ASSESSMENT OF CROP FARMERS' AWARENESS AND ADAPTATION STRATEGIES TO CLIMATE CHANGE IN KOGI STATE, NIGERIA: IMPLICATIONS ON AGRICULTURAL EXTENSION EDUCATION

By

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ABSTRACT

Recently, issues of climate change have been on the front burner of society's environmental discourse the world over. However, there may be deficiency in awareness especially in areas where dissemination of information is a problem. Additionally, coping with climate change has always been a challenge, especially in the study area where climatic conditions are unpredictable. This study assessed crop farmers' awareness and adaptation strategies to climate change in Kogi agricultural zone A, Nigeria. The study specifically; described the socio-economic characteristics of crop famers, assessed crop farmers' awareness on the effect of climate change, and ascertained the adaptation strategies employed to reduce the effect of climate change on livelihood of crop farmers. A three (3) stage random sampling technique was used to select 150 respondents for the study. Data obtained were analysed using descriptive statistics, sigma scoring, and mean score from Likert type of scale. Description of the socioeconomic characteristics of the sampled respondents showed that the majority (78.67%) of them were males with a mean age of 40 years. The result of the awareness of the effect of climate change showed the following items and their corresponding sigma score: hot environment (sigma score = 5.300), irregular rainfall (sigma score = 5.300), and yield reduction (sigma score = 5.082).The adaptation strategies adopted by crop farmers in the area include: change in cropping pattern (mean score = 3.69), crop diversification (mean score = 3.67), planting of drought resistant varieties (3.59) and change in calendar of planting (mean score = 3.57). The study recommends that government and relevant stakeholders should support farmers to increase their adaptation capacities through extension service delivery by providing the necessary resources such as credit, information and training. This can help them increase and sustain high levels of productivity even under changing climatic conditions.

Keywords: *Awareness, Adaption, Extension Education, Farmers*

1.0 INTRODUCTION

Climate change is now a part of our reality and the world has come to terms with the situation. In the 21st century, climate change could be regarded as the greatest global threat to agriculture, especially in developing nations. According to the United Nations Development Program (UNDP) of 2018, by 2080, the impacts of climate change could decrease agricultural productivity by 15-30 percent on average, and could hence increase the number of malnourished people by 600 million and the number of people facing water scarcity by 1.8 billion. The UNDP warns that climate change could slow the progress made in human developmental strides due to new threats to agricultural productivity. Agriculture remains the most important sector to Nigeria citizens and the country's economy.

Tambo and Abdoulaye (2012) posited that climate change and severe weather conditions are bane to sustainable farming, especially in areas where agriculture is majorly rain fed and where external shocks (like poverty, poor and inadequate access to production resources) are common. This is the context in which crop farmers in Kogi Agricultural Zone A carry out their farming and other livelihood activities. Although several studies have been carried out on adaptation to climate change in developing countries (Hirut, 2015; Okonya *et* al., 2013; Sofoluwe *et al*., 2011; amongst others); climate related issues could be location specific, especially when farming households are the focus. This forms part of the thrust for this study.

The specific objectives of this study are to:

1. describe the socio-economic characteristics of crop famers in the study area;
2. assess crop farmers' awareness on the effect of climate change; and
3. ascertain the adaptation strategies employed to reduce the effect of climate change on the livelihood of crop farmers.

2.0 METHODOLOGY

This study was carried out in agricultural Zone A area as delineated by the Kogi State Agricultural Development Project (Kogi ADP). Zone A has its zonal headquarter at Aiyetoro-Gbede. The Zone covers five Local Government Areas (LGAs) of the state. These include: Ijumu, Kabba-Bunu, Mapamuro, Yagba-East and Yagba-West.

A multi stage random sampling technique was used to select the respondents. In the first stage, three extension blocks were randomly selected from the six Blocks in the Zone. In the second stage, four (4) extension cells were randomly selected from each of the Block in the Zone. This gives 12 extension cells. In the third stage, fifteen (15) crop farmers were randomly selected in each of the extension cells, giving a total of 150 crop farmers for the study.

Primary data used for the study was obtained using a structured

questionnaire and analysed using descriptive statistics, sigma scoring, and mean score from Likert type of scale. The socioeconomic characteristics of crop farmers was described using descriptive statistical tools, while awareness and adaptation strategies were assessed using sigma scoring and mean score from Likert type of scale, respectively.

Sigma Scoring Method

The following step was used:

First obtain the percentage of crop farmers who are aware of the item:

$$\frac{\text{Number of crop farmers aware}}{\text{Total number of respondents}} \quad 100 = A\%$$

This is followed by dividing the percentage (A %) by two and minus the answer from 100 - (A% / 2) =B%

Check B% on the statistical table of normal deviates to get the sigma distance (X). Next increase the value of the sigma distance using a constant figure of 2 and multiplying the result by the same constant.

