academicJournals

Vol. 10(44), pp. 4134-4141, 29 October, 2015
DOI: 10.5897/AJAR2015. 9663
Article Number: B97B2E256035
ISSN 1991-637X

http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Effects of climate variability on the choices of livelihood among farm households in Anambra State, Nigeria

Festus Ugwoke Agbo*, Rosemary Nnedinso Arua and Eucharia Anulika Okonkwo

Department of Agricultural Economics, University of Nigeria, Nsukka, Enugu State, Nigeria.

Received 26 June, 2015; Accepted 16 July, 2015

Climate variability has detrimental effects on the livelihoods of rural people who depend on agriculture. The situation becomes critical because of the significant contributions of agriculture to the economic and social well being of the rural people. The effects of climate variability could manifest in declining agricultural productivity and competitiveness, greater risks to human health, increased unemployment and poverty, declined food security and conflicts of resource use. The study examined the determinants of farmers' choices of livelihoods and perceptions of the effects of climate variability on choices of livelihoods in Anambra State, Nigeria. Data for the study were collected using structured questionnaire administered to 160 respondents drawn from four agricultural zones in the State. Data were analyzed using frequency, mean and Multinomial Logit Model (MNL). Results showed that household income, gender, marital status, household size, education level of household head and farm size were the major determinants of farmers' choices of livelihoods. Gender, education level and household income had a positive significant influence while marital status, farm size, and household size had a negative significant influence on the choices of livelihoods. Farm households perceived increase in precipitation; temperature; and rate of erosion; as well as decrease in agricultural yield as effects of climate variability. It is suggested that extension personnel should be trained and motivated in order to disseminate relevant information to farmers on how to diversify their livelihood in order to cope with climate variability.

Key words: Agriculture, farmers, precipitation, temperature, climate variability threat.

INTRODUCTION

Africa is vulnerable to impacts of climate change and variability (Lobell et al., 2011), although the area contributes only <3% of the world's total greenhouse gas emission (IPCC, 2007). Climate variability has been considerably impeded Africa's development and even as it is expected that climate variability will increase and climate extremes will become more intense or more frequent (DFID, 2004). According to Antwi-Agyei et al. (2014), climate variability poses a significant threat to many sectors of sub-Saharan Africa's economy and

*Corresponding author. E-mail: fuagbo4real@yahoo.com. Tel: 08066592181, 07039743906.

agricultural sector being dependent on rain fed cultivation is most sensitive to climate variability. Climate variability refers to a measure of the frequency of changes in the values of climate variables and their range over a given time period. Temperature and precipitation are the climate variables most critical to measure with regard to food systems, because not only does the range between high and low value matter, but also the frequency at which these extremes occur and intensity of the event (Zierovogel et al., 2006). Climate stress is exemplified in the presence of year to year variability, seasonality, uncertainty and patchiness of rainfall and extreme events such as droughts and flooding (McCarthy et al., 2001). According to IPCC (1990, 1997), anthropogenic green-house gas emissions are significantly altering the earth's climate. It is predicted from the study that mean annual surface temperature will increase by 1 to 5˚C by year 2100 and that the global mean sea level will rise by 15 to 95 cm with consequent changes in the spatial and temporal patterns of precipitation. In Sub-saharan African because of the deterioration in agricultural production due to climate variation, many households look for livelihood choices other than purely crop production and animal production. Livelihood choices are those employment options that the farm households can engage in so as to provide for their needs. Households engage in farm, and non-farm (non-agricultural) livelihood activities such as crop production, animal rearing, petty trading in order to generate additional income for survival and cope with this harsh and difficult environment (Gebru and Beyene, 2013; Kalinda and Langyintuo, 2014). Livelihood activities of the households' are related to their endowment of social, human, financial, physical and natural assets (Nkoya et al., 2004).

