem structure and function.

According to Barlow (1990, p. 1561) the term *perception* means the computation of a representation that enables us to make reliable and versatile inferences about associations occurring in the world around us. In the present study, the term *perception* was used to refer to farmers' opinions, convictions and knowledge of the desertification process and of project interventions, and as such the farmers' perception in this regard is believed to shape their attitudes and behaviour towards the use of land resources and project interventions in Northern Ghana.

1.2 Research problem

The Bawku West District (BWD) is a wildlife corridor and it lies along the White Volta, an important trans-boundary river that flows from the Sahelian region to Ghana. Due to its location in the Sudan Savanna Ecological Zone (SSEZ) and sensitive environmental resources, the district has benefitted from among other projects; the Northern Savannah Biodiversity Conservation Project (NSBCP), Sustainable Land Management for Mitigating Land Degradation, Enhancing Agricultural Biodiversity and Reducing Poverty (SLaM), Ghana Environmental Management Project (GEMP) and the Sustainable Land and Water Management Project (SLWMP).

Based on the principles of the National Action Plan (NAP), local stakeholders have been involved in the design and implementation of the programmes and projects in the affected areas (EPA 2003; EPA 2005). However, some research findings of the situation in the Bawku area signal that projects/interventions on combating desertification in the district have had little impact because the local people are still driving land degradation through unsustainable practices (Yiran et al. 2012). In most cases the land is continuously being degraded by deforestation, bush burning and inappropriate farming practices which drive land degradation in the area (Bawku West District Assembly 2006; Yiran et al. 2012). Dejene et al. (1997) proposed that understanding farmers' or land users' perceptions of land degradation and project interventions and embracing their perspectives through strategically planned approaches is essential for successful restoration of degraded land.

Some studies have been done in the district through mapping and focus group discussions to assess how farmers are coping with the threat of desertification (Owusu 2012). However, research on the perception of farmers or land users of the various anti-desertification projects in the district has been limited. The key question this study sought to address was; why are the factors driving land degradation still ongoing in spite of the numerous project interventions to reduce or reverse the trend? For this reason, the purpose of the study was to improve understanding of farmers' perceptions of the desertification process in the BWD of Ghana and of the project interventions aimed at reversing that process in order to develop more holistic project/programme interventions on combating land degradation.

1.3 Goal and objectives of study

The overall aim of this study was to examine the impact of desertification control projects on farmers' perceptions, with particular regards to their understanding and interpretation of indicators of desertification.

The objectives of the study were:

- To examine the farmers' understanding of desertification in the BWD.
- To explore the farmers' perceptions of project interventions for combating desertification in the BWD.

1.4 Study area

The present study was specifically carried out in Kubore and Widnaba in the BWD; Kubore lies along the White Volta and Widnaba forms part of the eastern wildlife corridor.

The BWD falls within the transitional Sub-Saharan area, occupied by the Sudan Savannah Zone in the UER of Ghana. It lies between latitudes 10° 30'N and 11° 10'N, and between longitudes 0° 20'E and 0° 35'E (Bawku West District Assembly 2006). It shares boundaries with Burkina Faso in the north, Bawku Municipality to the east, the Talensi/ Nabdam District to the west and the East Mamprusi District to the south (Fig. 1). The district covers an area of approximately 1,070 km², which constitutes about 12% of the total land area of the UER (Bawku West District Assembly 2006).

The area experiences a unimodal rainfall regime lasting four months and a long dry period of eight months in a year. For the period 1961 and 1990 the average annual rainfall, temperature and relative humidity were 956 mm, 5 °C and 56%, respectively. Potential evapotranspiration amounts to 2882 mm. The excess of evapotranspiration over rainfall is 19,255 mm. The aridity index (ratio of annual precipitation to potential evaporation) is about 0.33, which makes it a desert area according to the UNCCD range of 0.05 to 0.65 (Bawku West District Assembly 2006).

The district is drained by both the White and Red Volta and their tributaries. These two rivers are fed from the Sahelian zone, which run contiguous to the district's eastern and western boundaries. The rivers overflow their banks during the rainy season but dry up soon after the season with disconnected pools of water in the beds separated by dry stretches of sand (Bawku West District Assembly 2006).

The vegetation consists of short deciduous trees, often widely spaced, with ground flora of grass species of varying heights and bare to severely eroded land. The sparsely distributed woodland and eastern wildlife reserve stretching from the Widnaba-Tilli area in the district is a favourable abode and a natural route for elephants moving to and from Burkina Faso through the district to the Northern Region (Bawku West District Assembly 2006).

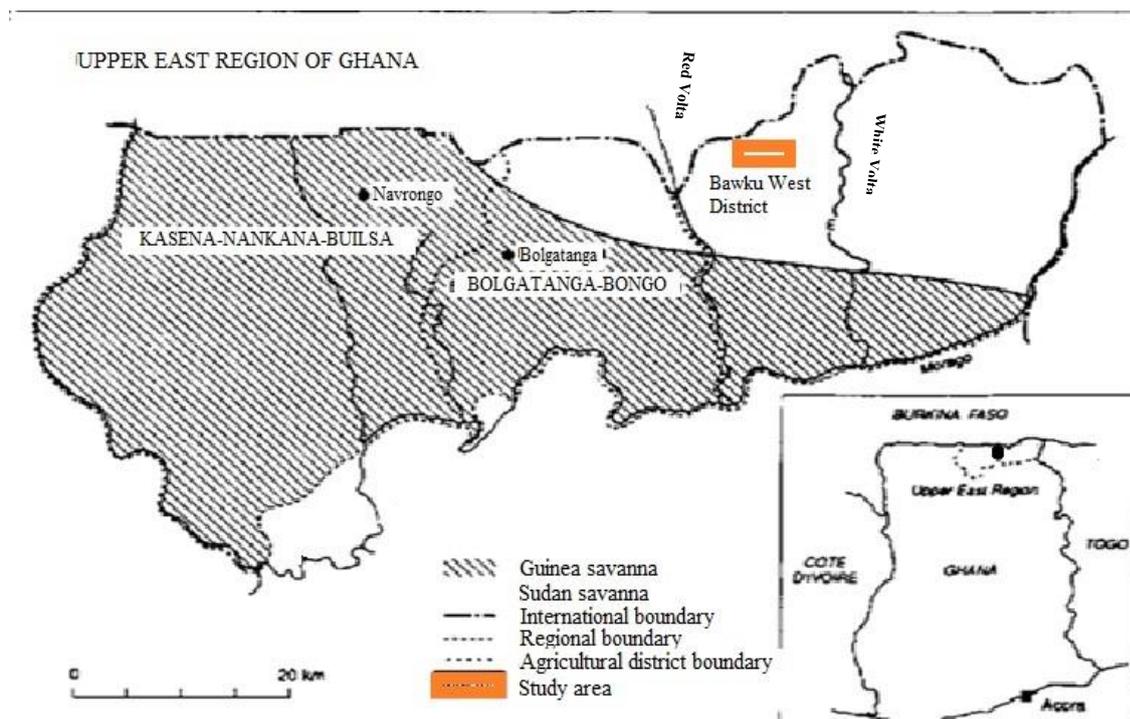


Fig. 1: Map of Upper East Region of Ghana Showing the Bawku West District and the Sudan Savanna Ecological Zone (Source: modified from Google/www.google.com).

According to the Ghana Statistical Service (2012) the district has a total resident population of 94,034 with males numbering 45,114 and females accounting for 48,920. The district is predominantly rural with about 80% of the population engaged in agriculture and fishing whilst about 6% is engaged in trading (Bawku West District Assembly 2006). Due to the harsh economic conditions in the area, the youth usually migrate to the south of the country in search of employment opportunities (Bawku West District Assembly 2006).

