



ASSESSMENT OF KNOWLEDGE LEVEL AND ADAPTATION STRATEGIES TO EFFECT OF CLIMATE CHANGE BY ARABLE CROP FARMERS IN SOUTH WESTERN NIGERIA

Apata, O.M. & A.O. Adekunmi

Department of Agricultural Economics and Extension Services, Ekiti State University Ado-Ekiti, Ekiti State, Nigeria.

Abstract

Climate change has in the recent years become a global concern. Both developed and developing countries of the world have now began to sensitize their people and creating awareness about recent climate change and its effect. The study analyses farmers' knowledge adaptation strategies to climate change challenges among arable crop farmers in Southwestern Nigeria. Primary was data collected from 120 farmers and were analyzed using descriptive statistics such as percentages and means score derived from a 4 – point likert scale, chi-square (χ^2) was used to determine the relationship between socio economic characteristics of respondents and their adaptation strategies to effect of climate change. The study established that the farmers' awareness level is not above average. Some farmers indicated that they were not being aware of any change in climate conditions. Major manifestations in the study area include: High temperature, irregular rainfall distribution, high relative humidity, hamattan, increased sunshine intensity and all these led to diseases, pests infestations, late maturation of crops, extinction of crops, and other effects like fire outbreak, drought erosion etc. Furthermore, the study showed that farmers have taken some measures such as changing in cropping pattern (21.7%), adoption of new technologies (34.2%), use of resistant crop varieties (20.0%). The above adaptation strategies are however faced with some constraints such as financial constraints, technical constraints, cultural constraints and lack of regular climate information among others.

The results of the hypothesis tested show that educational level (0.70) social status (.231), farming experience (.292) and annual income (.287) have positive relationships with farmers' adaptation strategies to effect of climate change. It is therefore, recommended that farmers should be more sensitized about climate change and both government and all the agencies concerned with climate change issues should direct their attention to rural areas to ensure effective response to the climate change.

Keywords: *adaptation strategies, awareness, knowledge level, climate change, arable crops farmers.*

Introduction

Climate change refers to a change in the average weather experienced in a particular region or location. Climate change can be described as change in global weather patterns. It can occur over a period ranging from decades to millennia (Abiodun, *et al*, 2011). It is a long term alteration in global weather pattern, especially increases in temperature and storm activity, regarded as a potential consequence of the green house effect (Encarta, 2009). Causes of climate change may be due to human activities such as increase in emissions of greenhouse gases, land use change and emission of aerosols.

IPCC (2007) reported that there has been detectable rise in global temperature during the last 40 years and this rise cannot be explained unless human activities are accounted for. On the other hand, recent studies showed that Africa has been drier in the last few decades (Nicholson *et al* (2000), L 'Hote *et al* (2002) and Oguntunde *et al* (2006). The degree of dryness varies from location to location.

A change in climate will affect natural resources, such as water, forest and grasslands. Changes in natural resources will have social and economic effects, some beneficial, some non-beneficial, for example, increased rainfall might increase the amount of water available for irrigation (beneficial effect on farming), but increase the rate of soil erosion and leaching (non-beneficial effect on farming). These effects either beneficial or detrimental on agricultural resources (plant and soil) would in turn affect the social and economic circumstances of farmers and others whose livelihoods depend on climatic parameters for production.

Climate change also leads to sea level rise with its attendant consequences such as fierier weather, increased frequency of fires, poverty, malnutrition and series of health and socio-economic consequences. Change in the world's climate will bring major shifts in food production because it has a profound influence on the growth, development and yields of crops, incidence of pests and diseases etc. (Pietmentel, 2002). Ezeh (2008) pointed out that "most agricultural impact studies have considered the effects of one or two aspects of climate change on a particular farming activity, which results to drastic shift or reduction in agricultural production. In general, food crops are sensitive to climate change. Most agricultural practices in Nigeria rely on rainfall and over 70% of the country's population directly and indirectly is rain fed agriculture (IFAD 2009). This implies that any change in rainfall intensity and pattern will impact agricultural

activities and hence the economy of the country. Climate change can also affect health of the populace. Abiodun *et al* (2011) opined that epidemics of malaria and meningitis which are common in Nigeria may increase as they strive better in warmer climate.

