Farmers Perception of Impact of Climate Changes on Food Crop Production in Ogbomosho Agricultural Zone of Oyo State, Nigeria

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Abstract- **The study assessed farmer's perception of impact of climate change on food crop production in Ogbomoso Agricultural zone of Oyo State, Nigeria. It highlights the socio-economic characteristics of the farmers, farmer's perception on climate change, impact of climate change on crop production and adaptation strategies adopted to mitigate the effect of climate change. Data were collected by using structured interview schedule administered on 360 farmers randomly selected from the three agricultural extension blocks in the study area. Description and analysis of data were carried out using frequency counts, percentages means and tables, while multiple regression was used to test the hypothesis. About 72.0% of the respondents were male, and 95.8% were between 31 and above 51 years old. While 29.4% had no formal education,70.6% have various levels of formal education. About 90% of the farmers had many years of farming experience ranging from6years to 21years and above. Only 31.1% and 24.7% of the respondents indicated delayed rainfall and higher temperature respectively as their perception of climate change. About 12% indicated unusual heavy rainfall, 9.4% indicated undefined season, while 4.4% and 4.2% respectively indicated flood with serious consequences and later fruiting of tree crops respectively as their perception of climate change. About 80.3% of the respondents mentioned low yield of crops as the impact of climate change on crop production, stunted growth (37.2%), ease spread of pest and diseases attack on crops (31.1%). Even though only 68.3% indicated increased water conservation as adaptation strategies, 74.7% mentioned planting of different crops while 54.4% change row orientation with respect to slope, as the adaptation strategies to mitigate impact of climate changes. A significant relationship at 0.05 significant level with coefficient of (R^2 = 0.612) was found between perceived climate change and adaptation strategies. Therefore Arable food crop farmers are more knowledgeable of climate change and even its impacts on their livelihood that should be considered in policy formulation on adaptation of agricultural production systems to climate change.**

Keywords- Farmers Perception, impact, climate change, Food Crop Production, Agricultural Zone, Oyo State.

I. INTRODUCTION

Agriculture places heavy burden on the environment in the process of providing humanity with food and fiber, while climate is the primary determinant of agricultural productivity (Apata et al 2009). The fundamental role ofagriculture in human welfare, concern has been expressed by federal agencies and others regarding the potential effects of climate change on agricultural productivity. Because the effectiveness of rainfall for crop and fish production is a function of the temperature values which affect evaporation and transpiration (Rudolf and Harmann 2009) Smith and Skinner (2002) asserted that climate plays a dominant role in agriculture having a direct impact on the productivity of physical production factors, for example the soil's moisture and fertility. Adverse climate effects can influence farming outputs at any stage from cultivation through the final harvest. Even if there is sufficient rain, its irregularity can affect yields adversely if rains fail to arrive during the crucial growing stage of the crops (Mowa and Lambi, 2006, Rudolf and Hermann 2009). Interest in this issue has motivated a substantial body of research on climate change and agriculture (Lobell et al, 2008) climate change is expected to influence crop and livestock production, hydrologic balance input supplies and other components of agricultural systems. However, the nature of these biophysical effects and the human responses to them are complex and uncertain. It is evidence that climate change will have a strong impact on Nigeria particularly in the areas of agriculture, land use, energy consumption, biodiversity health and water resources (Apata et al, 2009). Nigeria like all the countries of sub-Saharan Africa is highly vulnerable to the impacts of climate change (NEST, 2004, IPCC 2007 and Apata et al, 2009). Though climate change is a threat to agriculture and non-agricultural socio-economic development, agricultural production activities are generally more vulnerable to climate change than other sectors. (Kurukulasuriya, et al, 2006) . Ole et al, (2009) asserted that analysis of 9000 farmers in 11 African countries predicted falling in farm revenues with current climate scenarios. Also Butt et al, (2005) predicted future economic losses and increased the risk of hunger due to climate change. It seems clear the combination of high climatic variability poor infrastructure, economic poverty, drought, excess rainfall, poor livestock health, reduced crop yields, low productivity and a range of other problems associated with climate variability will constitute important challenges for Africa countries in particular (Adger et al, 2007). Food crop farmers in Oyo State Nigeria provide the bulk of arable crops that are consumed locally. The local farmers are experiencing climate change even though they have not considered it deeper implications (Apata et al 2009). This is evidenced in the late arrival of rain, the drying-up of stream

