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An Assessment of Farmers Perception and Adaptation Strategies to Climate Change in Beposo, Ghana

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Accepted

Abstract: This study analyses farmers' perception on climate change, their adaptation strategies in response to climate change and barriers to the adaptation process. A survey of 100 randomly sampled farmers was conducted using a standard questionnaire. An interview schedule was the main tool of data collection while descriptive statistics were the main analytical technique. Majority of the farmers studied perceived increase in temperature and a decrease in rainfall. In adapting to climate change, 91% of the farmers change planting dates, 86% use different crop varieties and 72 % implemented soil conservation measures as the major choice of adaptation techniques to climate change. Major barriers to climate adaptation are insufficient access to inputs and lack of credit.

Keywords: Adaptation, Barriers, Climate Change, Farmers, Perception, Descriptive Statistics

1. Introduction

Changes in climate as a global environmental problem has gained a lot of attention due to its negative impact especially in developing countries where the key goals related to poverty reduction, water, food, energy, education and health are critically influenced by climate change. Agriculture is important for food security in two ways: it produces the food people eat; and (perhaps even more important) it provides the primary source of livelihoods for most developing countries like Ghana. Minimizing the impacts of climate change requires perception and adaptation. Farmer's ability to perceive climate change is a key precondition for their choice of adaptation. Works by (Maddison, 2006) revealed that adaptation to climate change requires that farmers must first perceive that climate has changed, then identify useful adaptation options and implement necessary adaptation responses. Adaptation is widely recognized as a vital component of any policy response to climate change. It is reiterated that adaptation comprises actions to reduce vulnerability or enhance resilience (Adger & others, 2007). Adaptation measures therefore should be tackled in the context of development policies. Yamin and Huq (2005); Huq et al., (2006) and the World Resources Institute in recent methodological case study analysis have addressed how adaptation can be framed in the context of development. (McGray & others 2007).

Few attempts have been made to study farm level adaptation methods in the rainforest zones of Africa (NMSA, 2001; Nhemachena & Hassan, 2007; Deressa 2007 et al., Nwajiuba et al., Deressa 2007 et al., 2008 and Yesuf et al., 2008). Of these studies only Deressa et al. (2008) and Yesuf et al 2008 in Ethiopia attempted to determine the barriers to adaptation to climate change in the rainforest zone leaving a void in research. Against this background, the current study seeks to explore farmers' perception and adaptation to climate change in Ghana. Specifically the study seeks to (1) assess the socioeconomic characteristics of the respondents (2) assess the farmers perception on climate change (3) assess the farmers choice of adaptation measures in response to climate change and (4) identify barriers to adaptation measures.

1.1 Literature review

Climate is the primary determinant of agricultural productivity. Given the fundamental role of agriculture in human welfare, concern has been expressed by federal agencies and other stakeholders regarding the potential effects of climate change on agricultural productivity. Interest in this issue has motivated a substantial body of research on climate change and agriculture over the past decade.

Although causes and effects of climate change are separated in time and space, impact of climate change are unavoidable and happening now. Studies indicate that Africa agriculture is negatively affected by climate change (Pearce et al., 1996; McCarthy et al., 2001; Onyeneke, 2010) and that adaptation is one of the policy option for reducing the negative impact of climate change. (Adger et al., 2003; Kurukulasuriya & Mendelson, 2006). The risk of climate change to human and natural systems can be reduced by either adaptation strategies or mitigation (Klein et al., 2007). Therefore adaptation strategies are important as well as because of their ability to offset negative impact of climate change. Gbetibouo (2009) in his research on Understanding Farmers Perception and Adaptation to climate change and Variability also revealed lack of information and knowledge of appropriate adaptation measures as barriers to adaptation. Maddison (2006) and Nhemachena and Hassan (2007) showed that access to information through extension increases chances of adapting to climate change.

Adaptation has been defined by various groups with references to what they seek to solve. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities (IPCC, 2001). Although Smith et al. (2000) defines adaptation to include all adjustments in behaviour or economic structure that reduce the vulnerability of society to changes in climate system, adaptability refers to the degree to which these adjustments are possible in practices, processes or structures of systems to projected or actual changes in climate. Successful adaptation depends on technological advances, institutional arrangements, availability of financing and information exchange. (Watson et al., 1996:24)

The extent to which climate change impacts are felt depends largely on the extent of adaptation in response to climate change. Maddison (2006) identified farm size, tenure status, education, access to extension services, market access and credit availability, agro climatic conditions, topographical features and the availability of water as the major determinants of speed of adoption. Yesuf et al. (2009) in the analysis of the impact of climate change and adaptation on food production in Ethiopia also revealed changing crop variety, soil and water conservation as the major adaptation measures.