Although, climate changes will have global impacts on agriculture, the worlds' poorest people and countries are more at risk. This is because of their soil dependence on agriculture for livelihood and also because of a generalized incapacity to cope and adapt to climate extremes (Rarieya, 2007). A variety of arable crops are produced in Nigeria, all dependent on rainfall, sunshine and other climatic factors, so that where rain is abundant (from the coast up to the middle belt for example) crops that depend on rain are planted. Despite this obvious fact there is need for more information as much as possible awareness, level of knowledge on effect of climate change on farming activities of rural farmers. Also, their perception, needs and what they know about climate change in order to offer adaption practices that meet their needs (Royal society, 2005 and Apata et al 2009) Lobell *et at* 2008, Hassan and Nhemachem 2008).

This study therefore intends to access the perception of the effects of climate change on arable crops production and examine the impacts of climate change as it affects arable crop production, adaptation strategies of farmers as a means of achieving food security in southwestern Nigeria.

Objective of the Study

The main objective of the study was to examine the knowledge level and adaptation strategies to climate change of arable crops farmers in southwestern Nigeria. The specific objectives are to:

- identify socio-economic characteristics of farmers in the study area
- ascertain farmers' awareness and knowledge level of climate change
- ascertain farmers' adaptation strategies to climate change in the area, and
- identify the constraints of farmers in employing adaptation strategies to f climate change

Hypotheses of the Study

- i. There is no significant relationship between some selected socio-economic characteristics of farmers and their productivity.
- ii. There is no significant relationship between adaptation strategies and productivity.

Materials and Methods

The study area is southwestern Nigeria. It comprises of six (6) states with 85 different ethnic groups speaking 250 dialects across 300 communities. (NPC, 2006). The area has distinct seasons, these are rainy season (April – October) and the dry season (between November and March), temperature ranges between 21⁰C and 28⁰C with high humidity. The people are predominantly farmers growing mainly arable crops.

One-third of the total number of states in the south western Nigeria was simple randomly selected which were Oyo and Ekiti States. One Local Government Area was selected from each state. Two rural communities were randomly selected from each Local Government Area. Random sampling technique was employed to select 30 farmers in Iresa and 30 farmers in Ajaawa, making sixty farmers from Oyo State. Also 30 farmers were purposively selected from Asin and Ugbona making a total of sixty (60) farmers from Ekiti state. The total number of respondents selected for the study was one hundred and twenty.

Structured interview schedule was used to elicit information from the respondents. Focus Group Discussion (FGD) was also used to elicit information on climate change knowledge and adaptation from the farmers. Data generated were analyzed using descriptive statistics such as percentages and mean score derived from likert scale. Chi - Square was used to establish the association between farmers' adaptation strategies based on their knowledge on climate change and their productivity.

Result and Discussion

Personal Socio-Economic Characteristics

Age: The mean age of the respondent was 47.79 with standard deviation of 12.57. Table 1 showed that majority of the respondents were between 31 and 60 years of age which implies that they are in their active age and are mentally and physically capable of farming.

Sex: Majority of the respondents (about 90%) were male while 10 percent were female.

Marital Status: About 79.2 percent of the respondents were married and this implies that most of the respondents have families to cater for and therefore more responsible. **Educational status:** The results show that 40.0 percent of the respondents had up to secondary education while 21.7 percent had primary education. 11.7 percent had other forms of education like adult education programme while 8.3 percent attended tertiary institutions. On the other hand, 18.3% had no formal education. This implies that most of the respondents can read and write and this will help them to read labels and instructions on agrochemicals which will enhance adoption of agricultural technologies.

