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ANALYSIS OF FARMERS' ADOPTION OF CLIMATE CHANGE ADAPTATION TECHNOLOGIES IN IKOT EKPENE AGRICULTURAL ZONE OF AKWA IBOM STATE, NIGERIA

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ABSTRACT

The study examined adoption of climate change mitigation technologies among farming households in Ikot-Ekpene Agricultural Zone of Akwa Ibom State, Nigeria. Data were obtained from 150 farmers participating in the Agricultural Development Programme (ADP) using a two-stage sampling techniques. The data collected were analysed using descriptive statistics and likert scale rating techniques. The results from the perceived level/of farmers' knowledge of climate change mitigation technologies indicated thus: poor and unpredictable yield (X =3. 79), knowing the risk of .rainfall irregularities (X=3.47), moisture stress causes severe damage (X=3.13), occurrences of drought (X=3.42) and increasing pests and disease (X= 3.04). Of all the 23 climate change mitigation technologies packaged by Akwa Ibom State Agricultural Development Programme (AKADEP) only four (Homestead garden M=4.49, Legume application M=4.45, planting of fruit trees M=4.44 and crop rotation M=4.43) of the climate change mitigation technologies recorded very high adoption levels. The result also showed that there is no significant relationship between farmers knowledge level of climate change and adoption of mitigation technologies at 5% level of significance, hence, the null hypothesis was accepted. An urgent need for the Agricultural Development Programme to step up their enlightenment campaigns on climate change mitigation in the area is recommended.

Keywords: Climate change, farmers, adoption, nigeria

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1.0 INTRODUCTION

Climate change has become more threatening to sustainable agricultural development. It has become a major challenge to the fight against hunger, malnutrition, diseases and poverty in Africa through its impact on agricultural production (Nkeme, 2014). Its sensitivity and vulnerability to high ambient temperature and rainfall fluctuations cause crop failure, leading to food shortage (Brady, Dumanski, Johnston, Chiotti & Singh, 2008). Currently Nigeria is on the brink of severe food insecurity and could not meet the millennium development goals of eliminating hunger by 2015 (Okon, Enete & Okorji, 2016). Food insecurity in the country has become so worrisome that 25.30% of households have problems meeting food needs, the greatest percentage (65%) of households have meals once a day. Also, Okali, (2011) observed that about 47% of the Nigerian population is unable to meet the 2900- kcal mini food requirement. In addition, there is a widespread unemployment, estimated at 12.1% of economically active population (NBS, 2016). This situation has resulted in massive importation of food items such as rice, wheat, fish, oil, sugar, among others (Ayoade, 2006). This is because majority of Nigerian population depends of agriculture for their livelihood. Agriculture being seasonal in nature depends on the vagaries of weather, and this affects agricultural productions. Against this backdrop, the country may not meet its food needs as a result of low crop yield due to changes in climate and atmospheric composition (Nkeme & Ndaeyo, 2011). To avert this prevailing hunger situation especially in the sub Saharan region, food production must be increased to meet the ever increasing population. This could be achieved by combating climate change and mitigating its effect.

The effect of climate change has not only aggravated an existing problem but also contributes to the dwindling agricultural productivity and food insecurity in the nation (Nwachukwu & Nnadozie, 2011). As population pressure exacerbates or intensifies land degradation, deforestation and nuclear and greenhouse gas emissions make the development of technologies to mitigate and adapt to climate change very imperative.

Changing climatic conditions cause high temperature, unpredictable rainfall pattern, floods, desert encroachment, excessive drought and depletion of the ozone layer by greenhouse gases. These events have tended to reduce agricultural production, hence affecting the means of livelihood of farmers. Based on this, Nkeme, (2014) observed that farmers in the rural communities of Akwa Ibom State are threatened by problems associated with climate change.

In Nigeria, agricultural production is mostly practiced on subsistence scale and most farmers are poor. As a result they suffer most from the effect of climate change as their sources of income are devastated (Agbrevo, 2013). This worsens the already critical food situation. Ensuring food

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security is seriously threatened by climactic changes largely due to ever-increasing population. Much use of fuel wood, bush burning, removal of crop residues, emission of greenhouse gas and deforestation which causes land degradation by erosion have reduced the quality and productivity of land. Deforestation is the main source of carbon dioxide emissions in Nigeria. It is characterised by accelerated loss of forest cover due to changing climate conditions (Onumadu, 2009). This is also exacerbated by human intervention for the purpose of farming, gathering of fuel wood for domestic uses, mechanization and urbanization.

