Journal of Agricultural Extension and Rural Development Vol. 4(19), pp. 522-527, November 2012
Available online http:// academicjournals.org/JAERD
DOI: 10.5897/JAERD12.041
ISSN 2141-2154 ©2012 Academic Journals

Full Length Research Paper

Adaptation strategies of selected tree crop farmers to climate variation in Oyo State, Nigeria

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Accepted 4 June, 2012

This study examined the adaptation strategies of tree crop farmers to climate variation in Oyo State, Nigeria. Multistage sampling technique was used to sample 160 respondents for the study. The data collected were analyzed using descriptive and inferential statistics such as frequency counts, percentages, means, and Pearson Product Moment Correlation (PPMC). Result of analysis showed that majority of the tree crops farmers were in their active ages of between 15 and 55 years old (78.1%), males (73.8%), had tertiary education (41.2%), had between 11 and 20 years of experience in tree crop farming (35.0%) and had less than 15 acres of tree crops farmland (80.8%). Constraints being faced were low yield, stunted growth, high sunlight intensity, pest and diseases, prolong dry season among others. Most respondents were aware of climate variation and adaptation strategies employed includes mulching, increased irrigation, and crop diversification. Significant relationship existed between awareness (r = 0.013; p = 0.003) and adaptation of respondents to climate variation in the study area. It is recommended that farmers' adaptation to climate variation should be improved upon by research and extension, while the government should provide incentives to encourage continuous tree crop planting.

Key words: Climate variation, tree crop, adaptation, ecosystem.

INTRODUCTION

Climate variation refers to any significant change in measures of climate such as temperature, precipitation and/or wind. Climate variation as an environmental, social and economic challenge is on a global scale (Scholze et al., 2006). Millennium Ecosystem Assessment (2005) submits that climate variation is significantly caused by human actions such as the widespread use of land, broad scale deforestation, major technological and socio-economic shifts, and accelerated use of fossil fuels. The most devastating impacts of climate variation in Nigeria includes frequent drought, increased environmental damage, increased infestation of crops by pests and diseases, depletion of household assets, increased rural-urban migration, increased biodiversity loss, reduction of wildlife and other natural resources, changes in vegetation type, decline in forest resources, decrease in soil moisture and nutrient, increased health risk and spread of infectious diseases, and changing livelihood systems (Abaje and Giwa, 2007). More than ever before, climate variation is threatening to sustainable agricultural development of many developing nations. Nigeria's agricultural sector is more vulnerable to climate variation because it is dominated by landless, undernourished, poor, uneducated farmers, with low technological know-how and evidently ill-equipped to adequately adapt to climate variation (Barber et al., 2003). The effect of climate variation in tree crops production ranges from overall reduction in production to yield quality which invariably threatens both national and household income. Many efforts are being made to maintain balance and steady climatic conditions in different sectors, but in the agricultural sector, it is pertinent to keep production increasing to meet up with the ever-increasing need for nutrition, livelihood, and income. One way of achieving this is to keep farmers aware of the threat and increase their capability to work their way around it. This cannot be adequately done without first having the knowledge of their present level of awareness of the subject matter and the adaptation strategies they have employed. The cultivation of

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many tree crops and the presence of agricultural institutes in Oyo state are expected to have impact on farmers' awareness and adaptation to climate variation. Hence, this study examined the adaptation strategies of tree crops farmers to climate variation in Oyo State. The specific objectives of the study are to:

1. Determine selected personal characteristics of tree crop farmers in Oyo state,
2. Assess the level of awareness of tree crop farmers on climate variation,
3. Identify the adaptation strategies of tree crop farmers to climate variation, and
4. Determine the tree crop farmers' constraints regarding climate variation.

The hypothesis of the study is that there is no significant relationship between tree crop farmers' awareness of, and adaptation to climate variation in Oyo State, Nigeria.