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and Small Rivers that usually flows year round. Also the gradual disappearances of flood-recession cropping in riverine areas of Ondo State are among the effects of climate disturbances in some communities of south-western Nigeria. (BNRCC, 2008 and Apata et al 2009). In Srilanka when precipitation increases it results in a positive and significant impact on farmers revenues, whereas temperature has a strong negative impact. Also in Cameroon net revenue falls as precipitation decreases or as temperature increases while in South Africa climate change has significant effects on net revenue per hectares of sugarcane with higher sensitivity to future increase in temperature than precipitation Ole et al, 2009).

II. STRATEGIES TO MITIGATE IMPACTS OF CLIMATE CHANGES

To approach the issue of climate change appropriately, one must take into account local communities understanding of climate change, since they perceive climate as having a strong spiritual, emotional, and physical dimension. It is therefore assumed that these communities have an inborn, adaptive knowledge from which to draw and survive in high-stress ecological and socio-economic conditions. Thus, the human responses is critical to understanding and estimating the effects of climate change on production and food supply for ease of adaptation. Accounting for these adaptations and adjustments is necessary in order to estimate climate change mitigations and responses (Apata et al 2009 SPORE, 2008 BNRCC 2008). There are identification of production systems which are most resilient to climate variability, that is production systems with the ability to adjust or recover from negative impacts and take advantage of positive impacts of the current climate variability. One of the factors that contribute to increasing resiliency of agricultural systems is the identification of appropriate mixes of production activities. For example, establishing crop/livestock mixed systems, using a mix of crop species, cultivar types and sowing dates, combining less productive drought - resistant cultivars and high yield but water sensitive crops. In other words, modifying the production systems by introducing four strategies:

a) Increased diversification including activities that are less sensitive to drought and/or temperature stresses.
b) Compatibility: activities that take full advantage of beneficial climate conditions.
c) Escaping sensitive growth stages: This is by establishing crop practices that avoid the concentration of sensitive growth stages in the same period of the year (e.g different season lengths, sowing dates etc
d) Elimination: another pathway for increasing resiliency is by eliminating climate related factor which is most limiting to crop productivity (e.g. introducing irrigation in water-limited summer crops)(IPCC, 2007). Nevertheless rural communities in Nigeria have always managed their resources and livelihoods in the face of challenging environmental and socio-economic conditions (Mortimore and Adams 2001, and Ole et al 2009). They have to a large extent been able to develop their livelihood strategies in a way which enables them to constantly cope with and adapt to an erratic climate change, severe pest attack, changing agricultural policies at local, national, global levels and other natural factors (BNRCC,2008 Apata et al 2009,IPCC,2007, ODI,2007and Molua 2008). There is need to gain as much information as possible, and learn the positions of rural farmers and their needs, about what they know about climate change, in order to offer adaptation practices that meet these needs. (Royal Society 2005 and Apata et al 2009 Lobell et al 2008 Hassan and Nhemachem 2008).This study therefore intends to assess farmers perception of impact of climate change on food crop production, it also describe socio-economic characteristics of the respondents, examine farmers perception on climate change, identify impact of climate change on crop production and to ascertain adaptation strategies adopted to mitigate effect of climate change.

III. METHODOLOGY

The study was conducted in Ogbomoso Agricultural zone of Oyo State. This zone consist of five agricultural extension blocks out of which three namely, Ikoyi, Ajaawa and Iresa were purposively selected for the study due to rural based of those extension blocks. Multistage sampling technique was used to select, Three hundred and sixty (360) farmers for the study. Four extension cells, out of eight cells in each selected extension block were randomly selected and two communities were selected randomly from each cell making a total of 24 communities selected for the study. Fifteen (15) respondents were systematically selected from each community making One hundred and twenty (120) respondents chosen from each extension block. Finally, a total of three hundred and sixty (360) respondents constituted the sample size for the study. Structured interview schedule was administered on respondents through Personal contact, with assistance of employed trained e numerators in their various communities. The adaptation strategies adopted by the respondents to mitigate effect of climate change on food crop production was grouped into five categories. These strategies are (i) soil water management (ii) Farming operations (iii) Protection measure (iv) household livelihood and (v) education and finance. Data collected were subjected to descriptive statistics, such as frequency counts, tables and percentages. However for testing research hypothesis multiple regressions was used.