$(X + 2) \times 2 = Y$

Since sigma method assigns weight in reverse direction on a 10 point scale, the actual sigma score would be 10 minus the answer (Y).

$10 - Y = Z$

Decision rule: Any mean score (Z) less than 5 was considered as low level of awareness on rainfall variability.

Mean Score from Likert Scale

The five point Likert scale was used to assess farmers' adaptation strategies to reduce the effect of climate change as specified below:

Opinion	**Point**
Strongly Agreed (SA)	5
Agreed (A)	4
Undecided (U)	3
Disagreed (D)	2
Strongly Disagree (SD)	1

The mean response to each item was calculated using the following formula;

$$X = \frac{\Sigma}{N}$$

Where: X = means response, ∑= summation, F= number of respondents choosing a particular scale point, X = numerical value of the scale point and N = total number of respondents to the item.

For adaptation strategies, the mean response to each item was interpreted using the concept of real limits of numbers. The numerical value of the scale points (Response modes) and their respective real limits are as follows:

Strongly Disagree (SD) = 1 point with real limits of 0.5 1.49
Disagree (D) = 2 points with real limits of 1.50 2.49
Undecided (U) = 3 points with real limits of 2.50 -3.49
Agree (A) = 4 points with real limits of 3.50 4.49
Strongly Agreed (SA) = 5 points with real limits of 4.50 5.49

Decision rule: Any mean score of 3 and above implies that crop farmers agreed to that particular item.

30 RESULTS AND DISCUSSION

31 Socio-Economic Characteristics of Respondents

Table 1 shows a mean age of 40 years. This implies that crop farmers in the Study Area are still in their energetic and economically active ages. This may however tilt towards the aged category overtime. The dominance of male could be attributed to intensive labour requirement of farming activities and men's easy access to farmland. Greater proportions of the respondents were married; this may increase access to productive resources such as land and labour. Marriage may have implications on agricultural labour as family members may serve as source of available labour for farming activities. The mean household size of 6 members is the same as the national average household size and could be described as relatively high. Large household size may have a two-way effect on crop production; labour availability and household expenditure.

Table 1: Distribution of Respondents by Socio-economic Characteristics (n = 150)

Socio-economic characteristics	Frequency	Percentage	Mean/Mode
Age			
20-40	40	26.67	
41-60	74	49.33	40 years
61-max	36	24.00	
Total	150	100.0	
Sex			
Male	118	78.67	
Female	32	21.33	Male
Total	150	100.0	

Marital Status			
Married	141	94.0	
Unmarried	9	6.0	Married
Total	150	100.0	
Household Size			
1-5	59	39.33	
6-10	73	48.67	
Above 10	18	12.00	6 persons
Total	150	100.0	
Educational Level			
No formal education	30	20.00	
primary education	47	31.33	
secondary education	41	27.33	Primary educ
Tertiary	32	21.33	
Total	150	100.0	
Farming experience			
1-10	63	42.00	
11-20	49	32.67	
21-max.	38	25.33	10 years
Total	150	100.0	
Farm Size			
0.1-3.0	42	28.00	
3.1-4.0	23	15.33	2.1Ha
Above 4.0	85	56.67	
Total	110	100.0	
Annual farm income			
> 50, 000	41	27.33	
50,001-150,000	28	18.67	₦66,000.1k
Above 150,000	81	54.00	
Total	150	100	

Source: Field Survey, 2019

Table 1 also shows that, most of the respondents could read and write; this may have implications on awareness and adaptation to climate change. This agrees with Okoye, *et al.* (2014) when they reported that educated farmers are expected to be more receptive to new and improved technologies than farmers with no formal education. The average year of farming experience of 10 years is long enough time to give credible evidence of climate change and its effects. The result further shows a mean farm size of 2.0 hectares. This implies that farmers in the study area are mainly smallholder farmers and this may affect their adaptation strategies. This agrees with Oyekale (2009), who reported that small-scale farmers operate at subsistent level, making them vulnerable and less able to cope with the

consequences of climate change.

32 Awareness on the Effect of Climate Change

The distribution of respondents according to their awareness on the effect of climate change is presented in Table 2.

Table 2: Distribution of Respondents on their Level of Awareness on the Effect of Climate Change

Awareness	No. of Respondents	Sigma Score
Fluctuation in rainfall	94	5.026
Frequent flooding	91	4.968
Yield reduction	97	5.082
Irregular rainfall	109	5.300
Hot environment	109	5.300
Common pest infestation	92	4.986
Change in crop growing season	96	4.834
Change in time of planting	84	5.064

Source: Field Survey, 2018

According to the data in Table 2, most of the respondents with sigma score of (5.714) were aware of climate change. This awareness could be created by weather forecasting organization such the Nigerian Metrological Agency (NMA) or by personal observation. This is in agreement with Gehendra and Dinanath (2018) who reported that ninety eight percent (98%) of all villagers in Chitwan (India) recognize changes in the climate. Farmers are becoming increasingly conscious of local climate change issues.

