Journal of
Earth Science & Climatic Change

Afrifa et al., J Earth Sci Clim Change 2019, 10:4
DOI: 10.4172/2157-7617.1000516

Research Article Open Access

Adaptation Strategies of Rural Farmers to Climate Change at Wawasua Community in Brong Ahafo Region of Ghana

Alexander Baffour Afrifa[1]*, Anthony Baidoo[1] and Twene Oscar Opoku Yaw[2]

[1]*Centre for Climate Change and Gender Studies, University of Energy and Natural Resources, Ghana*
[2]*Department of Forest Science, University of Energy and Natural Resources, Ghana*

Abstract

Over the years, Brong Ahafo Region has experienced changes in climatic conditions. A descriptive cross-sectional study was conducted to investigate adaptation strategies of rural farmers to climate change in Wawasua community of the Sunyani Municipality. The data on 70 respondents selected were collected through focus group discussions, structured interviews and questionnaires and analyzed using Statistical Package for Social Sciences (SPSS) version 21.0. The study observed that the major effects of climate change on the rural farmers of Wawasua had been pest infestation, erratic rainfall, severe drought, increased temperature, food and water scarcity based on the levels of impact on the people's livelihoods. Majority of the farmers in the area had adopted some mitigation measures that could be used to address the climate change challenges including altering inputs, varieties and species for increased resistance to heat shock and drought, flooding and salinization; altering fertilizer rates to maintain grain or fruit quality; altering amounts and timing of irrigation and other water management; altering the timing or location of cropping activities. Strategies that are often deeply rooted in local cultures and knowledge are recommended for the rural communities. The ministry of food and agriculture should initiate programs that will help address some of the identified climatic challenges affecting the basic elements of food production.

Keywords: Climate change; Livelihood; Adaptation strategies

Introduction

Countries in Africa are among the most vulnerable globally to the effects of climate change because of the dependence of much of the population on agriculture, particularly rain-fed agriculture and widespread poverty that render them unable to withstand climate stress. Recurrent drought in many countries has demonstrated the effects of climate variability on food resources. Many people face food insecurity, even in good times, due to widespread poverty in many countries. Food security, nutrition, water resources and energy, are considered priority areas for the management of climate risk. The main aims within the agricultural sector are to analyze the vulnerability of the sector to climate change, support actions to improve resilience of agro ecosystems, and the development and transfer of technology for adaptation [1]. It is possible to identify two distinct responses to the impacts from a changing climate. One is to take steps to slow down and moderate the pace of change. Such actions are generally called 'mitigation' and have been designed to lessen emissions from activity generating carbon dioxide, methane and nitrous oxide (the most common greenhouse gases).

Another response to impacts from climate change is to focus on the ability or capacity of individuals, communities and nations to handle the impacts and/or take advantage of opportunities from altered conditions. Such actions are usually referred to as 'adaptation" measures. Developing and implementing adaptation strategies for climate change impacts is a specific element in formal international agreements. However, the climate change adaptation research, policy and programmes necessary for encouraging adaptation have been largely disregarded, despite the growing awareness that many regions and groups are increasingly vulnerable [2]. Possible adaptation strategies are assumed and tested for limiting or taking advantage of the projected effects from climate change. It advocates agro ecological farming approaches as the most suitable to support agricultural resilience of smallholders [1].

Top-down analysis frequently points to potential benefits for the food produced by agricultural sector if warmer temperatures and adequate moisture allow production to extend northward [3]. But such an outcome is conditional on producers having the capacity to take adaptive actions, a factor that is not always taken into account. Studies employing a bottom-up approach do focus on adaptive capacity and vulnerability and tend to be less optimistic about future climate change effects on rural community sectors, such as agriculture. This line of inquiry generally has a smaller-scale focus, namely the system of interest, and often begins by documenting current adaptive responses to a number of stresses (including weather and climate conditions) as the basis for understanding future capacity to adapt to climate [3].

Climate change and its impacts are reality in Ghana. Studies have shown that Ghana's climatic conditions have changed in the past four decades hence the focus of this study was on current community capacity. Results therefore fit within the bottom-up approach for understanding climate change impacts and adaptation. Key climate change policy documents indicate that compatibility between sustainable development goals and climate change actions is a key requirement for the development and implementation of climate change action [1].