1.5 Background information

The percentage of total land area of Ghana prone to desertification is 35% (about 83,489 km²) with the Upper East and eastern part of the Northern Region (78,718 km²) or 33% of the total land area of the country) which makes up the SSEZ facing the greatest hazard (EPA 2003). Desertification manifests itself in the area in the form of low income and loss of livelihoods, famine and increased out-migration due to low soil productivity and crop yields (Armah et al. 2011). The Upper East Region, particularly the Bawku area, is considered the most desertification-prone area in the country, and has attracted extensive attention and development interventions from the national government and international development partners (Gyasi et al. 2006; Yiran et al. 2012). To illustrate further the severity of the problem, the World Bank has estimated the cost of land degradation in Ghana to be equivalent to 9.6% of the country's GDP annually through unsustainable management of the forests and land resources (World Bank 2007).

The Government of Ghana has since the 1980's initiated major programmes and action plans to tackle land degradation in the country (EPA 2011; Owusu 2012). Based on the decisions by the United Nations Environment Programme (UNEP) and United Nations Development Programme (UNDP), Ghana was listed as one of the countries threatened by desertification in 1984. Consequently, the Environmental Protection Agency (EPA) of Ghana, with the mandate

of environmental protection and management including desertification in the country, prepared the first National Plan of Action to Combat Desertification (NPACD) in 1987 (EPA 2011). The NPACD led to a 10-year National Environmental Action Plan (NEAP) as a framework for interventions to safeguard land resources, which produced the Ghana Environmental Resource Management Project (GERMP) designed to implement and operationalize the NEAP (EPA 2003). The GERMP (1993-1998) was implemented with support from the World Bank, Danish International Development Agency (DANIDA), Department for International Development (DFID) and the Government of Ghana and it was aimed at developing and strengthening institutions to tackle land degradation problems (MES 2005). Also in line with the obligations under the UNCCD, Ghana prepared the NAP in 2002 with emphasis on environmentally sound and sustainable integrated local development programmes for drought prone semi-arid and arid areas, based on participatory mechanisms (EPA 2011).

Among the land restoration and natural resource management projects implemented in the BWD, there have been the NSBCP and SLaM. The NSBCP (2002-2008) had the primary objective of improving the environment and livelihoods of the people of the northern savannah zone through the conservation and sustainable use of natural resources whilst the overall goal of the SLaM project was towards sustainable ecosystem-based integrated land management in agricultural areas under threat of land degradation, for greater ecosystem stability and rural livelihood improvement (GEF 2002; GEF 2003). The mid-term evaluation of the NSBCP in the UER, including the two communities under the present study in the BWD, was captured in the Third National Report to the Committee for the review of the Convention to Combat Desertification (EPA 2005) as follows:

- Twenty (20) communities sensitized and practicing controlled burning or “no burning” in project communities.
- Nineteen (19) communities trained in seed nursery establishment and management for production and transplanting of 5,000 seedlings per nursery per year.
- Traditional healers trained in silviculture and nursery techniques and establishment of medicinal plant nurseries in respect of indigenous plants conservation.
- Provision of alternative livelihood to communities in the form of fruit tree (grafted mango) plantation development, beekeeping and honey production, low tillage bullock plough and legume cover crop schemes to assist reduce poverty in 19 communities.

Another relevant intervention in the district concerning land restoration is the Cooperative Integrated Project on Savanna Ecosystems in Ghana (CIPSEG) (1993-1997). It was aimed at using sacred groves to restore degraded lands whilst improving farming practices, preventing bush fires and enhancing livelihood of the people (Gyasi et al. 2006). The following are some of the outcomes of the project as recounted by Iddrisu and Telly (1999) in the National Report to the Third Session of the Conference of the Parties to the United Nations Convention to Combat Desertification:

- Reduction in the rate of cutting wood for fuel wood and poles by the people themselves and conservation of indigenous plant species.
- Survival of 80% of transplanted seedlings in degraded areas using the micro-catchment technique.
- Over 360 acres of agroforestry, multiuse woodlots and fodder banks established by individuals, farm families and community groups.

Currently, two desertification control projects among others, the GEMP and the SLWMP, both aimed at reversing land degradation and enhancing the maintenance of biodiversity, are being

implemented in several districts and communities including the study area in the northern savanna zone of Ghana. The GEMP (2009-date) is specifically targeted at strengthening institutions and rural communities to enable them to reverse land degradation and desertification trends in the three regions of northern Ghana and to adopt sustainable water and land management systems. It is aimed at improving food security and reducing poverty through activities such as education and training, sustainable farming, bush fire prevention and management, afforestation and community woodlot establishment and provision of alternative livelihood support. In spite of this, the Ministry of Environment and Science of Ghana in 2005 revealed in its assessment report that the programmes and interventions do not eventually halt the pressure on land resources, partly due to the behaviour of farmers.

2. DESERTIFICATION, RESTORATION AND PERCEPTION

Land degradation and desertification are two closely interrelated processes. The process of progressive loss or reduction of the biological function of the land, which is land degradation, is also referred to as desertification if it occurs in dry and sub-humid areas (Gyasi et al. 2006). Desertification impacts on river flow rates and the level of ground-water tables, eventually decreasing freshwater reserves (Abahussain et al. 2002). It leads to what is termed as 'environmental refugees', as many people migrate from their home places because of desertification (Imeson 2012). The desertification process in one area may also affect other areas through dust and sand deposition, and sometimes the impact can be felt far as in a different content, as in the case of coral reef dieback in the Caribbean resulting from the dust from Saharan Africa (Bainbridge 2007).

2.1 Combating desertification

Restoring degraded lands and stopping desertification is an important human endeavour in the face of growing needs for food, clothing and shelter (Mudita 1999), yet it remains challenging, particularly reducing pressure on land resources because of increasing human socio-economic activities and inadequate commitment from stakeholders to halt the process (Agyemang & Abdul-Korah 2014). To successfully restore degraded land, a wide variety of approaches are required (Crofts & Olgeirsson 2011). Accordingly, Crofts and Olgeirsson (2011) maintain that there is no single solution to reversing land degradation or combating desertification but that it requires integrated efforts, including education, active participation of land users, an appropriate legal framework and incentives.

Restoration, reclamation and rehabilitation are essential in reversing land degradation processes and desertification. Whereas restoration reproduces ecosystem function (energy flow, nutrient cycling, water cycling and productivity) and structure (species distribution and diversity), reclamation and rehabilitation often return degraded sites to use in stable conditions more readily with non-native species and less diversity (Bainbridge 2007). Lost qualities and functions of the land can be restored through sustainable land management and with the help of natural processes (Imeson 2012).

Restoration interventions can include soil amendments, seeding, planting, and aftercare. The productivity of a slightly degraded grazing land can be restored with a low-cost re-vegetation effort, but regeneration is difficult when the land is severely damaged or barren (Bainbridge 2007). Annorbah-Sarpei et al. (1993) reported that tree growing or afforestation incorporated into existing local knowledge and belief systems is the most important and a starting point for community participation in anti-desertification efforts in Ghana. Due to the extreme

temperatures, intense sun, low moisture, high winds and low fertility of desert lands, natural recovery is limited, even in the absence of exploitation by man (Bainbridge 2007).

Restoring degraded lands and reversing desert conditions are possible. A holistic view of the interactions between people and their ecosystems over a period of time is necessary for successful restoration (Bainbridge 2007). The most suitable restoration approach for an ecosystem depends on the type, degree and causes of the disturbance, the available funds, time and labour, and the goal of the project (Bainbridge 2007). Moreover, project implementing organisations must well understand ecosystem processes that can induce restoration of landscapes and counteract desertification for better and more effective strategies (Imeson 2012).

Programmes and projects designed to combat desertification must effectively address challenges associated with the root causes of the problem connected to its socio-economic sources (Ouma & Ogallo). Combating desertification in poor rural areas involves increasing the resilience of both ecological and socio-economic systems (Imeson 2012). The willingness of the local population to take appropriate local action is the most important step in the fight against land degradation (Mudita 1999). It is often anticipated that local people will embrace a restoration idea because it will improve their situation. Yet, interventions have to meet the real needs of the people and fit into both the socio-economic and ecological settings of communities. And without these considerations of full involvement of local land users in taking local actions in restoration interventions cannot be assumed, and land degradation is most likely to continue to take place (Mudita 1999; Bainbridge 2007).

