ASSESSMENT OF RICE FARMERS' PERCEPTION AND ADAPTATION STRATEGIES ON CLIMATE CHANGE IN JIGAWA STATE OF NIGERIA

[1]Muhammad, M. B., [1]Garba, A. and [2]Usman, K.
[1]Department of Agricultural Economics and Extension, Faculty of Agriculture,
Federal University, Dutse, Jigawa State
[2] Department of Agricultural Extension Management,
Kabba College of Agriculture, Kabba, Ahmadu Bello University, Zaria, Kaduna State
Corresponding email: musabakomuhammad@gmail.com
Phone number: 08035871740

ABSTRACT
Agriculture in Nigeria, as is globally, is now very climate dependent which significantly impacts on agricultural productivity. The aim of this study was to assess rice farmers' perception on climate change and adaptation strategies in Jigawa State, Nigeria. A questionnaire complemented with an interview schedule was used to elicit information from 232 farmers. The study revealed that significant number of farmers were male (93.9%), married (93.9%) and had non-formal education (41.7%). Main information used by the farmers were the informal sources of friends, families and neighbors. Majority of the farmers believed and perceived climate change to be unusual due to late onset of rainfall and decrease in crop yields. The main adaptation strategies employed by the farmers include changing from farming to non-farming activities and moving away from crops production to livestock rearing. The study recommends that farmers should be facilitated to change their management practices in line with climate change demands with increase in training of extension workers on efficient selection of adaptation strategies.
Keywords: Climate change, perception, Adaptation, rice, farmers, Jigawa state

INTRODUCTION

Climate has become one of the major and probably most important variable influencing and threatening agriculture in Nigeria, and, in effect overall food security in the world (Musafiri *et al.*, 2021*).* This will, in effect endanger the attainment of one of the Sustainable Development goals of ending hunger by 2023 (FAO, 2018). In recent times, effects of climate change has exacerbated in sub-Saharan Africa threatening a sustainable agricultural system, especially the small-scale farming communities who constitute the majority of farmers in developed countries(Franklin *et al.*, 2021).

Climate change refers to a broad array of alterations in climatic and weather conditions characterized by shifts in average conditions and in the frequency and severity of extreme conditions (Ojuederie and Ogunsola, 2017). Yields from rain-fed agriculture could be reduced significantly and the changes in agricultural production, could potentially cause food uncertainty for 9 billion people by 2050 (Ali *et al.*, 2017).

Rice (*Oryza sativa*) is an important food item in the diet of most Nigerian households. According to Food and Agriculture Organization, the country is the continent's largest producer of rice. Reports by FAO (2018) showed that prior to the government's policy restricting the importation of rice, Nigeria doubles as the continent's leading consumer of rice and one of the largest rice importer in the world, thus, underscoring the importance of this food item to the country. This statistics also suggest that Nigeria is not self-sufficient with respect to rice production.

With the advent of the ban on rice importation, it therefore, suggests that Nigeria will henceforth, supply all its demand for rice and for this to happen, the country must double its production capacity and equally address the challenges facing the agricultural sector particularly, those associated with climate change.

Rice farming is highly dependent on environmental factors which are the most important among several factors that influence agricultural production. Research by FAO(2018) has shown that rice production which is one of the world's most important crops for ensuring food security and addressing poverty will be thwarted as temperatures in rice-growing areas, increase with continued change in climate.

Accordingly, developing countries are mostly vulnerable to climate change due to warm climate and level of poverty that impede their capacity to mitigate the effect of climate change through the use of adaptation strategies (Georgieva *et al*, 2022). De Salvo *et al.* (2013) reported reductions in wheat yields in Africa, and maize yield in Nigeria because of increased temperatures Food prices are expected to rise due to the impact of climate change, thereby worsening the food insecurity and poor nutritional health conditions in Nigeria (Okou *et al.*, 2022. Putting these increasing challenges in perspective, it is imperative that farmers in the Jigawa State must come to terms with this climate challenges and adopt strategies to curtail climate change events. Owing to these reasons, it is therefore important to devote time and resources to assess rice farmers' perception on climate change and adaptation strategies in Jigawa

State. This study will therefore, attempt to describe the socioeconomic characteristics of the rice farmers in the study area; identify the sources of information on climate change used by the farmers, and assess rice farmers perceived effects of climate change.

MATERIALS AND METHODS

Jigawa State is one of the 7 states of northwestern region of Nigeria, situated in between latitudes11.00°N to 13.00°N and longitudes 8.00°E to 10.15°E. Jigawa shares common borders w ith Katsina and Kano States to the west, Bauchi and Yobe States to the east and northeast, respectively (Jigawa CDF, 2010). .
Jigawa State also shares an international border with Niger Republic to the nort, which provides great opportunity for regular cross border trading activities through the state. Current projected population estimate of the state is 7,373,187 in 2020.
The study area experiences two seasons namely the wet and dry seasons. The wet season is between June and October (4-5months) with August having the highest amount of rainfall (262mm). The average temperature is 30º Celsius with April being the hottest. The undulating relief of the area is covered by Sudan savanna.

The population for the study were rice farmers. A sampling frame of the farmers was obtained from the Jigawa Agricultural Development Authority (JARDA) in 2022. A multistage sampling procedure was used for the study. The first stage involved convenient selection of Dutse Local Government Area. The second stage involved the purposive selection of five major rice producing wards based on the predominance of rice production. The selected wards were Kaci, Kudai, Madobi, Jigawar - tsada and Chamo. The third stage involved selection of three villages from each of the selected wards while the fourth stage involved a simple random sampling of 20% of the sampling frame obtained from JARDA from each of the selected villages to give a total of 264 respondents.