Agriculture has to find new balance between producing food, managing natural resources and providing a livelihood base for the rural populace through formulation and implementation of agricultural technologies that stimulate the interest of farmers to remain in production. Moreover, farmers need to be integrated into the practices and activities to mitigate the effect of climate change, by adopting them. This is imperative since farmers through agricultural activities contribute greatly to climate changes which in turn threaten their means of livelihood. Several studies on climate change concentrated on other states of Nigeria. There has been limited information on adoption level of climate change mitigation by farmers in the study area. Therefore, this study examined the socio-demographic characteristics of the farmers; identified the sources of information on climate change; established the perceived knowledge level of farmers, and ascertained the adoption level of climate change mitigation technologies by crop farmers in Ikot Ekpene Agricultural Zone of Akwa Ibom State.

2.0 METHODOLOGY

The study was conducted in Akwa Ibom State. The State is situated in the South-South geopolitical zones in Nigeria, lies between latitude 4'32' and 5'33' North, and longitude 7'35'and 8'25' East, occupies a total area of 7'245933km2, and has estimated population of 3,920,208 (National Population Commission, NPC, 2006). The State has six Agricultural Development Programmes (ADP) Zones namely, Uyo, Ikot Ekpene, Oron, Abak, Eket, Etinan. The study area is in the rainforest zone and has two distinct seasons. Fishing and subsistence agriculture are the main occupations of the people. Crops grown in the locality include cassava, yam, maize, melon, sweet potatoes, cocoyarn, fluted pumpkin, oil palm, pepper, among other. In addition, some micro-livestock we usually raised at backyards of most homesteads (Umoh, 1997).

2.1 Sampling Technique and Sampling Size

A two-stage sampling technique was used in selecting the respondents (Crop Farmers). In the first stage, Ikot Ekpene Agricultural Zone of Akwa Ibom State was purposively selected. This was done because food crop production is the predominant occupation of the farmers in the study area. The second stage involves the use of random sampling technique to select 5 extension

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blocks from the selected Agricultural Zone and two circle each from the extension blocks. The list of registered crop farmers was collected from AKADEP. 30 farmers were randomly selected from each extension circle to arrive at a total of hundred and fifty (150) respondents. Structured questionnaire and oral interview was used to collect the primary data used for this analysis.

2.2 Analytical Technique

Frequencies and percentages were used to examine socio-economic, demographic characteristics and sources of information of the crop farmers. A 4-point likert rating scale of strongly disagree = 1, disagree = 2, agree =3, strongly agree = 4 with a means of 2.5 was used to assess the level of knowledge of climate change. A 5-point likert rating scale of analysis, always, often, seldom, rarely, never to which the numerical values 5, 4,3, 2, 1 were assigned respectively, when added up and divided by 5 gives a mean of 3. This was done to determine the level of adoption or how regularly adopted technology was practiced by the farmers. There is no significant relationship between knowledge level of farmers' and adoption of mitigation technologies was realised using Pearson's product moment correlation (r)

3.0 RESULTS AND DISCUSSION

Table 1 shows the results of the socio-economic characteristics of crop farmers in Ikot Ekpene Agricultural Zone of Akwa Ibom State. The Table showed that 62% of the respondents were female while 38% were male. Most of the respondents (70.61%) were within the age range of 40-59 years while those within the age range of 60 years and above constituted 3.36%. About 37.34% of the respondents had attained secondary educational status while 12% had tertiary education. The findings suggest a high level of literacy among the respondents. The educational status of crop farmers will enable them to acquire knowledge and skill and this will help to increase their productivity and reduce food insecurity. This result is in collaboration with the findings of Okon, Agom, Ukpe & Amusa (2016) who observed high literacy level of farmers in the study area. About 63% of the respondents had 11- 30 years of experience in farming, implying that these farmers are well knowledgeable on farming activities. According to Brady, Dumanski, Johnston, Chiotti, Singh (2008), greater years of farming experience increase the possibility of adoption of new innovations.