IV. RESULT AND DISCUSSION

1) *Socio-Economic Characteristics of the Respondents*

Table 1 show that 22.2% of the respondents were above 51 years of age, 21.7% fell between the age range of 41-45 while 21.1% and 17.5% were between the age ranges of 46-50,and 36-40 years respectively, also 13.3% fell between the

age range of 31-35 and 4.2% were less than 30 years of age. Data further shows that about 72.0% of the respondents were male, 70.5% were literate and 90.3% of the respondents had involved in farming for more than 5years. This implies that majority of the respondents had being in farming for many years.

2) *Farmers' perception on climate change*

Data in Table 2 revealed the responses of sampled farmers perception on climate change in their area as 31.1% indicated delayed rainfall, 24.7% indicated higher temperature 11.7% indicated unusual heavy rainfall, 9.4% indicated fast water evaporation and undefined season while 5.0%, 4.4% and 4.2% indicated more longer days than knight, flood with serious consequence and late fruiting of tree crops respectively as the determinant of climate change in their environment. This result conform with Lobell,(2008) Apata et al (2009) who reported that 89.0%, 72.0% and 65.0% of the respondents respectively indicated higher temperature, water evaporation from the ground is fast and delayed rainfall as the determinants of climate change.

3) *Impact of Climate Change on Crop Production*

Table 3 reveals that low yield on crop is the dominant impact (80.3%) stunted growth of crop (37.2%) ease spread of pest and diseases attack on crops. (31.1%) Drying of seedling after germination (27.2%) and ineffectiveness of agriculture chemicals due to delayed of rainfall 26.9%. These agree with findings of Molua (2008) who reported that performance of agriculture sector depends largely on the return of good rains and the timely and adequate provision of agricultural inputs.

4) *Perceived Adaptation strategies to mitigate impact of climate change on crop production.*

Table 4 presents adaptation strategies actually adopted by the respondents. These strategies are: increase water conservation (68.3%), shading and shelter/ mulching (59.4%) soil conservation (55.0%) move to different site (38.3%) while 34.2%, 20.6% and 19.2% of the respondents implement water conservation techniques practice, increase irrigation, and increase or reduction in land size cultivated respectively. Also respondents adopted planting of different crops (74.7%) Treat seed with fungicides before sowing (60.0%) planting different varieties of crops (58.9%), mixed cropping (96.7%) change use of chemical (68.9%). Furthermore 54.4% and 52.5% of the respondents adopted change of row orientation with respect to slope and Application of soil amendments e.g. farmyard manure respectively as the strategies to mitigate effect of climate change. Table 4 further revealed that 96.1% adopted ration food, 86.7% reduce expenditure and 59.2% avoid selling remaining food stocks. However, 86.1% and 11.9% revealed that adequate access to extension facilities and credit facilities are the strategies adopted to mitigate effects of climate change on crop production in the study area. These results are in line with Molua (2008) Rudolf and Hermann (2009) and Apata et al (2009) who reported that main strategies for reducing climate risk is to diversify production and livelihood systems like soil and water management measures, and plant protection measures that varied to maintain adequate crop yields. Results of regression analysis in Table 5 shows that increased or reduced land size cultivated (X1), shading and shelter /mulching (X2) mixed cropping (X3) change row orientation with respect to slope (X4) Access to extension facilities (X5) Access to credit facilities (X6) education level (X7) years of farming experience (X8) and zero tillage (X9) had positive significant relationship with the dependent variable and predicted 60% of the variations in the farmers perceptions of impact of climate change. This explains that the more the perceived impact of climate changes the more the adoption of adaptation strategies to mitigate climate change impact on food crop production.

V. CONCLUSION AND RECOMMENDATION

It is established from this study that farmers were aware of climate change and its impacts on food crop production. Further more, they are able to develop their livelihood and adaptation strategies in a way that enables them to constantly cope with an erratic impact of climate change on food crop production. Increase/reduce farm size, mulching, mixed cropping, row orientation with respect to slope, access to extension facilities credit facilities, zero tillage, educational level and years of farming experience were found to be significantly related to the perceived climate change in the study area. Hence, there should be off-farm employment that could stabilize income in the face of low crop production as a result of impact of climate change on crop production, also small scale irrigation project are of more sustainable nature that show a promising effect on climate change, income and risk reduction and there should be formulation of policy that considered arable food crop farmers experience in climate change with reliable and effective measure of adaptation. that need to be implemented that must be easily accessible to the end users.