Social status: Majority of the respondents held one position of responsibility or the other and these are village head (20.8%), youth leader (28.3%), religious leader (10.0), community/traditional leader (7.5%). The implication of this is that respondents were easily mobilized and they will have access to information towards adopting one innovation or the other and to solve problems which might arise from climate change.

Other income generating activities: All respondents (100.0%) are farmers however respondents still involved in other income-generating activities such as trading (29.2%), civil service (20.8%) artisan (7.5%) and others such as carpentry, bricklaying, etc. (32.5%). The impulse of this finding was that respondents diversified their means of livelihood which curb loss which might result from crop failure consequent due to climate change.

Number of years of farming experience: It was also shown in Table 1 that about 19.9 percent of the respondents had less than 20 years of arable crops farming, 33.2 per cent have been into arable crops production practices for a period between 21 and 30 years, while 27.5 percent had between 31 and 40 years of experience of farming. 6.5 percent had above 50 years of arable crop farming experience. This finding revealed that all the respondents had considerable number of years of farming experience because none of them had less than 10 years of arable crop farming experience. This makes it easy for the to know the effect of climate change on their farming activities and to develop adaptation strategies to climate change.

Annual income: Data in Table 1 indicates that 35.8 percent of the respondents earned between ₦ 401,000.00 and ₦ 600,000.00 while 25.8 percent earn between ₦201,000.00 and ₦ 400,000.00. About 32.5 percent earn above ₦ 600,000.00.

Table 1: Socio-economic Characteristics of Respondents (farmers)

Socio-economic characteristic	Frequency	Percentage
Age (in years)		
<30	8	6.7
31-40	31	26.0
41-50	31	25.9
51-60	33	27.4
>60	17	14.0
Sex		
Male	108	90.0
Female	12	10.0
Marital status		
Single	10	8.3
Married	95	79.2
Divorced	6	5.0
Widowed	9	7.5
Educational Status		
No formal Education	22	18.3
Primary Education	26	21.7
Secondary Education	48	40.0
Tertiary Education	24	20.0
Social status		
Community/traditional leader	9	7.5
Village head	25	20.8
Youth leader	34	28.3
Religious leader	12	10.0
Other social responsibilities	40	33.3

Years of farming experience

Less than 20 years	24	19.9
Between 21 and 30	40	33.2
Between 31 and 40	33	27.5
Between 41 and 50	15	12.5
Above 50 years	8	6.5

Other income generating activities

Civil service	25	20.8
Trading	35	29.2
Artsing	21	17.5
Others	39	32.5

Annual income (productivity)

Less than 200,000.00	7	5.8
Between 201,000.00 and 400,000.00	31	25.8
Between 401,000.00 and 600,000.00	43	35.8
Above 600,000.00	39	32.5

Source: Field survey, 2012

Types of crop planted by farmers majorly: It was revealed that 21.7 per cent of the respondents were planting maize while 14.4 percent involved in the cultivation of cowpea. Also 9.2 percent grew rice while 6.7 per cent and 20.0 percent

were involved in cassava and yam production respectively. The impulse of these findings was that all the respondents were arable crop farmers planting most of the listed arable crops which are cultivated purposively for family consumption.

Table 2: Distribution of respondents by type of arable crop planted

Type of Crop	Frequency	Percentage
Rice	11	9.2
Maize	26	21.7
Cowpea	17	14.2
Cassava	8	6.7
Plantain	5	4.2
Bananna	5	4.2
Cocoyam	4	3.3
Soybean	5	4.2
Potato	2	1.7
Yam	24	20.0
Vegetables	4	3.3
Pepper	7	5.8
Garden egg	2	1.7
Total	120	100.0

Source: Field Survey, 2012

Means score analysis of farmers' knowledge level of Awareness of climate change.

The results of the analysis in Table show farmers' awareness/knowledge level of climate change using mean score derived from 4. Point likert scale with 2.6 decision rule, farmers' responses on observed climate change manifestations in the area were as follows.

