

AGRICULTURAL EXTENSION SERVICES AND FARMERS' CLIMATE CHANGE MITIGATION MEASURES IN IKOM EDUCATION ZONE, CROSS RIVER STATE, NIGERIA.

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Abstract

The main purpose of this study was to examine agricultural extension services and farmers' mitigation measures in Ikom Education Zone, Cross River State, Nigeria. To achieve the purpose of this study, a null hypothesis was formulated to guide the study. A review of related literature was carried out based on the variables of this study. The survey research design was considered useful for the study. A multistage sampling technique was adopted in selecting the wards and six hundred and fifty two (652) respondents used for the study. A fifteen-item four point Likert scale questionnaire titled agricultural extension services and farmers' climate change mitigation measures (AESFCCMM) was the instrument used for gathering data for the study. To test the hypotheses formulated for the study, simple linear regression statistical tools was used for data analysis. The hypothesis formulated was tested at 0.05 level of significance. The results from data analysis and hypothesis testing indicated that there was a significant influence of agricultural extension services on farmers' climate change mitigation measures in the study area. Based on these finding it was recommended that the use of agricultural extension services in disseminating climate change information should be widely encouraged and utilized in helping farmers to continue to adopt sustainable climate change mitigation measures.

Key Words: Agricultural Extension Services, Farmers', Climate Change, Mitigation Measures

Introduction/Background to the study

Climate change is one of the most critical environmental issues facing the world today. This is evidence by the spate of conferences, campaigns, reports and researches on climate change in the last 20 years (Agenda 21 of Rio declaration, 1992, Intergovernmental Panel on Climate Change (IPCC) 2001, Copenhagen, 2009, Paris, 2016), to mention a few. The agricultural sector has a multiplier effect on any nation's socio-economic and industrial fabric because of the multifunctional nature of the sector. In Nigeria, agriculture is the main source of food and employer of labour employing more than half of the population. It is a significant sector of the economy and the source of raw materials used in the processing industries as well as a source of foreign exchange earnings for the country. Since agriculture in Nigeria is mostly rain-fed, it follows therefore that any change in climate is bound to impact its productivity in particular and other socio-economic activities in the country. The impact could, however, be measured in terms of effects on crop growth, availability of soil water, soil erosion, incident of pest and diseases, sea level rises and decrease in soil fertility. The issue of climate change has become more threatening not only to the sustainable development of socio-economic and agricultural activities of any farmer but to the totality of human existence.

United Nations Framework Convention on Climate Change (2006) defines climate change as a change of weather which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is, in addition to natural climate variability. The changes in climate are attributed directly to human activities and composition of global atmosphere over a period of time (Kankam & Oden, 2013).

Climate change impacts pose great dangers in Cross River State, Nigeria with consequences such as, sea level rise, flooding, water salinity, increase in pests and diseases among others. These impacts could manifest in food security challenges, damage to infrastructure, social dislocation, and decrease in soil fertility and changes in seasons. Additional impacts include threat to health as rising temperature could bring about diseases such as chronic heat rashes, Cerebra-Spinal Meningitis (CSM), stroke, malaria and other related diseases.

Climate change will affect every citizen, every part of our environment and our natural resources, and thus practically every aspect of our lives, our economy, our urban and sub-urban development patterns. Global concern regarding the devastating impact of climate change has emphasized the need for creating awareness strategies such as seminars, agricultural extension services, mass media and building community based capacity for adaptive measures to mitigate the effects of climate change. These problems of climate change persist by decades in Ikom Education Zone of Cross River State, because farmers are reluctant to fight or keep the local climate on check by their refusal to apply any of the mitigation and adaptive measures provided to them through some if not all of the awareness strategies such as seminars on climate change, environmental campaign groups and others mentioned above in their farms.

Climate Change Mitigation refers to efforts to reduce or prevent emission of greenhouse gases, through reduction in the use of fossil fuel engine to generate power, crop rotation, mulching by farmers to prevent heat from the sun to penetrate the soil, encouraging mix farming, decrease from bush burning, planting trees in farm, engage cover cropping. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behaviour.

