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Assessment of crop farmers awareness on climate change effect in Kebbi State, Nigeria

¹ Akut Solomon, ² Sa'adu Umar, ³ Yahaya Kaka, ⁴ Sani Ibrahim

^{1, 2, 3, 4} Department of Agricultural Economics and Extension, Kebbi State University of Science and Technology, Aliero, Nigeria

Corresponding Author: Akut Solomon

Abstract

The study assessed crop farmers' awareness of the effects of climate change in Kebbi State, Northwest Nigeria. A Multi stage sampling technique was employed to draw a sample of 240 respondents from Kebbi states. A structured questionnaire was used to obtain information from the respondents. Specifically, it determined crop farmers' awareness, their level of awareness on climate change effect and their sources of climate change information. Descriptive statistics was used for data analysis. The result showed (40.8%) of the respondents were males and (83.8%) married, (72%) had formal education. Decrease in crop yield/low harvest ($\bar{x}= 4.32$) was ranked first as the major

crop farmer's awareness on climate change effect. On the overall level of awareness, nearly all (94.2%) of the respondents had moderate awareness level of climate change effects, the results further showed radio (56%) as major source of climate change information, it was found out that nearly all of the respondents had a moderate awareness level of the effect of climate change. Therefore, the study recommended that efforts should be made to provide early warning weather information to farmers. The extension delivery system and other information outlets should be strengthened to champion the creation of awareness with respect to climate change challenges.

Keywords: Crop Farmers, Climate Change, Awareness, Kebbi State

Introduction

Agriculture remains pivotal to Nigeria both as a primary source of food for her increasing population and as a prime employer of labour. Despite the significance of agriculture, it is threatened by the challenges of climate change and potential climatic conditions and the impending challenge of increased food production to manage climate variability and increasing population [African Climate Policy Center (ACPC), 2011^[1]]. Crops including wheat, maize, and paddy are considered primary crops as they are staple foods to most of the population across the globe. By 2050, a 70-100 percent increase in cereal food supply is required to feed the predicted world population of 9.8 billion people (Godfray *et al.*, 2010)^[11]. Boosting the production rates is generally accepted as the solution to meet the increasing demand, but historic figures showed that the current production rates are nowhere near what are required to meet the targets (Ray *et al.*, 2013)^[22].

Climate change is increasingly being recognized as the most critical environmental challenge facing mankind in the 21st Century. The impacts of climate change are spatially diverse and it is held that developing countries will be more in jeopardy than developed countries due to their reliance on climate-sensitive sectors (Madu, 2010)^[13]. Africa has been identified as highly susceptible to climate change and climate variability; a condition provoked by the interaction of multiple stressors coupled with low adaptive capacity (Atedhor, 2013)^[7].

Climate change has constituted a serious threat to sustainable agricultural production and food security in many parts of the world especially in Kebbi State Nigeria. Climate change impacts on agriculture include biological effect on crop yield, the resulting impact on prices, production, consumption and the standard of living. Research findings have shown that agriculture in developing countries is currently being affected by climate change [International Food Policy Research Institute (IFPRI), 2009^[12]]. In Kebbi state, evidence of climate change includes delayed onset date of rains, increase in flood, increase in number of dry days during the raining season and increase in maximum temperature (Adebayo *et al.*, 2012)^[2]. In recent years, farmers in the state have been faced with the problems of flood, low yield arising from climate change variability particularly the delayed onset of rains and the increasing length and frequency of dry spells during the growing season. In addition, the problem of flood, high temperature and incidences of pests and diseases have also aggravated the famers' loss which

consequently, increase the incidence of poverty and low standard of living in the state.

Global climate change can have an impact on the production yields of crops and is an issue that must be addressed for attaining food security (Tripathi *et al.*, 2016) [25]. Unless farmers have appropriate knowledge and are fully aware about the effects of climate change, climate change will frustrate farmers' efforts to achieve sustainable agricultural production and food security. However, developing such strategies will require information from the farmers since the ability to adapt and cope with climate change depends on their knowledge, skills, experiences and other socio-economic factors (Maharjan *et al.*, 2011) [14]. It is against this backdrop that this study seeks to assess crop farmers' awareness on the effect of climate change in Kebbi State, Nigeria.

