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Assessment of Arable Crop Farmers' Perception and Adaptation to Climate Change in Ondo State, Nigeria

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ABSTRACT

The study investigated the perception and adaptation of arable crop farmers to climate change in Ondo State, Nigeria. Multi-stage sampling technique was used to select one hundred and twenty-eight respondents for the study. Structured questionnaire was used to collect primary data for the study while descriptive statistics (frequency and percentage), 5-point Likert type scale and Logistic regression model were used for data analysis. The results of the socio-economic characteristics of the respondents showed that, the mean age was 42.6 years, male accounted for 65.3%, married were 52.4% with mean household size of 7.0 members per household and respondents with primary education was represented by 50.5%. Furthermore, the arable crop farmers that indicated their awareness about climate change accounted for 56.8% while the mean score from the Likert scale revealed that, climate change leads to variability in agriculture production (M = 3.78), influences food insecurity (M = 4.58), affects livestock production (M = 4.53), influences rainfall and temperature extremes (M = 4.64), among others. The result of the logistic regression model showed the significant factors which influenced climate change adaptation included; age ($p<0.05$), education ($p<0.05$), years of experience ($p<0.05$), access to credit ($p< 0.01$), among others. Climate change affects arable crop production due to the fact that it is climate dependent. Climate change pattern such as; increased intensity and frequency of extreme temperature impact negatively on food production, environment and the population that depend on it for food security. It was recommended that arable crop farmers should be trained on climate change adaptation and be given access to credit for the adoption of technologies to cope with climate change.

INTRODUCTION

Majority of the population in sub-Saharan African countries like Nigeria live in rural areas and they depend on arable crop production as their major source of livelihoods. Arable farming entails the production of wide range of food crops or annual crops. This entails crops in which the life cycle is within one year; from germination to seed production and maturity. Arable crops included; yam, maize, cocoyam, cassava, among others. The increase in food prices and food insecurity in various homes is not unconnected with the challenges facing arable crop production in the rural areas. Arable farming or farming as the case may be is subjected to various challenges ranging from scarcity of land and poor soil fertility, natural hazards, soil degradation, pests and diseases infestation, variations in rainfall and temperature, among others. Climate change has been observed to have serious direct impact on agricultural production, because of the climate-dependent nature of agricultural production systems (Enete *et al*., 2011). This impact is particularly significant in developing countries like Nigeria where agriculture is the main source of income, employment and livelihoods for majority of the population (Enete *et al*., 2011).

Climate change constitutes a serious threat to sustainable agricultural production and food security in many parts of the developing world and it is one of the unprecedented threats of our time (Nicholas *et al*., 2012). Climate change is reported to have a wide range of interrelated impacts on the environment, farmers' wellbeing, livelihoods and incomes. According to Intergovernmental Panel on Climate Change (IPCC) (2001; 2007) climate change is the average weather conditions of a given place over time. Adaptation to climate change remains the most popular options to manage the impacts of climate change on agriculture in the world today. Sowunmi and Akintola, (2010), observed that the decline in crop yield and food production could be attributed to reduction or changes in rainfall, increased temperature, increased relative humidity, among others which are agents of climate. Adaptation to climate change requires that farmers perceive the changes in the prevailing climatic conditions and then identify useful adaptation strategies. Adaptation to climate change entails the adjustments in the natural or human activities in response to the actual or expected climatic changes and their effects which could cause harm or exploit the beneficial opportunities by the rural farmers (Efe, 2011). Fatuase *et al*. (2014) reported that farmers' perception of climate change is a necessary prerequisite for climate change adaptation. The effects of climate change on the environment, economy and social life of the people, most especially arable farmers whose livelihoods depend largely on rainfall cannot be overemphasized (Fatuase *et al*., 2014). With these serious adverse effects which climate change portends for arable crop production, an understanding of the effects of climate change adaptation by arable farmers become necessary.