2.2 Farmers' perceptions of desertification control projects

People's perceptions are constructed based on their convictions, values, norms, knowledge and interests. People's opinions about the way things are, or the way things should be, and experiences often define their perceptions (Te Velde et al. 2002). People respond to their environment according to the way they interpret it. It is therefore important to consider the perceptions and attitude dimensions of the target population in land restoration interventions (Schaich 2009).

Local knowledge is a key element in combating desertification and a lack of appreciation by the target population of externally initiated land restoration projects can undermine their participation in the implementation of the project (Annorbah-Sarpei et al. 1993). Individuals respond to each other in terms of their perceptions and usually their interpretation of a situation has real consequences (Brandt et al. 2003). For this reason, officials and farmers often perceive and respond to land degradation problems differently, and this perception gap is likely to impede successful implementation of land restoration projects. Whereas the official view is usually derived from science based data, farmers' views can be based upon their tradition and experiences (Dejene et al. 1997).

The perception gap between officials and farmers is further widened due to the way officials interpret changes in indicators and assess land resources. For instance, the perception among officials that there is prevalent land degradation may not be shared by farmers (Dejene et al. 1997). The divergent views espoused by authorities and sheep farmers in Iceland on land degradation provide an excellent example. Whereas authorities say land degradation is caused by grazing, farmers perceive it as a natural phenomenon, making grazing control programmes for land restoration challenging (Ólafsdóttir & Júlíusson 2000). In spite of the immense efforts by the Soil Conservation Service of Iceland (SCSI) to restore degraded lands, farmers' attitudes

towards the land and the interventions remain a long-standing problem and are difficult to reverse (Crofts & Olgeirsson 2011).

Carvalho et al. (2002) reported in their studies of agroforestry programmes on restoring degraded lands in Portugal that land restoration programmes and projects designed without due consideration to the perceptions and capacities of local people have often failed. Local people may also resist and disagree on priorities of project interventions due to uncertainty and change. They mentioned in the study that the farmers were initially reserved about the agroforestry programme because of uncertainty as to whether the trees planted were theirs or that of the state. This finding is further expanded by Schaich (2009), that local populations respond to land restoration projects with respect to their perception of the outcomes, beliefs, knowledge and behaviours. This corresponds with the outcomes of research carried out in Tanzania by Dejene et al. (1997), who reported that farmers, by their perceptions and interpretation of indicators of crop yield and pasture land, can tell if their soil is being degraded. Therefore, they have employed an intensification system using sustainable agronomy practices such as intercropping, composting and farmyard manure for a particular area and extensification of farming into new areas based on their experiences, yield, and labour or land expansion. Meanwhile, farmers are suspicious that government will convert communal lands into protected forest areas or use unpopular measures to destock their animals and are therefore unwilling to participate in land restoration projects.

Farmers in the southern coast region of Western Australia acknowledge the support for restoration interventions, but many don't recognise that land restoration projects which may have long term benefits are as important as the immediate productivity and revenue of their farms (Rogan et al. 2005). The farmers are also reluctant to accept that their actions are causing severe land degradation and therefore changes in attitudes and environmental values are slow (Rogan et al. 2005). A study by Cao et al. (2009) on farmers' attitudes about a land restoration project in China's northern Shaanxi Province revealed that the farmers' level of education and income strongly influenced their responses to anti-desertification projects. This showed that respondents who were economically empowered, especially those whose income had improved from the project, gave a higher priority to the environment and support for the restoration project. The study also revealed that farmers with a higher level of education gave a higher priority to desertification control issues.

Crofts and Olgeirsson (2011) argue that farmers' perception of the land must change to recognition that the land is a critical component in the long-term and therefore support programmes intended for improving the qualities of the land. But this may not be that simple. Sears et al. (1985) pointed out that a person's attitude towards an idea is a long-term orientation of his knowledge, beliefs, feelings and readiness to act on the idea. In view of this, attitudes become more resistant to change once established and do not also necessarily influence behaviour (Sears et al. 1985). In a related pronouncement, Heberlein (2012) mentioned that attitudes of people change slowly and usually have little impact on behavioural changes. This was further exemplified by the attitude among deer hunters in Wisconsin in the USA. According to Heberlein (2012), the hunters were extensively educated to change their attitudes and behaviour from hunting white-tailed deer but the hunters' attitudes and behavioural intentions only changed for a short time and they went back to the old practice. Even with enormous efforts through education, only a few of the hunters were influenced to change their behaviour (Heberlein 2012).

However, it is worth noting that Craswell et al. (1998) recommended in their study of agroforestry in the management of sloping lands in Asia and the Pacific region that

activities/practices which will increase yields whilst controlling land degradation must be given priority because farmers readily accept and participate in projects with obvious benefits to them (Craswell et al. 1998). Restoration efforts must therefore start with community empowerment, partnership and a reorientation of the attitudes of local people based on participatory approaches (Mudita 1999).

3. METHODS OF STUDY

3.1 Research approach

The study followed a qualitative research (data) approach. The qualitative research was used as a means for describing and attempting to understand the research problem from the viewpoints of particular people through their values, opinions and behaviours (Mack et al. 2005).

3.2 Research sample and interviews

The data were collected through semi-structured interviews. The aim of this research method was to gather broad views on the research subject. This technique allows considerable flexibility in the following up of questions. It is ideal for collecting data on people's experiences and perceptions (Mack et al. 2005). A semi-structured interview also provides the opportunity for the researcher to study selected issues in depth and detail and to open up new dimensions of a problem and is especially important if the sample size is relatively small (Patton 2002).

The field survey was conducted with a semi-structured questionnaire on the 19th and 20th of July, 2014. In order to identify and correct any problems, the questionnaire was earlier tested, on 10th May 2014. The questions were written in English but translated into Kusal, the local language of the area, by the researcher with the help of the BWD Deputy Agricultural Director for easy understanding by the farmers. A sample of the questionnaire is attached as Appendix I. The field survey involved writing down all the responses by the farmers on separate sheets of paper per interview and the use of an audio recorder for recording the interviews. A photographic camera was also used to take pictures of the land and restoration activities being carried out in the communities.

The interviews were carried out at the farm level in the communities by three (3) people; two (2) EPA Officers of the UER and the Deputy Director of the BWD Agriculture Development Unit with some assistance provided by the agricultural extension agents living among the farmers.

In all, 14 questionnaires were administered to 14 farmers in two communities, Kubore and Widnaba in the BWD, due to time and resource constraints. These two communities are located within one of the districts most at risk of desertification in Ghana, and as such they have participated in a number of land restoration and biodiversity maintenance projects in the past and are currently implementing other similar projects. The communities were also selected by the researcher because of the sensitive environmental resources existing there and the efforts by the government and NGOs directed at protecting them. Whereas Kubore lies along the White Volta, Widnaba forms part of the eastern wildlife corridor.

Simple random sampling process was used to select the farmers who were on their farms at the time the survey was conducted and who were older than 20 years. Twelve (12) farmers, six (6)

from each of the two communities, were picked and interviewed. In addition, each community's chief was interviewed as a key informant. Each participant responded to the same set of questions read to them in the local language and the respondents were also offered the opportunity to express their opinion on the questions and the interviewer a chance for follow-up questions. The questionnaire consisted of 21 open-ended questions covering the following issues: background demographics, farmers' knowledge and perception of desertification, indicators they associate with desertification, their understanding of desertification control projects and the socio-economic benefits derived from the projects among others.