Some studies have shown the potential impacts of climate variability on agriculture in developing countries. Downing (1992) asserted that changes in global climate variables may present a precarious future for the households dependent on agriculture for their livelihoods because of shifts in temperature and precipitation. According to the study, climate variability could markedly affect income from agricultural production, increase costs to consumers and could also lead to scarcity. According to Eboh (2009), the effects of climate variability on agriculture are projected to manifest through changes in land and water regimes, specifically changes in the frequency and intensity of drought, flooding, water shortages, worsening soil condition, desertification, diseases and pest outbreaks on crops and livestock. Yields of some major staples such as maize, groundnut, millet, sorghum and cassava have been projected to decrease by 7 to 27% in parts of Sub-Saharan Africa by 2050 due to climate change and variability (Schlenker and Lobell, 2010). Zierovogel et al. (2006), worked on food security, climate variability and climate change in Sub Saharan West Africa. From the study, it was showed that crop yield is sensitive to variability in the time of onset and cessation of the rainy or growing season. Egbe et al. (2014) studied the rural peoples' perception of climate variability in Cross River State, Nigeria. However, the study did not cover the effects of climate variability on livelihood of farmers, though it is a known that increasing poverty in rural areas has a link with climate variability. Climate variability has been projected as a hindrance to achieving the Millennium Development Goal of halving the proportion of hungry people and improving the food security of the populace. In order to ameliorate the effects of climate variability, there is need to study its effects on the livelihood of farm households. This is especially important in south east Nigeria especially in Anambra State where climate variability has shown tremendous and visible impacts.

In Nigeria, it is a well known fact that climate has varied in time and space, and that it will continue to vary in future (Ojo, 1987). In Southeast Nigeria, 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). In Northeastern Nigeria, drought caused death of many animals and about 60% drop in crop yield (IPCC, 2007). In Oyo, Southwestern Nigeria, flooding caused 30 deaths and displaced nearly 2000 people (Nigeria Metrological Agency, 2008). In Anambra State, farmers depend on the natural environment for their livelihood due to poverty and paucity of resources. According to Nwalieji and Uzuegbunam (2012), in 2012, the rice 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). About 40% of the land areas in the State are severely gullied, while 27.8% are mildly gullied. The state accounts for 65% of gully erosion in Nigeria and there are over 780 active gully erosion sites in the State (Chinweze et al., 2013). The State was seriously affected by 2012 flooding in Nigeria. There were cases of displacement of communities, loss of rivers, loss of farmland, destruction of high ways, link roads and infrastructure in Nanka, Obosi, Ekwulobia and Abatete all in Anambra 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 paper therefore analyzes the effects of climate variability on the choices of livelihood among farm households in Anambra State, Nigeria. The paper focused on:

(1) The identification of common livelihood choices of the farm households in the study area;
(2) The determination of the factors that influenced the

choices of livelihoods among the farm households in the study area;
(3) Ascertaining the perception of the farm household of the effects of climate variability on choices of livelihoods in the area.

MATERIALS AND METHODS

Study area and sampling

The study was conducted in Anambra State of Nigeria, with a population of 4.182032 million people (NPC, 2006). The State has a land area of about 4,415.54 square kilometers and lies between latitudes 5˚ 40' and 6˚ 48' North and longitudes 6˚ 35' and 7˚ 50' East. The State is bounded by Delta State to the West, Imo State to the South, Enugu State to the East and Kogi State to the North (Anambra State Government, 2007).

The State has twenty one Local government areas (LGAs) that are grouped into four agricultural zones namely: Awka, Onitsha, Anambra and Aguata. About 60 percent of the population is engaged in agricultural production such as food crops, tree crops, livestock and fisheries (Anambra State Government, 2007). Crops widely grown are yams, cocoyam, maize, okra, potatoes and amarathus. Tree crops grown include oil palm (*Elaeis guineensis*), mangoes (*Mangifera indica*), avocado pear (*Persea americana*), oil bean (*Pentaclethra macrophylla*) and paw-paw (*Carica papaya*) (Uguru, 1996).

Multi-stage sampling techniques were employed in the study. First, two LGAs most prone to climate variability were purposively selected from each of the four agricultural zones respectively, giving a total of eight LGAs, and these LGAs include Njikoka, Aniocha, Ogbaru, Idemili North, Anambra East, Ayamelum, Orumba North and Nnewi South . Second stage, two communities were randomly selected from each of the eight LGAs respectively making a total of 16 communities namely: Enugwu-Ukwu, Enugwu-Agidi, Agulu, Agu-Ukwu, Atani, Odekpe, Abatete, Eziowelle, Aguleri, Umueri, Ifiteogwari, Anaku, Nnaka, Oko, Ukpor and Osumenyi. In the last stage, 10 farm households were then randomly selected from each of the 16 communities giving a total of 160 respondents for the study.

Data collection and analysis

Data were obtained mainly from primary sources using structured questionnaire and interview schedule. The data focused on: socio-economic characteristics, choices of livelihood such as crop production, fishing, livestock production, Agro forestry and non-agricultural occupation, climatic variables including mean temperature and precipitation level within a period of one year. Climate data were obtained from the Nigerian Meteorological Agency (NIMET) database.