Objectives of the study

The specific objectives are to:

1. describes the socio-economic characteristics of crop farmers in the study area.
2. identify crop farmers' sources of climate change information.
3. ascertain crop farmers awareness of climate change effects and their level of awareness.

Materials and methods

The research was conducted in Kebbi State. Kebbi State was created in 1991 out of former Sokoto State. It lies in North-western Nigeria, with its capital in Birnin Kebbi. The state is bordered by Sokoto State to the north, Zamfara to the east, Niger State to the south, Dosso Region in the Republic of Niger to the northwest and the Republic of Benin to the west. Kebbi State has a total land area of 37,698,685 square kilometres [Kebbi State Government (KSG), 2017]. Based on projections from the 2006-2016 census figure, the state is estimated to have a population of 4.4 million [National Population Commission (NPC), 2006 [17]]. The state is made up of 21 local government Areas (LGAs) and has four emirate councils namely Gwandu, Argungu, Yauri and Zuru. Kebbi State falls between latitude 12°46'N and 12°27'N and longitude 4°19'E and 4°11'E. Agriculture is the main occupation of the people of the state especially in rural areas. The state has a mean temperature of 23°C and a maximum temperature of about 40°C. It is divided in to two ecological zones The Sudan savannah zone and Southern Guinea zone in the northern and southern parts respectively. This climate peculiarity supports the production of a wide range of arable crops, roots and tubers, agro-forestry, fisheries and livestock. The total cultivable land in the state consists of 320,000 hectares (ha) upland and 170,000 ha of Fadama land, with high potential of surface water and extractable shallow aquifer to support medium and small-scale irrigation activities (KSG, 2017).

The state is transverse by two major rivers, namely River Niger and River Rima. The landscape of Kebbi State is dominated by extensive flood plains (Fadama) serviced by the river systems of the Niger and Rima rivers. The vastness of agricultural land comprising upland, Fadama and several wetland areas creates an opportunity for all-year-round agricultural activities. Due to its vast arable land, it is currently playing a leading role in food production The major crops produced in Kebbi State are (rice, millet, sorghum, maize, groundnut, wheat, sugar cane, sweet

potatoes, and cassava. Sesame, Soya beans, Bambara nuts and Acha are grown as minor crops while vegetables such as tomato, onion, pepper, carrot, and cabbage are also produced), animal rearing and fishing respectively. (<https://en.m.wikipedia.org/wiki/kebbi>). In terms of Cultural festivals and artifacts, the State is famously known for the Argungu international Fishing and the Zuru annual Uhola Cultural Festivals. The Kanta Museum Argungu, the tomb of Sheik Abdullahi Dan Fodio (Hubbare) at Gwandu and Girmache Shrine at Zuru are other important tourist attraction sites.

Sampling procedure and sample size

The population of this study comprises of farmers growing crops in Kebbi State, Northwest of Nigeria. Kebbi State is divided in to four (4) Agricultural Zones namely Argungu Zone, Bunza Zone, Zuru Zone, and Yauri Zone. Selection of sample for the study was done using multi-stage and simple random sampling technique. At the first stage, in each of the agricultural zone, two Local Government Areas were randomly selected to obtain a total of eight (8) LGAs. At the second stage, three (3) villages were selected randomly, thus giving a total of twenty-four (24) villages. At the third and final stage, a simple random sampling of ten (10) respondents from each of the selected village was done, giving a total sample size of two hundred and forty (240) crops farmers for the study.

Method of data collection

Both primary and secondary data was used for the study. The primary data for the study was gathered through field survey with the use of a structured questionnaire designed in line with the objectives. The secondary information includes those sourced from journals, bulletins and other literature materials. The questionnaire for the study was used to collect information on socio-economic characteristics of the crop farmers, farmer awareness of climate change effects on crop production. The awareness statements were coded as an ordinal variable, and later choice options was coded, it was measured a 5-point Likert-type scale and this includes: Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree with a score of 5, 4, 3, 2, and 1 respectively. The scores were reversed in a reversed manner for negative statements. Thereafter, total maximum and minimum scores of ninety (90) and eighteen (18) was obtained for each respondent and was later used to categorize respondents' awareness into low, moderate and high level using mean score and standard deviation. Respondent that scored within the range of (Mean+ SD score) was categorized to have high awareness, those that score between the ranges of (Mean ± SD score) were scored moderate awareness while respondents having score between (Mean – SD score) had low awareness of climate change effects on crops. The respondents were then asked to identify their sources of information about weather and climate variability.