Climate change impacts are becoming an extra hardship to the existing poverty related problems facing the farmers. This has led to a shift in crops cultivated by the farmers in the rural areas of developing countries. Several studies (Falola *et al*., 2012; Bolaji-Olatunji *et al*., 2010; Deressa, *et al*., 2008) have reported that agricultural production across the globe and developing countries in particular is affected by climate change. A clear understanding of climate change is of critical importance in arable crop production because agriculture and livestock production in developing countries are climate dependent. However, there are little empirical studies on arable farmers' perceptions of climate change in the study area. Furthermore, little is known about how the knowledge of their perceptions of climate change and the best adaptation practices that should be employed on the prevailing effects climate change on the farm in the study area. Hence, this study is set to investigate arable crop farmers' perception and adaptation to climate change in rural areas of Ondo State, Nigeria.

METHODOLOGY

Study Area

The study was carried out in Ondo State in the South-west geo-political zone of Nigeria. Ondo state has eighteen local government areas with a population of 3,441,024 people (NPC, 2006). The State has approximate land area of 14,798.8 square kilometers with agrarian features which supports agricultural production (Ondo State, 2010). The study area lies between latitude 5^0 45^1 and 8^0 15^1 North and longitude 4^0 45^1 and 6^0 East of the Greenwich meridian. The study area falls in the tropical rainforest zone with a temperature range of between 24^0C and 33^0C with two distinct seasons; the rainy and harmattan seasons, respectively. The average rainfall pattern ranges between 1000mm to 2200mm per annum. In the study area, arable crops such as yam, maize, cocoyam, cassava, plantain, among others with tree crops such as cocoa, oil palm, kola etc. are also produced.

Methods of Collection of Data

The primary data were used for this study these were collected from the respondents with the aid of structured questionnaire and interview schedule. Information was collected on socio-economic characteristics, perceptions of farmers about climate change and other information that will help to address the objectives of this study. Other information elicited from the arable farmers included; benefits and constraints encountered due to climate perception and adaptation in the study area.

Sampling Procedures and Sample size

The respondents for this study were selected through multi- stage sampling technique. Stage one consisted of the purposive selection of Two (2) Local

Government Areas from the agricultural zones in the State. The second stage involved random selection of four (4) communities from each Local Government Area (LGA). Stage three entailed the random selection of four (4) household from each community. The last stage consisted of random selection household heads proportionate to the size of the arable crop farmers in the community. A total of one hundred and twenty-eight (128) respondents were selected for the purpose of analysis. The farmers were selected from the list of households who were into arable crop production in the selected communities based on the list collected from the Agricultural Development Programme (ADP) Extension Agents in study area.

Analytical Techniques

Data collected were analyzed using descriptive statistics such as frequency distribution counts, percentage, means and standard deviation were used to analyse respondents' socio-economic characteristics and other variables. The Likert type scale was used to analyse respondents' perception and adaptation to climate change. The Likert rating scale was structured on 5 points of Strongly Agreed (SA) = 5, Agreed (A) = 4, Undecided (U) = 3, Disagreed (D) = 2, and Strongly Disagreed (SD) = 1 and the decision rule for the Likert scale was arrived at by the structure of <1.5 = SD, 1.5 – 2.4 = D, 2.5 – 3.4 = U, 3.5 – 4.4 = A and 4.5 – 5 = SA. The logistic regression analysis was used to analyse factors influencing arable crop farmers' perception of climate change and adaptation practice in the study area.

Logistic Regression Model

The binary logistic regression model or logit model was used to estimate the factors influencing arable farmers' perception and adaptation to climate change. This method estimates the probability of a yes or no outcome (Greene, 2000). The binary dependent variable which was given the value of Y = 1 for arable crop farmers being aware of climate change and Y = 0 for arable crop farmers that are not aware of climate change. The logit regression model is a unit or multivariate technique which allows for the estimation of the probability that an event occurs or not thus predicting a binary dependent outcome from a set of independent variables. The model was used to determine the factors influencing arable farmers' perception of climate change and adaptation. The logit model was adopted for this study as against linear probability and probit models due to the following reasons. Firstly, it ensures production of probability of choice within the range of (0, 1) and secondly, it has the lowest diagnostic test and the greatest Pseudo R^2 (Mcfadden) value. Moreover, logit model is easier and more convenient to compute when compared with probit model. Logit is based on cumulative logistic probability function which is computationally flexible and easy to interpret. The logit model was explicitly expressed as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 ... + \beta_{10} X_{10} --- (1)$$