3.3 Data analysis

All interviews (audio recordings) were transcribed word-by-word by the researcher and compared to those filled out on sheets of paper in the field by the interviewers. This arrangement gave an opportunity to the researcher to cross-check the data and to ensure it is harmonised. The researcher then coded the data using upward coding, i.e. common responses were all assigned to an attribute and then a higher level of specific themes as follows: 1) indicators that farmers' associate with desertification, 2) farmers' perception of desertification control projects, 3) socio-economic benefits derived from the projects, and 4) perceived ecological impacts of the projects. Each response was treated uniquely and included in the analytical process. Same or similar responses from each interview were grouped together as attributes. Then attributes which relate to a particular theme/category were assigned to it.

The data were analysed using a descriptive method, thus summarising the categories based on the individual attributes and supported with direct quotes by the farmers. The results of the study are presented in tables, whilst frequency and means are used to discuss the results. The number of times a particular attribute occurred during the interview process was counted; therefore the frequencies do not add up to 100 percent.

3.4 Demographic background of respondents

The average age of the farmers interviewed was 52.4 years with the youngest farmer 27 and the oldest 76 years of age. Out of the 14 farmers randomly interviewed from the two communities, 4 were females whilst 10 were males (Table 1). Men and women in the communities have highly differentiated roles. The men are all land owners and heads of households in accordance with the socio-cultural traditions of the area. The men do the farm preparations including ploughing as well as providing grains, shelter and family security, whereas the women's roles are limited to sowing, marketing of food produce, cooking and fetching water and firewood. Female headed households are rare and their role in decision making tends to be limited. Women also seemed disadvantaged relative to men in terms of access to land and control over resources. One (1) of the women interviewed was a widow and cultivating a portion of her late husband's farmland given to her by the husband's family and another one who was farming on her husband's land said the husband was a businessman and only becomes active in the farming during the main season. As part of their roles, the remaining two (2) women were growing vegetables on their husbands' farms whilst their spouses took care of the staple crops.

The majority of the respondents have been farming all their lives and have never had a formal education or dropped out of school at early stages of their lives. A high number of nine (9) of the farmers interviewed did not go through the formal school system, with only one (1) ordinary level (O-Level) certificate holder.

Farming in the area is done in two (2) different periods round the year. The main crops planted by the farmers included millet (*Panicum miliaceum*) and maize (*Zea mays*) in the main rainy season, in contrast to tomatoes (*Lycopersicon esculentum*), peppers (*Capsicum annuum*), onions (*Allium ascalonium*) and water melons (*Citrullus lanatus*) cultivated during the dry season.

Table 1. Background demographics of the respondents (no. of responses, N=14)

Demographic characteristics of respondents	Frequency
Age (years)	
21- 30	1
31- 40	2
41-50	3
> 51	8
Average age = 52years	
Sex	
Male	10
Female	4
Education	
Non- formal	9
Basic	2
Middle school/ J. H. S	2
O. Level/ S. H.S	1
Farming experience (years)	
< 10	1
10 – 20	2
21 – 30	2
31 – 40	3
> 40	6
Land ownership status	
Owner of farmland	10
Non-owner of land	4

3.5 Ethical issues

For qualitative research like this study, appropriate ethical standards must be maintained. Ethical standards and procedures provide a platform where the interviewers and the respondents with the differences in expectations and understanding of the issues at stake share their experiences (Peled & Leichtentritt 2002). Interviewees/respondents were approached courteously and their opinions given due consideration during the research process. They were not promised any benefits or support from this study and it was agreed to keep their identity anonymous. The respondents' participation in this exercise was voluntary without being influenced or coerced. They were also provided with the necessary information on the study's goal, objectives and the processes involved in the data collection.

3.6 Gender Effects

In the rural communities of Northern Ghana men and women have highly differentiated roles. Gender inequalities affect women's ability to participate in discussions with development agencies in matters affecting their well-being since their numbers are limited in a development

committee, and as a result limit their full participation in development programmes. The cumulative effects of these problems are that the women are poverty-struck, ignorant and have a low standard of living (Bawku West District Assembly 2006). Moreover, studies show that women suffer most from land degradation and desertification as their needs including water, food and fuel-wood are adversely impacted because they travel longer distances and sometimes spend a whole day in search of firewood and water (DISCAP 2002).

The present study was not designed to address gender and gender equality issues, and it acknowledges the socio-economic traditions of the study area. The men in the study area are usually the heads of households and land owners, and therefore they were more likely to be interviewed in this study than women. However, the main purpose of the study was to improve understanding of the farmers' perceptions of the desertification process in Northern Ghana and of project interventions in order to develop more holistic and successful project/programme interventions to combat land degradation. If the study's findings will lead to improvements in designing and implementing desert control project interventions, it is expected to have a positive impact on the environment and people's livelihoods. As such, the expected impact is likely to have positive effects on gender issues, though more of an indirect than direct impact.

4. RESULTS

4.1 Indicators farmers associate with desertification

The farmers interviewed mentioned a number of indicators they associate with desertification, including its causes and negative impacts. All seven (7) respondents from Kubore were aware of desertification and land degradation in the community or their farms, whereas in Widnaba 5 had some knowledge of it.

The indicators farmers in the two communities associated with desertification are presented in Table 2 below. More than half of the respondents out of the 14 interviewed mentioned decline in soil fertility and low/poor crop yields as major signs of land degradation and desertification in the area, whilst only one (1) farmer linked poor germination/growth of indigenous crops to the phenomenon. Even though a prolonged/poor rainfall pattern is a consequence of desertification rather than indicator, as many as ten (10) respondents mentioned it as an indicator. Figure 2 shows photographs of bare land and deforestation in the communities as mentioned by the respondents.

Table 2. Indicators farmers in the Bawku West District associate with desertification (N=14)

Indicators associated with desertification	Frequency
Reductions in vegetation/tree cover	7
Increased bare patches of land	2
Soil erosion (rills and gullies)	2
Decline in soil fertility	9
Low/poor crop yields	12
Poor germination/growth of indigenous crops	1
Disappearance of native species	3
Diseases/pests to crops	2
Prolonged/poor rainfall pattern and drought	10

Interestingly, the three (3) oldest farmers among the respondents, with the ages of 62, 73 and 76 years, stated disappearance of native species as a sign of desertification. When the 73 year old farmer was asked about the causes of land degradation/desertification in his community, he was quick to note the following observations, *“all the environmental problems in this community [referring to Widnaba] are caused by the youth who have abandoned school and just idling about”*. He continued, *“they burn the forest every year because they are looking for small rats, and this act sometimes spread beyond control and destroy several acres of millet or maize farms”*. He further suggested that the youth did not know the importance of environmental resources, especially the forest which used to provide them with certain special herbs for treating various diseases and that it was very dangerous to enter the once dense forest many years back. According to him, it is because of a lack of knowledge and appreciation of the environment that the youth behave in the way they do. However in Kubore, one (1) respondent rather blamed the reduction in tree cover on a group of people involved in large scale firewood sales and charcoal production and also nomadic herdsmen (‘Fulani’) who move with their cattle from Mali through the community on their way to the southern part of Ghana.



Figure 2. Bare land with scanty plants in the Kubore area (left). (Photo: Emmanuel Yeboah, 10 May 2014). Trees cleared along the wildlife reserve in Widnaba to open up new land for cultivation (right). (Photo: Vitus Asalinga, 14 June 2013).

4.2 Farmers’ understanding, involvement and perception of desertification control projects

All the farmers interviewed except two (2) said they have benefited from or been involved in anti-desertification related projects in one way or another, but not all of them had been participating at the same time. The majority of the respondents (11 out of 14) had the perception that project interventions to combat desertification are mainly tree planting/growing by Government and Non-Governmental Organisations (NGOs) as shown in Table 3 below. They cited establishment of woodlots, growing fruit trees and afforestation (Fig. 3) as the most notable tree planting interventions, among others.