Method of data analysis

Data were analyzed using descriptive statistics. The descriptive statistics include frequency counts, means, percentages, standard deviation and ranks.

Results and discussion

Socio-economic characteristics of farmers

40.8% of the respondents were within the ages of 31-40

years. This situation indicates that most farmers in Kebbi State are within the active ages favourable to the sustenance of crop production. This scenario also indicates that most of the youths are involved in farming in the study area. This also agreed with the assertion made by Adeola (2010)^[3] that young people of productive ages tend to withstand stress, put more time in various agricultural operations and participate in programmes which can result to increased output.

Table 1: Distribution of respondents by socio-economic characteristics (n=240)

Variables	Frequency	Percentage (%)
Age		
≤ 20-30	35	14.6
31-40	98	40.8
41-50	77	30.0
51-60	25	10.4
≥ 61	10	4.2
Sex		
Male	210	87.5
Female	30	12.5
Marital status		
Married	201	83.8
Separated	23	9.6
Widow/Widower	7	2.9
Single	5	2.1
Divorced	4	1.6
Educational status		
Primary	55	22.9
Secondary	49	20.4
Post-secondary	69	28.7
Quaranic	27	11.3
Adult education	40	16.7
House hold size		
1-5	31	12.9
6-10	73	30.4
11-15	101	42.1
16-20	27	11.3
≥21	8	3.3
Farming System		
Mono Cropping	90	37.5
Mixed Cropping	212	88.3
Crop Rotation	8	3.3
Inter Cropping	167	69.6
Relay/Overlapped Cropping	142	59.2
Annual income (N)		
≤ 50,000	1	0.4
51,000 -300,000	97	40.4
301,000-400,000	123	51.3
401,000-500,000	12	5.0
≥501,000	7	2.9

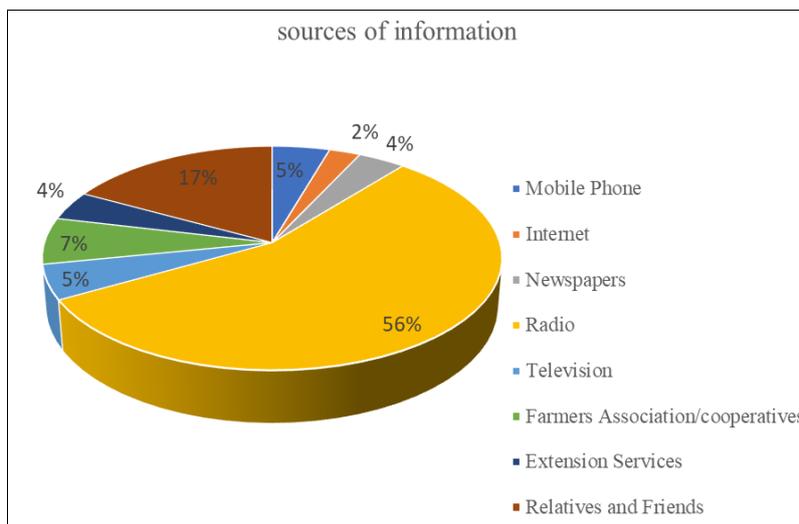
Source: Field Survey, 2020

The result in Table 1 also shows that majority of the respondents were males (87.5 %) while female participation constitutes a smaller proportion. The implication of this findings is that the representation of men is stronger than that of women in farming activities. Women work in agriculture as farmers on their own account, as unpaid