Where: Y = 1 if arable farmers are aware of climate change and Y= 0 for if arable farmers are not aware of climate change. The explanatory variables are as follows;

X_1 = Age of arable crop farmers (years)
X_2 = Gender (1 = male; 0 = otherwise)
X_3 = Marital status (1 = married; 0 = otherwise)
X_4 = Educational level of arable crop farmers (years of formal schooling)
X_5 = Years of experience in arable crop production (years)
X_6 = Cultivated land size of arable crop farmers (in hectares)
X_7 = Household size of arable crop farmers (number)
X_8 = Access to credit (amount of loans accessed)
X_9 = Contact with extension officers (number)
X_{10} = Distance to market/urban centre (km)
$b_1 – b_{10}$ = coefficients of variables
b_0 = intercept
u= error term

RESULTS AND DISCUSSION

The socio-economic characteristics; age, gender, marital status, household size and educational attainment of respondents is revealed on Table 1. Age is an important factor on the decision making about activity choice. The result showed that 68.6 percent of the respondents were between the age bracket of 30 and 60 years while 17.8 percent and 13.6 percent were less than 30 years and 60 years and above, respectively. The result showed that the mean age of the respondents was 42.6±4.2 year which is within the economic active age. On gender, 65.3 percent were males. This is in line with Kimaro *et al.* (2015) who reported more male than females in their studies. Gender of household head is important as it influences the capacity of the household to source income and access assets such as land and capital which have a direct bearing on agricultural productivity (World Bank, 2008). The marital status revealed that 62.4 percent of the respondents were married. Being married has been a peculiar characteristic of the rural farmers and as a mark of responsibility. Furthermore, 16.4 percent, 14.8 percent and 6.4 percent were widowed, single and divorced, respectively. The result revealed a mean household size of 7±2 members per household which is more than the average national household size. This implies that larger family sizes are more likely to become successful because they have more labour to work on the farm (Delgado, 1999). Moreover, large family enhances labour supply in the form of young, middle aged and elderly members for non-farm activities.

Educational attainment of respondents which is a determinant of economic activities and decision make up of individuals revealed that 50.5 percent had primary education while respondents with secondary school education accounted for 35.3 percent. Moreover, respondents with no formal education and tertiary education are represented by 10.5 percent and 3.7 percent, respectively. However, access to education increases the chances of accessing a number of economic activities, information and adoption of agricultural technologies to cope with climate change and adaptation practices on the farm (Minot *et al.*, 2006). Nkhori (2004) pointed out that education increases the ability of households to employ their resources effectively and access, interpret and analyse information. On the cultivated land size which has being one of the major constraints in agricultural production, the result revealed a mean size of 1.98±0.67 hectares. This indicated that a small portion of land is available for arable farmers in the study area. This is in line with Awoke and Okorji (2004) who reported poor land accessibility for arable crop production. On access to agricultural inputs by respondents, 66.3 percent reported that they do not have access to inputs while 33.7 percent reported access to input on the farm. However, lack of access to inputs as reported by respondents may not be unconnected with the high cost of inputs, non-availability and inadequacy of inputs with attendant effects on climate change perception and adaptation.

Table 1: Distribution of respondents by socio-economic characteristics n = 128

Variables	Percentage (%)	
Age (yrs)		
<30	17.8	
30 – 60	68.6	
>60	13.6	
Mean (SD)		**42.6±4.2**
Gender		
Female	34.7	
Male	65.3	
Marital Status		
Single	14.8	
Married	62.4	
Widowed	16.4	
Divorced	6.4	
Household Size		
<5	21.4	
5 – 10	50.6	
>10	28.0	
Mean (SD)		**7.0±2.0**
Educational Attainment		
Primary Education	50.5	
Secondary Education	35.3	
Tertiary Education	3.7	
No formal Education	10.5	
Size of Land Cultivated (hect.)		
< 0.5	28.8	
0.5 – 2.5	68.6	
>2.5	2.6	
Mean (SD)		**1.98±0.67**
Access to Inputs		
Yes	33.7	
No	66.3	