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Table 1: Socio-Economic Characteristics of the Respondents

Variables	Frequency	Percentage (%)
Age		
20-29	19	12.7
30-39	20	13.3
40-49	59	39.3
50-59	47	31.3
60 years and above	5	3.4
Total	**150**	**100**
Sex		
Female	93	62
Male	57	38.0
Total	**150**	**100**
Marital Status		
Single	14	9.33
Married	86	57.33
Divorce	21	14.00
Widow	29	19.37
Total	**150**	**100**
Education Level		
Non formal	32	21.33
Primary	44	29. 33
Secondary	56	37.33
Tertiary	18	12.33
Total	**150**	**100**
Primary Occupation		
Farming	71	47.33
Government	29	19.33
Trading	31	20.67
Artisan	12	8.00
Others specify	7	4.67
Total	**150**	**100**
Farming Experience		
0-10	45	30.01
11-12	56	37.33
21-30	38	25.33

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Above 31	11	7.33
Total	**150**	**100**

Source: Field Survey, 2014

The demographic characteristic of the respondents are presented in Table 2. The result showed that majority (43%) of the farmers rented their farm land, about 22.67% of them owned farm land, while 30% of the farmers shared the farm land. Most (58%) of the farmers in the study area responded that extension agents have visited their farms at least twice per month while only 12.01% had contact with extension agents at least thrice per month. The results of farmers' monthly income showed that majority (46%) of the farmers were low income farmers. Only 5.33% of the farmers had earned above ₦ 30,000 monthly from the sales of their farm produce. This showed that farming in the study area was practiced at a subsistence level. Over sixty percent (62.67%) of the respondents did not belong to co- operative societies while about 37.33% were members of co-operative societies.

Table 2: Demographic Characteristics of the Respondents

Variables	Frequency	Percentage (%)
Land Tenure		
Land owner	34	22.67
Tenant	71	47.33
Share cropper	45	30.00
Total	**150**	**100**
Monthly Income (Naira)		
≤ 5000	13	8.67
5001-10,000	69	46.00
10,001-20,000	33	22.00
20,001-30,000	27	18.00
>30,001	8	5.33
Total	**150**	**100**
Members of co-operative Societies		
Yes	56	37.33
No	94	62.67
Total	**150**	**100**
Extension contact (Monthly)		
None	31	20.67
Once	14	9. 33

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Twice	87	58.00
Thrice	18	12.00
Total	**150**	**100**

Source: Field Survey, 2014

3.1 Distribution of Respondents by Information Sources

Table 3 shows the distribution of respondents by information sources. The Table shows that majority (38%) of the respondents had access to information on agricultural climate change mitigation technologies through relatives, extension agents (34%) and friends (28%). This result is in line with Davies & Davies' (2009) findings who reported that the source of information to farmers is mostly through interpersonal communication which occurs from day to day interactions and activities among families, relatives and friends. Moreover, this study negates the findings of Unamma, Onwudike, Uwaegbute, Edeoga & Nwusu (2005), which identified extension as the major source of disseminating information.

Table 3: Distribution of Respondents by Information Sources on Climate Change

Sources of Information	Yes Frequency	%	No Frequency	%
Radio	-	-	-	-
Television	-	-	-	-
Friends	42	28.90	108	72.80
Relatives	57	38.90	93	62.60
Extension agents	51	34.20	99	66.60
Total	**150**	**100**	**100**	**100**

Source: Field Survey, 2014

3.2 Mean Distribution of Respondents According to Level of Knowledge of Climate Change

Result from Table 4 shows that majority (X =3.81) of the respondents claimed experiencing poor and unpredictable yield. (X =3.47) of the respondents agreed knowing the risk of rainfall irregularities, since late rainfall has adverse effect on crop growth and yield. Other variables include occurrences of drought (X =3.42), moisture stress causes severe damages (X =3.13), increasing pests and diseases (X =3.04), crop lodging attributable to excessive flooding (X =2.99) noticeable increase temperature in my locality (X=2.75), and moisture stress causes severe damages (X=3.13). The result from the table depicts that increased temperature in the

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study area could also lead to poor crop development and poor yields. This result is in accordance with the findings of Ifennyi-Obi, Abiabaka, Adesokpe & Issa (2011), Adejuwon (2004) who reported that moisture stress causes severe damage to the whole physiological development, maturation and finally reduces the yield of crops. The result implies that farmers sampled for the study had variation in their responses due to their varying degrees of knowledge about climate change.