The data were used to identify the most common livelihood choices, the factors that influenced the choices of the livelihoods and ascertain the perception of the farm households of the effects of climate variability on choices of livelihoods. Descriptive statistics, such as mean, frequency distribution and likert type scale rating and multinomial logit model were used to realize the objectives. Multinomial logit has been employed in climate change studies by several authors. For instance, Kurukulasuriya and Mendelsohn (2006) used the multinomial logit model to see if crop choice by farmers is climate sensitive. Deressa et al. (2009) also employed Multinomial logit model to analyze factors that affect the choice of adaptation methods in the Nile basin of Ethopia.

Model

The multinomial logit was used in this study because of the various response categories. The livelihood choices were grouped into four categories, category 1, if the farm household chose crop production; category 2, if fishing was chosen; category 3, if livestock production was chosen and category 4 if the major livelihood choice was from agro-forest resources. The multinomial logit model was estimated with set of coefficients $\beta^{(1)}, \beta^{(2)}, \beta^{(3)}$ and $\beta^{(4)}$ as follows:

$$\Pr(Z = 1) = \frac{e^{x\beta(1)}}{e^{x\beta(1)} + e^{x\beta(2)} + e^{x\beta(3)}\, e^{x\beta 4}} \quad (1)$$

$$\Pr(Z = 2) = \frac{e^{x\beta(2)}}{e^{x\beta(1)} + e^{x\beta(2)} + e^{x\beta(3)} + e^{x\beta(4)}} \quad (2)$$

$$\Pr(Z = 3) = \frac{e^{x\beta(3)}}{e^{x\beta(1)} + e^{x\beta(2)} + e^{x\beta(3)} + e^{x\beta(4)}} \quad (3)$$

$$\Pr(z = 4) = \frac{e^{x\beta(4)}}{e^{x\beta(1)} + e^{x\beta(2)} + e^{x\beta(3)} + e^{x\beta(4)}} \quad (4)$$

To identify the model, one of the $\beta^{(1)}, \beta^{(2)}, \beta^{(3)}$ and $\beta^{(4)}$ was arbitrarily set to 0. When $\beta^{(4)}$ was arbitrarily set = 0, the remaining coefficients $\beta^{(1)}, \beta^{(2)}, \beta^{(3)}$ measured the change relative to the Z =4. The socio-economic characteristics of the farm household constituted the explanatory variables. By implication, after estimating the parameters, one can predict the probability that a sampled household with a specified set of socio-economic characteristics may chose crop production, fishing, livestock production or agro-forestry as their choice of livelihood relative to non-agricultural occupations such as trading.

Therefore, using four category response as in the model for this study and setting $\beta^{(4)}$ = 0, the equation becomes

$$\Pr(Z = 1) = \frac{e^{x\beta(1)}}{e^{x\beta(1)} + e^{x\beta(2)} + e^{x\beta(3)}} \quad (5)$$

$$\Pr(Z = 2) = \frac{e^{x\beta(2)}}{e^{x\beta(1)} + e^{x\beta(2)} + e^{x\beta(3)}} \quad (6)$$

$$\Pr(Z = 3) = \frac{e^{x\beta(3)}}{e^{x\beta(1)} + e^{x\beta(2)} + e^{x\beta(3)}} \quad (7)$$

$$\Pr(Z=4) = \frac{1}{e^{x\beta(1)} + e^{x\beta(2)} + e^{x\beta(3)} + e^{x\beta(4)}} \quad (8)$$

The relative probability of Z = 1 to the base category is

$$\frac{pr(z=1)}{pr(z=4)} = e^{x\beta(1)} \quad (9)$$

This is called the relative likelihood and X and $\beta_k^{(1)}$ are vectors and are equal to (X1, X2,..., Xn) and $\beta_1^{(1)}, \beta_2^{(1)}, \beta_3 k^{(1)}$ respectively, the ratio of relative likelihood for one unit change in X1 relative to the base category is then stated as:

Table 1. Frequency distribution of the respondents according to choices of livelihoods

Livelihood Choices	Number of respondents	Percentage
Crop production	80	50.0*
Fishing	13	8.13
Livestock production	58	36.3
Agro forestry	9	5.57
Non-agricultural occupation	18	11.25*

* = Multiple responses were recorded, Source: Field survey, 2014.

$$\frac{e^{\beta_1^{(1)} x_{1+\ldots\ldots+\beta_1^{(1)}(x_{1+}1)+\ldots\ldots+\beta_k^{(1)}xk}}}{e^{\beta_1^{(1)} x_{1+\ldots\ldots+\beta_1^{(1)}x_1+\ldots\ldots\ldots+\beta_k^{(1)}xk}}} \quad (10)$$

Enete (2003) citing StataCorp (1999) reported that, the exponential value of a coefficient is the relative likelihood ratio for one unit change in the corresponding variable. As pointed out, the dependent variable "choices of livelihood" have four (4) possible values; value 1, 2, 3 and 4 if it is crop production, fishing, livestock production and agro-forestry respectively.