Source: Field Survey, 2016

The analysis of crop planted (Table 2) indicated that 46.3 percent intercropped maize with cassava while 18.4 percent practiced the mixed cropping system by planting maize, yam and cassava together on the same farmland. This may be to serve as a form of insurance against crop failure due to the effect of climate change. Furthermore, 15.7 percent, 12.2 percent, and 7.4 percent, respectively cultivated cassava only, yam only and maize only as sole crops on their farmland in the study area. Arable crop farmers' level of awareness about climate change revealed that, 57.8 percent reported that they were aware of climate change adaptation while 6.5 percent, 10.3 percent and 26.4 percent respectively indicated that they were fairly aware, not aware and highly aware of climate change adaptation and the effects on their crops. However, despite the fact that arable farmers were aware of climate change adaptation practice, studies revealed that majority of the rural farmers lack the appropriate adaptation strategy to climate change (Nkondze *et al.*, 2013). On sources of information about climate change, majority of the respondents (51.6 percent) reported through mass media (radio, television, mobile sensitization programme and government). Others indicated extension officers (7.8 percent) and individual contacts

(40.6 percent) as sources of information on climate change in the study area. However, inadequate access to agricultural extension services was reported by the respondents which may be responsible for the low level of information awareness, poor adaptation practices and information dissemination on climate change among the farmers. On constraints facing arable farmers relative to climate change adaptation strategies, the result revealed that 45.5 percent reported poor access to information as one of the challenges facing arable farmers on climate change adaptation strategy. Furthermore, inadequate capital, uncoordinated government policies, and inadequate access to extension services accounted for 9.3 percent, 8.2 percent and 6.6 percent, respectively. This in line with the finding of Saliu *et al*. (2014) who reported inadequate capital, lack of information and poor access to extension services among others as factors militating against farmers awareness on climate change and adaptation practice.

Table 2: Distribution of respondents by crops planted, level of awareness on climate change, sources of information and challenges n = 128

Variables	Percentage (%)
Crops planted	
Maize	7.4
Yam	12.2
Cassava	15.7
Maize/Cassava	46.3
Maize/Yam/Cassava	18.4
Level of awareness	
Highly aware	26.4
Aware	56 .8
Fairly aware	6.5
Not aware	10.3
Sources of information	
Through extension agents	7.8
Through mass media	51.6
Through individual contacts	40.6
Constraints facing arable farmers	
Inadequate inputs	8.2
Inadequate capital	30.4
Poor access to information/Illiteracy	45.5
Uncoordinated government policies	9.3
Inadequate access to extension services	6.6

Source: Field Survey, 2016

On the effects of climate change (Table 3) the arable farmers agreed that climate change could lead to variability in agricultural production and increase rate of diseases infection (item statements 1 and 6 ($\mathrm{M} = 3.78$ and 3.56). In this study, the respondents strongly agreed to item statements 2-5 with the mean scores of $\mathrm{M} = 4.58, 4.53, 4.64$ and 4.51, respectively. The results on adaptation strategies indicated that arable crop farmers strongly agreed on item statements 7, 8, 9 and 12 while the agreed on item statements 10 and 11 (Table 3).

Table 3: Effects of climate change and adaptation strategies on arable crop production