Table 4: Mean Distribution of Respondents According to their Level of Knowledge (n=150)

Indicator for knowledge	SD	D	A	SA	TR	MEAN	DECISION
Noticeable increase temperature my locality	32 (13.91)	46 (20.00)	62 (26.96)	90 (36.13)	230	2.50	Accepted
Knowledge the risk of rainfall irregularities	7 (1.34)	12 (2.30)	134 (25.7)	368 (70.6)	521	3.47	Accepted
Crop loading attributes to excessive flooding	41 (9.15)	66 (14.7)	97 (21.6)	244 (54.50)	498	2.99	Accepted
Poor and unpredictable yield	12 (4.89)	26 (10.61)	79 (32.24)	128 (52.24)	245	3.32	Accepted
Increasing pests and diseases	10 (4.15)	21 (8.7)	87 (36.09)	123 (57.04)	241	3.28	Accepted
Moisture stress causes severe damages	2 (0.25)	6 (1.27)	88 (18.72)	374 (79.5)	470	3.13	Accepted
General undefined whether	1 (0.25)	4 (0.98)	144 (35.4)	254 (62.56)	406	2.62	Accepted
Occurrences of drought	112	78	27 (14.03)	31 (6.04)	251	3.42	Accepted
Grand means score						3.16	

Source: Field Survey, 2014

3.3 Level of Adoption of Climate Change Mitigation Technologies

Table 4 shows the mean adoption score of 2.50 serving as the cut-off between high and low level of adoption of the twenty-three variables of climate change mitigation technologies packaged by the Agricultural Development Programme (ADP) in Akwa Ibom State and disseminated to farmers in Ikot Ekpene Agricultural Zone of the State. Only 4 out of the 23 technologies

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recorded very high adoption, they included, Homestead garden (X = 4.49), Legume application (X = 4.45), Planting of fruit trees (X 4.44) and crop rotation (X =4.43). This agrees with the findings of Nhemachema & Hassan (2007) who reported that expected economic benefits or returns accruing from the use of technology highly influence adoption.

However, most (13) of the technologies recorded high adoption level while (5) of them recorded low adoption level. Very low (least) adoption was pump-powered irrigation. This finding is in consonance with the findings of Nkeme & Ndaeyo (2013) who reported low level of adoption of irrigation among farmers in the rain forest zone.

Table 5: Mean Distribution of Farmers' Level of Adoption of Climate Change Mitigation Technologies

	Mitigation Technologies	Never	Rarely	Seldom	Often	Always	Mean
1.	Changing time of planning and harvesting	47 (31.33)	38 (35.33)	14 (9.33)	29 (19.33)	22 (14.67)	2.83
2.	Prevention of bush burning	52 (34.67)	31 (20.67)	20 (26.67)	17 (11.33)	10 (6.67)	2.35
3.	Control of felling	87 (58)	11 (7.33)	6 (4.00)	32 (20.67)	15 (10.00)	2.17
4.	Less use of fuel wood	57 (38.0)	30 (20)	21 (14)	41 (27.33)	16 (10.67)	2.83
5.	Tree planting	41 (27.33)	34 (22.67)	9 (6.00)	38 (25.33)	28 (18.67)	2.85
6.	Legumes application	8 (5.33)	31 (20.67)	10 (6.67)	21 (14.00)	80 (53.33)	3.89
7.	Alley cropping	88 (58.66)	24 (16.00)	19 (12.67)	12 (8.00)	4 (67)	1.8
8.	Non removal of crop residues	103 (68.67)	20 (13.30)	3 (2.00)	18 (12.00)	6 (4.00)	1.6
9.	Pump-powdered irrigation	125 (83.33)	14 (9.33)	7 (4.67)	0 (0.00)	4 (2.67)	1.29
10.	Planting Wind Break (PWB)	20 (13.33)	6 (4.0)	13 (8.67)	29 (19.33)	82 (56.67)	3.98
11.	Forest recreation	90 (60.00)	23 (15.33)	8 (5.33)	18 (12.00)	11 (7.33)	1.91
12.	Establishment of fire break	46 (30.67)	28 (18.67)	13 (8.67)	29 (19.33)	34 (22.67)	2.17