X1 = Age of households head (in years)
X2 = Gender of the household head (if male 1; 0 if female)
X3 = Marital status (married 1, otherwise 0)
X4 = Household size (number of individual in the family.)
X5 = Education of household head (years)
X6 = Farming experience (in years)
X7 = Access to credit (Access = 1, 0 otherwise)
X8 = Household income (In Naira)
X9 =Farm size (in hectares)
X10 = Membership of farmers organization (if any 1, otherwise 0)
X11 = Precipitation (Annual mean precipitation level in mm)
X 12= Temperature (Average temperature of the area in degree celcius)

In addition, a 4 point likert type scale rating of "very severe, severe, moderate and no effect" was also used to ascertain the perception of climate effects among the farm households. The mean was 2.5 and the interval scale was 0.05. Mean score above 2.55 was considered very severe while below 2.45 was considered moderate and between 2.45 and 2.55 were considered severe.

RESULTS AND DISCUSSION

Livelihood choices of the respondents

People make livelihood choices according to the level of their household assets or availability of infrastructure in their community (Gebru and Beyene, 2012). The frequency distribution of respondents according to their choices of livelihood is shown in Table 1. The Table shows that 50% (half) of the respondents chose crop production as their major source of livelihood, 36.3% chose livestock production, while 8.13, 5.57 and 11.25% of the respondents chose fishing, agro forestry and non- agricultural livelihood respectively. The communities sampled had very limited livelihood options as most of them indicated to have little or no significant secondary livelihood sources. The implication is that the communities will have reduced resilience to the effects of climate variability due to lack of wide range of livelihood options. This is line with the work done by Oni and Fashogbon (2013) which showed that in Nigeria that farming is the predominant livelihood activity. In addition, in Ogun state, Nigeria, majority of farm households engage in fishing and fishing related activities as their occupations (Olawuyi and Rahji, 2012). However, it is evident that rural households in Nigeria engage in multiple livelihood activities such as trading, small scale business enterprises and processing of agricultural goods and arts and craft in order to supplement earnings from agriculture (Matthews-Njoku et al., 2007; Ekong, 2003; Adepoju and Obayelu, 2013).

Factors influencing Choices of livelihood among the respondents

Table 2 summarizes the multinomial logistic regression analysis of the socio-economic factors that influenced livelihood choices adopted by the respondents. The base category in the model is $\beta^{(4)}$ and the model was estimated with maximum likelihood procedure. The Chi square result was highly significant ($p< 0.0000$), suggesting that the model has a strong explanatory power. The pseudo R^2 was 27.85%, thus confirming households' choice decision making process could be attributed to fitted covariates. In terms of consistency with *a priori* expectations on the relationship between the dependent and the explanatory variables, the model appeared to have performed well.

Gender coefficient was positive and significantly ($p< 0.01$) related to the probability of the male headed household choosing fishing as a major livelihood source as compared to crop production. This implies that male headed households are more likely to choose fish production as a livelihood option while the female headed households are more likely to choose crop production. Also in a traditional African society, serious fishing activities are always done by male folks. It is also believed that male headed households have ready access to information about new technologies and may

Table 2. Multinomial logit regression results of factors influencing the choices of livelihoods among the respondents in the area.