According to United Nations Development Programme (2007), mitigation refers to actions that reduce the human contribution to the planetary greenhouse effect while adaptation refers to responses to the changing climate and policies to minimize the predicted impacts of climate change. Mitigation actions include lowering emissions of greenhouse gases like carbon dioxide, methane, and particles like black carbon (soot) that have a warming effect. Increasing the net uptake of carbon dioxide through land-use change and forestry can make a contribution as well. As a whole, farming activities result in higher global concentrations of greenhouse gases and to a warming of the planet and the effect is increased by various self-reinforcing cycles in the Earth system (such as the way melting sea ice results in more dark ocean water, which absorbs more heat, and leads to more sea ice loss). Also, the absorption of increased carbon dioxide by the oceans from farming activity is leading to increased ocean acidity with adverse effects on marine ecosystems.

UNFCCC (2007), also pointed out that there is need to make farmers sensitive towards nature through a strong programme (agricultural extension services, news papers, textbooks etc.) of climate change and how to mitigate its impact. Agricultural extension services is a Climate change awareness strategies for mitigation measures involves creating knowledge, understanding and values, attitude, skills and abilities through

agricultural extension services (mass media, textbooks, journals, newspapers) among individuals and social groups towards the issues of climate change for attaining a better quality environment.

Climate change specialists have repeatedly pointed out that a solution to climate change mitigation will require climate change awareness through agricultural extension services for its proper understanding of the mitigation measures. The education of farmers through the above mentioned strategies will go a long way in achieving this purpose; farmers after being educated can provide a vital link in the delivery of environmental knowledge, its associated problems and solution. In order to fasten their awareness towards climate change it is necessary to know how far climate change awareness strategies have been able to influence farmers perception and behaviour towards climate change and investigate what level of awareness farmers poses from some awareness strategy such as agricultural extension services and the mitigation skills farmers possess from these strategies to aid the reduction of the impact of climate change to global environment. This research therefore assesses agricultural extension services and farmer's climate change mitigation measures in Ikom Education Zone of Cross River State.

Statement of the problem

Nigeria is experiencing adverse climate conditions with negative impacts on the welfare of millions of people. Farmers are complaining of Persistent droughts and flooding, off season rains and dry spells have sent growing seasons out of orbit, on a country dependent on a rain fed agriculture. Climate change is an unprecedented phenomenon and poses threats to food security in Nigeria as the rain forest regions of Nigeria including that of Cross River State are changing with regards to crops planting seasons.

Climate change has increased the region temperature, reduced the air quality we breath, pollute water, caused flooding, changes in seasons, infrastructural decay; increased pests and diseases, reduced soil fertility and reduced crops yields over the years and farmers are blaming the supreme being for the changes in climate and seasons while they keep on exploring and exploiting the earth's resources. Unless climate change is tackled, all the "best efforts" to help this great country, to come out of food shortages could be to no avail. One of the biggest threats is growing climate unpredictability, which makes subsistence farming difficult. This study posed the following questions: are farmers aware that the earth's temperature is rising because of some of their farming activities?, are awareness strategies or sources of information such as agricultural extension services that farmers in Ikom Education Zone obtain information are assessable to farmers?, can agricultural extension services as climate change awareness strategy in anyway influences the mitigation measures adopted by farmers?, does the mitigation measures applied by farmers in Ikom Education Zone reduce climate change impact on farm productivity and environmental safety because of the services of agricultural extension officers?.

Research questions

The following research question was raised to guide the study:

What is the influence of agricultural extension services on farmers' climate change mitigation measures?

Statement of hypotheses

The following hypothesis was formulated to guide the study:

Ho: Agricultural extension services has no significant influence on farmers' climate Change mitigation measures

Literature Review

Review of related literatures on the study. It was carried out under the following sub-heading:

Agricultural extension services and farmer's climate change mitigation measures.

Climate change has become a very prominent issue in the media, international and national policy processes. The 4th Assessment Report of the International Panel on Climate Change (IPCC, 2007) summarized the expected impacts of climate change and served as a wake-up call for policy-makers and the public alike. The main projected future climate change are a continued rise in temperature (very likely greater than what was observed in the 20th century), increased incidence of heat waves and heavy precipitation events, decrease of rainfall in sub-tropical areas, rising sea levels and the increased likelihood that these aspects will develop in a non - linear and non-predictable manner (IPCC, 2007).

Universally, agricultural extension role in agricultural sector is educational. Extension officers are expected to provide and disseminate information to farmers. Other services expected of extension officers, in their role and responsibilities, include providing institutional support and facilitating farmer's needs to support agricultural production. Several models of extension exist in enabling extension services to be more clients oriented. In all of these models, government policy is considered important.

According to Igodan (2006), extension worker must be involved in monitoring and evaluation of the performance of farmers in development of projects. It should also be emphasised that agricultural extension enhances the efficiency of making adoption decisions.