METHODOLOGY

The population of the study are all registered tree crop farmers in Oyo State. Multistage sampling technique was used to sample respondents for the study. Oyo state was stratified into 2 vegetation zones namely; derived savannah and rainforest. Fourteen Local government Areas (LGAs) each in the zones were registered with Tree Crops Development Unit, Ibadan Headquarter, Oyo State, among which two prominent tree crops producing LGAs were purposively selected each from the zones. The four local government areas selected were Iddo and Ona-Ara from rainforest zone, Afijio and Ibarapa Central from the derived savannah zone. Proportionate sampling technique was then used to select 50% of the members from the total registered tree crop farmers of the LGAs selected. From Iddo and Ona-Ara LGAs, out of the 65 and 73 registered tree crops farmers, 33 and 37 respectively were selected making a total of 70 respondents from the rainforest zone. Likewise, out of the 98 and 82 registered tree crops farmers in Afijio and Ibarapa Central LGAs, 49 and 41 respectively were selected making a total of 90 respondents from the derived savannah zone. A total of one hundred and sixty (160) respondents were thus sampled for the study. Interview schedule was used to elicit information (personal characteristics, farming characteristics, awareness of climate variation, constraints regarding climate variation, and adaptation strategies based on tree crops cultivated) from the respondents. Respondents' adaptation to climate variation is the dependent variable of the study, while the rest aforementioned ones are the independent variables. Respondents answered No (1) or Yes (2) to items eliciting information on awareness, adaptation strategies, and constraints regarding climate variation. Twenty-four items were used to determine the level of awareness of respondents, with maximum score = 48, minimum score = 24, mean score = 22.0. Respondents with score of 22 and above were concluded to have high awareness, while the ones with score below 22.0 have low awareness of climate variation. Frequency counts, percentages, means, and PPMC were used in data description and analysis.

RESULTS AND DISCUSSION

Respondents' personal characteristics

Table 1 shows that majority of the respondents were in their active age of between 15 and 55 years, implying that tree crop production only attract energetic and vibrant people. Both males and females were involved in tree crop production, but majority were males. 82.5% of the respondents were married, suggesting that these farmers had families that must be provided for and so adaptation strategies to climate variation towards stable and/or increased production was a necessity to them. Moreover, 41.2% of the respondents had tertiary education, corroborating Gbadamosi (2009) that states that unemployed graduates are now returning to farming, with particular interest in tree crop cultivation. This high literacy rate is a factor that can be capitalized upon to build awareness and capacity to mitigate the effects of climate variation.

Farming information of respondents

Result in Table 2 reveals that majority of the respondents cultivated tree crops on less than 15 acres of land, signifying that these farmers were not really commercialized. Also, 35.0% of the respondents had 11 to 20 years of experience in tree crop farming, implying that tree crop farming is not a new enterprise in Oyo state.

Respondents' awareness of climate variation

Table 3 showed that majority of respondents were aware of hot evenings, increased sunlight, increased sun intensity, continuous rise in temperature, and prolonged dry season. Also, respondents were aware that rainfall pattern had been fluctuating in the last five years, amount of rainfall had reduced, many rainfalls were accompanied with strong winds, erosion, and runoff of top soils was rampant. Awareness of high incidence of pests and diseases, decaying of fruits before maturation, water deficit in soil, increase in soil acidity and toxicity due to soil water deficit, and decrease in soil microbial population due to varying rainfall distribution were high among the farmers. Tree crop farmers in Oyo state were also aware of increased deforestation, variation in the onset of harmattan period, and rampant occurrence of forest fires. This result indicates that climate variation is significantly obvious enough in farming activities and corroborates the study of Gwary (2011) that the evident signs of climate variations are reduced soil water, increased soil erosion, and eventual threats to food security.

Distribution of respondents' level of awareness of climate variation

Table 4 revealed that majority (60.0%) of the tree crop farmers in the study area had high level of awareness of

Table 1. Distribution of respondents' selected personal characteristics (n=160).