Table 1
Source: Field Survey 2009

Variables Age	Frequency	Percentage
>30	15	4.2
31-35	48	13.3
36-40	63	17.5
41-45	78	21.7
46-50	76	21.1
51 and Above	80	22.2
Total	360	100.0
Sex	Frequency	Percentage
Male Female	258	71.7
	102	28.3
Total	360	100.0
Educational Level	Frequency	Percentage
No formal Education Primary Education Junior Secondary Education Senior Secondary Education Tertiary Education Others Quranic Education Adult literacy education	106	29.4
	85	23.6
	52	14.4
	61	16.9
	24	6.7
	32	8.9
Total	360	100.0
Years of farming experience	106	29.4
		23.6
1-5	85	14.4
6-10	52	16.9
11-15	61	6.7
16-20	24	8.9
21 and Above	32	
Total	360	100.0

Table 2:
Farmers perception of Climate Change

Perception	Frequency	Percentage
Higher temperature	89	24.7
Fast water evaporation from the ground Delayed rainfall	34	9.4
Undefined season	112	31.1
Flood with serious consequences	34	9.4
Later fruiting of tree crops	16	4.4
Unusual heavy rainfall	15	4.2
More longer days than knight	42	11.7
Total	18	5.0
	360	100.0

Source: Field Survey 2009

Table 3: Impact of Climate Change on Crop Production

Impact*	Frequent	Percentage
Low yield of crops	289	80.3
Stunted Growth	134	37.2
Drying of seedling after germination Ease spread of pest and diseases attack on crops	98	27.2
	112	31.1
Ineffectiveness of agricultural chemicals used due to delay in rainfall	97	26.9

Source: Field Survey 2009

Table 4: Adaptation strategies to Climate Change

Adaptation*	**Frequency**	**Percentage**
Soil water strategies implement water conservation techniques	123	34.2
Increase or reduce land size cultivated	69	19.2
Move to different site	138	38.3
Increase irrigation	74	20.6
Increase water conservation	246	68.3
Soil conservation	198	55.0
Shading and shelter /Mulching	214	59.4
Farming Operations	269	74.7
Planting of different crops	212	58.9
Planting of different varieties	172	47.8
Early Planting	89	24.7
Early harvest when dry soil is expected	76	21.1
Apply more or fewer inputs	83	23.1
Different planting dates	216	60.0
Treat seeds with fungicides before sowing	348	96.7
Mixed cropping	237	65.8
Mixed farming	215	59.7
Zero tillage	23	6.4
Changes from crop production to livestock production Change use of chemicals fertilizer and pesticides	248	68.9
Protection measure	196	54.4
Change row orientation with respect to slope	189	52.5
Apply soil amendments eg farmyard manure	98	27.2
Increase fertilizer application three days prior to sowing		
Household Livelihood	149	41.4
Undertake non-farm economic activities	213	59.2
Avoid selling remaining food stocks	312	86.7
Reduce expenditure ration food	346	96.1
Ration food	89	24.7
Migrate		
Education and finance	310	86.1
Access to extension facilities	43	11.9
Access to credit facilities	07	1.9
Government Policies		

Source: Field Survey 2009

Table 5: Regression analysis on perception of Climate Change and adaptation strategies.

Independent Variables	
Constant	56.501 (3.743)*
Farm size (X1)	0.132 (2.062)*
Shading, shelter and mulching (X2)	0.313 (2.189)*
Mixed Cropping (X3)	0.549 (2.520)*
Change row orientation with respect to slope (X4)	0.723 (3.147)*
Access to extension facilities (X5)	0.834 (2.128)*
Access to credit facilities (X6)	0.379 (2.832)*
Educational level (X7)	0.284 (2.568)*
Years of Farming experience (X8)	0.127 (3.231)*
Zero tillage (X9)	0.615 (2.586)*

Source: Data Analysis 2009

R^2 - 0.612
AdJ R - 0.734
F - Value - 4.5
* Significant at 0.05 level

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