Analysis of Climate Change Perception by Farming Households in Ohaozara Local Government Area of Ebonyi State, Nigeria

Enyigwe, J. O; Chukwu, V. O; Agbom, M.. D and Chukwu, B. C.*

Department of Agricultural Economics, Management and Extension, Ebonyi State University, Abakaliki, Nigeria

K E Y W O R D S

Climate change,
Adaptation Strategies,
Farming Households

A B S T R A C T

This study analyzed climate change adaptation perception by farming households in Ohaozara Local Government Area of Ebonyi State. The study ascertained the perception of the farming household on the effects of climate variability and identified constraints to climate change adaptation measures. Multi-stage random and purposive sampling techniques were used for the selection of 100 respondents. Results shows that loss of crops ($\bar{x}$=2.98), increase in frequency of drought ($\bar{x}$=2.95), decrease in agricultural yield ($\bar{x}$=2.94), high cost of food ($\bar{x}$=2.92), erosion ($\bar{x}$=2.89), loss of income ($\bar{x}$=2.87), poor supply in the market ($\bar{x}$=2.84) were perceived effects of climate change. Further analysis identified individual/financial, natural, social/institutional and environmental constraints as constraints to farmers' adaptation strategies. Thus, there is high level of awareness and perception of climate change effects in the area. The study recommended that policy makers and extension services should enlighten farmers more about climate change and adaptation strategies, identified constraints should be addressed by both private and government sectors. Development agenda should incorporate climate change adaptation policies.

*C O R R E S P O N D I N G A U T H O R

achukwuvic@gmail.com

INTRODUCTION

Climate change is mainly induced by human activities on the environment, though the contributions of natural phenomena cannot be over-emphasized. Human activities greatly contribute to increase in greenhouse gases (GHGs) emissions into the atmosphere leading to unusual increase in global temperature. Climate change according to Onu and Ikechi (2016) is one of the major global problems threatening the survival of humans, animals, crops and the entire ecosystems. Emeka (2008) asserts that climate change is one of the global threats with serious impact on agriculture, natural ecosystem, water supply, health, soil and atmosphere, which are all elements that constitute the support for long term sustainability of most production processes on earth.

Climate change is perceived differently at different levels of conceptualization depending on socioeconomic variables, location and livelihood activity (Digg, 1991; West *et al*. 2007). Depending on the perception and awareness, farmers make certain changes on their livelihood patterns that occur through climate change (Kessler, 2006). Adaptation in its simplicity is how perception of climate change is translated into decision-making process (Bryant *et al*., 2000) by different individuals in different sectors. Their perception determines the course of action taken, thus different individuals may have different courses of action consequent on the impact, depending on their different characteristics and prevailing environmental conditions.

In order to adapt to climate change, individuals must first perceive that changes are taking place (Madison, 2007; As faw and Lipper, 2011) and their choices and farming practices are based on a set of expectations about weather, markets and other factors which are based upon their own experiences (Madison, 2007), as well as information they may obtain from a range of sources including extension agents. Asfaw and Lipper (2011) and Pannell (2009) point out that if farmers are to adopt land conservation techniques, they must first be aware that the technology exists and perceive that it is profitable. Understanding why farmers do what they do can improve the quality of policy and programming decisions at various levels (Leagans, 2011).

In Ebonyi State, droughts have been relatively less persistent, while rainfall is observed to be increasing and temperature increases and reduces moderately over the years compared with Northern Nigeria (Okorie *et al*., 2012). Farmers depend on the natural environment for their livelihood due to poverty and paucity of resources. According to Nwalieji and Uzuegbunam (2012). Farmers in the state suffered reduction in crop yield and grain quality, reduction of farm land by flood, high incidence of weeds, pests and diseases, decrease in soil fertility and the surge of human diseases such as meningitis, malaria and cholera. Extreme variation in climate variables has made these farmers vulnerable and helpless (Anayo, 2010).

The State was seriously affected by flood in 2012. There were cases of displacement of communities, loss of rivers, loss of farmland, destruction of high ways, link roads and infrastructure in the State. Huge amounts of money set aside for other purposes were used to ameliorate the effect of the natural disaster. These changes in the environment affected the composition of rural livelihoods through their impacts on agricultural production and income. This study therefore analyzes climate change adaptation among rural farm household in Ohaozara L.G.A of Ebonyi State, Nigeria.