Variable	Frequency	Percentage
Age		
15-25	12	7.5
26-35	25	15.6
36-45	52	32.5
46-55	36	22.5
Above 55	35	21.9
Sex		
Male	118	73.8
Female	42	26.2
Marital status		
Married	132	82.5
Widowed	7	4.4
Divorced	9	5.6
Single	12	7.5
Educational level		
Non formal	21	13.1
Primary	34	21.3
Secondary		
Tertiary	66	41.2

Source: Field survey, 2010.

Table 2. Distribution of respondents' farming information (n=160).

Variable	Frequency	Percentage
Farm size (acres)		
<15	129	80.8
16-31	26	16.2
32-47	3	1.8
48-63	2	1.2
Years of farming experience		
< 10	37	23.1
11 – 20	56	35.0
21 – 30	20	12.8
31 – 40	12	7.5
41 – 50	6	3.8
51 – 60	29	18.1

Source: Field survey, 2010.

climate variation while 40.0% of the respondents had low level of awareness of climate variation. This implies that more than half of the target farmers are aware of climate variation, corroborating BNRCC (2011) that farmers are not left out of information on climate variation. This level of awareness suggests that these farmers by instinct have sought approaches to manoeuvre their activities around this inconsistency.

Distribution of respondents' adaptation strategies to climate variation employed based on tree crop grown

Table 5 revealed that tree crop farmers mainly adopted: mulching (50.0, 48.1, 48.1 and 46.9% of cocoa, kolanut, oil palm, and citrus farmers respectively) to avoid removal of top soils and leaching; increased irrigation (46.9, 44.4, 48.8, and 50.0% of cocoa, kolanut, oil palm, citrus farmers respectively) to increase soil water moisture and nutrient accessibility; and crop diversification (43.8, 45.6, 44.4, and 48.9% of cocoa, kolanut, oil palm, and citrus farmers respectively) to ensure various income sources in order to keep their household income stable. More so: 34.4, 35.6, 35.6, and 38.8% of cocoa, kolanut, oil palm, and citrus farmers respectively adopt increased organic manure use to increase soil fertility and improve soil compaction; 30.0, 28.1, 29.4 and 30.0% of cocoa, kolanut, oil palm, and citrus farmers plant different varieties of these crops for early maturity and resistance against drought, pests and diseases; 33.8, 33.8, 30.0, and 31.9% of cocoa, kolanut, oil palm, and citrus farmers respectively change harvest early to avoid fruit over ripening and decay; and 28.8, 28.1, 28.8 and 28.1% of cocoa, kolanut, oil palm, and citrus farmers practice shifting cultivation for soil fertility regeneration and to produce food crops to ensure their household food security. Among the least adopted strategies were changing planting dates with 17.5, 16.3, 16.9 and 17.5% of cocoa, kolanut, oil palm, and citrus farmers respectively, suggesting that majority of the tree crops were old and farmers were not encouraged to plant new ones; and increased use of agrochemicals with 10.0, 10.0, 10.0 and 9.4% of cocoa, kolanut, oil palm, and citrus farmers respectively, implying that farmers had gone a little complacent on the health, yield of tree crops and quality of fruits. This result shows that farmers were rational and would continue to work their ways around challenges to their production and survival; and also reveals their wealth of experience in tree crop farming. The result corroborates with the study of Nhemachena and Hassan (2008) that concludes that common adaptation measures include diversifying crops, planting different crops or crop varieties, replacing farm activities with nonfarm activities, changing planting and harvesting dates, increasing the use of irrigation, and increasing the use of water and soil conservation techniques.

Respondents' constraints regarding climate variation

Result on Table 6 reveals series of constraints, with the most serious being low yield (85.0%), stunted growth (80.6%) and high sunlight intensity (76.9%). All these

Table 3. Distribution of respondents' awareness of climate variation (n=160).

