PERCEPTION OF RURAL CROP FARMERS ON EFFECTS OF CLIMATE CHANGE: THE CASE OF OSUN STATE, NIGERIA

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Abstract

The study examined the effects of climate change on crop production in rural areas of Osun State, Nigeria. A multi-stage sampling technique was employed to select two hundred and forty respondents used for the study. The data collected was analyzed with Frequency counts, Percentages, mean and Probit regression analysis The average age of the respondents was 28.4 years, with the percentage of males to females being 75.4 percent and 24.6 percent respectively. About 65.8 percent of the respondents were married and the primary occupation of most of the respondents (83.8%) was farming Most of the respondents (76.2%) could read and write. The major pre-disposing factors engendering climate variability were bush burning, deforestation, and over-cropping of land. The problems confronting farmers as a result of climate change were shortage of water supply (52.9%), rise in surface temperature (54.2%), and shortage soil moisture (46.7%). Some of the coping strategies employed by the respondents to reduce the effects of climate change were the application of green manure (83.8%), prompt weeding to avoid low production through weeds competition with crop plants (83.3%), intercropping/mixed cropping (62.5%). The result of the probit regression model shows that six variables were statistically significant to the effect of climate variability; these are: age (t = 2.25), education (t = -2.36), marital status (t = -1.26), income (t = -2.3), farm size (t = 2.02) and farming experience (t = -2.42). It is recommended that farmers should widely and further be enlightened with regards to climate change, its effects, and solutions to reduce it.

Introduction

Climate change depicts any substantial change in the earth's temperature over an extended period. According to Adejuwon (2004), climate change is the variability or average state of the atmosphere over time ranges, from a decade to millions of years. It is a global problem and one of the fundamental challenges facing the entire universe today. It disrupts and incapacitates livelihoods, health, and well-being of millions of the poorest people across the world. The developing countries are seriously bearing the impact of climate change. The inter-governmental panel on climate change (IPCC) (2001) predicted Africa as the likely continent that will experience the worst hit of climate changes, because of the effects it will have on water balance and agriculture, which constitute the main source of livelihood and survival for most rural families in the region.

However, it is pertinent to note that Africa contributes less than four percent (4%) of the greenhouse gas emissions that contribute to climate change (Agriculture Nigeria, 2014; Adejuwon, 2004). Climate change phenomenon affects agriculture in a number of ways according to (Agriculture Nigeria, 2014). These include crop failure resulting from extreme weather events such as thunderstorms, heavy winds, and floods. Uncertainties at the onset of farming seasons due to changes in rainfall characteristics; desertification in the Sahel has been blamed on overgrazing practices of the rural population, pests and diseases migrate in response to climate changes and variation (e.g. tsetse fly has extended its range northward). It also affects the severity of both pests and diseases that ordinarily and regularly affects livestock in the Northern area. Climate elements variables such as temperature, humidity, wind speed influence animal performances in terms of growth, milk production, wool production and reproduction. Climate change can also affect the quantity and quality of feedstuffs in pastures, as well as the forage, and grains available for feeding livestock. . Climate change also brings about declining soil fertility due to increased incidences of

flooding and erosion. Change in land use in the coast may have a drastic effect on agricultural output, and hence livelihood activities. Coastal areas where fishing constitutes the major means of livelihood of the people will be affected because of rising waters (Agriculture Nigeria, 2014). The importance of agriculture cannot be overemphasized since about 80 percent of the country's poor live in rural areas, and primarily earn their living from agricultural production (National Bureau of Statistics (NBS) (2006). Nearly 2 billion hectare of land globally have been seriously degraded, with some irreversibly damaged (FAO, 2010). In Africa, over 494.2 million hectares (approximately 16%) of land is degraded (Ezeaku and Davidson, 2008: 42). Nonetheless that a lot of efforts have been geared towards reversing the ugly trend of land degradation, most public interventions in developing countries, and especially Nigeria, have not yielded much results (Fameso, 1992: 13). The reasons for this low performance could be traced to the nature of land practices adopted and soil conservation technologies introduced (Anande-Kur, 1986: 18) and socioeconomic conditions of the users of the technologies among other factors. (Jansen *et al.*, 2006: 92; Bravo-Ureta, *et al.*, 2006: 267).