Farmers do face barriers when adapting to climate change. Barriers are defined as obstacles that can be overcome with concerted effort, creative management, change of thinking, prioritization and related shifts in resources, land uses, and institutions etc. Adger et al. (2007) argue that some barriers are malleable and can be overcome with sufficient political will, social support, resources, and effort.

2. Methodology

Study Area Description

Beposo lies in Shama in the Western part of Ghana and its geographical coordinates are $5^{\circ} 7' 0''$ North and $1^{\circ} 37' 0''$ West. It has an estimated population over 2000 and is predominantly a farming community.

Sampling and Data Analysis

A simple random sampling technique was used to select 100 farmers in Beposo. Using a standard questionnaire, an interview was the main tool of data collection while descriptive statistics such as frequencies, percentages and graphs were the main analytical technique.

3. Results and Discussion

Socio- economic characteristics of respondents

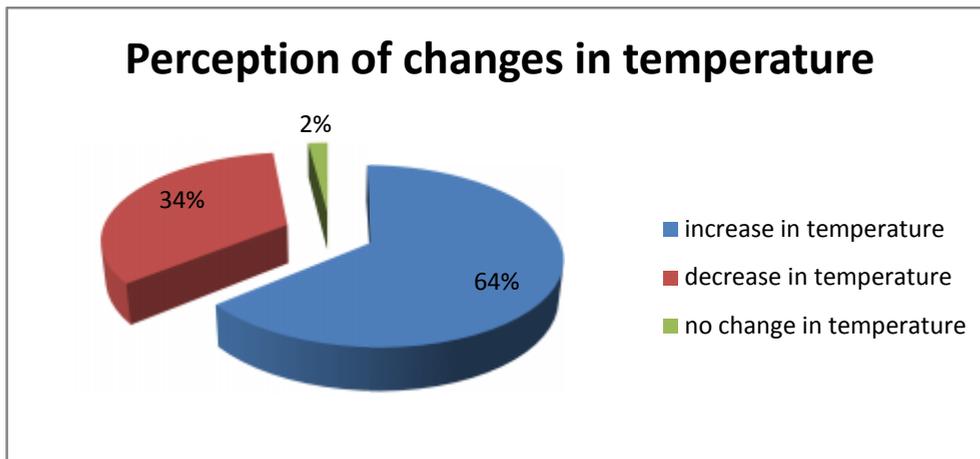
In an attempt to investigate the socio economic characteristics, respondents were asked questions pertaining to that. Of the respondents interviewed, the males constitute 54% while the remaining 46% were females. 16% of the respondents interviewed were between the ages of 20-30 years; 44% forming the majority were between 31-40 years; 32% were between 41-50 years, 1% was between 51-60years and 7% were between 61-70years. Of the respondents 54% were heads of their families while the remaining 46% interviewed were not. 43% of the respondents had household size between 1-5 persons, 50% had between 6-10 persons, and 7% had between 11-15 persons. Though educational levels of the respondents ranged from non formal to the tertiary levels, the number of years spent at these levels differed with the respondents. 6.0% of the respondents had no formal education; 14.0% had obtained basic education; 58.0% constituting the majority had obtained middle/Junior high school education, 21.0% had obtained O'level/Senior high school education and only 1% had obtained education up to the tertiary level. With regards to their farming experience, majority constituting 60.0% had 1-10years of farming experience, 19% had 11-20years, 14% had 21-30years, and only 7% had 31-40years experience. Majority of the respondents forming 73% were farming on their own land while the remaining 27% were farming on lands that belonged to families and friends. Of the respondents interviewed, majority constituting 74% had farmland size between 0.5-2acres, 19% had farmland size of 2.5-4 acres, 3.0% had farmland size between 4.5-6 acres, and 4% had farmland size between 6.5-8 acres. 87% of the respondents had other income generating activity while 13% only source of income was farming usually done on subsistence level. 2% of the respondents interviewed earned annual income between GH¢100-500, majority constituting 50% of the respondents earned annual income between GH¢600-GH¢1000, 28% earned between GH¢1100-GH¢1500, 11% earned between GH¢1600-GH¢2000, 1% earned between GH¢ 2100-GH¢2500, 4% earned between GH¢2600-GH¢3000 and 3% earned between GH¢3100-GH¢3500 and only 1% earned GH¢ 4500.