Four (4) respondents perceived desertification control interventions as support from the Government to the farmers/communities to adopt measures to restore degraded lands whilst seven (7) thought of it as education/sensitisation by government officials against bush burning

and felling of trees. The responses of contour and stone bunding, planting vertiver grass in erosion spots, planting trees on bare patches, minimum tillage and crop residue management were particularly mentioned by the more educated farmers who had gone through middle school and the O level. One of them from Kubore said he has been practicing minimum tillage as well as ploughing across the slope. He maintained that if the farmers in the community carry out good farming and sustainable land management practices on their land, not only will their livelihoods improve but also be sustained as the fertility of the soils improves. According to them, their success stories will also attract additional support from ongoing or new projects as they would already be in the good books of project managers and institutions implementing the projects.

Table 3. Results of farmer’s perception on desertification control projects (N=14)

Farmers perception on desertification control projects	Frequency
Tree planting initiated by government and NGOs -establishment of woodlots, growing fruit trees, riparian protection and afforestation	11
Education/sensitisation -against bush burning, against tree felling and to turn crop residues into compost	7
Training and assistance for livelihood activities -beekeeping, basket weaving, rearing small ruminants, shea butter production and local soap making	3
Support to restore degraded lands -contour and stone bunding, planting vertiver grass on erosion spots, planting trees on bare patches and along river bodies	4
Technical advice and support to practise sustainable land management (SLM) techniques -minimum tillage, crop residue management, use of compost and animal manure	3

With regards to practicing crop residue management and composting, the field investigations revealed that only one (1) farmer had prepared compost at Widnaba and two (2) in Kubore (Fig. 3). The farmer in Widnaba explained why he was the only one in the entire community to be making compost. According to him, it is labour intensive and time consuming to prepare a small quantity of compost for just an acre of land. ‘*Even though chemical fertilizer is expensive, it is better for us and it gives us quicker results*’, he said. He added that he could not stop using chemical fertilizer but rather will use it alongside the organic compost.



Figure 3. Cassia Plantation (1-year old) in Widnaba established by the GEMP project (left). (Photo: Osman Fuseini, 26 August 2013). Picture showing compost preparation by household in Kubore (right). (Photo: Yussif A. Mumin, 19 July 2014).

For his part, the chief of Widnaba said he was the chairman of the Community Environmental Management Committee formed in 2010 by EPA through the GEMP project, and he also oversees the fire volunteer squad. According to him, EPA recently gave the anti-bush fire squad wellington boots and cutlasses and they also receive training and sensitisation every year at the onset of the dry season from the Ghana National Fire Service (GNFS) to prevent bush fire cases in the community particularly preventing fire from entering the eastern wildlife corridor. The chief however added that sometimes they also get promises from different organisations to help them fix their land problems, but they end up not getting the support, or other times the support is too small to make any meaningful impact on their lands which leaves his people discouraged about the projects.

When asked about their involvement in past or present projects, the majority of the respondents answered that they have been part of general communal interventions involved in tree planting and aftercare, as well as members of environmental committees and fire volunteer squads. Four (4) of them said that they had also participated individually by practicing SLM activities on their farms. According to the farmers, they usually find out about the projects in community meetings and fora, through radio announcements and sometimes from farmers in other communities. On the issue of the strength and weaknesses of the projects, most of the farmers interviewed mentioned that the support from the projects was not enough to counteract their main weaknesses. They particularly said many tree planting initiatives in the communities have been less successful because the material inputs such as chain-link for fencing, fencing poles, water storage tanks, watering cans, water holes and donkey carts for fetching water in some cases to the project site are not included in the support. A number of them, however, mentioned that the projects have led to increased income levels and capacity building on good environmental practices among the farmers as their main strengths.

4.3 Perceived ecological impacts of project interventions

Table 4 below presents results from respondents in Kubore and Widnaba on their perception of the ecological impacts of past and current project interventions. A significant half of the farmers interviewed (7) reported a reduction in the number of bush fire cases as the most evident

ecological impact in the area from anti-desertification projects, and out of this number, five (5) of them were from Kubore. The chief of Kubore recounted that there used to be a number of devastating bush fire cases and indiscriminate tree felling in the community, but because of the continuous sensitisation by EPA and GNFS officials, the number of bush fire cases in the community has been reduced. He said, *“with the support we get from [the] Government, the Assembly Member of this community has helped me to put in place community bye-laws with stringent punishment to culprits who set the bush burning other than their farms but it still occurs at night and my people usually say it comes from somewhere else into our community. I have also advised fire wood gatherers to avoid cutting down live trees and rather take only the dry branches of trees or dead wood and I think it is working”*.

Table 4. Farmers’ perception of the ecological impacts of project interventions (N=14)

Perceived ecological impacts of project interventions	Frequency
Enhanced protection of river catchment area	1
Improvement in soil fertility on farm	4
Increased protection of soil from erosion	2
Reduction in number of bush fire cases	7
Reduction in rate of indiscriminate tree felling	4

Figure 4 below shows pictures of a natural regeneration area from bush fires and other disturbances and protection of soil from water erosion through stone lining. Out of the 14 farmers interviewed two (2) indicated increased protection of soil from water erosion as their observable ecological impact from the interventions.

Four (4) respondents each indicated improvement in soil fertility through increased knowledge and practice of SLM techniques on farms and reduction in the rate of indiscriminate tree felling as the ecological impact of land restoration projects. However, one (1) of them expressed his frustrations and challenges with the implementation of communal projects. According to him, after the farmers initially put so much effort into a tree growing project, the drought set in later and without provisions for an alternative source of water by the project or fencing, the plants died and other times too animals or fire destroyed them because nobody really cared about it. But, he also mentioned that he had successfully rehabilitated the rill erosion which used to be on his farm and his brother too had established a 1-acre mango plantation on his farm with the support from a project.





Figure 4. Natural regeneration and non-bush burning in Widnaba. Area not practiced (A1). Area practiced (A2). Stone lining against water erosion in Kubore. Farmers lining stones (B1). Lined stones, grass and shrubs restored the degraded land (B2).

4.4 Socio-economic benefits derived from the project interventions

All the respondents who had been part of desertification control projects reported a change in the socio-economic setup of their communities or their own lives. The respondents cited a number of benefits they have derived from the interventions (Table 5).

Table 5. Results of respondents on the socio-economic benefits of project interventions

Socio-economic benefits of project interventions	Frequency
Increased crop yields	4
Provision of potable water (borehole and well)	2
Increased income from alternative livelihood activities (shea butter production, local soap and pomade making, bee keeping)	6
Formation of groups (accessing credit, benefits sharing and assisting one another)	8
Provided fuel/fire wood for households	2
Increased women's participation in community work	1

The most common benefits mentioned by respondents were that the desertification project interventions have led to the formation of groups and associations. These associations have then helped the farmers to access credit from banks and savings and loans institutions, as well as resulted in an increase in their income from the alternative livelihood activities with eight (8) and six (6) respondents respectively. Beneficiary farmers were quick to point out that the livelihood support has increased their income and improved their living conditions. Whereas the women interviewed benefitted most from the alternative livelihood activities including shea butter production, local soap and pomade making, the men only benefitted from the bee keeping activity (Fig. 5). A farmer in Widnaba involved in the bee keeping activity said he was no longer relying on his farm production alone. Now he makes extra money from the harvest of the honey to take better care of his wife and children, but his major problem is during the dry season when people burn the trees.



Figure 5. Pictures of alternative livelihood schemes. Shea butter mill (left). Bee hive mounted on trees (right). (Photos: Emmanuel Yeboah, 20 July 2014).

The least frequent answer was that the interventions have contributed to an increase in women's participation in community work. Two (2) of the respondents mentioned that the projects have provided them with firewood. One of the women interviewed in Kubore said she was part of a fuel woodlot project established in the community by an NGO, more than 15 years ago. As she put it, *“the woodlot belongs to the NGO so the community members cannot use it as we wish except occasionally when members who were part of its establishment are allowed to harvest the tree branches for firewood”*.