It is clear from the above that the unsustainable agricultural practices by farm families are brimming with problems. Adapting to climate variability and mitigating its impact is something that should strongly be considered, but most importantly, is the understanding of what climate change is to the rural people and how they can adapt and reduce its vulnerabilities. It is therefore expedient to examine the effect of climate change on Agricultural production among rural farmers in Osun State, Nigeria. The specific objectives are to: describe the socio-economic characteristics of rural farmers in the study area; assess the various factors which predispose rural farmers to climate change effects; identify the different coping strategies the respondents employ to combat climate change effects; and to determine the effects of climate variability on rural farmers in the study area.

Methodology

The study was conducted in Osun State, Nigeria. The State has a Population of about 3,423,535 million people (National population Commission, 2006). The state is located in the Southwestern part of Nigeria and lies within latitude 70^0 and 90^0 north of the Equator and Longitude 2.75^0 and 6.76^0 East of the Greenwich Meridian. The State shares common boundaries with Kwara State to the North, and Ogun State to the South, Oyo State to the West, and Ondo State to the East. The State has three Agricultural Development Programmes zones (ADPs), viz: Osogbo; Ife Ijesa and Iwo zones.

A well-structured interview schedule was used to elicit information from respondents. Two hundred and forty (240) respondents were selected using a multi-stage random sampling technique. At the first stage, five, four and three Local Government Areas (LGAs) were proportionately selected based on the number of LGAs in each of these zones. At the second stage, two rural communities were randomly selected from each of the LGAs sampled. At the final stage, 10 rural farmers were randomly sampled from each community selected. Descriptive statistics such as frequency counts, percentage, means, mode, and standard deviation were used to explain the socio-economic characteristics of the respondents. Probit regression analysis was employed to determine the effects climate change has on rural farmers.

The probit regression model isspecified as follows:

$Pr\ (Y - 1) = f\ (F_0 + X_1\beta_1)$

Where: Pr = Probability function

X_1 = n x k matrix of explanation

P_1 = K x 1 Nectar of parameter to be estimated.

F = Cumulative probability distribution

Y = dependent variable (vulnerable = 1, non-vulnerable = 0)

Results and Discussion

Socio-economic characteristics of respondents: Table 1 reveals that 26.3 percent of the respondents were between 50 and 59 years of age, while 24.1 percent were 60 years and above. The average age of the respondents was 28 years; an indication that they were still in their active age. Also, 75.4 percent of the respondents were male while 24.6 percent were female. This implies that the men dominated farming in the study area. The results also presented that 65.8 percent of the respondents were married, 20.8 percent were single and 13.4 percent were widows/widowers. The primary occupation of most of the respondents (83.8%) was farming. About 8.6 percent engaged in the processing of farm produce. Only 4.2 percent of the respondents were petty traders whilst 3.3 percent were artisans. The average household size of the respondents was seven people. A considerably large

household size typical of rural settings in developing countries like Nigeria could be a useful source of labour for farming activities. On educational status, 19.2 percent of the respondents had primary education, 37.5 percent had a secondary education while 19.6 percent had tertiary education. It shows that a majority of the respondents (76.2%) were literates. According to Davis *et al.* (2007), Education is the key asset to determining households' ability to access opportunities that offer higher returns (whether in agriculture or non-farm activities) and it is a major means of escape from poverty.

The majority of the respondents (75.4%) derived their capital from personal savings, 8.8 percent relied on friends and/or relatives, 14.2 percent depend on cooperative societies, and 1.6 percent of the respondents obtained funds from formal financial institutions. It could be affirmed that a higher proportion of the respondents depends on informal sources for credit facilities. The over-dependence on informal sources of credit, could be attributed to the difficulties in obtaining loans/credits from formal sources as explained by the farmers in the study area. The respondents had enough experience in farming, with an average farming experience of 9.3 years. About 76.6 percent of the respondents had less than one hectare of agricultural land, only a few (4.2%) have above two hectares. The majority (75.4%) of the respondents belonged to religious groups, while 9.2 percent belonged to community groups.