Materials and Methods

Study area

The study was carried out in Wawasua of the Sunyani Municipality, Brong Ahafo Region. The study area lies between latitudes 7.35° N and 7.05° N and longitudes 2.30° W and 2.10° W [4]. The community members engage farming as major source of income.

***Corresponding author:** Alexander Baffour Afrifa, Centre for Climate Change and Gender Studies, University of Energy and Natural Resources, Ghana, Tel: +233(0)352290382; E-mail: alexander.afrifa@uenr.edu.gh

Received February 26, 2019; **Accepted** April 24, 2019; **Published** April 29, 2019

Citation: Afrifa AB, Baidoo A, Yaw TOO (2019) Adaptation Strategies of Rural Farmers to Climate Change at Wawasua Community in Brong Ahafo Region of Ghana. J Earth Sci Clim Change 10: 516. doi: 10.4172/2157-7617.1000516

Wawasua lies within the Wet Semi-Equatorial Climatic Zone of Ghana. The monthly temperatures vary between 23°C and 33°C with the lowest around August and the highest around March and April. The average annual rainfall is 88.99 cm. It experiences double maxima rainfall pattern with the main rainy season between March and September and the minor between Octobers to December. The relative humidity averaging between 75% and 80% during the rainy seasons and below 70% during the dry seasons is ideal for luxurious vegetative growth. The two major forest reserves in the study area are the Yaya and Amama Forest Reserves. Cocoa and citrus thrive well in the vegetation type in the Municipality. The water bodies including the Tano, Amama, Kankam, Benu, Yaya and Bisi rivers are seasonal [4].

The study adopted a cross-sectional survey study design involving the quantitative data collection techniques. This research was conducted in Wawasua community with a sample size of Seventy (70). The target population for this study included farmers (aged 21 to 60 years) who had been involved in farming activities for one year or more. The community was divided into two zones or strata specifically North and South. The households within each stratum were selected using simple random sampling technique. In each household, the family head was selected to be interviewed. In situations where the head was not available, the wife of the household head or the son/daughter of the household head was made to provide information. Thirty (30) household residents were interviewed from each of the two strata. Ten (10) opinion leaders were purposively selected for the study.

Data analysis

The data collected were analyzed using Statistical Package for Social Sciences (SPSS) version 21.0. By the use of this software, appropriate tables, frequencies and charts were generated which aided in easy understanding of the research results. The results were presented in tables, and charts.

Results

Demographic characteristics of respondents

The demographic characteristics of the respondents are represented in the Table 1. The findings show that majority, (74%) of the respondents were males whereas the remaining (26%) were females. The average age of the respondents was 47 years. The minimum age was 22 years whiles the maximum age was 78 years. The ages for the respondents ranged from 22 to 78 years. Finding from the table also indicates that (32%) of the respondents were within the age range of 41-50 years, (28%) were above 51 years, (20%) of the respondents were within the age bracket of 31-40 years whereas the remaining (16%) respondents were within the age bracket of 21-30 years.

The data gathered in terms of educational status shows that the number of respondents who had JHS/Middle School education formed the highest (42%) as compared to those who had no formal education, primary education, and SHS/'O'level/'A' level/ Vocational. In addition, findings indicate that a majority (92%) of the respondents were married whereas (4%) each of the respondents was single and widowed respectively. These finding indicates that majority of the respondents contacted were married which means that the respondents were matured enough to respond appropriately to the questions.

Table 1 further depicts that a high number, (32%) of the respondents had been living in Wawasua for over 21 years, (26%) had been living for 6-10 years, (24%) had lived in the community for 16-20 years, (16%) had lived for 1-5 years whereas only (2%) had been living for 11-15 years. This means that majority of the farmers contacted had been living Wawasua for 3 years or more and this was vital for the study because long community experience is associated with being acquainted with matter relating to the community and the environment in which the farmers operate.

The demographic characteristics of the respondents as represented in Table 1 showed that the study covered different category of farmers in Wawasua and as a result, diverse views were solicited which revealed the true reflection of the study area. The inclusion of different category of individuals with respect to gender, age, educational experience and years of stay also contributed immensely in minimizing sampling biases.