Perception of changes in Temperature

When asked about the perception of changes in temperature, majority constituting 64% of the total respondents perceived an increase in temperature. 34% of the respondents indicated decrease in

temperature while only 2% of the respondents were contrary to this opinion, ie. perceived no change in temperature.

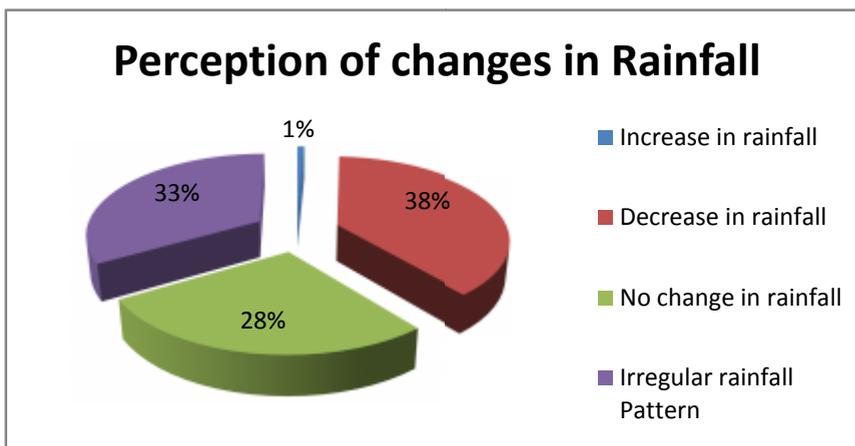
Figure 1.



Perception of changes in Rainfall

Only 1% of the farmers interviewed perceived an increase in rainfall. Up to 38% of the total respondents perceived decrease in rainfall. Although 29% of the total respondents perceived no changes in rainfall, up to 33% were contrary to this view since they perceived irregular rainfall pattern.

Figure 2

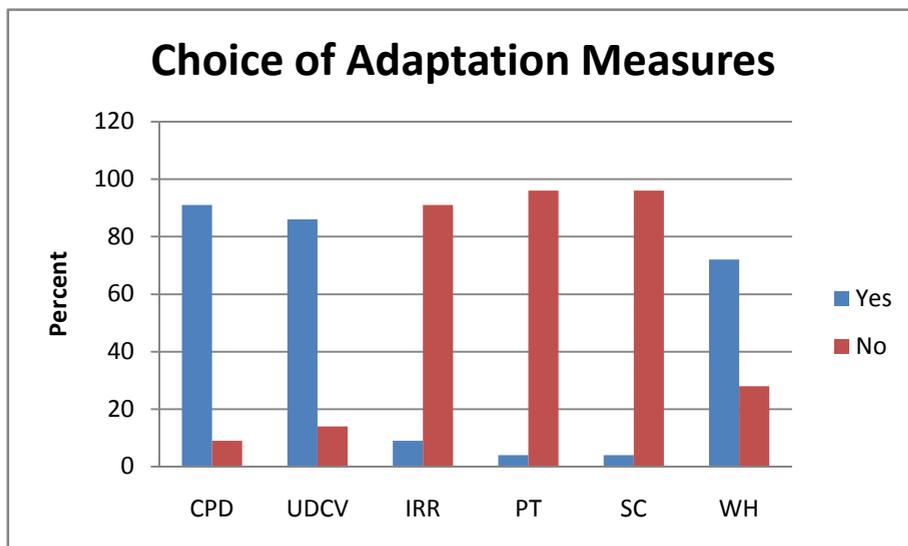


Choice of Adaptation Strategies in response to climate change

When asked if respondents (farmers) had some adaptation methods due to the perceived changes in climate, majority forming 87.4% of the total population had adaptation methods while the remaining 12.6% had not. Changing planting dates, using different crop varieties and water harvesting were the major methods. The use of irrigation, planting trees, and soil conservation were the least adapted strategies despite their numerous benefits.

91% of the respondents interviewed adapted changing planting dates while the rest (9%) did not see its significance. 86 % of the respondents adapted using different crop varieties while the remaining 14% did not. With irrigation as an adaptation method, only 9% of the respondents used it while the majority (91%) did not despite its contributions. Only 4% of the respondents adapted to planting trees as an adaptation measure while majority constituting 96% did not see its significance. Most respondents (96%) did not adapt to soil conservation during changes in climate with only 4% using this strategy. The use of water harvesting had 72% of the respondents adapting to this measure while the remaining 28% did not.