According to Adesope (2007) of the many sources of information available to farmers, agricultural extension is the most important for analyzing the adoption decision. Also, in the specific case of climate change adaptation, access to climate information may increase the likelihood of uptake of adaptation techniques.

According to FAO (2003), it has been observed that agricultural extension is involved in public information and education programs that could assist farmers in adapting and mitigating the effects of climate change. Such involvements include awareness creation and knowledge brokerage on the issues of climate change; building resilience capacities among vulnerable individuals, communities and regions; encouragement of wide participation of all stakeholders in addressing climate change issues and developing appropriate framework for coping/adapting to climate change effects/impacts.

The study of Phokele & Sylvester (2013) on the role of extension services in climate change adaptation in Limpopo province, South Africa. The researcher investigated the role extension services plays in climate change adaptation in Limpopo province in South Africa. A representative sample of 300 farmers aged 16 to 65 years (46% males and 54% females) participated in the study. The study involved Sekhukhune and Capricorn districts, with 56% farmers in Capricorn and 44% in Sekhukhune district. The following 10 local municipalities were visited: Elias Motsoaledi, Makhuduthamaga, Fetakgomo, Ephraim Mogale, Tubatse, Lepelle Nkumpi, Blouberg, Aganang, Polokwane, and Molemole. The research was analysed with software package for social scientists (SPSS). The following analyses were done: Descriptive analysis and Univariate analysis. The results showed that there is a great association among gender, employment, information of climate change, adaptation to climate change, information received through extension services, food scarcity, food security and agricultural production.

There is need for mitigation and development of strategies that will help human beings to adapt to climate change. Mitigation refers to any strategy or action taken to remove the green house gases released into the atmosphere, or to reduce their amount. Mitigation may also be seen as implementing policies to reduce GHG emissions and enhance sinks. It is also efforts to adjust to ongoing and potential effects of climate change. 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. This can occur in physical, ecological, and human systems. Adaptation and mitigation are therefore complementary to each other. For example, if mitigation measures are undertaken effectively, lesser will be the impacts to which we will need to adapt. Similarly, if adaptation measures (or the degree of preparedness) are strong, lesser might be the impacts associated with any given degree of climate change (IPCC, 2007).

The characteristics and implications of climate change show that it is a multi-dimensional problem whose causes and effects are challenges to recent development initiatives; Hence the need for trans-disciplinary approaches towards its mitigation and adaptation. These may have risen the concern and interest of individuals, researchers, organisations especially non - governmental organisations (NGOs) on this issue of global warming with the view of having balanced approach towards addressing climate change through short and long-term measures NGO is a legally constituted, voluntary association of individuals or groups that is neither a government agency nor profit enterprise. It is a private organisation that pursues activities to relieve suffering, promote the interests of the poor, protect the environment, provide basic social services, and/or understand community development. Some NGOs have participated in climate change issue. For examples Chevron that participated in the Carbon Sequestration Leadership Forum, an international climate change initiative focused on development of improved, cost-effective technologies for the separation and capturing of carbon dioxide ([www.chevron.com/global issues/climate change/?campaign=Africa:-corporate-iee](http://www.chevron.com/global_issues/climate_change/?campaign=Africa:-corporate-iee)) (World Meteorological Institute, 2007).

The Climate Action Network (CAN) a worldwide network of over 430 Non-Governmental Organizations (NGOs) working to promote government and individual action to limit human-induced climate. In Nigeria, and specifically in Cross River State quite a number of NGOs exist but at different levels and orientations. Some are community, city, state nationally and internationally based. Also, they have acquired different orientations focusing on service, charity, participation and empowerment. It is possible that they are experiencing and participating in climate change issue hence the need to investigate on their knowledge/ perceptions on climate change and their roles toward its mitigation and adaptation. The study specifically ascertained NGOs awareness, perceived causes, effects, mitigation and adaptation measures to climate change, perceived roles as well as barriers to performance of these roles in climate change mitigation and adaptation (Igwebuikwe et al, 2009).

In a study of Iwuchukwu, Nwankwo, & Ogbonna, (2014), on Knowledge and roles of Non-Governmental Organizations (NGOs) in Climate Change Mitigation and Adaptation in Anambra State. The study ascertained knowledge and perceived roles of state based-Non Governmental Organizations (NGOs) in climate change mitigation and adaptation in Anambra State, Nigeria. Multistage random sampling technique was employed to select thirty-five respondents from 4 local government areas and 7 NGOs in the state while data were collected with questionnaire. Percentage and mean scores were used in analyzing the data.