Variables	Fishing (2)	Livestock production (3)	Agro forestry (4)
Gender	2.5289*** (0.9525)	0.3314 (0.4624)	-1.0216 (0.9030)
Age	0.0057 (.0473)	0.0460 (0.0342)	-0.0342 (0.0633)
Marital status	-3.1588** (1.3391)	-1.9673** (0.8848)	14.0730 (1176.587)
Household size	-0.2146 (0.1875)	-0.2577** (0.1177)	-0.6769** (0.2636)
Education	-0.6869 (0.0789)	0.1245** (0.0613)	-0.0916 (0.0954)
Farm size	-1.2944*** (0.3856)	-0.0808*** (0.2624)	-0.5983 (0.4424)
Farming Exp	0.1068 (0.0673)	-0.0016 (0.0471)	0.1026 (0.0771)
Household income	0.0001*** (3.05e-06)	6.91e-06*** (2.13e-06)	6.95e-06*** (3.28e-06)
Credit access	-0.7762 (0.6938)	-0.2479 (0.4375)	0.7176 (0.8862)
Membership of org	1.2527 (0.9530)	-0.1816 (0.4911)	0.2367 (1.0154)
Precipitation	-0.0015 (0.0023)	-0.0033 (0.0019)	0.0007 (0.0032)
Temperature	-0.5528 (0.4021)	0.3014 (0.2409)	-0.1508 (0.5669)
Intercept	12.9375 (9.8807)	-2.4041 (6.6004)	-10.1960 (1176.656)

Statistics: chi^2 (36) = 98.54, prop > ch^2 = 0.0000; Pseudo - R^2 = 0.2785; number of observation= 160. Note: (1) Crop production is the comparison category. The figures in parenthesis are standard errors. ***p ≤ 0.01; **0.01 < p ≤ 0.05.4.4, Source: Field survey, 2014.

not be confronted with traditional social barriers as in the case of female headed households. Hence, they make their livelihood choices more freely than their female counterparts (Asfaw and Admassie, 2004).

Age coefficient was not statistically significant in all the livelihood options, but was positively related to the probability that the household will choose fishing or livestock production and negatively related to the probability of the household choosing agro forestry as a livelihood strategy as compared to crop production. This could mean that agro forest might be far from home, hence older household heads may not have the strength to trek to forest for their livelihoods. This agrees with the findings of Jacobs (2000) in which older household heads left the tedious jobs to the younger ones and adopted the easier jobs.

The coefficient of marital status was negatively and significantly ($p<0.05$) related to the probability of the household choosing fishing and livestock production as their major sources of livelihood in comparison with crop production. However, marital status was positively related to the probability that the household head will choose agro forestry production. Implying that married household heads could have bigger household size which could mean more family labour for crop production and agro forest activities.

Household size was negative and significantly ($p<0.05$) related to the probability that the household chooses livestock production or agro forestry as their major sources of livelihood in comparison with crop production. This means that households with bigger sizes are more likely to choose crop production as their major source of livelihood. This could be because bigger household sizes mean more available family labour for crop production activities (Okon and Enete, 2009). This finding is also in line with that of Hassan and Nhemachena (2008), who observed that household with bigger sizes were more likely to choose crop production as their choice of livelihood.

Educational level of the household head was positive and significantly related to the likelihood of the household head choosing livestock production in comparison with crop production. This implies that educated household heads are more likely to practice livestock production in comparison with crop production. Education is expected to impact positively on farmer's decision making, since educated households are expected to be more informed and knowledgeable on the best livelihood choices to make in combating the effect of climate variability. This finding is in line with that of Birkmann and Fernando (2008), who noted that education and skills up grading are powerful adaptive strategies for individual families and communities. In addition, Adi (2007) identified education as one of the determinants of livelihood choice in Eastern Nigeria.

Farm size had a negative and significant ($p<0.01$) relationship with the probability that the household chooses fishing or livestock production as their major source of livelihood as compared to crop production. The implication of this finding is that households with large land size are more likely to choose crop production as their major source of livelihood.

Farming experience was positive and not statistically significant in fishing and forestry, but was negative in livestock production, compared to crop production. This could mean that households with more years of experience

could chose fishing and agro forestry as their major sources of livelihood.

Household income was positive and statistically significantly ($p<0.01$) in all choices of livelihood. This is to be expected because income is the major determinants of livelihood options. There is every tendency of the household choosing a livelihood source that will generate more income in other not to be crushed by the depressed economic situation. More income got from a livelihood source, the greater the probability of a household choosing it as their major livelihood option. This finding is in line with Kinsella et al. (2000), who observed that financial resources such as cash, credit and other economic assets are essential for pursuit of livelihood strategies.

Credit access was not statistically significant in all the livelihood choices but was positive in agro forestry option and negatively signed in both fishing and livestock production option as compared to crop production. This could mean that household heads that had access to credit facilities most likely chose agro forestry production as their major livelihood choice.

Membership of farmer's organization was not statistically significant and was positively signed in both fishery and agro forestry as livelihood choices, but negatively signed in livestock production. The implication of this finding is that household heads that are members of farmer's organization are more likely to choose fishing and agro forestry production as their major livelihood sources.