S/No	Item Statement	SA	A	U	D	SD	Mean (M)	Remark
	Effects of Climate Change							
1	Leads to variability in agriculture production	85 (66.4)	29 (24.3)	8 (6.5)	6 (5.0)	----	3.78	A
2	Influences food insecurity	76 (59.4)	31 (25.8)	11 (9.2)	6 (5.0)	4 (3.3)	4.58	SA
3	Affects livestock production	72 (56.3)	47 (39.2)	4 (3.3)	5 (4.2)	----	4.53	SA
4	Influences rainfall and temperature extremes	77 (60.2)	38 (31.7)	10 (8.3)	------	3 (2.5)	4.64	SA
5	Unusual dryness/drought	71 (55.5)	27 (22.5)	19 (15.8)	5 (4.2)	6 (5.0)	4.51	SA
6	Increase rate of disease attack during excess rainfall	65 (50.8)	49 (40.8)	14 (11.7)	----	-----	3.56	A
	Adaptation Strategies							
7	Crop diversification/ Planting different crops	97 (75.8)	25 (20.8)	------	6 (5.0)	------	4.55	SA
8	Adoption of irrigation practice	100(78.1)	28 (23.3)	-----	-----	-----	4.88	SA
9	Changing planting dates	68 (53.1)	38 (31.7)	7 (5.8)	15 (12.5)	-----	3.56	SA
10	Planting climate resistant crops	67 (52.3)	40 (33.3)	------	13 (10.8)	8 (6.5)	3.50	A
11	Use of cover cropping	68 (53.1)	39 (32.5)	12 (10.0)	9 (7.5)		3.51	A
12	Adoption of mixed farming system	79 (61.7)	42 (35.0)	7 (5.8)	-----	----	4.62	SA

Source: Field Survey, 2016 Note: SA = Strongly Agreed; A = Agreed; U = Undecided; D = Disagreed; SD = Strongly Disagreed. M = Mean

The result of the logistic regression analysis on factors affecting climate change adaptation practice by arable farmers (Table 4) revealed that the chi-square statistics was found significant (Prob>chi^2 = 0.000) while the Pseudo R^2 was 0.6529. This implies the joint prediction of the model by the explanatory variables. Moreover, age, educational level (years of formal schooling), years of experience, household size, cultivated land size and access to credit were found significant. Age has a positive significant coefficient at 5 percent level of significance which implies that a unit increase in farmers' age increases the probability of awareness about climate change and the adaptation practice by 4.1. This is in line with Adamu *et al*. (2014) but contrary to Nhemachema (2008) who found a negative significant relationship between age and climate change and adaptation practice. The level of education and years of experience were positively significant with arable farmers' awareness on climate change at 5 percent level of significant. This implies that additional years of formal schooling and farming experience increases farmers' perception of climate change and adaptation by 4.7 and 14.4 respectively. This study is in agreement with the finding by Farayola *et al*. (2013) who found a positive significant relationship between arable farmers' level of education and climate change and adaptation.

There was a positive significant relationship between cultivated land size and climate change and adaptation at 5 percent level of significance. This implies that increase in cultivated land size increases the probability of arable farmers' perception and awareness on climate change by1.8. This is consistent with the finding by Fallah *et al*. (2012). The result showed that there is negative relationship between arable farmers' household size and the probability of farmers' awareness on climate change at 5 percent level of significance. This implies that an increase in household size decreases the probability of arable farmers' awareness of climate change and adaptation by - 0.2. This is inconsistent with the finding by Temesgen *et al*. (2014) who reported positive relationship between household size and climate change adaptation practice. The study revealed access to credit is positive and significantly related to climate change adaptation practice at 1 percent level of significance. This implies that improvement in arable farmers' access to credit increases their awareness about climate change and adaptation by 2.9. This could be due to the fact that farmers with credit or capital have the likelihood of adopting modern technology and access information on climate change. This is consistent with Deressa *et al*. (2008) and Owombo *et al*. (2014) but, at variance with the finding by Otitoju (2013) who reported a negative relationship between access to credit and climate change and adaptation practice.

Table 4: Logistic regression model on factors influencing climate change adaptation practice

Variables	Coefficient	Standard error	z- statistics	Marginal effect
Age of farmers X_1	0.04112	0.2637	0.54	0.023**
Gender X_2	1.01940	0.6700	1.52	0.128
Marital status X_3	0.15865	0.5371	2.03	0.142
Educational level X_4	0.047690	2.0068	2.73	0.036**
Years of experience X_5	0.14415	0.7896	1.83	0.010**
Cultivated land size X_6	0.01899	1.2839	1.71	0.028**
Household size X_7	-0.00235	0.0510	-1.95	0.051*
Access to credit X_8	0.02959	0.0158	1.87	0.002***
Contact with extension officers X_9	0.59288	0.7846	0.76	0.250
Distance to market/urban centre X_{10}	-0.20867	0.2366	-0.88	0.378
Cons	-3.57767	3.8951	-0.92	0.358
Observations	**128**		**LR chi^2 = 63.21**	
Prob>chi2	**0.0000**		**Pseudo R^2 = 0.6529**	
Log Likelihood		**-126.798**		