Results revealed that greater proportion (60%) of NGO members were not aware of climate change while about 63% indicated that issues on climate change have not been included in their programme. They perceived major causes of climate change as over industrialization (M=2.77) and use of automobiles (M=2.74) while land degradation and over flooding (M=2.77 each) were major effects of climate change. Proper land use and management (M=2.89) and reforestation/ (M=2.83) were mitigation measures while minimum tillage (M=2.74) and use of resistant varieties (M=) were adaptive measures to climate change as perceived by them.

They further perceived creation of awareness and sensitization of rural people/farmers about climate change (77.1% each) and helping government in enforcement of policies and laws that will help to mitigate climate change (57.1%) as roles they can play in climate change mitigation and adaptation. They did not perceive any major problem that can mar their contributions to climate change issue. The study emphasized on the need for private sector especially NGOs investment and participation in global and sensitive issues like climate change. This will go a long way in discovering and disseminating quick and useful information on climate change and probably ultimate solution to it.

In Nigeria, particular threats are posed to agricultural production arising from changes in rainfall patterns which have resulted to increased desertification in the Sahel region and flooding in the southern part of the country. In Enugu state, the most significant impacts of climate change experienced by farmers as identified by (Igwebuikwe et al, 2009) are; soil erosion, lack of portable water for human consumption and livestock use, loss of vegetation/pastures, intense weed growth, incidence of pests and diseases distortion and destruction of wildlife ecosystems, decrease in soil fertility and health related issues of climate change which can affect production, drudgery and stress from heat.

According to IPCC (2011) the biggest effect of climate change in Enugu State include reduced farm yield and income, drying up of streams/rivers, reduction in storage quality of crops, loss of pastureland/vegetation and destruction of wildlife ecosystem. They noted that these effects are likely attributable to the fact that Enugu state has a drier weather; being closer to the North, and hence has inherent insufficient rain water for maximum crop yield. To effectively adapt to the vagaries of climate change, rural farmers need information on climate change; as information deficit, in itself, is a type of vulnerability as it is easy for the void to be filled with inaccurate and misleading information.

Solomon (2002) asserts that information needs, if effectively met, will enable the user (farmer) to make appropriate decisions on any related problem (climate change) facing him or her. While many farmers are already coping with varying climatic conditions, the weather is becoming less predictable, and some of their strategies may no longer work. Therefore, to a significant degree, the effectiveness with which farmers adapt to climate change depends on how well current information on climate change issues is made available to them. Consequently, it is essential to provide answers to the following research questions: how knowledgeable are rural farmers in Enugu state

In the study of Okoro, Agwu, &Anugwa (2016) on Climate Change Information Needs of Rural Farmers in Enugu State. Nigeria. The study assessed the information needs of rural farmers on climate change issues in Enugu State, Nigeria. Using the multistage sampling procedure, 152 respondents were selected and data were collected through the use of a structured interview schedule. Descriptive statistics, factor analysis and multiple linear regression model were used for the analysis. Results of the study

showed that all (100.0%) the respondents were aware of climate change, but lacked adequate knowledge of key climate change issues. The multiple linear regression model revealed a significant influence of years of formal education ($t= 2.020$; $p\leq 0.05$), membership of social organizations ($t=2.385$; $p\leq 0.05$), number of climate change training ($t= -2.438$; $p= p\leq 0.05$), farm size ($t=2.564$; $p\leq 0.05$), and access to credit ($t=2.833$; $p\leq 0.05$) on the respondents' level of knowledge on climate change. The information needs on climate change as perceived by farmers were: use of improved varieties ($\chi= 1.80$), occupational diversification ($\chi=1.78$), and change in timing of farm operations ($\chi=1.76$), among others. Poor extension services and infrastructure were the major constraints to effective communication of climate change information. The study recommends the empowerment of extension agents by government to teach farmers climate change adaptation and mitigation measures using languages they can understand and in a participatory manner so as to enable them cope with the challenges of climate change.