The coefficient of precipitation was not statistically significant and was positive in agro forestry as a livelihood source but negatively signed in both fishing and livestock production as livelihood choices in comparison with crop production. This could mean that increase in precipitation will more likely increase the probability of the household heads choosing agro forestry production as their major livelihood source. Also, increase in precipitation will decrease the probability of the household choosing fishing or livestock production as their major source of livelihood.

Temperature was not statistically significant but was negatively related to the probability of the household heads choosing fishing and agro forestry as livelihood options. It was however, positively related to the probability of the household heads choosing livestock production as compared to crop production.

The perceptions of the effects of climate variability on choices of livelihoods by the respondent

In Table 3 the overall mean value (Summation across the 20 items) on the perception of the farm household on the effects of climate variability on choices of livelihood in the study area was 3.06 and the standard deviation was 0.864. The overall perception on the effects of climate variability on choices of livelihood shows that the farm household in all the communities sampled perceived the effects of these elements of climate variability which had adverse effects on their choices of livelihood. This finding is in line with Jallow et al. (1999), who noted that climate variability through sea level, storm and flood frequency, impact on the physical capital of the households or of entire communities, leading not only to decrease harvesting capacity but also to disrupting of public infrastructure and services that support livelihood. Gworgwor (2008) stated that the uncertainty on the magnitude of change make awareness imminent at all level. He also suggested that the present solution to man's survival on the earth's environment sustainably hinge on the option of knowledge of climate variability and adopting mitigation and adaptation measures as widely recognized as vital components or approaches to reducing climate variability. The table observed that fourteen (14) out of twenty (20) effects of climate variability perceived by the farm households were above 2.55 indicating very severe (VS) (with a mean score of 3.18-3.49). These perception on the effects of climate variability that were assessed on four likert scale include: increase of precipitation (3.49), increase in temperature (3.48), decrease in soil fertility (3.18), loss of crop due to flood (3.36), loss of income (3.43), increase of pest and disease (3.30), depletion of household assets (3.41), increase in rate of erosion (3.39) poor supply in market (3.23), decrease in agricultural yield (3.44), land degradation (3.26), high food price (3.47), loss of infrastructure (3.31) and poverty (3.43). The table also shows that only two perceptions on effects of climate variability on choices of livelihood were recorded severe (S) by the respondent. These were migration (2.46) and lack of access to the market (2.48).

This finding was similar to Okorie et al. (2012) who noted that in the southeast state, drought have been relatively less persistent, while rainfall is observed to be increasing and temperature increases and reduces moderately over the year compare with others states in northern part of the country. In addition, in South Africa, Gbetibouo (2008), 91% of the farmers surveyed perceived an increase in temperature over the past 20 years. In contrary, Apata (2011), noted that in southwest, Nigeria that 58% of the investigated farmers perceived decreasing rainfall over the past 10 years.

Conclusion

Conclusively, household income, gender, marital status, household size, educational level and farm size were the major determinants of households' choice of livelihood sources in the study area. Households with large land sizes chose crop production as their major livelihood choice. However, male headed households especially in riverine areas chose fishing as their choice of livelihood, perhaps because they had no access to land. Educated

Table 3. Mean Ratings of the perception of the effects of climate variability on the choices of livelihoods by the respondent. (N=160).

S/N	Perception on the effects of climate variability on the choices of livelihood.	$\overline{X}$	Std.Dev
1	Increase in precipitation	3.49***	0.604
2	Decrease in precipitation	2.34*	1.263
3	Increase in temperature	3.48***	0.582
4	Decrease in temperature	2.09*	1.045
5	Decrease in soil fertility	3.18***	1.007
6	Loss of crop due to flood	3.36***	0.740
7	Loss of income	3.43***	0.749
8	Increase in frequency of drought	2.28*	1.309
9	Increase of pest and disease	3.30***	0.725
10	Migration	2.46**	1.033
11	Depletion of household assets	3.41***	0.873
12	Increase in rate of erosion	3.39***	0.691
13	Poor supply in the market	3.23***	0.833
14	Decrease in agricultural yield	3.44***	0.670
15	Land degradation	3.26***	0.820
16	High food price	3.47***	0.624
17	Changing from farming to non-farming activities	2.36*	1.174
18	Loss of infrastructure such as school, road &hospital	3.31***	0.663
19	Poverty	3.43***	0.650
20	Lack of access to the market	2.48**	1.233
	Mean (Overall)	3.06	0.864