workers on family farms. However, Mahmood *et al.* (2017)^[15] attributed low participation of women in yam production in Ekiti State to the drudgery and strenuous agronomic practices involved. Again, Table 1 also reveals that (83.8%) were married. This means that married people were more involved in farming and received assistance from their spouses in carrying out some activities on the farm. On level of education attained, the result shows that about 71.6% of the respondents had one form of formal education. It can be implied that farmers in the study area had some level of formal education that could impact on their awareness of effects of climate change. This line of thought is in harmony with the findings shared by Fadairo *et al.*, (2015)^[9] and Orifah and Fadairo (2015)^[19] that education in its entirety focuses on conveying knowledge that is intended to bring about change in attitude, skills or knowledge as the case maybe. Furthermore, the result on household size reveals that majority of the respondents 42.1% have household size of within 11-15. This finding is in line with Solomon (2008) who opined that large households assist more on farm and other household activities, also (Mugula and Mkuna 2016^[16]) reported that large household size might have positive impact in the improvement of the productivity especially if members fully participate in farming activities and those households are more likely to adapt to climate change. Table 1 further shows that majority of the respondents 88.3% practiced mixed cropping. This suggests that the farmers diversify their production because of the risks of total loss of crops and uncertainties involved in farming, Farauta *et al.*, (2012)^[10], reported that the indigenous adaptive measures being used by farmers to cushion the harmful effects of climate change includes intercropping, multiple cropping, expansion of cultivated land area, movement to different site, mixed farming and use of wetland/river valley e.g. Fadama. Lastly, table 1 shows that 51.3% crop farmers earn annual income of ₦301,000- ₦400,000.

Farmers' sources of climate change information

The results as reported in Figure 1 shows that the respondents received information about climate change mainly from the local radio station (55.8%) this is attributed to less cost involvement in using radio as it does not compulsorily require direct electricity or generator so the local farmers can afford to power the radio via batteries and the device can be moved around by the farmers. Other sources such as Relatives and Friends (17.1%), television (5.0%), farmers' association/extension (6.7%), mobile phones (4.2%), extension services (3.8%), newspapers (3.5%) and internet (2.5%) were far less important. These results are quite different to those obtained by Umar (2016)^[27], who reported that in Katsina State of Nigeria, farmers mainly received information from relatives and friends. Similarly, Umar *et al.*, (2013)^[28] reported that relatives were the main source of farmers' information on climate change. Availability and accessibility of information on climate change are assumed to be key determinants of the extent of farmer awareness, understanding and knowledge of climate change impacts (Ajayi 2014)^[4].



Source Field Survey, 2020, * Multiple responses

Fig 1: Distribution of respondents according to sources of information on climate change

Rank order of crop farmer’s awareness on climate change effect

The results in table 2: shows ranked order of crop farmer’s awareness on climate change effect. The findings revealed that 11 out of 18 awareness statements were favourably responded to by the crop farmers and were rated above the awareness grand mean 3.90. It was observed that farmers’ awareness of the effects of climate change was highest for statement items that associated climate change with: Decrease in crop yield/low harvest ranked 1st (\bar{x} = 4.32), this implies that crop productivity of farmers has declined due to the effect of climate change. These agrees with the finding of Adebayo *et al.*, (2012) [2] who reported from their findings that majority (about 87%) of the respondents had their crop yield reduced as a result of low rainfall brought about by climate change has affected agricultural activities, Arya’s (2010) [6] who also reported that unreasonable rainfall, droughts and high heat leads low crop production and this agrees with the estimation of Ben Mohamed *et al.*, (2002) [8] who estimated that by 2025, cereal production in Nigeria will decrease by 13% because of climate change. Increase in (high) temperature was ranked 2nd (\bar{x} =4.21), The decrease in crop yield above could be attributed to irregularities of temperatures to the extent that many crop species would not withstand such high temperatures which sometimes leads to total loss of crops. The farmers’ assessment agreed with the experts report on temperature trend in the state (Adebayo 2012) [2]. The increase in temperature has the tendency to inflict more harm not only on agricultural production but also on the ecosystem. The dryness in the environment is more (\bar{x} =4.16), and Total rainfall is decreasing with extended dry spells (\bar{x} =4.16) were ranked 3rd respectively, these results corroborated with the previous research findings on general decline in annual rainfall in many parts of Nigeria (Odjugo, 2009; Umar, 2011; Sawa and Adebayo, 2011) [18, 26, 23].