Figure 3

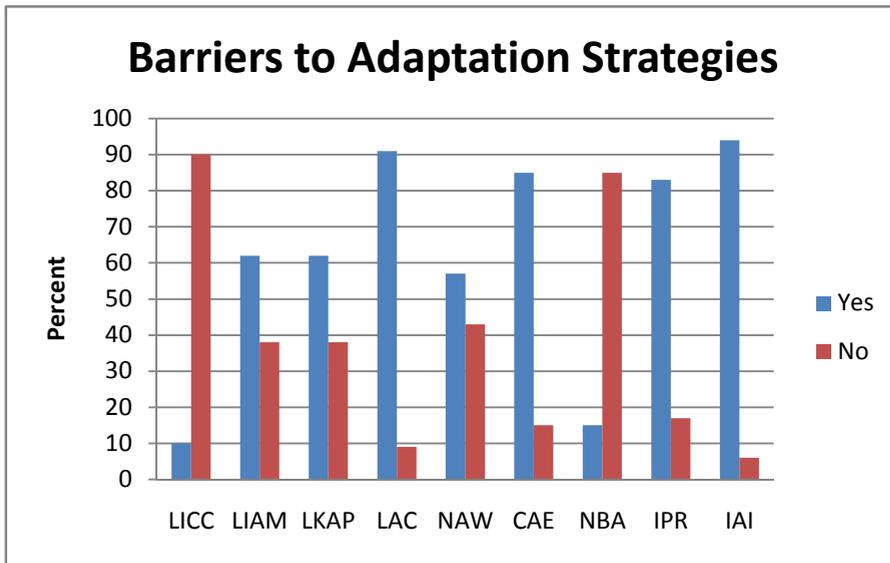


Note: **CPD** = Changing Planting Dates **UDCV** = Using Different Crop Varieties **IRR** = Irrigation
PT = Planting Trees **SC** = Soil Conservation **WH**= Water Harvesting

Barriers to Adaptation Strategies

When asked if there were no barriers to adaptation, only 15% of the total respondents indicated the affirmative while the remaining 85% forming the majority perceived barriers. Insufficient access to inputs, lack of access to credit, changes being expensive and insecure property rights were the major barriers to adaptation.

Figure 4



Note: **LICC** =Lack of Information about Climate Change **LIAM** = Lack of Information about Adaptation Measures **LKAO** = Lack of Knowledge about Adaptation Options **LAC** = Lack of access to Credit **NAW**= No access to Water **CAE** = Changes are Expensive **NBA** = No Barriers to Adaptation **IPR** = Insecure Property Right **IAI**= Insufficient Access to Inputs

Most (94%) attributed insufficient access to inputs as a major barrier to adaptation methods while only 6% of the total respondents were contrary to this opinion. 83% of the respondents perceived insecure property right as a barrier while 17% did not perceive so. 85% of the respondents perceived that changes to adaptation measures are expensive while the remaining 15% did not think so. Only 10% of the respondents indicated lack of information about climate change as a barrier while the remaining 90% had no problem with that. Lack of information on adaptation measures and lack of knowledge

about adaptation options both had 62% of respondents indicating them as barriers with the remaining 38% of respondents of each contrary to this opinion.

4. Conclusions

Farmer adaption to climate change is crucial since in Africa farmers are vulnerable to changes in the climate. However, in order to enhance policy towards tackling the challenges climate poses to farmers, it is important to have knowledge of farmer's perception on climate change, choice of adaptation methods and the barriers affecting adaptation to climate change. Specifically, the study investigated farmer perception of changes in temperature and rainfall, choice of adaptation methods, and barriers to adaptation methods.

Almost all the farmers interviewed perceived changes in climate. Most farmers perceived increase in temperature and a decrease in rainfall. Changing planting dates, using different crop varieties and soil conservation were the major choice of adaptation measures to climate change. Farmers indicated insufficient access to inputs and lack of credit to be the major barriers to adaptation. The assessment of farmers' perception and adaptation methods to climate change and its barriers suggest the availability of credit, availability of inputs, investing in yield-increasing technology packages, conducting research on less expensive adaptation measures, considering property right laws, improving extension services, encouraging farmer groups/networks and investing in irrigation as the areas that require policy emphasis.

Acknowledgments: The author is grateful to Miss Rebecca Owusu of the University of Cape Coast for her valuable support

Conflict of Interest

"The author declares no conflict of interest".

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