S/N	Statement	Yes		No	
		Frequency	%	Frequency	%
1	Evenings are mostly hot	112	70.0	48	30.0
2	Compared to years back, the heat now is higher	137	85.6	23	14.4
3	Rainfall period has been fluctuating in the last five years	136	85.0	24	15.0
4	The amount of rainfall has reduced	122	76.3	38	23.8
5	Many rainfalls are accompanied with strong winds	117	73.1	43	26.9
6	Sunlight period has increased	111	69.4	49	30.6
7	Sun intensity is higher compared to five years ago	100	62.5	60	37.5
8	Many rainfalls are accompanied with erosion	114	71.3	46	28.8
9	Hot afternoon are accompanied with flies	79	49.4	81	50.6
10	Runoff of top soils is more rampant	128	80.0	32	20.0
11	There is high incidence of pests and diseases	123	76.9	37	23.1
12	Fruits become over ripped before harvesting period	84	52.5	76	47.5
13	Deforestation has increased than before	123	76.9	37	23.1
14	There are reductions in number of fruits per tree	108	67.5	52	32.5
15	There is variation in the onset of harmattan period	134	83.8	26	16.2
16	There has been more cases of decaying fruits	132	82.5	28	17.5
17	Occurrence of forest fires is more rampant	131	81.9	29	18.1
18	There is continuous rise in temperature	137	85.6	23	14.4
19	Dry season is prolonged	127	79.9	33	20.6
20	There is water deficit in the soil	107	66.9	53	33.1
21	There is too much water retained in the soil	74	46.3	86	53.7
22	Variability in rainfall pattern is affecting tree crop production	139	86.9	21	13.1
23	Variability in rainfall distribution has reduced soil microbial population	139	86.9	21	13.1
24	Water deficit in the soil has increased soil acidity and toxicity	120	75.0	40	25.0

Source: Field survey, 2010.

Table 4. Distribution of respondents' level of awareness of climate variation (n=160).

Level of awareness	Frequency	Percentage	Mean score
High (22.0 and above)	96	60.0	22.0
Low (below 22.0)	64	40.0	
Total	160	100.0	

Source: Field survey, 2010.

effects were obvious challenges to tree crop production in the study area, corroborating with the report of Gwary (2011) that food security is an attendant consequence of climate variation in Nigeria.

Test of hypothesis

There is no significant relationship between tree crop farmers' awareness of, and adaptation to climate variation in Oyo State, Nigeria. Table 7 shows that there was a significant relationship between tree crop farmers' awareness of, and adaptation to climate variation ($r = 0.013$; $p = 0.003$). That is, the higher tree crop farmers' awareness of climate variation, the more they took up strategies to adapt to the situation to sustain their production, as against the report of Reddy et al. (2010) that submits that high awareness did not translate to high adoption of adaptation strategies.

CONCLUSION AND RECOMMENDATION

Tree crop farmers in Oyo State, Nigeria were mainly males, married, educated, and agile. They have long years of farming experience, but not commercialized. They are well aware of climate variation and its effect on their production and thus, adopt practices to cushion its

Table 5. Distribution of respondents' adaptation strategies to climate variation employed based on tree crop grown (n=160).

Strategies adopted	Cocoa farmers		Kola nut farmer		Oil palm farmers		Citrus farmers	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Increased use of organic manure	55	34.4	57	35.6	57	35.6	62	38.8
Early harvesting	54	33.8	54	33.8	48	30.0	51	31.9
Planting of different varieties	48	30.0	45	28.1	47	29.4	48	30.0
Mulching	80	50.0	77	48.1	77	48.1	75	46.9
Increased irrigation	75	46.9	71	44.4	78	48.8	80	50.0
Crop diversification	70	43.8	73	45.6	71	44.4	67	48.9
Shifting cultivation		28.8	45	28.1	46	28.8	45	28.1
Changing planting dates	2	17.5	26	16.3	27	16.9	28	17.5
Increased use of agrochemicals	16	10.	16	10.0	16	10.0	15	9.4

Source: Field survey, 2010.