The study therefore, seeks to find solutions to the following research questions. What is the level of awareness of Climate change among farming households in the area? What are the perceptions of the farm households on the effects of climate variability on choices of adaptation in the area? What are the constraints of climate change adaptation among the farm households?

Objectives of the Study

The broad objective of the study was to analyze climate change perception among rural farming households in Ohaozara Local Government Area of Ebonyi State, Nigeria. The specific objectives were to:

i. ascertain the perception of the farming household on the effects of climate variability on their choices of adaptation in the area; and
ii. identify the constraints of climate change adaptation measures among the farming households in the study area.

MATERIALS AND METHODS

The study was carried out in Ohaozara Local Government Area of Ebonyi State. The area comprises of nine (9) autonomous communities, these communities are Ugwulangwu, Mgbom Ugwulangwu, Uburu, Etiti Uburu, Eweze Uburu, Okposi, Okposi Okwu, Mgbom N'Echara, and Enu Uburu. Ohaozara lies between latitude 8^0, 5^1 and 8^0, 3^1 East and longitude 6^0,40^1 and 6^0,45^1 North. It covers an area of about 296.72m^2 with projected population of 148,317 peoples (NPC, 2006).The mean temperature is between 27^0C and 28^0C and the prominent climatic seasons are rainy season, lasting from April to October, and dry season, lasting from November to March.

Multi-stage random and purposive sampling techniques were used for the selection of five (5) communities. Two (2) villages were purposively selected to make a total of 10 villages. Ten (10) farm households' heads were randomly selected to make a total of 100 respondents. Primary data were collected through the use of structured questionnaire and interview schedule. Mean scores generated from a four point likert scale and factor analysis were used to analyze the data.

Model Specification

Factor Analysis Model

Factor analysis is a statistical method used to describe variability among observed correlated variables in terms of a potentially lower number of unobserved variables called factors.

In order to obtain the factor loadings of each of the variables necessary for achieving aspects of objective v, factor analysis model presented below was used.

$$\text{Xij} = \varphi_{i1}F_{i1} + \varphi_{i2}F_{i2} + \varphi_{i3}F_{i3} + \cdots \varphi jmF_iK + e_ij$$

Where; Xij = Observation on variable Xj for the ith sample number, F_ik = Score on factor Fk (k = 1,2,3,…….,m), F1-Fm = Common factors, e_ij = The value on the residual variable Ej for the ith sample member, φji…….φjm = Factor loadings (regression weights)

The associated assumptions were applied accordingly while the suitable number of factors was subjectively selected based on varimax rotated factor matrix to be obtained using SPSS analytical software. The exploratory factor analysis techniques using the principal factor model with interactions and varimax rotation will be adopted. The factor loading under each constraint (beta weight) represents a correlation of the variables (constraint areas) to the identified constraint factors and has the same interpretation as any correlation coefficient. Kaisier's criterion using factor loading of 0.40 and above in naming and interpreting the factors and constraint variable were adopted as applied by Nwibo and Eze (2013).

RESULTS AND DISCUSSION

Perception of the Farming Households on the Effects of Climate Change on their Choices of Adaptation Measures in the Area.

The result obtained was presented in Table 1. The result of the analysis shows that the major perception of the farm households that affect their choices of adaptation were loss of crop due to flood ($\bar{x}$=2.98), increase in frequency of drought ($\bar{x}$=2.95), decrease in agricultural yield ($\bar{x}$=2.94) and high food price ($\bar{x}$=2.92). This is followed by increase in rate of erosion ($\bar{x}$=2.89), loss of income ($\bar{x}$=2.87), poor supply in the market ($\bar{x}$=2.84), increase in temperature ($\bar{x}$=2.82), increase of pest and diseases ($\bar{x}$=2.78), depletion of household asset ($\bar{x}$=2.73), decrease in precipitation ($\bar{x}$=2.72), land degradation ($\bar{x}$=2.66), decrease in soil fertility ($\bar{x}$=2.64) and increase in precipitation ($\bar{x}$=2.63). Others are poverty ($\bar{x}$=2.55) and lack of access to the market ($\bar{x}$=2.51). This implies that loss of crop due to flood, increase in frequency of drought, decrease in agricultural yield and high food price are the major perception of the farm households that affect their choices of adaptation in the study area. Umeh and Chukwu (2014) and Onyeneke *et al* (2012) obtained similar result in the study area.

