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RICE FARMERS' SOCIO-ECONOMIC CHARACTERISTICS INFLUENCING ADAPTATION TO CLIMATE CHANGE IN TARABA STATE, NIGERIA

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ABSTRACT

Relationship between socio-economic characteristics of rice farmers on adaptation to climate change in Taraba state, Nigeria was determined in this study. Multistage random sampling technique was used to select 251 respondents. The study adopted the survey design with the use of questionnaire. The data were analyzed using descriptive statistics and multinomial logit regression analysis. Results show that 75.0% of the respondents were males; mean age of the respondents was 44 years, 74% of the respondents were married with a mean household size of 7 persons. The average years spent in school was 10 years, the mean farm size, years of farming experience and annual income of the respondents were 3 hectares, 16 years and ₦595667.04, respectively. Only 39.0% of the respondents were members of associations. The result of multinomial logistic regression revealed that farmers' socio-economic characteristics such as age (-0.136), years spent in school (-0.176) and farm size (0.238) had significant effects on the number of climate change adaptation strategies by the farmers. Therefore, it is recommended that programs on how to adapt effectively to climate change variability should be embarked upon by relevant authorities; this will help farmers adapt to the effects of climate change and also affordable climate change technologies should be appropriated and developed by government for resource poor farmers since most of them are small scale and low income earners.

Keywords: Rice farmers; Climate adaptation; Socio-economic characteristics

INTRODUCTION

Rice is one of the most important staple foods in the world which is widely consumed by a large part of the world's human population. According to the FAOSTAT (2012), supported by Omics International (2014), it is the agricultural commodity with the third highest worldwide production after Sugarcane and Maize. Rice is one of the agricultural products that is of growing importance in Nigeria, where there is a history of indigenous rice production and consumption (Johnson Takeshima and Gyimah-Brempong, 2013). Rice is mainly produced by small-scale farmers whose production are characterized by low output

resulting from production inefficiency, aging farming production, low technological know-how and so on (Fasoyiro and Taiwo, 2012). According to West Africa Agricultural Productivity Programme (WAAPP, 2014), agriculture as a sector provides the source of livelihoods for almost two-thirds of the population in the continent. Many agricultural development programmes were therefore initiated to boost food production at international level.

Climate change is the variation in the statistical distribution of average weather conditions over a prolonged period of time from 30-35 years and above in any region of the world (Adetayo and Owolade, 2012; Ikehi, 2014; Ikeh *et al*., 2014). It reflects abnormal variations to the expected climate within the earth's atmosphere and subsequent effects on other parts of the earth which has extensive impacts on the already daunting challenges facing sustainable development, especially in Sub-Saharan Africa. Thus, an urgent response to support climate change mitigation and adaptation in Africa, cannot be underestimated. Even though the continent is the least contributor to greenhouse gases, still, it is the most vulnerable to the adverse impacts of global climatic change, due to inadequate adaptive capacity ICCCSDA (2017). In the Sub-Saharan Africa, because Agriculture is one of the sectors, which is sensitive to global warming, most farmers make low crop yields due to the incidents of extreme weather conditions such as high and fluctuating rainfall patterns, flooding, droughts, high temperature, and other disparaging weather conditions caused by climate change. Climate change adaptation is increasingly becoming an area of growing interest and engagement for many developing countries that unfortunately bear the brunt of an overheating planet caused by developed Countries. The uncertain effects of a changing climate on Nigeria's economy pose significant setbacks for meeting development targets like Nigeria's aspiration to be among the twenty best performing economies of the world by the year 2020 (Vision 20:20) and achievement of the millennium Development Goals (Stanley, 2012). Adaptation generally is primarily tailored towards agricultural productions principally through irrigation and planting crop resistant species, most local farmers are aware that the stress on their local environment and livelihoods has increased and low capacity for adaptation is a serious issue (Egbe *et al.*, 2014).

According to Arimi (2014) poor access of farmers to credit facilities may discourage adaptation to appropriate climate change technology as most farmers will not be able to procure necessary inputs such as the Federal Agricultural Released Oriza (FARO) technology which includes drought tolerant rice seed and herbicides. He also observed that inadequate and poor extension services to farmers may hinder farmers' access to necessary information on climate change adaptation strategies.