Source: Authors Computation, 2016

CONCLUSION

This study investigated arable farmers' perception and adaptation to climate change in rural areas of Ondo State, Nigeria. The result of the descriptive statistics revealed that the mean age of respondents was 42.6±4.2 years; 62.4 percent were married while the mean household size was 7±2 members per household with 50.5 percent having primary education and 46.3 percent were into maize intercropped with cassava cultivation. The mean rating from the Likert scale showed that climate change leads to variability in agricultural production (M = 3.78), influences food insecurity (M = 4.58), affects livestock production (M = 4.53), influences rainfall and temperature extremes (M = 4.64), among others. The result of the logistic regression model showed the significant factors which influenced climate change and adaptation practice included; age ($p<0.05$), education ($p<0.05$), years of experience ($p<0.05$), access to credit ($p< 0.01$), among others.

RECOMMENDATIONS

Based on the findings of this study, it was recommended that arable farmers should be provided with access to credit and inputs to be able to address the challenges of climate change. Adequate education and training should be encouraged among the arable crop farmers. Furthermore, government should make meteorological information on climate change available and accessible to arable farmers to guide them in their adaptation strategies on the farm.

REFERENCES

Adamu, Y., Yusuf, S. G. and Biwe, E. R. (2014). Climate Change Awareness and Rural Farmers Productivity in Yamaltu Deba Local Government Area of Gombe Stae, Nigeria. *Proceedings of the Annual National Conference of Nigerian Association of Agricultural Economists, Federal University of Technology, Akure, Nigeria, 24th – 27th February, 2014*

Awoke, M. U. and Okorji, C. (2004). The Determination and Analysis of Constraints in Resource Use Efficiency in Multiple Cropping System by Smallholder Farmers in Ebonyi State Nigeria. *Africa Development*, 29 (3):58-69.

Bolaji-Olatunji, K. A. Olufolaju, A. D. and Awe, F. (2010). Climate Change, Adoption and Sustainable Natural Resources Management in Nigeria. *Proceedings of the 44th Annual Conference of Agricultural Society of Nigeria (ASN), 1449-1451*

Delgado, C. (1999). Sources of growth in smallholder agriculture in Sub-Saharan Africa. *Agrekon,* 38 (SI): 165-189.

Deressa, T. R., Hassan, C. Ringler, T. A. and Yusuf, M. (2008). Analysis of the determinants of farmers' choice of adaptation methods and perceptions of climate change in the Nile basin of Ethiopia.International Food Policy Research Institute (IFPRI), Washington DC.

Efe, S. I. (2011). Climate Change: A challenge to our generation . In A. T. Salami and O. O.I. Orimoogunje Environmental Research and Challengesof Sustainabledevelopment in Nigera. Obafemi Awolowo University Press, Ile – Ife 143-164.

Enete, A. A., Madu, I. I., Onwubuya, E. A., Onyekuru, A. N., Mojekwu, J. C. Mojekwu and Eze, F. (2012). Indigenous agricultural adaptation to climate change: Study of southeast Nigeria. African technology Policy Studies Network TECHNOPOLICY BRIEF/ No. 25 Website: www.atpsnet.org.

Falola, A., Fakayode, S. B., Akangbe, J. A. and Ibrahim, H. K. (2012). Climate Change Mitigation Activities and Determinants in Rural Guinea Savannah of Nigeria. *Sustainable Agriculture Research* 1(2); 2012

Fallah, R., Armin, M. and Tajabadi, M. (2012). A Study of Attitudes and Determinant Factors in Insurance Development for Strategic Agricultural Products, *Technical Journal of Engineering and Applied Science*, 2(2): 44-50.