Table 6. Distribution of respondents' constraints regarding climate variation (n=160).

Constraints	Frequency	Percentage	Ranking
Deforestation	104	65.0	6th
High sunlight intensity	123	76.9	3rd
Pest and diseases	118	73.8	4th
Low yield	136	85.0	1st
Stunted growth	129	80.6	2nd
Reduction in soil fertility	96	60.0	7th
High evaporation	88	51.9	8th
Prolong dry season	107	66.9	5th

Source: Field survey, 2010.

Table 7. Pearson product moment correlation test of the relationship between tree crop farmers' awareness of, and adaptation to climate variation.

Variable	Correlation coefficient (r)	Degree of freedom	p-value	Decision
Awareness	0.013	160	0.003	Significant

Source: Field survey, 2010; significance is at $p < 0.05$.

effect, but there are still salient indications of undue contentment with the low yield and quality of tree crops, as most of them have diversified into cultivation of other crops. Mulching, increased irrigation, and crop diversify-cation were the major adaptation strategies among the farmers, while low yield, stunted growth, and high sunlight intensity were the major constraints as regard climate variation. It is concluded that there was a significant relationship between tree crop farmers' awareness of, and adaptation to climate variation in Oyo State. Recommendations are that: tree crop farmers should organize themselves into groups because collective efforts have more significant results than individual ones; agricultural research should come up with techniques and technologies to mitigate the effects of climate variation; and extension services should get abreast of proven adaptation strategies to climate variation and work them out with farmers. Also, educational institutes and concerned Non-Governmental Organizations (NGOs) should facilitate research by providing empirical com-parison of various adaptation strategies across the agro-ecological zones of Nigeria and other tropical countries. Finally, government should come up with policies to reduce climate variation, mitigate its effect, facilitate research, mobilize extension service, and provide incentives to tree crop farmers to encourage

continuous production.

REFERENCES

Abaje IB, Giwa PN (2007). Urban flooding and environmental safety: a case study of Kafanchan town in Kaduna State. Paper presented at the golden jubilee/150th anniversary and 49th annual conference of the Association of Nigerian Geographers (ANG) held on 15th-19th October, 2007 at the Department of Geography, University of Abuja, Gwagwalada– Abuja.

Barber H, Jennifer S, Ann EB, William, GA (2003). Neighborhood social change and perceptions of environmental degradation. Popul. Environ. 25:7-108.

Building Nigeria's Response to Climate Change (BNRCC) (2011). Local action on climate change. Quarterly newsletter: February, 2011. Available at http://www.nigeriaclimatechange.org/docs/ BNRCC_Quarterly_Newsletter_February_2011.pdf (Assessed 02/08/2011)

Gbadamosi OA (2009). Perceived effect of climate variation on production among fish farmers in Oyo State. M.Sc. dissertation, University of Ibadan, Ibadan, Nigeria.

Gwary DM (2011). Disaster risk reduction and climate change adaptation in Nigeria. Paper presented at National Emergency Management Agency (NEMA) regional workshop on climate change in Asaba, Delta State. July, 2011.

Millennium Ecosystem Assessment (MEA) (2005). Available at http://www.maweb.org/en/index.aspx (Assessed 12/06/2010)

Nhemachena C, Hassan R (2008). Micro-level analysis of farmers' adaptation to climate change in Southern Africa, IFPRI discussion paper No. 714 Washington, DC: International Food Policy Research Institute.

Reddy VR, Brown P, Bandi M, Chiranjeevi T, Reddy DR, Roth C (2010). Adapting to climate variability in semi-arid regions: a study of sustainable rural livelihoods framework. Livelihoods and Natural Resources Management Institute (LNRMI) working paper No. 1. September, 2010. Hyderabad.

Scholze M, Knorr W, Arnel NW, Prentice IC (2006). A climate-change risk analysis for world ecosystems. Proceed. Natl. Acad. Sci. 103(35):116-122.