

Full Length Research

Determinants of Household Food Security and Climate Change Impacts on Agriculture in Ghana

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A highly variability and unpredictable climate has always being experienced in the Upper East Region of Ghana where the is occurrence of droughts and floods which often occur in the same area within months and poses a threat to food productivity where production is mainly rain fed and decreased yield due to loss of lands and creates uncertainty about what and when to plant, people at risk from hunger, decreased fish stock due to increasing temperatures and fall of net revenues from crops. This study was carried out to examine the determinants of household food security and climate change impact on agriculture in the Talensi Nabdam District of Upper East Region of Ghana. Data was collected from sample households by administering questionnaire. Random sampling was used in selecting seven communities in Talensi Nabdam District in Upper East Region of Ghana. They communities include; Belungu, Kongo, Damolgo, Zalerigu, Dagliga, Nangodi, and Damolgo. About 88% of the responce was male and 12% represented females. Majority of the responce about 46% falls within age range of 31-40. From the study, about 43% of the household were food secured and 57% of the household were food insecure. Farmer based organization, household size; extension contact and labor with the exception of credit, married, age and male had significant impact on household food security in the study area.

Keywords: Food security; household; determinants.

INTRODUCTION

Adeola, 2014 describes climate as the characteristics condition of the earth's lower atmosphere of a specific location whiles climate change is defined as the long term changes in average weather conditions. Agriculture is highly sensitive to climate because crop yield depend on average weather conditions: both crop growth and development are temperature related (Kurukulasuriya and Mendelsohn, 2006; Easterling et al., 2007). Climate change is a threat to agriculture and food security because of the loss in food production through crop

failure and increase in disease and mortality rate of livestock (Akpodtaga and Odjugo, 2010). It also implies that it will indirectly increase poverty and sustain poor living standards if efforts are not made to produce food optimally while minimizing environmental degradation (Adeola, 2014).

Sagoe, 2006 reported that Agricultural production is Ghana's main source of employment with over 70% of the population earning its livelihood from this sector. It generates about 75% of the export earnings of the

country and a major source of food and government savings on revenues. An overall economic progress will therefore depend to a large extent on the agricultural sector (Sagoe, 2006)

In a study by Sagoe, 2014 reported that Agricultural productivity has been found to be affected by climate change and such changes cause response in many human and natural systems, understanding climate variability will improve agricultural decision making and eventually productivity.

Sagoe, 2014 reported that climate change has the possibility of degrading soil and water resources and subsequently subsistence agriculture production which is largely practiced by farmers. Although impact of the climate change on agriculture is estimated to result in small percent in global income, which is positive for developed regions but negative for developing countries like Ghana. The estimated economic impact indicates the lowering of income of vulnerable population and increase in people at risk to hunger. According to Sagoe, 2014, in Ghana crop production suffered or reduced during the drought period in 1990 but picked up in 1991-1992 with the returns of more normal rains. Food crops are therefore vulnerable to the damaging effects of climate change. If the changes take place gradually, it may be able to adapt. But then sudden changes such as water shortages increase in crop damage as a result of new unpredictable changes in interaction among crops, weeds, insects and diseases or pathogens could have drastic effect (Sagoe, 2006).

According to a study by Aidoo et al., 2013, Food insecurity is a term used to describe whether or not household has access to sufficient quality or quantity of food. Food insecurity is increasing in the world where 925 million people are undernourished. Out of them, about 900 million people are living in developing countries (FAO, 2010). Bashir et al., 2012 reported that more than 70% of these people live in rural areas and depend, directly or indirectly on agriculture for their living. Usually, there are limited number of markets and less diversity and availability of food items in rural areas that affect food security of rural households (Morris et al., 1992). The majority of the developing countries under invest in the agricultural sector due to which these households are more vulnerable to price instability (Bashir et al., 2012).

Aidoo et al., 2013 reported that Ghana's economy until recently had been strongly dominated by the agricultural sector. The agricultural sector is the second largest contributor to the country's GDP after the service sector, yet it is characterized by low productivity and limited competitiveness. This is because the sector is dominated by subsistence and smallholder production units applying mostly basic and low level technology (Duffour, 2010). In 2000, world leaders committed themselves to the Millennium Development Goals (MDGs) and one aim of the MDGs is to eradicate poverty and hunger. The target

is "to reduce by half the proportion of people who suffer from hunger" by 2015. Over 800 million people in the world are food insecure (Gyamfi, 2006). Ghanaians are not exception even though Ghana is endowed with numerous natural and human resources (Aidoo et al., 2013).