Small-scale farmers who constitute the majority in Africa have been experiencing tragic crop failure, reduced agricultural productivity, increased hunger, malnutrition, and diseases as a result of climate change (Zoellick, 2009). Farmers are also facing problems of extreme weather conditions such as flood, drought and low soil fertility which are responsible for low rate of rice production. These challenges called for adaptation to climate change or variability in order to maintain optimum level of production (Arimi and Jenyo-Oni, 2014). It is against this backdrop that the research was being carried out to assess the effect of socio-economic characteristics of rice farmers to climate change adaptation strategies in rural communities of Taraba State, Nigeria.

METHODOLOGY

The Study Area

This study was conducted in Taraba State which is situated in the North Eastern part of Nigeria. According to the NPC (2006), the population of the state is put at 2,294,800 million people and has a land area of 54,428 square kilometers. Taraba State lies between latitude 6º30'N to 9º36'N and longitude 9º30'E to 11º45'E. It shares boundaries with five states, on the west by Plateau, Nasarawa and Benue states, on the East by Adamawa state and Republic of Cameroon and to the North by Gombe state (TADP, 2007). Farming is the major occupation of the people.

Sampling Technique and Sample Size

The State was divided into three zones, the Northern zone comprising Ardo-kola, Jalingo, Lau, Yorro, Zing and Karim-Lamido, the Central zone comprised Gassol, Bali, Gashaka, Sardauna and Kurmi, while the Southern zone comprised Ibi, Wukari, Donga, Takum and Ussa Local Government Areas. Multistage Sampling technique was employed to select a sample size of 251 respondents in the study area. The first stage Taraba State was stratified into three Agricultural Zones, the second stage involved purposive selection of two Local Government Areas from each of the Agricultural Zones in the State based on high concentration of rice farmers, and the third stage involved selection of two communities from each of the selected Local Government Areas using the random sampling technique. The last stage involved a proportional allocation of 10% across board to select the total sample size of 251 respondents.

Data Collection and Analysis

The study adopted the survey design and collected information (data) through interview schedule and observations with the aid of a questionnaire from 251 respondents in the study area. Data collected were analysed using both descriptive (frequency, percentages, mean) and inferential (multinomial logit regression) statistics.

RESULTS AND DISCUSSION

Socio-economic Characteristics of rice farmers

The results of the socio-economic characteristics of rice farmers as shown in Table 1 revealed that 75% of the respondents were males whereas 23% were females, suggesting that rice farming was dominated by male farmers. In a similar study conducted by Abdullahi (2012), 84% of the farmers in Paiko Local Government of Niger State were said to be male. This could be attributed to the fact that farming operations are generally seen to be that of men folk especially as men were usually considered to be stronger in carrying out tedious work. The mean age of the respondents was 44 years. This implied that the majority of the farmers were still in their productive age and may likely be willing to adapt effectively to climate change variability in order to increase rice production as well their income level to

raise their standard of living. The results further revealed that 74% of the respondents were married whereas 11% were single implying that rice is the source of livelihood for the farm families. This agrees with a similar study carried out by Uddin (2014) which revealed that 85.8% of the Edo State farmers were married. This indicates that agricultural production in the state is dominated by married people and this will have a great influence in farm labour availability. The mean household size was 7 members. This implied that the higher the number of household sizes of the respondents, the more the availability of the family labor for farm activities. On the negative side, Bola, Aliu and Omonona, (2012) reported that a larger household size could as well worsen the poverty situation particularly if such composition is more of dependants as such will involve feeding of more mouths.

Table 1: Socio-Economic Characteristics of Rice Farmers (n=251).

Variable	Frequency	Percent	Mean
Sex			
No response	6	2.4	
Male	188	74.9	
Female	57	22.7	
Total	251	100.0	
Age (yrs.)			
21 – 40	93	37.1	
41 – 60	149	59.4	
>60	9	3.6	
Total	251	100.0	44.09
Marital status			
No response	3	1.2	
Single	28	11.2	
Married	185	73.7	
Divorced	21	8.4	
Widowed	14	5.6	
Total	251	100.0	
Household size			
1 – 5	81	32.3	
6 – 10	131	52.2	
11 – 15	35	13.9	
>20	2	0.8	
Total	251	100.0	7.18
Years spent in school			
No response	8	3.2	
1 – 6	44	17.5	
7 – 12	131	52.2	
13 – 17	67	26.7	
>18	1	0.4	
Total	251	100.0	10.27
Primary occupation			
Farming	185	73.7	
Civil service	24	9.6	