Climate change will have significant impacts on the livelihoods of rural poor in developing countries. The Intergovernmental Panel on Climate Change report (2007) provides an extensive assessment on the expected effects of climate change on agriculture in the African region. It estimates that Africa will be the most vulnerable to climate change globally, due to the increase by between 1.5-4.0°C in temperature in this century. Projections on yield reduction show a drop of up to 50% and crop revenue is forecast to fall by as much as 90% by 2100. The agricultural sector is also expected to experience periods of prolonged droughts and/or flood during the El Nino events. Agricultural losses of between 2-7% of the GDP are expected by 2100 in parts of the Sahara, and 0.4%-1.3% and 2*4% in Western and Central Africa and Northern and Southern Africa respectively. Fisheries will be particularly affected due to changes in sea temperature that could decrease trends in productivity by 50-60% (Parry, Canziani, Palutikof, van der Linden, Hanson, 2007).

Furthermore, the Overseas Development Institute (2007) posits that productivity in agriculture will further be undermined by a reduction in fertile agricultural land availability and expansion in the coverage of low potential land (Rachel, Leo, Eva, David, 2007). More so, in response to variations in temperature and precipitation, Africa is expected to experience an increase in crop pests and diseases in addition to altered soil fertility. Declining income and rising unemployment are expected to hit agricultural zones in combination to worsening health. A fall in nutrient access is likely to raise susceptibility to diseases such as malaria and HIV/AIDS (Food and Agricultural Organization 2009).

In Nigeria, analysis of climatic data collected by the Nigerian Meteorological Institute over several decades reveal that since the 1970s, most parts of Nigeria have experienced some shifts in weather patterns. For instance, in recent years, the average amount of rainfall has decreased by 15 to 20% while rainfall intensity has increased by about 10 to 15% leading to high surface runoff and frequent flooding, and soil erosion in various parts of the country. This has adversely affected crop yields while promoting the development and spread of pests. Complications arising from poor land use and land degradation further compound the problem (World Meteorological Institute, 2007).

The overall climate change poses a substantial challenge to Africa's agricultural development. From food security, nutrition to sustainable development, climate change is a significant threat to the welfare of millions of the continent's rural poor. Contending with this challenge therefore requires the development of intensive research and policy frameworks to enable the development of proper adaptation measures which will reduce

the continent's vulnerability. This however is dependent largely on the generation, dissemination and adoption of useful information on climate change.

According to the World Meteorological Organization (2011) climate information and prediction services enable better management of climate variability and change and adaptation through the incorporation of science-based practices into planning, policy and practices on the global, regional and national scale. Ilevbaje (1999) corroborates this by stressing that information is crucial in agricultural development. It also enables farmers to take decisions regarding their choice of practices in order to avert or reduce risks related to climate change and promote sustainable development. While progress has been made in generating climate change information in sub-Saharan Africa majority of the African countries continue to suffer the full impacts of climate change. Investigations conducted have revealed massive deficits in the transmission of early warning messages in highly vulnerable countries, where climate services where they exist are largely inaccessible to millions of rural poor whose livelihoods are climate-dependent (Lugon, 2010).

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A study conducted by GOZ-UNDP, & GEF (2010) in Chiredzi district Zimbabwe revealed that majority of the farmers indicated that the information they received on climate change did not meet their needs because it was too generalized. They however indicated that they required information that would assist them in planting crops that are commonly grown in their area. However, the lack of the required information in climate change information received by the farmers rendered the entire information on climate change unreliable which affected adversely their productivity.

According to USAID (2007) appropriate interventions must incorporate disaster planning response and mitigation into governance systems and engage vulnerable groups into participatory fora to address their vulnerability and to identify adaptations to climate change impacts. Sustainable adaptation should also allow for decision making from all stakeholders, including poor men and women and should incorporate site-specific information as the non-consideration of these factors might result to the rejection or slow adoption of such adaptation technologies. Furthermore, involvement of local community members enhances ownership and sustainability. Lugon (2010) maintains that transmitting climate information to the grassroots level is one of the major challenges to making climate and weather information relevant to vulnerable communities.

In a study by Umunakwe, Nnadi, Chikaire & Nnadi, (2014) on Information needs for climate change adaptation among rural farmers in Owerri West Local Area of Imo State, Nigeria. Information on climate risks communicated timely, in clear and relevant terms and through credible sources is essential for mobilizing decision makers across societies to take actions that will enhance their capacity and willingness to adapt to climate change. An informed public is better able to prepare for a likely occurrence of climate disaster and thus avert or cope with its attendant effects. The study analyzed information needs for climate change adaptation among rural farmers in Imo state,

Nigeria. Specifically, it determined the socio-economic characteristics of the farmers, investigated their knowledge of climate change, identified their sources of information on climate change, identified their information needs for climate change adaptation and analyzed the socio-economic determinants of the farmers' needs for climate change adaptation.