High temperature (1.3), irregular rainfall pattern (3.0), relative humidity (-2.4), high intensity of sunshine (-2.7) with general average mean score of 2.6. This shows that the farmers' awareness level is just average while some farmers are aware of some changes in weather some did not notice any change, probably due to age difference and this supports the submission of Ezeh (2008) "that reported that climate change is a long term effect that started over years not less than 20 years ago, therefore, not all the respondents will be aware or notice any change in weather.

The results in Table 3 indicate distribution of respondents by visible effects of climate change on productivity 21.7 percent indicated that increase in pests and diseases' attacks was the effect of climate change they notice, 20.0 percent submitted that climate change cause late maturity of crops. Other effects of climate change indicated by the respondents are reduction in yield (6.7%), migration (8.3%) and extinction of crops (6.7%), relocation (10.0%) and other effects such as drought, flooding and erosion (26.7%).

Table 3: Distribution of Respondents by Visible Effect of Climate Change and Adaptation Strategies

Variables	Frequency	percentages
Effects of Climate Change		
Reduction in yield	8	6.7
Pest and disease attack	26	21.7
Late maturation of crops	24	20.0
Migration	10	8.3
Relocation	12	10.0
Extinction of crops	8	6.7
Others	32	26.7
Adaptation Strategies		
Mixed cropping	5	4.2
Intercropping	24	20.0
Diversification	26	21.7
Crop rotation	41	34.2
Resistance varieties	24	20.0
Constraints to adaptation to climate change		
Financial constraints	42	35.0
Lack of climate information	31	25.8
Cultural constraints	28	23.3
Technical constraints	16	13.3
Inadequate extension education	3	2.5

Source: Field Survey, 2012

In adapting to effect of climate change, the result of the analysis in Table 3 showed that farmers used one adaption strategy or the other depending on their knowledge level of climate change challenges. Such adaptation strategies as;

change in cropping pattern 21.7 percent, adoption of new technology such as crop rotation 32.2 per cent, change in farm location has 20.0 percent; other adaptation strategies adhere to are Mixed (4.2%) Inter cropping (20.0%) and the use of resistance varieties (20.0%). On the constraints facing farmers in employing the coping strategies to climate change challenges as in Table 4, the result shows, that majority of the farmers are having financial constraints/lack of incentives (35.0%), this is followed by those facing lack of climate information with 25.8 percent, cultural constraints was the problem indicated by 23.3 percent of the respondents (farmers). Others have technical constraints (13.3%) and inadequate extension workers education with 2.5 percent of the respondents.

The result of the hypothesis tested shows the relationship between the respondents' socio-economic characteristics and their perception to the effect of climate change. It was deduced that variables "age", "sex", "marital status", and "other income generating activities" have negative signs which implies that there is an inverse relationship between these variables and farmers' perception to the effect of climate change. Thus, the aged respondents are not inquisitive about the vagaries of climate change while the majority who were male, married and not aged are more knowledgeable about climate variabilities. Education, social status, farming experience and annual income have positive coefficient and are significantly related perception of effects of climate change, this shows a direct proportionality, indicating that the more the educational level of the respondents', membership of social organization, high number of years of experience and high annual income they will have access to climate change information so they will be able to have better perception about climate change.

Table 4: Relationship between Socio-economic Characteristics and Perception of Climate Change

Socio-Economic variables	Coefficient	Significant (Standard error)
Age	- .110	.370
Sex	- .044	.614
Marital status	- .050	.562
Educational status	.033	.070 *
Social status	.231	.009 **
Off-farm income	- .109	.213
Experience	.292	.023 **
Annual income	.287	.001 ***

Source: Field Survey, 2012

Summary and Conclusion

Summarily, the farmers' level of awareness of climate change in the study areas is not beyond average with mean score of 2.6 response by using a 4 – point likert scale. Although, some farmers are highly aware of the changes in weather, some have not noticed any change taken places. Climate change manifestations in the study area includes high temperature, irregular rainfall, high sunshine, high relative humidity and variation in harmattan and all these have led to ; high rate of diseases and pests attack, late maturation of crops, reduction in yields of crops, extinction of crops which have constituted climate change challenges. Farmers use adaptation strategies for the challenges such as changing in cropping pattern, adoption of new technologies, change in farm locations, others used resistant crop varieties, and practicing Inter cropping and mixed cropping systems. Though farmers were using these adaption strategies, there are some constraints facing them in employing the strategies such as lack of finance, cultural constraints, technical constraints, lack of climate information and inadequate extension education.