Hunting	5	2.0	
Trading	37	14.7	
Total	251	100	
Farm Size (Ha)			
No response	2	0.8	
1 – 5	116	46.2	
6 – 10	76	30.3	
11 – 15	47	18.7	
16 – 20	10	4.0	
Total	251	100	3.0
Farming experience (yrs.)			
1-5	11	4.4	
6-10	73	29.1	
11-15	58	23.1	
16-20	38	15.1	
>20	71	28.3	
Total	251	100.0	16
Membership of cooperative			
No response	1	0.4	
Yes	97	38.6	
No	153	61.0	
Total	251	100.0	
Annual income (₦)			
No response	4	1.6	
₦1 – ₦200000	17	6.8	
₦200001 – ₦400000	70	27.9	
₦400001 -₦600000	61	24.3	
₦600001 – ₦800000	47	18.7	
₦800001 – ₦1000000	31	12.4	
>₦1000000	21	8.4	
Total	251	100	₦595,667.04

Field survey, 2019

The results on level of education showed that the average years spent in school was 10 years. This showed that most of the farmers were literate, and the implication is that educated farmers were likely to be more receptive to changes that can enhance their productivity and help them in adapting efficiently to climate change. Idrisa, Ogungbaniru, Ibrahim and Bawa (2012) in Egbule (2013) also noted that education plays an important role in creating awareness in farming communities because educated people are capable of sourcing information on agricultural innovations The results also showed that majority (74%) of the respondents were engaged in farming as their primary occupation. The mean farm size of the respondents stood at 3 hectares. This showed that farmers in the study area were farming rice on a small scale. The mean farming experience was 16 years indicating that the farmers were experienced in rice farming. The implication is that, with such a number of years in rice farming, the farmers were in a better position to know the limitations associated

with cultural practices, the effects of climate change and the need to adapt and cope with these effects.

The results further showed that 61% of the respondents were nonmembers of an association, whereas 39% were members of associations. Farmer's organizations are effective channels of communicating information to farmers and access to credit facilities. This implied that most of the farmers may not gain easy access to information and credit facilities to combat climate change. The mean annual income was ₦595, 667.04 indicating that most of the farmers were low income earners. The implication is that the farmers may be willing to seek information on climate change adaptation strategies but may not have the financial strength to do so. This agrees with the report of Arimi (2014) who pointed out that poor access of farmers to credit facilities may discourage adoption of appropriate climate change adaptation technology as most farmers will not be able to procure necessary inputs such as the FARO technology which includes drought tolerant rice seed and herbicides.

Effects of Socio-economic characteristics of rice farmers on the number of climate change adaptation strategies adopted

Analysis of factors affecting farmers adapting a range of climate change adaptation strategies using multinomial logit regression model showed a well fit of the model to the observed data. Specifically, the likelihood ratio test indicates a better fit of model with independent variables over the intercept only model ($X^2 = 106.635$; $P \leq 0.01$). This implies that the independent variables in the model significantly explained the variation in the probability of farmers adopting a particular range of adaptation strategies.

More significantly, the reference category is greater than 9. The analysis showed that the coefficient of age (-0.136) and year of schooling (-0.176) was negative and significant at 5%. This implies that increase in age and years of schooling decreases the probability of a farmer using between 4 and 6 adaptation strategies relative to using greater than nine (9) adaptation strategies. The result is consistent with the findings of Adebayo, Onu, Adebayo and Anyanwu (2012) which observed that identification and adoption of measures that could result in climate change adaptation is easier and faster among the young and educated farmers than the old and uneducated farmers. Also, the coefficient of farm size was positive (0.238) and significant at 5% implying that an increase in farm size increases the probability of a farmer choosing between 4 and 6 adaptation strategies relative to choosing number of strategies greater than 9. This suggested that farmers with larger farms prefer to adopt smaller number of climate change strategies to overcome the stress of coping with a higher number on a big farm.

The results further indicated that age (-0.122) and farm size (0.278) were the significant factors that influence the probability of a farmer choosing between 7 and 9 strategies relative to choosing a number of strategies greater than nine (9). Specifically, increase in age decreases the probability of a farmer choosing between 7 and 9 strategies compared with choosing a number of strategies greater than 9. In contrast, increase in farm size increases the probability of a farmer choosing climate change adaptation of between 7 and 9 relatives to choosing a higher number of strategies higher than nine (9).