Table 2: Rank order of crop farmer’s awareness on climate change effect

Farmers’ awareness on climate change effect	Mean	S. D	Ranking
Decrease in crop yield/low harvest	4.32	0.863	1 st
Increase in (high) temperature	4.21	0.876	2 nd

The dryness in the environment is more	4.16	0.959	3 rd
Total rainfall is decreasing with extended dry spells	4.16	0.919	3 rd
The green environment is reducing	4.15	0.910	5 th
Increase in weed infestation	4.01	0.823	6 th
Introduction of new varieties of crops	3.99	0.928	7 th
Long period of dry season is caused by climate change	3.98	1.025	8 th
Too much rain/occurrence of flood on farm lands is caused by climate change	3.95	1.098	9 th
Loss of soil fertility (soil erosion)	3.90	0.982	10 th
Long period of harmattan is more experienced in recent years	3.90	0.978	10 th
Introduction of new species of insect Pest	3.83	1.079	12 th
Short season length	3.78	1.149	13 th
Drought period during the raining season is longer	3.78	1.0208	13 th
Windstorm/thunder storms	3.69	1.092	15 th
Death or total loss of crops is the resultant effect of climate change on crop farming	3.56	1.137	16 th
Longer duration of rainfall	3.46	1.185	17 th
Overflowing of streams/rivers is due to the effect of climate change	3.33	1.167	18 th

Source: Field Survey, 2020

Grand Mean: 3.90

Overall categorisation of crop farmer’s level of awareness on climate change effect

The result on the categorization of respondents’ level of awareness on the effects of climate change in Table 3 shows that majority (94.2%) of the respondents had moderate awareness level of the effects of climate change, (5.4%) of the respondents had high awareness level of the effects of climate change, while (0.4%) had low awareness level. It can be inferred from the result that considerable proportion of farmers are aware of the effects of climate change while a sizeable proportion of farmers in the study area are still ill informed of the effects of climate change. The extent to which a community is aware of climate change reflects its level of exposure to climate risks. The fallout from this is that the low level of awareness of the effects of climate change by that proportion might wane farmers’ knowledge on strategies required to adapt thus leading to aggravated outcomes and short supply of crops. This line of thought is in consonance with the position of Akinngabe *et al.*, (2012)

[5] who adduced that low level of awareness in Nigeria is responsible for the aggravated effects of climate change. Similarly, Shukla *et al.*, (2016) [24] found that 85% of respondents were aware of climate change. However, the result of the study suggests that a lot needs to be done to quicken farmers' awareness and response to the exigencies of climate change.

The findings of the study show that the farmers were very much aware of the recent increase in rainfall in the study area which resulted in flood disaster. The losses that the farmers incurred in the last flood disaster which ranges from loss of farmlands, crops, livestock and homesteads among others were still fresh in their memories. Although one may think that the local farmers in the study area may not understand the concept of global warming or climate change, but they observe and feel the effects of decreasing rainfall, increasing air temperature, increasing sunshine intensity and seasonal changes in rainfall patterns as seen in (Oruonye, 2012) [20]. An increase in temperature is conducive for a proliferation of pests and diseases, which are detrimental to crop production (Ozor and Nnaji, 2011) [21].

Table 3: Overall categorisation of crop farmer's level of awareness on climate change effect

Total awareness score	Frequency	Percentage	Decision
18-41	1	0.4	Low
42-65	226	94.2	Moderate
66+	13	5.4	High

Source: Field Survey, 2020

Conclusion

The study concludes that Majority of farmers are moderately aware of the effects of climate change and they submitted that climate change has affected their farming activities in recent years. The effects mentioned include reduced crop yield, increase in (high) temperature, the dryness in the environment is more and total rainfall is decreasing with extended dry spells. Similarly high temperature causes wilting of crops and diseases while excessive rainfall leads to destruction of farmlands and properties by flooding. The source of information about climate change and its effects by the farmers is mainly from the local radio station.

Recommendations

1. Efforts should be made to sensitize farmers on the effects of climate change to improve their awareness and the likelihood of improving their production.
2. The extension delivery system and other information outlets should be strengthened to champion the creation of awareness with respect climate change and its effects on crop production.
3. The Government and Non-Governmental Organisation should provide early warning weather information to farmers and encourage farmers to constitute themselves into farm-based organisations for easy access to agricultural information and support.

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