Recommendations

Having concluded that, most farmers in southwestern Nigeria are not highly aware of the climate change and its challenges it is therefore recommended that:

1. The farmers should be more sensitized about climate change, their effects, solutions and modern adaptation measures. This could be achieved by organizing seminars on climate change regularly for them.
2. Government should pay more attention to the various methods used by farmers in adapting to the effect of climate change so as to help increase arable crop production which in turn increases food production and enhances living standard of the farmers.
3. Both government and non-governmental organizations and all the agencies concerned with climate change issues should also direct their attention to rural areas to ensure effective response to the climate change.
4. Research institutions should come up with measures in which the rural/local farmers will be able to cope with climate change challenges.
5. Extension agents and teachers should be posted to the local communities to educate people on climate change and measures to get adapted to climate change challenges.

Acknowledgement

Oyebode, O.T. is hereby acknowledged for her hard work and perseverance during the data collection stage of this study. Her contribution is highly appreciated.

References

Abiodun, B.J., Salami, A.T., Tadross, M. (2011):Developing Climate Scenarios, Biophysical Impacts and Adaptation Strategies in Nigeria. A final report submitted to Nigeria Environmental Study/Action Team (NEST) as part of the

Building Nigeria Response to Climate Change (BNRRC) Project. Pp 1-40.

Apata T.G. Samuel, K.D. and Adeola, A.O. (2009). Analysis of Climate Change Perception and Adaptation among Arable Food Crop Farmers in South Western Nigeria paper presented at the conference of International Association of Agricultural Economics pp.2-9.

Fakon, W.P. and Naylor R.L.(2008): Prioritizing climate change adaptation needs for food Security in 2030. *International Journal of Science* 31(9) 60-71.

Hassan, R and Nhemachena, C (2008) Determinants of African Farmers' Strategies for adaptation to climate change *African Journal of Resource Economics* 2(1)pp.83-104.

IFAD (2009): Enabling poor rural people to overcome poverty. International Fund for Agricultural Development (IFAD) (www.ifad.org/operations/projects/regions/pa/factsheets.ng.pdf).

Intergovernmental panel on climate change (IPCC) (2007). Climate change impacts, Adaptation and vulnerability. In Third Assessment Report of the Intergovernmental Panel on Climate Change Parry, M.L. Canziani, O.F. Palutikof, J.P, Vanderlinden, P.J, and Hasson, C.E. (eds) Cambridge University Press, Cambridge, United Kingdom pp. 8-9.

L 'Hote, Y., Mahe, G., Some, B. Triboulet, J.P. (2002): Analysis of a Sahelian annual rainfall index from 1986 to 2000; the drought continues. *Hydrological Sciences Journal*, 48(3), 489-496.

Lobell, D.B. Burke, M.B, Tebaldi C. Manstrandrea, M.D, Fakon, W.P. and Naylor R.L. (2008) Prioritizing climate change adaptation needs for food security in 2030, *International journal of science* 31(9) pp. 60-71.

Nicholson, S.E., Some, B. and Kone, B. (2000): An analysis of recent rainfall conditions in West Africa, including the rainy seasons of the 1997El Nino and the 1998 La Nina years. *Journal of Climate* 13(14) 2628-2640.

Pietmentel, D. (2002): Climate Change and Food Supply. <http://www.priemetal@edu.USA>.

Rarieya, M (2007): Creating trading Zones and Exertise for Climate Information. <http://www.Reien@piedu.USA>.

Royal Society (2005) impact of Climate Change on Crops Worse than previously thought <http://royalsociety.org/news.asp>? Accessed September, 2010.