Table 1: Mean Score Distribution of the Respondents Based on their Perception on Effects of Climate Change on their Choices of Adaptation Measures.

Perception	Mean($\bar{X}$)	Remark
Increase in precipitation	2.63	Accepted
Decrease in precipitation	2.72	Accepted
Increase in temperature	2.82	Accepted
Decrease in temperature	2.43	Rejected
Decrease in soil fertility	2.64	Accepted
Loss of crop due to flood	2.98	Accepted
Loss of income	2.87	Accepted
Increase in frequency of drought	2.95	Accepted
Increase of pest and disease	2.78	Accepted
Migration	2.34	Rejected
Depletion of household assets	2.73	Accepted
Increase in rate of erosion	2.89	Accepted
Poor supply in the market	2.84	Accepted
Decrease in agricultural yield	2.94	Accepted
Land degradation	2.66	Accepted
High food price	2.92	Accepted
Changing from farming to non-farming activities	2.08	Rejected
Loss of infrastructure such as school, road andhospital	2.02	Rejected
Poverty	2.55	Accepted
Lack of access to the market	2.51	Accepted

Source: Field Survey, 2019.

Constraints to Climate Change Adaptation among the Farm Households in the Study Area

Table 2 shows the result of the factor analysis. The first factor was named individual/financial factors; they included High cost of input (0.837), Lack of formal education (0.643), Limited availability of land for farming (0.412), High cost of farmland (0.520), Inherited system of land ownership (0.838), Poor infrastructural development (0.838), High cost of irrigation facilities (0.716), high cost of fertilizers and other inputs (0.860), High cost of improved varieties (0.737), Non-availability of farm labour (0.667), limited income (0.743), Non-availability of processing facilities (0.544) and High cost of processing facilities (0.687). This showed that individual/financial constraint is one of the key problems facing the rural farm household adaptation to climate change in the study area. This is in agreement with the observation made by Okeke (2012), that the major problem faced by farmers in Anambra State is lack of capital/high cost of inputs.

Table 2: Varimax Rotated Component Matrix on Constraints to Climate Change Adaptation

Constraints	Factor 1 individual/ Financial constraints	Factor 2 Natural constraints	Factor 3 Social/ Institutional	Factor 4 environmental
Unpredictable weather	0.216	0.719	-0.611	0.345
Inadequate government support	0.305	0.333	0.705	0.286
Poor weather information	-0.800	-0.142	0.629	-0.456
Land tenure issues	0.307	0.229	0.758	0.349
High cost of input	0.837	0.344	0.218	-0.543
Inadequate extension officers	0.267	0.056	0.805	0.312
Lack of formal education	0.643	0.331	0.083	-0.766
Poor soil fertility	0.205	0.272	0.222	0.567
Limited availability of land for farming	0.412	0.273	0.324	0.334
High cost of farmland	0.520	-0.666	0.330	0.330
Inherited system of land ownership	0.838	0.206	0.351	0.321
Poor access to information sources	0.259	0.111	0.515	-0.543
Non-availability of credit facilities	0.341	0.258	0.853	0.278
High cost of irrigation facilities	0.716	-0.019	-0.611	0.331
Non-availability of farm inputs e.g. improved seeds	0.305	-0.663	0.705	-0.738
Inadequate knowledge of how to cope or build resilience	0.207	0.029	0.958	0.089
High cost of improved varieties	0.737	0.344	0.318	0.345
Non-availability of farm labour	0.667	-0.453	-0.755	0.087
Lack of access to weather forecast technologies	0.321	0.042	0.875	-0.651
Government irresponsiveness to climate risk management	0.056	0.237	0.678	0.278
Non-availability of storage facilities	0.243	0.321	0.560	0.212
Limited income	0.743	0.331	0.208	-0.422
Non-availability of processing facilities	0.544	-0.881	0.067	0.078
High cost of processing facilities	0.687	0.202	0.341	0.311
Traditional beliefs/ practices e.g. on the commencement of farming season etc	0.066	0.215	0.508	0.233
Poor agricultural extension service delivery	0.034	0.344	0.432	0.328
Lack of capacity of extension personnel to build resilience capacity of farmers on climate change	0.271	0.281	0.671	0.326
Poor information on early warning systems	0.043	0.213	0.754	0.341