In an attempt to estimate the problem going forward, farmers were also asked the specific questions: what they needed in order to improve their land conditions and what they thought farming in the area would be like in the next 20 years? Majority of the farmers (11) mentioned fertilizer as the most common resource they needed to fix the declining soil fertility and therefore improve crop yields. Other similar resources cited were tractor/bullock for ploughing their farm lands before planting, as mentioned by eight (8) farmers followed by three (3) farmers who said they needed credit to purchase farm inputs and to maintain their farms. A farmer lamented that the support they get usually comes late and is too small to make any meaningful impact on their land. He mentioned an instance from seven (7) years ago. Back then his community received tree seedlings from a project at the end of the rainy season for a communal afforestation project but the project eventually failed because the rains soon stopped and the plants withered. He suggested that for any project involving tree planting, it must start early in the rainy season and fruit trees must also be considered as that has multiple benefits and the farmers would be encouraged to take good care of them along with their farming activities. In addition, the Widnaba chief mentioned that if the Government or NGO wanted them to plant trees in the future, then he expects the projects to provide them with all the materials/inputs necessary for the successful implementation of those interventions. According to him, project managers sometimes complain to him about the failures of their initiatives and blame the community members for that, yet his people in the community are telling him different stories about those interventions and reasons for their failures.

With regards to the question on the future of farming in the area, six (6) respondents simply said they did not know what the future of farming in the area would be like. Four (4) farmers mentioned that they expected the conditions of the land to improve. They foresee that the agricultural potential will increase, but only if the institutions implementing the projects

increase their effort in terms of the support given to farmers and cover a lot more farmers, otherwise the bush fires and tree felling cannot be controlled. The chief of Widnaba said if the Government continues and also increases the support given to them, then they will be able to improve their soil fertility and produce enough food to feed themselves and other community members in the near future. Two (2) other farmers said the rainfall pattern kept shifting backwards and at the time of this interview on the 19th and 20th of July 2014, they were yet to receive rain for cultivation. For this reason, one (1) of them anticipated a change in cropping from the use of their familiar local crops to other crop species with a short gestation period and the other expected a shift from rain-fed farming to irrigation farming in the future.

5. DISCUSSION

Based on the study results, a majority of the farmers were aware of land degradation and threats of desertification in their communities. This is particularly encouraging given that the district has participated in a number of desertification control projects to date, yet research shows that the land in the district continues to be degraded (Gyasi et al. 2006; Yiran et al. 2012). The farmers can tell that their farmlands are degraded and the evidence within the literature Dejene et al. (1997) supports this outcome. Almost exclusively, the respondents referred to low/poor crop yield as a sign of decline in soil fertility and therefore land degradation. However, a large number of the respondents also referred to a prolonged/poor rainfall pattern as an indicator of desertification because that is the most evident factor on drought and desertification in the area and that determines the farming seasons in the area. This response also suggests a strong linkage between rainfall and decline in soil fertility and its subsequent effect on low/poor crop yield.

For the few farmers interviewed, those with a higher level of formal education (middle school and ordinary level) appeared to be more aware of the conditions of their land. As mentioned in the results, they were more aware of the benefits of the anti-desertification projects to their farms and communities and their responses indicated a higher priority to desertification issues compared to the lower and non-formal educated farmers. This corresponds with the conclusions drawn by Cao et al. (2009), who stated that higher educated farmers were more eager to participate in a land restoration project and implement its activities.

Given that the disappearance of native species as an indication of land degradation was mentioned by the oldest farmers among the respondents, with particular reference to a community forest as being the repository for herbal medicine in the past, gives some hint. This suggests that the farmers' perception about the land and its resources can be linked to their knowledge, belief and experience with the forest, which is supported in the literature by Te Velde et al. (2002). Furthermore, it is widely known that reduction in tree cover is a notable indicator of land degradation and desertification and the farmers' responses with regard to dwindling vegetative cover and land degradation in the study area is an additional demonstration that they can easily notice changes in the tree cover and therefore are capable of reading their land.

A majority of the farmers perceived desertification control projects mainly as tree planting or afforestation. This outcome is in accordance with the findings of Annorbah-Sarpei et al. (1993) that initiatives by government and NGOs to safeguard the land resources in Northern Ghana have mainly focused on tree planting. Even though the farmers indicated support for land restoration activities, their responses seem to imply a common opinion shared among them that the projects, particularly communal afforestation, belong to the Government or implementing organizations. As such, the farmers do not see themselves as part of the interventions. They

referred to plantations and afforestation projects established in their communities as belonging to the Government. This seems to suggest that community participation through partnership, empowerment and control was not thoroughly pursued by some of the projects. Even where other projects employed participatory approaches, it appears the farmers do not recognise the institutionally driven approach of project interventions, which are typically initiated externally as a joint effort or the farmers simply disagree on the goals and priorities of the interventions due to uncertainty of ownership (Annorah-Sarpei et al. 1993; Carvalho et al. 2002).

This outcome reemphasizes Arnalds (2005) findings in his study of Approaches to Landcare - A Century of Soil Conservation in Iceland. According to Arnalds (2005), past land restoration interventions in Iceland have failed to achieve their expectations, even with enormous effort and resources because of their institutionally driven approach (top-down). The report said this has occasioned a perception among local stakeholders that project interventions belong to the Government instead of individual farmers or communities claiming ownership. Arnalds (2005) also reported that in many cases, the interventions focused on the indicators of land degradation and not the actual source of the problems, which is worth taking note of.

In spite of this, responses from the farmers suggested that the projects have led to greater awareness against bush burning and tree felling. Nevertheless, these degradative activities are still ongoing in the communities. The farmers know that their actions can lead to severe land degradation, nonetheless their long-term established attitudes and environmental values appear slow to change. From the interviews, it appeared that perceptions and attitudinal changes even among some of the farmers have little influence on their behaviour/actions and there was also an indication that the local people will go back to the old practices once the projects end. A similar outcome was given by Rogan et al. (2005) who stated that farmers acknowledge the support for restoration projects, but think the impacts are long term and hence are reluctant to change their attitudes from the old order, and even where there are changes, it is slow.

In addition, it appeared that the interventions in the BWD usually occur on a small scale with few farmers or households participating from the communities. As a result, the other members of the community who are not involved in the project or do not benefit from it continue to impede the efforts of the restoration by their actions. From the responses in this study, one way to sustain farmers' interest and support to the desertification control projects is to consider the promotion and adoption of agroforestry.

Land ownership did not seem to influence the farmers' perception of land restoration projects. Respondents from the two communities showed that men were the customary land owners, but women helping their husbands on the farms could as well employ good farming practices. Similarly, insignificant trends appeared for the farming experience. The number of years of farming alone did not appear to have influence the farmers' perception of land restoration projects.

In terms of the ecological impacts of desertification control projects, the responses indicated that the interventions have achieved some successes, but on a smaller scale because only a small fraction of land users are usually involved. It also appeared that farmers have little motivation to follow through with hard manual restoration work which ends up not yielding any benefits to them or their communities. These findings correspond to the study by Carvalho et al. (2002) on agroforestry programmes in restoring degraded lands in Portugal. Again, it became clear in the present study that individual farmer projects were more successful than the communal ones. Another observation made in this study was that different organisations, governmental and non-governmental, are doing the same things in trying to help farmers and communities dealing with the effects of land degradation and desertification, which is not bad but leads to inefficient

use of inadequate funding, as was also reported by Owusu (2012). Moreover, there seems to be a lack of coordination between project organisers, as well as inconsistent approaches being employed by some of the projects, leaving doubts in the minds of the farmers as to the real objectives of the interventions. This finding is consistent with the findings by Mudita (1999).

Besides restoring degraded lands, most of the projects provide alternative livelihood schemes to participants in order to reduce the pressure on land resources (Imeson 2012). The alternative livelihood support is usually in the form of non-agricultural and off-farm activities such as: beekeeping, shea butter production, guinea fowl production, mat/basket weaving, fruit tree growing, local soap making, mushroom growing and fish farming. For instance, the beekeeping activities are strongly linked to a reduction in the pressure on tree cover because to produce honey, the bees use nectar from plants and so beneficiaries are encouraged to protect the trees from bush fire and indiscriminate cutting. Unfortunately, it appeared some beneficiaries do not recognise the linkages and even those who do also lack local support/regulations to protect their interests.