Farmers in the study area were also aware of the hotness in the environment and irregular rainfall due to climate change with sigma score of 5.30 for each. This agrees with Ikhile (2007) and Odjugo (2009) when they reported that the major problem of climate change is increasing atmospheric temperature which results in the hotness of the environment.

The farmers were also aware of reduction in crop yield with sigma score of 5.082; this has been a major concern to the farmers. This finding is in line with Sofoluwe *et al*. (2011) when they reported that there has been reduction in the yield of sorghum as a result of the effect of climate change. Other major effect of climate change include; fluctuation in rainfall (signma score = 5.026) and change in time of (sigma score = 5.064). Change in rainfall pattern could lead to the reduction in growing season as many farmers in the study area alleged they hardly get two to three planting periods.

33 Adaptation Strategies Employed by Farmers to Reduce the Effect of Climate Change

The adaptation strategies employed to reduce the effect of rainfall variability on livelihood of crop farmers are presented in Table 3.

Table 3: Adaptation Strategies to Reduce the Effect of Climate Change

Adaptation strategies	SA	A	U	D	SD	TSS	Mean Score
Planting of drought resistant varieties	20	12	21	54	43	538	3.59
Crop diversification	4	21	33	54	38	551	3.67
Change in cropping pattern	7	11	38	60	34	553	3.69
Change in calendar of planting	8	14	43	54	31	536	3.57
Soil conservation	7	28	48	48	19	494	3.29
Afforestation (planting of trees)	7	17	45	58	23	523	3.49
Agroforestry (raising shade tolerant crops)	12	21	41	56	20	501	3.34
Fertilizer/manure use	8	14	47	59	22	523	3.48

Source: Field Survey, 2018.
Note: SA = Strongly Agreed, A = Agreed, U = Undecided, D = Disagreed, SD = Strongly Agreed, TSS = Total Sum of score

Result in Table 3 shows that most of the farmers agreed to change in cropping pattern as a key strategy to reduce the effect of climate change. In addition to changing cropping patter, the farmers also engage in crop diversification so as to reduce the negative effect of climate change. Crop diversification involves the growing of different varieties of crop on the same piece of farm land. Enete *et al*. (2011) reported that multiple/intercropping, though a tradition for smallholder farming in Nigeria may have been intensified as a result of climate change because different crops have different levels of resilience to weather variability, hence, planting many crops in a field could ensure that the farmer get some output in the face of extreme weather situations. This finding agrees with Benhin (2016) who reported that growing a variety of crops on the same plot is an appropriate adaptation strategy for farmers because it helps to avoid complete crop failure as different crops may be affected differently by climate change. Furthermore, Hassan and Nkemechena, (2008) reported that increased diversification is a strong climate change adaptation measure.

Other strategies adopted by the farmers in reducing the effect of climate change include; planting of more drought resistant varieties (mean score = 3.59), change in calendar of planting (mean score = 3.57), afforestation practices (mean score = 3.49) and use of fertilizer/manure as (mean score =3.48). An earlier study by Odjugo (2009) noted

that climate change led farmers in Northern Nigeria to shift in crops cultivated. The preferred crops grown are guinea corn followed by groundnut and maize, but due to increasing temperature and decreasing rainfall amount and duration occasioned by climate change, the farmers as a means of adaptation shifted to the production of millet followed by maize and beans.

40 CONCLUSION AND RECOMMENDATIONS

Increasing manifestation of the effect of climate change on crop productivity is a major driver for this study. It was observed that crop farmers in Kogi State, Nigeria were aware of change in climatic condition in recent time. Noticeable indicators of this change include hot environment, irregular rainfall, yield reduction and change in planting time. In a bid to reduce the vagaries of climate change, crop farmers changed their pattern of cropping and were also involved in crop diversification.

Based on findings of this study, the following are recommended:

1. Extension service should be strengthened through adult education programmes for farmers to expose farmers to effective and efficient adaptation strategies to climate change.

2. Government and other relevant stakeholders (especially the Kogi ADP) should embark on effective campaign on the consequences of climate change, especially in rural areas. Not only will it raise awareness, it will also create in-depth knowledge of human activities that are major contributors to climate change and expose the alternative ways of doing things. Provision of the right information on climate change will bring about effective and efficient adaptation.

3. Government and relevant stakeholders should support farmers to increase their adaptation capacities through the provision of necessary resources such as credit, information and training. This can significantly help them increase and sustain high levels of productivity even under changing climatic conditions.

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