Data were elicited from 120 farmers using structured questionnaire and interview schedule. These were analyzed using percentages, bar charts and mean statistics. The hypothesis was analyzed using ordinary least square regression model at 0.05%. Results revealed that majority (95.1%) of the farmers described their knowledge of climate change as change in rainfall pattern. It also revealed that the farmers identified radio (61.6%), extension agents (35.8%) and newspaper (27.5%) as their major sources of information on climate change. The result further revealed that the farmers identified effects of climate change ($M=4.15$), causes of climate change ($M=4.06$), vulnerable groups to climate change ($M=4.03$), appropriate socio-cultural practices in climate change adaptation ($M=3.99$), crops adaptable to climate change ($M=3.96$), sources of information on climate change ($M=3.93$), agro-forestry practices ($M=3.89$), flood/erosion control practices ($M=3.85$), afforestation practices ($M=3.75$), carbon trading ($M=3.68$) and adaptation strategies ($M=3.34$).

The study recommended the organization of capacity building programmes relevant to agriculture, the timely generation and dissemination of information on climate change and the reviewing of extension curriculum to accommodate the training of extension personnel on climate change issues as strategies for enhancing adaptation to climate change.

Hamisu, Ardo, Makinta, Garba, & Musa, (2017) conducted a study on A Review on Current Status of Agricultural Extension Service in Nigeria. This study reviewed on the current status of agricultural extension in Nigeria. Numerous extension approaches have been used in Nigeria. The basic and essential task of agricultural extension has been and still is: The exchange and means of sharing information, knowledge and skills for improved livelihood regardless of its organization. In a changing world and its environment, however, the context and hence the challenges in agricultural extension service changes; such as: improvement in agricultural production, environmental degradation, biotechnology, HIV/AIDs; reduced government support for public research and extension; entrance of private service providers; increasing private sector involvement and development of information and communication technology in extension service. The conventional development paradigm (T & V, University extension approach, ministry of agriculture approach, commodity/ sectorial agency extension, non-profit organizations or NGOs,).

These old styles of agricultural extension services has an assumption that its primary task is to convey a superior technology to local farmers either as adopters or rejecters of innovations, but as the originator of technical knowledge of improved practices. There is now a rival view of extension represented by the participatory approach to development. The bottom-up view of strategies is an emerging paradigm in development thinking and practices. It was recommended that a demand-driven (private) extension service be institutionalized to thrive along with the UAES, which has often been seen as part of the social services rendered by government for the farming populace. It was also recommended that a legal legislative action be put in place, which would, among other things, define the responsibilities of the various tiers of government towards financing agricultural extension services in Nigeria.

Research Methodology

The research design that was adopted for this study is the survey research design. This design was considered appropriate for this study as it collected data from the sample from which generalization was made to the population. The population of the study comprises all registered farmers in Ikom Education Zone of Cross River State. There are one hundred thousand, three hundred and sixty-two (100,362) registered farmers in Ikom Education Zone according to, Cross River State Ministry of Agriculture (2016). The entire data is presented in table 1.

Table 1: Population of farmers in Ikom Education Zone of Cross River State

S/N	Local Government	Population		Total
		Male	Female	
1.	Abi	7318	9318	16636
2.	Boki	6730	10000	16730
3.	Etung	7334	9610	16944
4.	Ikom	8468	8468	16916
5.	Obubra	1320	3736	16936
6.	Yakurr	8100	8100	16200

Source: Cross River State Ministry of Agriculture (CRSMA)

The population of the study is 100,362, The sample for this study was 667 male and female farmers from six (6) local government areas with (66) wards in Ikom Education Zone of Cross River State. The number of farmers selected was to obtain adequate representative samples of farmers from each Local Government Areas. All the selected wards in the four LGA's selected were used to ensure equal representation in the study. See Table 2.

The researcher adopted multistage sampling techniques to select the sample for this study. A stratified sampling technique was used to group the population under study into local government area and Gender. Simple random sampling technique was used in selection of wards in local government areas in Ikom Education Zone, purposive was used to select the number of respondents in each LGA's in the zone while accidental sampling techniques was used to administer the questionnaire for data collection.

The instruments used for data collection was a set of survey questionnaire called "Agricultural Extension Services and Farmers Climate Change Mitigation Measures Questionnaire" (AESFCCMMQ). The questionnaire was divided into three sections A, B and C. Section A focused on the personal data of the farmers such as sex, age, local government area of farmer, educational qualification. Section B elicited information on agricultural extension services while section C measure mitigation measures among farmers.