According to a study by Aidoo et al., 2013, Food insecurity in Ghana is concentrated in the rural areas. Majority of the Ghanaian rural population chronically suffer from mass poverty in more severe situations than the urban dwellers. In 2009, according to the report by comprehensive food security and vulnerability analysis (CFSVA), 19% household of rural households were food insecure as compared to 10% of urban households. Undernourishment and malnutrition are common in rural Ghana and very large proportion of peasant farmers live under the absolute poverty line. Moreover, lack of means of production and large family size (majority of which are dependents) are the main characteristics of Ghanaian peasant farmers at present (Aidoo et al., 2013).

Therefore, this study seeks to examine the determinants of household food security and climate change impact on agriculture in the Talensi Nabdum District of Upper East Region of Ghana.

MATERIALS AND METHODS

Data Type, Source and Sampling

Data was collected from both primary and secondary sources. Primary data was collected from the sampled household by administering questionnaire. Random sampling was used in selecting seven communities in Talensi Nabdum District in Upper East Region of Ghana. They communities include; Belungu, Kongo, Damolgo, Zalerigu, Dagliga, Nangodi, and Damolgo.

Analytical model

Determinants of household's food security among farmers in Talensi Nabdum District of Upper East Region of Ghana were analyzed by using binary logit model. The USDA Household Food Security Scale (Revised in March, 2000) was also used to determine food insecure households. Food security was the dependent variable and a binary variable which took a value of one if a household was found to be food secured and zero if otherwise (see for example Feleke et al., 2005); Batunde et al., 2007 and Bashir et al., 2010). The independent variables are explained below:

EDU = Educational (number of years of schooling of household)

AGE = Age of the household farmer

HHs = Household size of residence

EX = Extension (1, if farmer received extension contact in 2014, 0 otherwise)

GEN = Sex (1, if farmer is male, 0 otherwise)

CRE = Credit (1, if farmer have access to credit in 2014, 0 otherwise)

ORG = Farmer's organization (1, if farmer is a member of local group, 0 otherwise).

RESULTS AND DISCUSSION

Socio-economic characteristics of households

Table 1 shows the socio-economic characteristics of the residence. About 88% of the residence was male and 12% represented females and this conforms to a study done by Fariya Abubakari et al., 2014 who also found out from the same study area that males forms majority. Majority of the residence about 46% falls within age range of 31-40 and this contradicts to the findings of Fariya and Farida, 2015, from the same study area that about 33% of the households falls within age range of 40-49. About 70% of the households were married and 50% of the residence falls within the household size 8-10, and 60% had no access to formal education and 80% had no access to formal education.

Food security status of household

Table 2 shows the food security status of household. From the study, about 43% of the household were food secured and 57% of the household were food insecure. This contradicts with the findings of Bashir et al., 2012 who found out that about 72.9% of landless households living in semi-rural areas in Pakistan were food secured.

Determinants of household food security

The estimated parameters for the binary logit model are shown in Table 3. The estimated maximum likelihood of the model R^2 was 0.82% which indicates that 82% of the likelihood of the household being food secure was strongly explained by the independent variables. Farmer based organization, household size; extension contact and labor with the exception of credit, married, age and male had significant impact on household food security in the study area.

Results of Logit analysis

Married was significant at 1% and is positive which means a unit increase in marriage will increase food security by 0.96145. This implies that as more people are married in

the study area, the population will increase and as it increase, they would engage in farming activities that will help increase food production in the district.

Household size was negative and 1% significant level, which means that a unit increase in household size would decrease household food security by 0.21256. This implies that the household was populated from the time of the survey and did not engage in activities such as controlling erosion, bush fire to help boost the nutrient status of their soil and using modernized farming methods and adopting best conservation methods which could lead to low or no yield.

Credit access was positive and also significant at 1%, which means a unit increase in credit access would increase food security by 8.01278. This implies that as the farmers are able to get access to credit, their farm income would increase and as it increase, they will be able to by improved seeds, abandon their indigenous farming practice and practice mechanized farming, practice irrigation farming to help increase their production as well as productivity.