Effect of climate change on farmers

Figure 1 illustrates the effect of climate change on the farmers in Wawasua. Some of the climate change issues that have had serious impact on the rural community identified by the respondents include crop loss (94%), pest infestation (90%), warm temperature (82%),

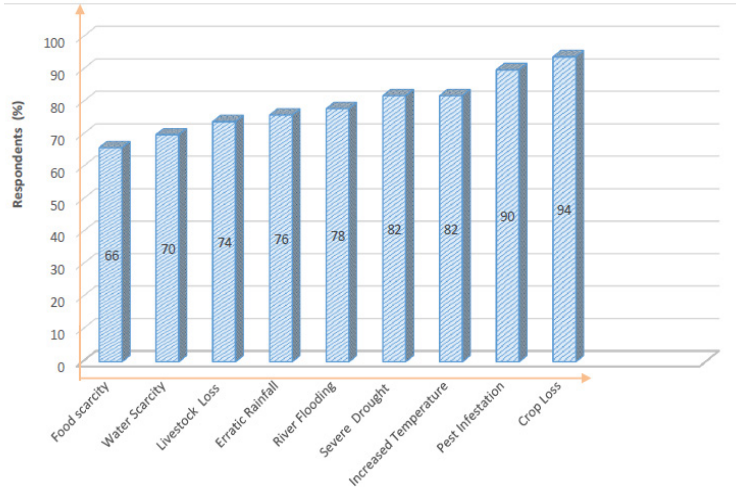

Figure 1: Effect of climate change on farmers (Source: Field Survey, 2017).

severe drought (82%), flooding (78%), erratic rainfall (76%), livestock loss (74%), water scarcity (70%), and food scarcity (66%) in descending order.

Measures to address challenges of climate change

Figure 2 provides information with regards to the measures used by the respondents to address the stated challenges of the climate change. Seventy-four percent (74%) of the respondents reported on changing planting time and using water harvesting techniques as the most appropriate strategies. Sixty-two percent (62%) of the respondents also talked about changing from livestock cultivation to crop cultivation while others (60%) realized a reduction of the number of livestock reared. Few respondents, made up of 26%, reported that planting different crops and changing from crops to livestock could address the climate change challenges. Only two percent (2%) could talk about the use of irrigation by the rural farmers to address the climate change menace.

Discussion

Effect of climate change on farmers

The study revealed several effects of climate change on the farmers at Wawasua. The major effects of climate change include; pest infestation, crop loss, livestock loss, erratic rainfall, severe drought, increased temperature, food scarcity, and water scarcity in the order of magnitude based on the levels of impact on the people's livelihoods since farming had been their only source of their social and economic obligations. The effects of climate hazards on the livelihoods of the people had been tagged to the different means by which the people were coping with these effects and trying to secure their livelihoods in the face of these changing climatic conditions. It is, however, observed that all the issues raised by the respondents were significantly strong (66% to 94%) because farming and rural livelihoods have strong positive correlation since crop production is highly threatened. Significantly increasing food production and rural vulnerability, particularly in areas that already suffer from chronic soil and water resource scarcity, high exposure to climatic extremes including droughts and flooding, poverty and hunger as observed by FAO [5] could be a serious issue in the coming years. Men, being the heads of the families, could be highly affected and this could have a serious impact on the women and children in the area. This could lead to large-scale migration as rural poor populations would abandon areas that can no longer support livelihoods, food and fuel [5].

Due to the difficulty in getting water, especially in the dry season, people who had been worst hit by the water shortages had adopted strategies where water harvested could be used in various ways. Water which previously could have been thrown away after being used for one purpose, such as washing of clothes, were being kept and re-used for watering backyard gardening. Gyampoh et al. [6] had reported that even though local people may not understand the concept of climate change, they feel its effects: decreasing rainfall, increasing air temperature, increasing sunshine intensity and seasonal changes in rainfall patterns.

Measures to address challenges of climate change

Majority of the farmers in the area had adopted some mitigation measures that could be used to address the climate change challenges including change of planting dates and the use of water harvesting technique. A lot of farmers were practising rain-fed agriculture which had not been reliable over the years due to erratic rainfall pattern. The farmers, who had been using the indigenous knowledge in weather prediction, had not been able to predict correctly on the planting periods because of climate change. Consequently, most of the crops planted over the years had failed, threatening food production and increasing rural poverty and vulnerability due to reduced adaptive capacity and higher climate vulnerability. Adaptation will be needed to protect livelihoods and food security in many households that are expected to be the most vulnerable in the study area as observed by FAO in 2012 [5]. These include altering inputs, varieties and species for increased resistance to heat shock and drought, flooding and salinization; altering fertilizer rates to maintain grain or fruit quality; altering amounts and timing of irrigation and other water management; altering the timing or location of cropping activities.