Table 2: A representation of percentage sampled from each wards and LGA’s in Ikom Education Zone of Cross River State

S/N	LGA’s	Population		Total	Total number of wards	Wards sampled	Respondent sampled per LGA	Percentage sampled %
		Male	Female					
1.	Abi	7318	9318	16636	10	2	167	1
2.	Boki	6730	10000	16730	11	2	167	1
3.	Ikom	8468	8468	16916	11	2	169	1
4.	Obubra	13200	3736	16936	11	2	169	1

The researcher developed a key, which served as a guide for coding the data collected for, analysis. The items on the questionnaire were sorted based on the variables measured. The total number of the responses ticked (✓) in each of the section covering all the variables under the study was added. The total scores for each section were recorded against these variables. Linear regression statistical technique will be use in the analysis. These scores will be recorded on the blank column as indicated by the researcher.

The items was scored on a four point modified likert scale ranging from Strongly agree (SA), Agree (A), Disagree (D) and Strongly disagree (SD) for each worded items. The scores were in this order. The instrument was first given to a lecturer in the Department of Environmental Education and three (3) experts in research and statistics to scrutinize for item relevance to the variables under consideration for face and content validity. Reliability refers to the consistency with which the items measure what they are supposed to measure. To ascertain the reliability of the instrument, a trial test was conducted in Akankpa LGA on 50 farmers drawn from the population who are not members of the sample to be used for the study. The responses from the administration were tested using Crombach alpha Coefficient statistic. The Cronbach alpha coefficient results showed a reliability coefficient ranging from 0.704 which indicated that the instrument was reliable enough to be used for this study.

Presentation of results

Hypothesis

Agricultural extension services do not significantly influence farmers’ climate change mitigation measures. The independent variable in this hypothesis is agricultural extension services while the dependent variable is farmers’ climate change mitigation measures. Simple linear regression statistical tool was used for data analysis. The result of this analysis is presented in Table 3.

The result of analysis presented in Table 6 showed that the predictor or independent variable (agricultural extension services) significantly influence the predicted variable (farmers’ climate change mitigation measures). The predictor variable accounted for only 3.3% of the variance in farmers’ climate change mitigation measures in Ikom Education Zone of Cross River State. This showed a very weak relationship between the predictor and predicted variables.

Furthermore, the regression ANOVA revealed there was a moderate significant positive influence of agricultural extensive services on farmers’ climate change mitigation measures $F(1, 650) = 21.869; p < .05$. Based on this result, it was revealed that the more

the agricultural extensive services provided for farmers, the better the mitigation measures they would adopt to cope with the harsh effects of climate change in the localities. Again, if the extension services decline, the mitigation measures adopted by farmers will be less positive and sustainable in the area of this study.

Table 3: Simple linear regression analysis of the influence of agricultural extension services on farmers' climate change mitigation measures in Ikom Education Zone of Cross River State (N = 652)

Model	R	R ²	Adj.R ²	Std error of estimate
1	.180	.033	.031	4.16558

Source of variance	SS	Df	MS	F	Sig
Regression	379.446	1	379.446	21.869	.000
Residual	11278.830	650	17.352		
Total	11658.276	651			

Discussion of finding

Agricultural extension services and farmer's mitigation measures

The finding from analysis and testing of hypothesis two showed that the null hypothesis was upheld. This implied a non-significantly influence of agriculture extension services on farmers' climate change mitigation measures in Ikom Education Zone of Cross River State. This could be based on the assumption that there are very low extension services provided for farmers in the study area or that most extension services do not cover climate change and its mitigation or adaptation measures. It is predicted that if the level of agriculture extension services increase, farmers will increasingly adopt positive mitigation measures that would enable them cope with the effects associated with changes in climate. The finding of this study contradicted the finding of Adesope (2007) which reported that of the many sources of information available to farmers, agricultural extension is the most important for analyzing the adoption decision. Also, in the specific case of climate change adaptation, access to climate information may increase the likelihood of uptake of adaptation techniques.

The finding of this study also contradicted the finding of FAO (2003) which revealed that it has been observed that agricultural extension is involved in public information and education programs that could assist farmers in adapting and mitigating the effects of climate change. Such involvements include awareness creation and knowledge brokerage on the issues of climate change; building resilience capacities among vulnerable individuals, communities and regions; encouragement of wide participation of all stakeholders in addressing climate change issues and developing appropriate framework for coping/adapting to climate change effects/impacts.