***Very severe (SV), **Severe(S), * Moderate (M), Source: field survey, 2014.

household heads chose livestock production as their major livelihood choices. Gender, education level and household income had a positive and significant influence while marital status, farm size, and household size had a negative but significant influence on the choices of livelihoods. The farm household equally perceived increase in precipitation, increase in temperature, decrease in soil fertility, loss of crop due to flood, loss of income, increase in pest and disease, depletion of household assets, increase in rate of erosion, decrease in agricultural yield, poverty, high food price as very severe effects of climate variability while decrease in temperature, decrease in precipitation, increase in frequency of drought were moderate on their choice of livelihood. Based on the findings of this study, the extension personnel should be trained and motivated in order to disseminate relevant information to farmers on how to diversify their livelihood in order to cope with climate variability.

Conflict of Interest

The authors have not declared any conflict of interest.

REFERENCES

Adepoju AO, Obayelu OA (2013). Livelihood Diversification and Welfare of Rural Households in Ondo State, Nigeria. J. Dev. Agric. Econ. 5(2):482-489.

Adi B (2007). Determinants of agricultural and non-agricultural livelihood strategies in Rural communities; Evidence from Eastern Nigeria. J. Dev. Areas 40(2):93-94.

Antwi-Agyei P, Stringer LC, Dougill AJ (2014). Livelihood adaptations to climate variability: Insights from Farming Households in Ghana. Regional Environ. Change 14(1):3-14.

Anayo TV (2010). Perception of climate change in Akwa South.

Anambra State Government (2007). Nigeria Information and Guide. Accessed from: www.nigeriagalleria.com/Nigeria/States_Nigeria/Anambra_State.html on 13th March, 2014.

Apata TG (2011). Factors Influencing the Perception and Choice of Adaptation Measures to Climate Change among Farmers in Nigeria. Evidence from Farm Households in Southwest Nigeria. Environ. Econ. 2(4):74-83.

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

Birkmann J, Fernando N (2008). Measuring revealed and emergent vulnerability of coastal communities to Tsunami in Sirlanka. Disasters 32(1):82-105.

Chinweze C, Abiola-Oleke G, Jideani C (2013). Traditional Knowledge in Climate Change Anambra State, Nigeria Case Study. European Climate Change Adaptation Conference Integrating Climate into Action. University of Hambury, Germany.

Deressa TT, Hassan RM, Ringler C, Tekie A, Mahmud Y (2009). Determinants of Farmers' Choice of Adaptation Methods to Climate Change in the Nile Basin of Ethopia. Glob. Environ. Change 19:248-255.

DFID (2004). Climate change in Africa. Key Sheet Series No. 10.

Downing T E (1992). Climate Change and Vulnerable Place Global Food Security and Country Studies in Zimbabwe, Kenya, Senegal and Chile. Discussion Paper on Environmental Change Unit, University of Oxford, Oxford.