The study results also appear to demonstrate improvements in the social cohesion in the communities through the formation of groups and associations, as well as access to alternative forms of credit. These positive effects are encouraging for community driven actions in the future. However, it must also be pointed out that only a few individuals or groups from the communities often enjoy these economic incentives and empowerment.

6. CONCLUSION AND RECOMMENDATIONS

The study met its objectives in examining the farmers' understanding of desertification and their perception of project interventions in the BWD. The farmers interviewed were aware of land degradation and the threats of desertification in their communities and their impact on their farmlands. They can tell that their farmlands are degraded based on low/poor crop yield which they associate with a decline in soil fertility and prolonged rainfall/drought. They also provided insights into their experience and options of desertification control projects. The focus of many of the interventions in the district is community tree growing/afforestation. Meanwhile individual farmers received some support in terms of technical advice on SLM techniques, training and assistance for alternative livelihood activities. The farmers perceived project interventions, particularly communal plantations and afforestation, as belonging to the Government or implementing organizations and not to the communities. This indicates that more work needs to be done by project implementing organisations to make the farmers feel that they are the owners of the interventions. As Arnalds (2005) upholds, increasing bottom-up participatory approaches will build a sense of local ownership, which is vital to successful land restoration interventions.

It has been highlighted by this study that the farmers interviewed knew that their actions may be causing severe land degradation, but they are reluctant/slow to change their attitudes. It is however important to note that perceptions and attitudes do not always lead to behavioural change or action. Further studies, such as a comparative study in communities less popular with project interventions, or an examination of the underlying values, beliefs and short term interests associated with land use, could be useful to understand why farmers continue to follow practices that are causing land degradation. From the interviews, the farmers' perceptions of land restoration projects are based on their knowledge, beliefs and feelings. Respondents indicated support for land restoration activities, but some of the farmers have had negative

experiences with the projects and this creates despondency among them; therefore they have become less enthusiastic about implementing the interventions.

In terms of ecological impacts, it appears the projects have been less successful. The impression given is that only a small fraction of farmers or households from the entire communities usually get direct support/benefits, and the efforts of these engaged individuals are not protected by community bye-laws or regulations. Implementing organisations must look for ways to upscale existing projects or sustaining them in the long term. As recommended by Arnalds (2005), for project implementing organisations to build shared trust with farmers as well as to promote the adoption of SLM practices, long-term financing or duration interventions are imperative. In some cases, recovery of severely denuded lands can even take up to 25 years or more (Bainbridge 2007), and therefore interventions require a long-term commitment from funding and implementing agencies. It is also important for different implementing organisations working on restoration activities in the same community or area to coordinate their actions in order to operate at a sufficiently larger scale with the possibility of achieving real socio-economic and ecological impacts. Enhanced education together with increased technical support and economic empowerment will also help to sustain behavioural changes and to prevent farmers from going back to their old habits.

The local target population will only fully embrace a restoration idea and give it their maximum support if the project interventions meet their real needs with regards to the socio-economic and ecological conditions and with their full involvement in taking local actions. To plan any desertification control project, it is important to incorporate the needs and preferences of the target population at all stages of decision making and particularly give special attention to the perceptions of the people making use of the land resources.

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REFERENCES

- Abahussain, A. A., A. S. Abdu, W. K. Al-Zubari, N. A. El-Deen, and M. Abdul-Raheem. 2002. Desertification in the Arab region: analysis of current status and trends. *Journal of Arid Environments* **51**:521-545.
- Agyemang, I., and R. Abdul-Korah. 2014. Strategies to combat desertification in Northern Region of Ghana: The role of Environmental Protection Agency. *Physical Sciences Research International* **2**(2): 35-43.
- Annorbah-Sarpei, J., N. Dube, E. Rugumayo, S. B. Schearer, and J. Tomlinson. 1993. The importance of participatory approaches for dry land management and anti-desertification programs. Based on case studies from Burkina Faso, Ghana, Kenya and Zimbabwe. Prepared for the Intergovernmental Negotiating Committee for a Convention to Combat Desertification.
- Armah, F. A., J. O. Odoi, G. T. Yengoh, S. Obiri, D. O. Yawson, and E. K. Afrifa. 2011. Food security and climate change in drought-sensitive savanna zones of Ghana. Mitigation and adaptation strategies for global change. *Mitig Adapt Strateg Glob Change* **16**:291-306.
- Arnalds, A. 2005. Approaches to Landcare—a century of soil conservation in Iceland. *Land Degradation & Development* **16**:113-125.
- Bainbridge, D. A. 2007. *A guide for desert and dryland restoration: new hope for arid lands*. Island Press, Washington D.C.
- Barlow, H. 1990. Conditions for versatile learning, Helmholtz's unconscious inference, and the task of perception. *Vision Research* **30**:1561-1571.
- Bawku West District Assembly. 2006. URL <http://bawkuwest.ghanadistricts.gov.gh/> [accessed on 25 May 2014].
- Brandt, J., N. Geeson, and A. Imeson. 2003. A desertification indicator system for Mediterranean Europe. URL <http://www.kcl.ac.uk/desertlinks> [accessed on 10 May 2014].
- Cao, S., C. Xu, L. Chen, and X. Wang. 2009. Attitudes of farmers in China's northern Shaanxi Province towards the land-use changes required under the Grain for Green Project, and implications for the project's success. *Land Use Policy* **26**:1182-1194.
- Carvalho, T., C. Coelho, A. Ferreira, and C. Charlton. 2002. Land degradation processes in Portugal: Farmers' perceptions of the application of European agroforestry programmes. *Land Degradation & Development* **13**:177-188.
- Craswell, E., A. Sajjapongse, D. Howlett, and A. Dowling. 1998. *Agroforestry in the management of sloping lands in Asia and the Pacific*. Pages 121-137. *Directions in Tropical Agroforestry Research*. Springer.
- Crofts, R., and F. G. Olgeirsson. 2011. *Healing the Land: The Story of Land Reclamation and Soil Conservation in Iceland*. Soil Conservation Service.

Dejene, A., E. K. Shishira, P. Z. Yanda, and F. H. Johnsen. 1997. Land degradation in Tanzania: perception from the village. World Bank Technical Paper No. 370, World Bank Publications, Washington D.C.

Diao, X., and D. B. Sarpong. 2007. Cost implications of agricultural land degradation in Ghana: an economywide, multimarket model assessment. International Food Policy Research Institute, Ghana Strategy Support Program (GSSP). Background Paper No. GSSP 0003: 1 – 3.

DISCAP (District Capacity Building Project). 2002. District Capacity Building Project: Gender Analysis and Strategy, Accra, Ghana. URL <http://www.discap.org/Publications/Gender%20Analysis%20and%20Strategy.pdf> [accessed on 25 May 2014].

EPA (Environmental Protection Agency). 2003. National Action Programme to Combat Drought and Desertification. EPA, Accra, Ghana.

EPA (Environmental Protection Agency). 2005. Third National Report to the Committee for the Review of the United Nations Convention to Combat Desertification. EPA, Accra, Ghana.

EPA (Environmental Protection Agency). 2011. Ghana Strategic Investment Framework (GSIF) for Sustainable Land Management (SLM). EPA, Accra, Ghana.

GEF (Global Environmenta Facility). 2002. Ghana Northern Savanna Biodiversity Conservation Project, Project Appraisal Document. GEF, Washington, D.C. URL http://www.thegef.org/gef/sites/thegef.org/files/repository/Ghana-Northern_Savanna_Biodiversity_Conservation.pdf [accessed on 11 May 2014].