Solomon (2002) asserted that information needs, if effectively met, will enable the user (farmer) to make appropriate decisions on any related problem (climate change) facing him or her. While many farmers are already coping with varying climatic conditions, the weather is becoming less predictable, and some of their strategies may no longer work. Therefore, to a significant degree, the effectiveness with which farmers

adapt to climate change depends on how well current information on climate change issues is made available to them. Consequently, it is essential to provide answers to the following research questions: how knowledgeable are rural farmers in Enugu State.

Conclusion and Recommendations

The findings of the study revealed that there is a significant influence of agricultural extension services on farmers' climate change mitigation measures in the study area. Changes in global climatic conditions have become increasingly obvious especially in the area of this study. The need for people especially the rural inhabitants to develop adaptation and/or mitigation measures has become paramount in order to cushion the harsh effects associated with such changes. Climate is seen as a consequence of poor human-environment interaction that has resulted in severe alterations in natural processes. This call for urgent step that would enable people cope with changes in climate. Environmental awareness has been identified as a viable tool that can be utilized to sensitize and build capacity for climate change adaptation and possible mitigation measures.

It has therefore become an issue of utmost consideration among various stakeholders to brace up and empower the vulnerable with requisite support that would enable them cope with the effects experienced as a result of climate change. This is because an uninformed or poorly informed individual lives in uncertainty and cannot save the environment from further degradation and damage. Hence, the need to raise a citizenry that is aware of and capable of participating actively in solving environmental problem and preventing the occurrence of new ones at all times. Based on the findings obtained in this study, it was recommended that Agricultural extension services should be expanded and intensified in the study area in order to enable farmers developed better and improved climate change mitigation measures.

References

- Adesope, O. M. (2007). *Mobilization of youth for proper impact in the community*. Onitsha: Expart publishing press.
- FAO, (2003). World Agriculture toward 2015-2030. Food security and agricultural mitigation in developing countries: Options for capturing synergies. An FAO Perspective, Rome.
- GoZ-UNDP/GEF , (2010). Capacity needs assessment and strategy for enhanced use of seasonal climate forecasts for small-holder farmers in Chiredzi District, Zimbabwe. *Environmental Management Agency*, Harare, Zimbabwe.
- Hamisu, S. I. Ardo, A. M. Makinta, M. M. Garba, S. & Musa, G. (2017). A Review on Current Status of Agricultural Extension Service in Nigeria. *Asian Journal of Advances in Agricultural Research* 1(3)1-8.
- Igodan, C. O. (2006). Survey of rural women in Oyo state Nigeria institute of African studies, press report, University of Ibadan, Nigeria.
- IPCC (2007). Climate change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Metz, B. Davidson O. R. Bosch, P. R. Dave, R. Meyer, L. A.). Cambridge, UK; New York, NY: Cambridge University Press.
- Kankam, B & Oden, S.N (2013) Climate Change and Development in Ghana: Implication for Curriculum Innovation in Senior High School Social Studies and

- Language Arts Curricula. A Case Study. *International Journal of Educational Review*, 8: 109-128.
- Lugon, R. (2010). Climate information for decision-making: Lessons learned from effective user-provider communication schemes. The Graduate Institute Centre for International Governance, Geneva.
- Ogallo, L. (2007). CLIPS: RCOFs, Regional networking and consensus building and use liaison for targeted climate service delivery presented at the Public Weather Services Symposium. Geneva, Switzerland.
- Umunakwe, P. C, Nnadi, F. N, Chikaire, J. & Nnadi, C. D. (2014). Information Needs for Climate Change Adaptation among Rural Farmers in Owerri West Local Area of Imo State, Nigeria. *Agrotechnol* 3:118.
- United Nations Framework Convention Climate Change (UNFCCC), (2007). *Climate Change: Impacts Vulnerability and Adaptation Developing United Countries*.
- United States Agency for International Development (2007). Adapting to climate variability and change: A guidance manual for development planning. USAID and Stratus Consulting, Washington.
- World Meteorological Institute, (2007). Climate information for adaptation and development needs.
- Yesuf, M. Di Falco, S. Deressa, T. Ringler, C. & Kohlin, G. (2008). The impact of climate change and adaptation on food production in low-income countries: Evidence from the Nile Basin, Ethiopia. International Food Policy Research Institute, IFPRI.