Eboh E (2009). Implications of Climate Change for Economic Growth

and Sustainable Development in Nigeria: In: Eboh E, Ozor N, Onuoha C, Amaechi C (2009). Enugu Forum Policy Paper 10 Debating Policy Options for National Development. Africa Institute for Applied Economics.
Egbe CA, Yaro MA, Okon AE, Bisong FE (2014). Rural Peoples' Perception to Climate Variability/Change in Cross River State, Nigeria. J. Sustain. Dev. 7(2):25-36.
Ekong EE (2003). Rural Sociology: An Introduction and Analysis of Rural Nigerian: Dove Education Publication.
Enete AA (2003). "Resource Use, Marketing and Diversification Decisions in Cassava Producing Household of Sub-Sharan Africa". Ph.D Dissertation presented to the Department of Agricultural Economics, Catholic University of Louvain, Belguim.
Gebru GW, Beyene F (2012).Rural household livelihood strategies in drought-prone areas: A case of Gulomekeda District, eastern zone of Tigray National Regional State, Ethiopia. J. Dev. Agric. Econ. 4(6):158-168.
Gbetibouo GA (2008). Understanding Farmers' Perceptions and Adaptations to Climate Change and Variability: The Case of the Limpopo Basin, South Africa, IFPRI Research Brief 15-8.
Gworgwor NA (2008). Climate change and sustainable rural livelihood in the Sudan- Sahelian zone of Nigeria. In: Akande T and Kumuji A (Eds.), Challenges of climate change for Nigeria.
Hassan R, Nhemachen C (2008). Determinants of Africa Farmers' Strategies for adapting to climate changes: Multinomial choice analysis. AFJARE 2(1):85-104.
Inter governmental Panel for Climate Change (IPCC) (1990). Climate Change: The IPCC Scientific Assessment: A Report from IPCC working Group 1 Cambridge University press.
Inter governmental Panel for Climate Change (IPCC) (1997). The regional Impact of Climate in an assessment of Vulnerability: A Special Report of IPCC working Group 11 Summary for policy makers. Cambridge University Press.
Inter governmental Panel for Climate Change (IPCC) (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability. In: Parry ML, Canziani OF, Palutikof JP, van der Linder PJ, Hanson CE (eds.), Contribution of Working Group II to the IPCC fourth assessment report. Cambridge University Press, Cambridge.
Jacobs D (2000). Low inequality with low distribution? An analysis of income distribution in Japan, South Korea and Taiwan compared to Britain. Centre for Analysis of Social Exclusion (CASE). Paper No. 33.
Jallow BP, Toure S, Barrow MM K, Mathieu AA (1999). Coastal Zone of the Gambia and the Abidjan region in Côte d'Ivoire: Sea level rise vulnerability, response strategies and adaptation options. Climate Res. 12(2-3):129-36.
Kalinda T, Langyintuo A (2014). Livelihood Strategies, Shocks and Coping Mechanisms among Rural Households in Southern Zambia. Curr. Res. J. Soc. Sci. 6(4):120-133.
Kinsella J, Wilson S, Jang F, Renting H (2000). Pluriactivity as a livelihood strategies in Irish farm households and its Role in Rural Development Sociology. Ruralis 40(4):481-496.
Kurukulasuriya P, Mendelsohn R (2006). Crop Selection: Adapting to Climate Change in Africa. CEEPA Discussion Paper No. 26, Center for Environmental Economics and Policy in Africa, Pretoria. South Africa: University of Pretoria.
Lobell DB, Banziger M, Magorokosho C, Vivek B (2011). Nonlinear Heat Effects on African Maize as Evidenced by Historical Yield Trials. Nat. Climate Change 1(1):42-45.
Matthews-Njoku EC, Adesope CON (2007). Livelihood Diversity Strategies Rural Woman in Imo State Nigeria. Niger. J. Agric. Ext. (10):117-123.
McCarthy J, Canziani O, Leary NA, Dokken DJ, White KS (2001). Climate Change, Adaptation and Vulnerability. Contribution of Working Group II, Third Assessment Report of IPCC, Cambridge University Press.
National Population Commission (NPC) (2006). Provisional Population Census Report. Abuja. National Bureau of Statistics.
Nigeria Metrological Agency (NIMET) (2008). Climate, Weather and Water Information for Sustainable Development and Safety.
Nkoya EJ, Pender P, Jagger D, Sserunkuuma C, Kaizzi HS (2004). Strategies for sustainable land management and poverty reduction in Uganda Research Report 133 International Food Policy Research Institute (IFPRI) Washington. D.C.
Nwalieji HU, Uzuegbunam CO (2012). Effects of Climate Change on Rice Production in Anambra State, Nigeria. J. Agric. Extension. 16(2):81-91.
Ojo SO (1987). The Climate Drama: An Inaugural Lecture Delivered at the University of Lagos Press, Nigeria.
Okon UE, Enete AA (2009). Resource Use Efficiency among Urban Vegetable Farmers in Akwa Ibom State, Nigeria. Tropicultura. 27(4):211-217.
Okorie FC, 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.
Olawuyi SO, Rahji MAY (2012). Analysis of Livelihood Strategies of Household's Heads in Ode-Omi Kingdom, Ogun-Water Side Local Government Area, Ogun State, Nigeria. IJRRAS 11(2):338-345.
Oni OA, Fashogbon AE (2013). Food Poverty and Livelihoods Issues in Rural Nigeria. Chapter 5: In Poverty, Price Volatility, Efficiency and the Impacts of Population Shifts. Accessed on 9/2/2015. Available at: http://www.afjare.org/resources/issues/vol_8_no2/Chapter%205.pdf
Schlenker W, Lobell DB (2010). Robust Negative Impacts of Climate Change on African Agriculture. Environ. Res. Lett. 5:014010.
Uguru MI (1996). A note on the Nigerian vegetable cowpea. Genet. Res. Crop Evol. 43(2):125-128.
Zierovogel G, Nyong A, Osman B, Conde C, Cortes Downing T (2006). Climate Variability and Change: Implications for Household Food Security. The AIACC Project Office, International START Secretariat Washington DC, USA. AIACC Working Paper No. 20.