GEF (Global Environmenta Facility). 2003. Medium-Sized Project Brief: Sustainable Land Management for Mitigating Land Degradation, Enhancing Agricultural Biodiversity and Reducing Poverty (SLaM) in Ghana. GEF, Washington, D.C. URL http://www.thegef.org/gef/sites/thegef.org/files/gef_prj_docs/GEFProjectDocuments/Land%20Degradation/Ghana%20%20Sustainable%20Land%20Management...Mitigating...Enhancing%20Agricultural...SLaM/3-10-04%20Revised%20SLaM%20Ghana.pdf [accessed on 11 May 2014].

Ghana Statistical Service. 2012. Population and Housing Census (2010), Accra, Ghana. URL http://www.statsghana.gov.gh/docfiles/2010phc/2010_population_and_housing_census_final_results.pdf [accessed on 19 May 2014].

Gyasi, E. A., O. Karikari, G. Kranjac-Berisavljevic', and V. V. Vordzogbe. 2006. Climate change vulnerability and adaptation assessment relative to land management in Ghana. University of Ghana, Legon, Accra. URL http://www.nlcap.net/fileadmin/NCAP/Countries/Ghana/LAND_MANAGEMENT_DRAFT_FINAL_REPORT.pdf [accessed on 11 May 2014].

Heberlein, T. A. 2012. Navigating Environmental Attitudes. Oxford University Press, New York.

Iddrisu, S. O. S. A., and E. M. Telly. 1999. National Report to the Third Session of the Conference of Parties to the United Nations Convention to Combat Desertification in National Validation Workshop of Stakeholders, Bolgatanga, May 17, 1999.

Imeson, A. 2012. *Desertification, Land Degradation and Sustainability*. John Wiley & Sons Inc., Chichester, UK.

Mack, N., C. Woodsong, K. M. Macqueen, G. Guest, and E. Namey. 2005. *Qualitative Research Methods: A Data Collector's Field Guide*. Family Health International, North Carolina, USA.

MES (Ministry of Environment and Science). 2005. *Ghana's National Capacity Self Assessment Report: Capacity Needs For Global Environmental Management*, Ministry of Environment and Science, Accra, Ghana.

Mudita, J. W. 1999. *The Readiness of Solving Land Degradation in Eastern Indonesia: The East Nusa Tenggara Case*. The Ministry of Forestry and Plantations, Jakarta.

Nicholson, C., J. Tucker, and M. B. Ba. 1998. Desertification, drought, and surface vegetation: An Example from the West African Sahel. *Bulletin of the American Meteorological Society*: **79**(51).

Ólafsdóttir, R., and Á. D. Júlíusson. 2000. Farmers' perception of land-cover changes in NE Iceland. *Land Degradation & Development* **11**:439-458.

Ouma, G., and L. Ogallo. n.d. *Desertification in Africa*. URL https://profiles.uonbi.ac.ke/gouma/files/desertification_final.pdf [accessed on 13 April 2014].

Owusu, A. B. 2012. Farmers coping with the threat of desertification: A case study of the Upper East Region, Ghana. *Wudpecker Journal of Agricultural Research* **1**(8): 317 - 330.

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. 3rd edition. Sage Publications, Thousand Oaks, CA. http://www.goodreads.com/book/show/236023.Qualitative_Research_Evaluation_Methods [accessed on 26 May 2014].

Peled, E., and R. Leichtentritt. 2002. The Ethics of Qualitative Social Work Research. *Qualitative Social Work* **1**:145-169.

Rogan, R., M. O'Connor, and P. Horwitz. 2005. Nowhere to hide: Awareness and perceptions of environmental change, and their influence on relationships with place. *Journal of Environmental Psychology* **25**:147-158.

Schaich, H. 2009. Local residents' perceptions of floodplain restoration measures in Luxembourg's Syr Valley. *Landscape and Urban Planning* **93**:20-30.

Scherr, S. J., and S. Yadav. 1996. Land degradation in the Developing World: Implications for food, agriculture, and the environment to 2020. *Food, Agriculture, and the Environment Discussion Paper* **14**:3.

Sears, D. O., J. L. Freedman, and L. A. Peplau. 1985. *Social Psychology*. 5th edition. Prentice-Hall Inc., Eaglewood Cliffs, New Jersey 07632, USA.

Te Velde, H., N. Aarts, and C. Van Woerkum. 2002. Dealing with ambivalence: farmers' and consumers' perceptions of animal welfare in livestock breeding. *Journal of Agricultural and Environmental Ethics* **15**:203-219.

UNCCD (United Nations Convention to Combat Desertification). 1994. *United Nations Convention to Combat Desertification*, United Nations, New York, USA. URL <http://www.unccd.int/Lists/SiteDocumentLibrary/conventionText/conv-eng.pdf> [accessed on 30 April 2014].

UNCCD (United Nations Convention to Combat Desertification). 2011. *Desertification: A Visual Synthesis*. UNCCD Publications. URL <http://www.unccd.int/Lists/SiteDocumentLibrary/Publications/Desertification-EN.pdf> [accessed on 30 April 2014].

UNU (United Nations University). 2007. *Desertification and the International Policy Imperative*. Pages 338 in C. King, H. Bigas and Z. Adeel, editors. *Proceedings of a Joint International Conference*, Algiers, Algeria, December 17-19, 2006.

World Bank. 2007. *Ghana Country Environmental Analysis*. No. Report No. 36985-GH. Washington, DC. URL <https://openknowledge.worldbank.org/handle/10986/7568> [accessed on 10 April 2014].

Yiran, G., J. Kusimi, and S. Kufogbe. 2012. A synthesis of remote sensing and local knowledge approaches in land degradation assessment in the Bawku East District, Ghana. *International Journal of Applied Earth Observation and Geoinformation* **14**:204-213.

APPENDICES

Appendix I

Questionnaire

1. What is your age? 0-20 21-30 31-40 41-50 51 and above
2. What is your level of education?
3. How long have you been farming?
4. What are the changes you have observed in the condition of the land for the period you have been farming?
5. What will you associate with low soil fertility on your farm?
6. Do you know what a desert land/desertification is? Yes No . If yes, can you please explain?
7. What do you think are the causes of land degradation in this area?
8. What is the Government or NGOs doing about the land condition in this area?
9. What is your understanding of project intervention to combat desertification?
10. Do you know of any project/intervention to halt desertification in this area?
11. How did you get to find out about the project?
12. What is/was your involvement in the project?
13. What are/were the strengths of the project?
14. What are the weaknesses?
15. Are you doing something on your farm to reduce land degradation?
16. How has the project changed your life/the community?
17. How would/did other people benefit from the project?
18. How do you use the new information (or knowledge) from project intervention in your day-to-day life?
19. Are you using any other knowledge or information to reduce land degradation on your farm?
20. What do you need in order to improve your land condition?
21. What do you think farming in this area will be like in 20 years?

Appendix II

Acronyms / Abbreviations

BWD	-	Bawku West District
CIPSEG	-	Cooperative Integrated Project on Savanna Ecosystems in Ghana
DADU	-	District Agriculture Development Unit
EPA	-	Environmental Protection Agency
GEMP	-	Ghana Environmental Management Project
GERMP	-	Ghana Environmental Resource Management Project
GNFS	-	Ghana National Fire Service
NAP	-	National Action Plan
NEAP	-	National Environmental Action Plan
NGO	-	Non-Governmental Organisation
NPACD	-	National Plan of Action to Combat Desertification
NSBCP	-	Northern Savannah Biodiversity Conservation Project
SCSI	-	Soil Conservation Service of Iceland
SLaM	-	Sustainable Land Management for Mitigating Land Degradation, Enhancing Agricultural Biodiversity and Reducing Poverty Project
SLM	-	Sustainable Land Management
SLWMP	-	Sustainable Land and Water Management Project
SSEZ	-	Sudan Savanna Ecological Zone
UER	-	Upper East Region
UNCCD	-	United Nations Convention to Combat Desertification