Table 1: Socio-economic characteristics of respondents

Variable	Frequency	Percentage
Age (in years)		
≤ 29	23	9.6
30 – 29	41	17.1
40 – 49	55	22.9
50 – 59	63	26.3
≥ 60	58	24.1
Sex		
Female	59	24.6
Male	181	75.4
Marital status		
Married	158	65.8
Single	50	20.8
Widow/widower	32	13.4
Major occupation		
Farming	180	75.0
Trading	20	8.3
Farm produce processing	30	12.5
Artisan	10	4.2
Household size		
1 – 4	45	18.8
5 – 9	94	39.2
10 – 14	75	31.2
≥ 15	26	10.8
Educational level		
No formal education	57	23.8
Primary	46	19.2
Secondary	90	37.5
Tertiary	47	19.6
Source of income		
Personal savings	181	75.4
Bank loan	21	8.8
Cooperative societies	34	14.2
Friends and relatives	04	1.6
Farming experience		
- 30	49	
31 – 45	10.9	20.4
46 – 60	83	45.0
Farm size (ha)		34.6
0 – 1 ha		
– 1.9	184	76.6
≥ 2ha	46	19.6
	10	4.2

Source: Field survey, 2016

Pre-disposing factors of rural areas to climate variability

Table 2 explains varying predisposing factors to climate variability in the study area as submitted by the respondents. The majority of the respondents (75.4%) submitted that human activities, with particular reference to bush burning, engender climate change. This submission is consistent with Botkin and Shaw (2007) who affirmed that bush burning releases excess carbon dioxide, which concentrates in the earth's atmosphere resulting in climate change. In addition, about 45.8 percent of the respondents agreed that land use practices exposed them to climate change, especially with reference made to bush burning (75.8%), deforestation (45.8%), and over-cropping (43.3%). Lawrence (1998) argued that tropical forests are already under intense pressure from logging, fragmentation and hunting. Other factors, which engendered climate change in the study area, were building and road constructions (30.8%) and industrial generation of heat (25.0%). All these emanated from human activities. In fact, human alteration of the earth surface is unprecedented (Turnerll et al, 2002).

Table 2: Pre-disposing factors of rural areas to climate variability

Variable	Frequency	Percentage
Removal of forest/deforestation	110	45.8
Bush burning	181	75.4
Over-cropping of land	104	43.3
Industrial generation of heat	60	25.0
Housing and road construction	74	30.8

Source: Field Survey, 2016
Multiple response were given

Effects of climate change

Table 3 highlighted the effects of climate change in the study area, which have debilitating effects on their crop production. About 54 percent submitted that climate change increases temperature of their area, while 52.9 percent of the respondents disagreed that irregular rainfall was the consequences of climate change.

About 45.8 percent of the respondents opined that fierce and frequent storms are the major effects they experience due to climate variability, while 46.7 percent of the respondents mentioned scarcity of water and soil moisture as the consequences of the climate change. About 42.5 percent and 42.1 percent respectively admitted that climate changes increased the level of poverty and migration to urban areas. About 4.4 percent of the respondents stated that climate change enhanced the infestation of crops with pests and diseases. These findings are in agreement with the submission of Parry *et al*. (2007) who asserted that by climate change, diseases are likely to spread from the tropics to the temperate and northern regions. They further argued that a number of countries in the sub-Saharan Africa (SSA) already experienced considerable water stress because of insufficient and unreliable rainfall changing patterns and flooding.