The few people who had reported about the use of irrigation (9%) were those who have had some educational qualification up to A' Level. The irrigation technology could help address the off-season challenges in the area. FAO [5] had appropriately reported that, increased irrigation and fertilization necessary to maintain production in marginal semi-arid regions under climate change conditions may also greatly enhance the ability of soils in those areas to sequester carbon.

Some of the adaptive measures that had been adopted successfully by the farmers had been; the use of hybrid crop varieties that can withstand the harsh weather conditions, provision of shade leguminous

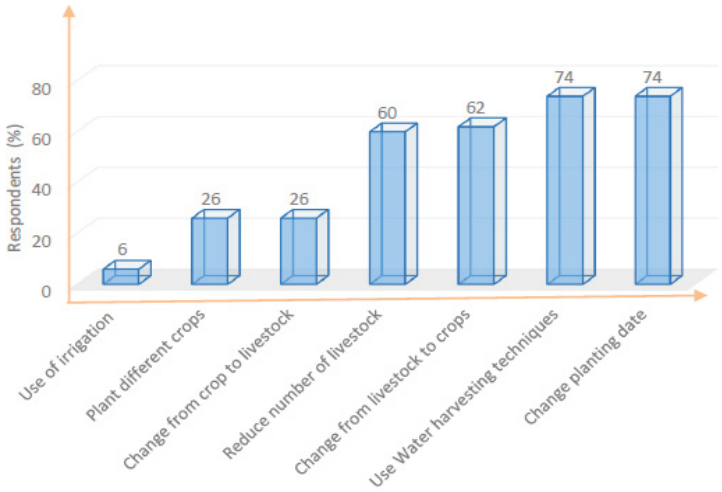

Figure 2: Strategies for a successful adaptation of climate change (Source: Field Survey, 2017).

Variables	Response	Frequency	Percentage
Gender distribution	Male	45	64.0
	Female	25	36.0
	Total	**70**	**100.0**
Age Distribution	21-30 years	8	11.0
	31-40 years	20	29.0
	41-50 years	28	40.0
	51 and above	14	20.0
	Total	**70**	**100.0**
Educational Qualification	No formal education	27	38.0
	Primary	6	9.0
	JHS/Middle School	31	44.0
	SHS/'O'level/'A' level/Vocational	6	9.0
	Total	**70**	**100.0**
Years of living in the community	1- 5 years	8	11.0
	6-10 years	13	19.0
	11-15 years	1	1.0
	16-20 years	22	31.0
	21 years and above	26	38.0
	Total	**70**	**100.0**

Table 1: Demographic characteristics of respondents.

tree species in their farms [6] and the use of cover crops and mulching to conserve moisture in the soil [7-17].

Conclusion

The effects of climate change on farmers in the face of the socio-economic pressures include; pest infestation, crop loss, livestock loss, erratic rainfall, severe drought, increased temperature, food scarcity, and water scarcity. These had increased the risk of food insecurity, rural poverty, hunger and vulnerability in the area. This could lead to large-scale migration as rural poor populations would abandon areas that can no longer support livelihoods, food and fuel. Sensitization of farmers on effect of climate change should be intensified in the rural areas to minimize the effect of climate change on rural livelihoods.

Majority of the farmers in the area had adopted some mitigation and adaptation measures that could be used to address the climate change challenges including altering inputs, varieties and species for increased resistance to heat shock and drought, flooding and salinization; altering fertilizer rates to maintain grain or fruit quality; altering amounts and timing of irrigation and other water management; altering the timing or location of cropping activities. Empowering the farmers, building their capacities and strengthening their initiatives in the appropriate adaptation and mitigation strategies could reduce most of the climate change impacts on the people. Promoting opportunities and facilitating empowerment for the rural farmers could make them more adaptable and amenable to the required change. Strategies that are often deeply rooted in local cultures and knowledge are recommended for the rural communities. The ministry of food and agriculture should initiate programmes that will help address some of the identified climatic challenges affecting the basic elements of food production.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Acknowledgement

We are very appreciative of the advice, criticisms, and suggestions of the reviewers, who provided detailed and insightful comments to strengthen the paper.

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