Farayola, C.O, Adedeji, I.A, Popoola P.O, Amao, S.A.(2013). Determinants of Participation of Small Scale Commercial Poultry Farmers in Agricultural Insurance Scheme in Kwara State, Nigeria. *World Journal of Agricultural Research,* 2013, (1) 5: 96-100

Fatuase, A. L. Ajibefun, I. and Imoudu, P. B. (2014). Farmers' Understanding of Climate Change Ondo State, Nigeria. *Proceedings of the Annual National Conference of Nigerian Association of Agricultural Economists, Federal University of Technology, Akure, Nigeria, 24th – 27th February, 2014*

Greene, W.H. (2000). *Econometric analysis* (4th ed.). New Jersey: Prentice Hall.

Intergovernmental Panel on Climate Change (IPCC, 2001). Climate Change 2001. Impact, adaptation and vulnerability Contributions of Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change. Cambridge: University press Cambridge.

Intergovernmental Panel on Climate Change [IPCC] (2007). Impact, adaptation and vulnerability. Contributions of Working Group 1 of the Intergovernmental Panel on Climate Change to the Third Assessment Report of IPCC. London: Cambridge University Press.

Kimaro, P. J., Towo, N. N. and Moshi, B. H. (2015). Determinants of Rural Youth's Participation in Agricultural Activities: The Case of Kahe East Ward in Moshi Rural District, Tanzania *International Journal of Economics, Commerce and Management*, 3 (2): 2-35

Minot, N., Epprecht, M., Anh, T.T.T. and Trung, L.Q. (2006). Income diversification and poverty in the Northern upland of Vietnam Research Report No. 145, *International Food Policy Research Institute*, Washington, DC.

Nhemachema, C. and Hassan, R. (2007). Micro-level analysis of farmers' adaptation to climate change in Southern Africa. IFPRI Discussion Paper No. 00714 International Food Policy Research Institute, Washington DC.

Nicholas, O. I., Urama, K. and Mwangi, W. (2012). Climate Change Vulnerability and the Use of Indigenous Technologies for Adaptation among Smallholder Farming Communities in sub-Saharan Africa. Journal of Agricultural Extension 16(2) December, 2012.

Nkondze, M. S., Masuku, M. B. and Manyatsi, A. (2013). Factors affecting households' vulnerability to climate change in Swaziland: A case of Mpolonjeni Area Development Programme (ADP). *Journal of Agricultural Science, 5*(10), 108-122.

National Population Commission (NPC, 2006). Population Census Data Ondo State, Nigeria. FRN Official Gazette, National and State Provisional Total Census; FGN Printer, Lagos, Nigeria 94(21): 175-198

Ondo State (2010). Facts and Figures on Ondo State. Ministry of Economic Planning and Budget, Department of Research and Statistics, Ondo State, Akure.

Otitoju, M. A. (2013). The effects of climate change adaptation strategies on food crop production efficiency in southwestern Nigeria. A Ph.D thesis submitted to the Department of Agricultural Economics, University of Nigeria, Nsukka.

Owombo, P. T., Koledoye, G. F., Ogunjimi, S. I., Akinola, A. A., Deji, O. F. and Bolarinwa, O. (2014). Farmer's adaptation to climate change in Ondo State, Nigeria: A gender analysis. *Journal of Geography and Regional Planning 7*(2), 30 - 35.

Saliu, M. A., Babatunde, K. M. and Adekanmbi, O. A. (2014). Climate Change and its Mitigation on Rural Cattle Farmers: Lessons from Saki Area of Oyo State, Nigeria. *Proceedings of the Annual National Conference of Nigerian Association of Agricultural Economists, Federal University of Technology, Akure, Nigeria, 24th – 27th February, 2014*

Sowunmi, F. A. and Akintola, J. O. (2010). Effects of climate change variability on maize production in Nigeria. Summary for Policy Makers. Research Journal of Environmental Earth Sciences, 2(1): 19-30

Temesgen, D., Yehualashet, H. and Rajan, D. S. (2014). Climate change adaptations of smallholder farmers in south eastern Ethiopia *Journal of Agricultural Extension and Rural Development, 6*(11): 354-366.

World Bank (2008). World Development Report: Agriculture for Development, Washington DC: The World Bank. Report No. 16740-BD.

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