Source: Field Survey, 2019.

The second most important was natural factor which is Unpredictable weather (0.719). This is in line with the observation made by Olalinde, Manyoung and Akintola, (2007), that majority of the farmers had their crops affected by drought, flood, wind and storm, and diseases and pest, these they categorized as natural risks, noting that the implication is that crop yield could be low due to the negative effects of these natural occurrence.

Furthermore, factor 3 was considered and named social/institutional constraints which include Inadequate government support (0.705), Poor weather information (0.629), Land tenure issues (0.758), Inadequate extension officers (0.805), Poor access to information sources (0.515), Non-availability of credit facilities (0.853), Non-availability of farm inputs e.g. improved seeds (0.705), Inadequate knowledge of how to cope or build resilience (0.958), Government irresponsiveness to climate risk management (0.678), Non-availability of storage facilities (0.560), Traditional beliefs/ practices e.g. on the commencement of farming season etc (0.508), Poor agricultural extension service delivery (0.432), Lack of capacity of extension personnel to build resilience capacity of farmers on climate change (0.671) and Poor information on early warning systems (0.754).

Finally factor 4 was named environmental constraints due to the factors that loaded high in it; these include Poor soil fertility (0.567).

From the study, it was observed that individual/financial and social/institutional constraints pose the greatest threat to adaptation of climate change followed by natural factors and environmental factors. This corresponds to the work of Onyeneke *et al* (2021).

CONCLUSION AND RECOMMENDATIONS

The major perception of the farm households about climate change were: loss of crop due to flood, increase in frequency of drought, decrease in agricultural yield and high cost of food prices. Based on the findings of this research, the study recommends that policy makers and extension services should enlighten farmers more about climate change and adaptation strategies, identified constraints should be addressed by both private and government sectors and development agenda should incorporate climate change adaptation policies.

REFERENCES

Anayo, T.V (2010). Perception of climate change in Akwa South. Anambra State Government. Nigeria Information and Guide. Accessed from: www.nigeriagalleria.com/Nigeria/States_Nigeria/Anambra_State.html on 13th March, 2019.

Asfaw A, Admassare A (2004). The role of education on the adoption of chemical fertilizer under different socio-economic environments in Ethiopia. *Agricultural Economics* 30(3):215-228.

Chinenye, J.O; Umeh, G.N and Onyeneke, R.U ((2021). Impact of Climate Information Services on Crop yield in Ebonyi State, Nigeria. Climate MDPI Pg 1-16.

National Population Commission (NPC) (2006). Provisional Population Census Report. Abuja. National Bureau of Statistics.

Okorie F.C, Okeke I, Nnaji A, Chido C, Mbano E (2012). Evidence of Climate Variability in Imo State of Southern Eastern Nigeria. J. Earth Sci. Eng. pp.544-553.

Onyeneke, R.U; Amadi, M.U, Njoku C.L and Osuji, E.E (2021). Climate Change Perception and uptake of Climate-Smart Agriculture in Rice Production in Ebonyi State, Nigeria. Atmosphere MDPI. 1-21

Umeh, G.N and Chukwu, V.A (2014). Farmers' Perception and Adaptation Initiative to the Effects of Climate Change on Food Production in Abakaliki L.G.A of Ebonyi State, Nigeria. International Journal of Science and Resaerch Vol 4 (12): 417-422.

Bryan, E., Deressa, T.T., Gbetibouo, G.A and Ringler C., (2009). Adaptation to climate change in Ethiopia and South Africa: options and constraints. Environ Sci Policy 12 (4): 413-426.