Response of Fisheries to Climate Change

According to a study by Kunateh, 2011, the importance of fish for a nation cannot be underestimated. In 2004, the Food and Agriculture Organization (FAO) revealed that fish are an important protein source for some West African countries, comparing nearly two-thirds of daily animal protein intake in Ghana, the Gambia and Sierra Leone. However, Ghana's fisheries have experienced gradual decline during the last four decades, mostly due to overfishing and lack of good governance in the fishery sector. The decline of the fishing sector has limited the country's ability to meet domestic demand and threatened the economic and food security of many Ghanaians. Ghanaian fishermen produce 70-80% of Ghana's fish protein requirements and provide jobs for fishmongers, and other traders, hence many livelihoods depend on it. Currently, 10% of the Ghanaian population is estimated to depend on coastal fisheries for their livelihood, and inland fisheries are equally important factors in determining productivity of fisheries, with changes in climate also having an impact on productivity of coastal and river ecosystems, as well as catch ability. Because fish is a main protein source in Ghana, a dramatic reduction in fish harvesting will affect negatively the nourishment level of the nation, likely to impact women and children the worst (Kunateh, 2011).

Effect of Climate Change on Cereals and Staples

Kunateh 2011 in his study reported that high temperatures in Ghana will lead to low cereal yields

Table 1: socio-economic characteristics of respondents

Household characteristics	Frequency	Percentage
Gender		
Male	88	88
Female	12	12
Age		
21-30	34	34
31-40	46	46
41-60	20	20
Marital status		
Single	23	23
married	70	70
Divorced	7	7
Household size		
0-2	20	20
3-7	30	30
8-10	50	50
Educational level		
No formal education	60	60
Primary	23	23
JHS	10	10
SHS/O' LEVEL	7	7
Credit access		
Yes	20	20
No	80	80

Source: field survey, 2014.

Table 2: food security status of household

Food security status	Frequency	Percentage (%)
Food secure	150	43
Food insecure	200	57
Total	350	100

Source: Field survey, 2014.

Table 3: Logit estimates for determinants of food security

Variable	Z-value	Odd-ratio
constant	1.7892	
Age	0.0571	-1.42562
Male	0.432	1.41982
Married	0.321***	0.96145
Education	0.0001	0.01298
FBO	-0.921	0.21908
HHS	-2.152***	0.21256
Extension contact	-6.664	1.90291
Credit	0.547***	8.01278
Family labor	0.413	1.80127
Pseudo R ²	0.841	
Log likelihood	-16.3671	
Observations	350	

Note: *** significant at 1%

Source: Field survey, 2014.

throughout the country, especially maize and millet, which is a key staple crop in the north. This fall in cereal crop yield will mainly be due to a reduction in the growing period, and an increase in evaporation rates. Furthermore, roots and tubers such as cassava, yam and cocoyam – which are also key staples in the Ghanaian diet – will see a fall in its production as well. According to researchers, production of cassava, for instance, is expected to reduce by up to 53% by 2080, and cocoyam by 68%. The north will be the region most severely affected, as it is the most vulnerable area in Ghana, in terms of agriculture, due to its high level of dependence on agriculture for livelihood and its adverse climate conditions. Many areas of the southern Ghana which covers 60% of the country enjoy two crops each year whilst the northern Ghana which covers 40% of that country is mostly savannah where the dry season invariably brings food shortages. As recurring drought has already had adverse impact on food and livestock production in the north, consequently leading to loss of food security, widespread hunger, deepening poverty and migration (Kunateh, 2011). Fariya and Farida, 2015, reported that livestock can be affected in two ways by climate change; the quality and amount of forage from grasslands may be affected and there may be direct effects on livestock due to higher temperatures.

Potentials of Agriculture in Combating Climate Change

Kunateh 2011 reported that adapting to climate change is vital in order to remain productive and competitive. Adaptation to climate change for food production activities such as farming, livestock rearing and fishing will require a shift to new and appropriated production methods and techniques, in order to counter the ameliorating effects of adverse climatic conditions on land, water and human capital, which are key inputs in food production. For example, agricultural adaptation may result on an increase in soil organic matter, through increased use of manure or the adoption of more agro-forestry-based techniques. While increase in the availability of irrigation systems could help combat the effects of prolonged droughts. Agriculture also offers an important pathway for reducing future emissions and for managing efficiently the Ghana key limited resource, such as water, land and biodiversity. If farmers are supported in introducing modern methods for growing their crops, they can reduce their emissions while growing more to feed themselves and earn extra incomes. Techniques such as conservation agriculture require less tilling of the land and thus keep more carbon trapped in the soil. Helping farmers access the most up to date knowledge and tools can prevent the need for further clearing of natural habitats for agriculture and

keep forests and grasslands in tact as vital carbon sinks (Kunateh, 2011).

CONCLUSIONS

About 88% of the respondents were male and 12% represented females. Majority of the respondents about 46% falls within age range of 31-40. From the study, about 43% of the households were food secured and 57% of the households were food insecure. Farmer based organization, household size; extension contact and labor with the exception of credit, married, age and male had significant impact on household food security in the study area.

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