Table 3: Effects of climate change

Variable	Frequency	Percentage
Shortage of water supply	127	52.9
Flooding	101	42.1
Rise in surface temperature	130	54.2
Fierce and frequent storms	110	45.8
Shortage of soil moisture	112	46.7
Poverty Diseases and pests	102	42.5
	97	40.5

Source: Field Survey, 2016
Multiple response were given

Distribution of respondents based on coping strategies employed to combat climate variability

In response to the challenges of climate change, Table 4 shows that the respondents employed different measures. Prompt weeding, application of green manure, intercropping/mixed cropping and mulching changes in planting and harvesting dates. Various coping strategies like prompt weeding, green manuring, intercropping, mulching and precision planting and harvesting were employed at 83.3, 83.8, 62.5, 47.9 and 42.1frequencies respectively. Other strategies employed by the respondents, include irrigation (12.5%), tree planting (21.7%), culling of infected animals (25.8%) and decreasing the stocking rate of animals (25.0%).

Table 4: Distribution of respondents based on coping strategies employed to combat climate variability

Variable	Frequency	Percentage
Irrigation	30	12.5
Prompt weeding	200	83.3
Intercropping/mixed	150	62.5
cropping	115	47.9
Mulching	52	21.7
Tree planting	201	83.8
Application of green	62	25.8
manure	60	25.0
Culling of infected	101	42.1
animals	75	31.3
Decrease in stocking	78	32.5
rate of animals		
Changes in planting and		
harvesting dates		
Minimum tillage		
Drainage		

Source: Field Survey, 2016
Multiple response were given

Probit regression results of determinants of households' adaptive capacities to effects of climate change

The results of the probit model presented in Table 5, and the chi-square value was used to determine the goodness of fit of the model. The value is statistically significant at one percent level. The result shows that six variables are statistically significant. These include age (t=2.25), education (t=2.36), marital status (t=-1.21), income (t=-2.38), farm size (t=2.02) and farming experience (t=-2.42). It can be deduced that the older the farmers, the more vulnerable they are to climate change; and the larger the farm size, the more the effects of climate variability. Of the six significant variables, four are inversely related to the adaptive capacity of climate change challenges. These are educational level of farmers (t=-2.36), marital status (t=-1.26), income (t=-2.38), and farming experience (t=-2.42). This indicates that an increase in any of these variables will lead to a decrease in the effect of climate variability. The higher the educational level of farmers, the stronger the adaptation capacityagainst climate change. Similarly, the married farmers would have his or her household join him or her to ameliorate the effects of climate change. As the income of the farmers increase, there is the probability of employing adequate and appropriate resources to mitigate the effects of climate change. In addition, as farmers' farming experiences increase, the better the coping strategies to climate variability. These findings are in line with the affirmation of IPCC, (2001), that adaptation depends on factors, such as wealth, technology, education, information, skills, infrastructure, access to resources and management capabilities.

Table 5: Probit regression results of determinants of households' adaptive capacities to effects of climate change

Variable	Regression co-efficient	Standard error	Co-efficient
Age	-0.012	0.0012	2.2504
Sex	2.01223	0.03395	-2.36091
Education	-0.026	0.051	-1.26410
Marital status	0.129	0.058	0.74360
Occupation	0.00801	0.00622	0.23220
Household	0.34803	0.1324	-2.38429
size	2.0028	0.01378	2.02011
Income	-20340	0.07351	-2.41740
Farm size	0.01432	0.01547	0.63250
Farming			
experience			

Pearson Goodness of fit Chi-square = 632.658
Df = 222
P = 0.000

Conclusion and Recommendation

The study revealed that some of the predisposing factors to climate variability in the study areas are bush burning, deforestation, clearing of natural vegetation for roads and building construction, industrial generation of heat, and emission of gases that increase the atmospheric carbondioxide. These are all human activities, which engendered challenges like land degradation, soil erosion and consequent infertility, loss of forest resources, and shortage of water supply which culminated into low food production or food shortage.

Based on the findings the study affirms that rural crop farmers are well acquainted with the signs and effects of climate change. However, it thus appears that farmers do not possess adequate skills and resources necessary to adapt with climate change. This study therefore recommends that all the agencies concerned with climate change (i.e. government, non-government and private agencies) should devote attention to rural areas where food production takes place, especially concerning skill empowerment and resources supply. Research Institutions, Universities and other related centers should come up with more improved and effective strategies that can best assist rural/local farmers to cope with climate change challenges.

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