Overall, the result implies that increase in years spent in school and age decreases the probability of choosing a greater number of strategies to combat climate change. Whereas increase in farm size increases the probability of a farmer using a higher number of adaptation strategies that will help him cope with the effects of climate change.

Table 2: Multinomial logit regression of the effects of socio-economic characteristics of the rice farmers on the number of climate change adaptation strategies adopted

Number of strategies adopted	strategies/variables	B	Std. Error	Wald	Exp (B)
1 - 3	Intercept	-3.050	848.104	.000	.119
	Age	-2.131	12.882	.27	2.796
	Household size	1.028	28.439	.001	4.775
	Years spend in formal school	1.563	18.750	.007	
	Farm size (ha)	1.489	93.292	.000	4.431
	Farming experience	1.879	18.128	.011	6.548
	Annual farm income	.000	.000	.000	1.000
	Sex				
	Male	-21.779	1832.219	.000	3.47E-10
	Female	-69.693	489.949	.020	5.40E-31
	Marital status				
	Single	69.903	1284.028	.003	2.282E30
	Married	50.960	1352.088	.001	1.355E22
	Divorced	27.191	562.937	.002	6.443E11
	Occupation				
	Farming	-1.787	186.766	.000	.167
	Civil Service	44.941	508.170	.008	3.294E19
	Hunting	-4.854	2800.503	.000	.008
	Trading	℃		.	.
	Member of org.				
	Yes	7.152	.000	.	1.276E3
	No	5.94136	3.281	.000	380.203
4 - 6	Intercept	22.931	396,969	.003	
	Age	-136	.058	5.549	.873
	Household size	.041	.111	.134	1.042
	Years spend in formal school	-.176	.103	2.926	.838
	Farm size	.238	.141	2.860	1.269
	Farming experience	-.027	.054	.247	.974
	Annual farm income	-1.992	1282.530	.000	.136
	Sex				
	Male	-14.194	396.960	.001	6.850E-7
	Female	-	.	.	.
	Marital status				
	Single	.177	1.990	.008	1.194
	Married	16.103	1228.899	.000	9.855E6
	Divorced	1.352	1.206	1.258	3.867
	Widowed	13.709	596.779	.001	8.990E5
	Occupation				
	Farming	-1.800	1.411	1.627	.165
	Civil Service	-2.114	1.445	2.141	.121
	Hunting	-3.485	1785.072	.000	031

	Member of org.				
	Yes	.039	3599.227	.000	1.039
	No	-.406	.669	368	.666
7 - 9	Intercept	19.615	396.969	.002	566.
	Age	-.122	.058	4.389	.885
	Household size	.012	.108	.013	1.012
	Years spend in formal school	-.059	.101	.349	1.012
	Farm size	.278	.138	4.062	1.331
	Farming experience	-.008	.053	.022	.992
	Annual farm income	.000	.000	.022	1.000
	Sex				
	Male	-2.385	1282.530	.000	.092
	Female	-14.154	396.960	.001	7.130E-
	Marital status				
	Single	-.427	1.826	.055	.653
	Married	15.993	1228.899	.000	8.824E6
	Divorced	1.125	1.069	1.108	3.081
	Widowed	14.921	596.779	.001	3.020E6
	Occupation				
	Farming	-1.269	1.423	.795	.281
	Civil Service	-1.574	1.423	1.198	.207
	Hunting	-3.257	1785.072	.000	.039
	Member of org.				
	Yes	-13.901	3991.667	.000	9.181E-7
	No	.107	.666	.026	1.113

Field survey, 2019

** Significant at 5%

CONCLUSION

This study concludes that most of the farmers are within the age bracket of 41-60 years which shows that they are in their active age and have the energy to cultivate the land, and majority of the respondents are males 74.9 % that can withstand agricultural activities which are mostly energy demanding compared to their female counterparts. Rice farmers in the study area were constrained with inadequate capital and land for farming. These farmers will be more resilient and adapt to climate change effectively if there is an efficient information network about climate change. Therefore, it is recommended that programs on how to adapt effectively to climate change variability should be embarked upon by relevant authorities; this will help farmers adapt to the effects of climate change, farmers should be encouraged to form cooperative societies to pool their resources together towards adapting to the effects of climate change and also affordable climate change adaptation technologies should be appropriated and developed by the government for the resource poor farmers since most of them are small scale farmers, more female farmers should be encouraged to participate in agricultural activities to boost their production as well income level and also see agriculture as a business not labour intensive.

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