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13.	Agricsilviculture	86 (57.30)	16 (10.67)	18 (12)	20 (13.33)	10 (6.67)	2.01
14.	Home stead garden	20 (13.33)	12 (8.00)	5 (3.33)	11 (7.33)	202 (68)	4.09
15.	Composting	48 (32.00)	18 (14.00)	21 (14.00)	8 (5.33)	55 (36.67)	3.03
16.	Contour ridging	20 (13.33)	11 (7.33)	9 (6.00)	18 (12.00)	92 (61.33)	2.17
17.	Terrace planting	93 (62.00)	30 (20.00)	10 (6.67)	13 (8.67)	4 (2.67)	1.7
18.	Corp rotation	46 (30.67)	8 (5.33)	12 (8.00)	16 (10.67)	68 (45.33)	3.34
19.	Plantation farming	67 (44.67)	29 (19.33)	7 (4.67)	32 (21.33)	15 (10)	2.33
20.	Treatment of seeds	46 (30.67)	9 (6.00)	13 (8.67)	27 (18.00)	55 (36.67)	3.24
21.	Using improve varieties/ drought	16 (10.67)	28 (7.33)	11 (7.33)	68 (45.33)	27 (18.0)	3.41
22.	Control of erosion	20 (13.33)	14 (19.33)	5 (3.33)	32 (21.33)	79 (52.67)	3.91
23.	Planting of fruits tress (PFT)	33 (22.00)	8 (5.33)	27 (13.65)	13 (18.00)	69 (46.00)	3.55
	Grand mean						2.937

Source: Field Survey, 2014.

Table 6 shows the Pearson product moment correlation (PPMC) analysis of the relationship between farmers knowledge level and adoption of mitigation technologies. The result of correlation analysis shows a significant relationship between knowledge level of farmers' and adoption of climate change mitigation technologies. Therefore, the null hypothesis is rejected and the alternative hypothesis accepted (r=0.341, p=0.001). This result is in agreement with Nhemachana & Hassan (2008) that better knowledge on climate information help farmers' to make proper decision on the adoption of climate change mitigation technologies. There was also a significant relationship, (r=0.294, p=0.07) between climate change mitigation technologies and knowledge level of climate change. This infers that the simplicity and clarity of all the identified climate change mitigation technologies collectively have a direct bearing on the knowledge level of the respondents. This could mean that simplicity of climate change innovation aids better understanding of such innovation.

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Table 6 Pearson Product Moment Correlation (PPMC) showing relationship between farmers' knowledge level of climate change and adoption of climate change mitigation technologies

Variables	r-value	p-value
Knowledge level of climate change	0.341	0.001
Adoption of climate change mitigation technologies	0.294	0.07

CONCLUSION AND RECOMMENDATIONS

The study examined boosting food security through adoption of agricultural climate change mitigation technologies in Ikot Ekpene, Akwa Ibom State, Nigeria. The result of the descriptive statistics showed that 70.61% of the farmers were within the age range of 40-50 years. About 76% being the majority of the farmers were educated. 58% of the farmers had contact with extension agents at least twice per month. Majority 56% of the farmers were low income farmers. Farmers in the study area had access to information on the climate change mitigation technologies though the result of likert rating analysis showed that only 4 (four) out of the 23 (twenty-three) climate change mitigation technologies recorded very high level adoption. This implies that extension delivery has not sufficiently educated the farmers on the importance of adopting the agricultural technologies which enhance sustainability of production and improvement of their livelihoods. It is recommended that extension agents of Akwa Ibom State Agricultural Development Programme (AKADEP) should lunch enlightenment campaigns to sensitize farmers on the benefits of adopting agricultural climate change mitigation technologies. Farmers should form associations or co-operative societies that will organize and disseminate essential information on agricultural climate change mitigation technologies in the study area.

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