Table 1 : Sampling frame of rice farmers in the study area

District	Ward	Village	Sampling frame	20% of the sampling frame
Dutse district				
	Kaci	Burtulan	72	14
		Fagoji	47	10
		Zai	90	18
	Kudai	Yalwa	98	20
		Dadin duniya	126	26
		Bakin jeji	84	16
	Madobi	Baranda	115	24
		Kafin jiba	189	38
		Jangawa	77	16
	Jigawar tsada	Jaudi	60	12
		Manganda	46	10
		Dutsawa	41	8
	Chamo	Isari	85	18
		Kwadage	72	14
		Digawa	101	20
Total	**5**	**15**	**1303**	**264**

Source: JARDA survey, 2022

The main source of data for this study was primary data which was collected from the field, using structured questionnaires coupled with an interview schedule. Primary data containing information as age, education, farm size, gender, farming experience, family size among others. Also, information on sources of information on climate change used by the farmers, the farmers' perception on climate change, and adaptation strategies adopted were collected. Descriptive statistics was used to analyze the data.

RESULTS AND DISCUSSIONS

Socio-economic Characteristics of the Respondents

The results of socio-economic characteristics of respondents' show that majority of the respondents were between the age category of 31-50 years, implying presence of young and agile population

(Table 2). This is an important asset for efficient production and change. The result on age agrees with the findings of Adekunmi, 2022) who reported similar age range for rice farmers in Jigawa State. Also, almost all of the respondents were married and male gender had dominance effect in rice production in the study area. This pattern maybe due to the influence of the socio-cultural environment and this agrees with the findings of Adekunmi, (2022) ho argued that women were more engaged in non-farm activities and domestic chores than their male counterpart.

Over half of the respondents (58.3%) had formal education with no membership of associations. The literacy level of farmers could enhance their level of understanding and desirability of adopting innovation and farm technologies or interacting with extension agents. This result conforms to the findings of Mustapha *et al*. (2011). Similarly, majority (39%) had farm size of less than 1 hectare mainly acquired through inheritance, thus indicating that rice cultivation in the study area was on a marginal technical unit. This result disagree with the findings of Adekunmi (2022) who reported over 74% of the farmers woth farm size of between 1-3 hectares.

Table 2: Distribution of respondents' socio-economic characteristics

Variables	Frequency	Percentage (%)
Age (Years)		
21-30	54	20.4
31-40	106	40.2
41-50	80	30.3
>50	24	9.1
Gender		
Male	248	93.9
Female	16	6.1
Marital status		
Married	248	93.9
Single	12	4.5
Divorced	2	0.8
Widow/widower	2	0.8
Household size		
1-5	40	15.2
6-10	146	55.3
11-15	54	20.5
>15	24	9.0
Education level		
Primary	66	25.0
Secondary	50	18.9
Tertiary	38	14.4
Non-Formal	110	41.7
Membership of association		
YES	110	41.7
NO	154	58.3
Rice farming experience (Years)		
1-5	32	12.1
6-10	92	34.8
11-15	58	22.0
16-20	50	18.9
>20	32	12.1
Farmland size (ha)		
< 1.0	52	39.4
1.0-2.0	37	28.0
2.1-3.0	42	31.8
> 3.0	1	0.8
Source of land acquisition		
Inheritance	74	56.1
Rent	37	28.0
Purchase	18	13.6

Source: Field Survey, 2022

Respondents' main sources of information on climate change

Table 3 below shows responses on climate change information sources used by the respondents in the study area. Research has shown how accessibility to reliable agricultural information of climate forecast could significantly improve adoption of new management practices and also facilitate use of some climate adaptation strategies by farmers (Abid *et al.,* 2016). The result shows that neighbors, family and friends, and, radio ranked first, second and third, respectively as the main sources of information on climate change. Research institutes and print media were the least used information sources by the respondents. This implies that the respondents obtained enriched information on improved rice management practice from different sources. This finding is in consonance with that of Muhammad (2019) who found fellow farmers as the main source which farmers obtained agricultural information.

Table 3: Distribution of respondents according to sources of information used (n= >264)

Parameter	Frequency*	%	Ranking
Extension agent	16	6.1	Eight
Television	16	6.1	Eight
Family and friends	238	90.2	Second
Farmers cooperatives	36	13.6	Sixth
Research institutes	4	1.5	Eleventh
Farmers training	12	4.5	Ninth
Radio	158	59.8	Third
Print media	8	3.0	Tenth
Neighbors	250	94.7	First
Personal experience	152	57.6	Fourth
Internet	18	6.8	Seventh
Observation	94	35.6	Fifth

Source: Field survey, 2022
*Multiple responses

Perceived Climate Change Indicators

The results in Table 4 show that shorter than normal rainfall, decrease in rainfall days and rise in temperature respectively, ranked first, second, and, third as the perceived climate change indicators among the respondents. Increase in crop yield and above normal rainfall were the least perceived climate change indicators. This implies that the respondents experienced unfavourable and favourable perception on climate change in the study area. Findings are also in agreement with that of Ogbodo *et al.* (2018) who reported erratic rainfall as perceived climate change indicators among Kenyan maize farmers.

Table 4: **: Distribution of Respondents Perceived Effects of Climate Change**

Indicators	Frequency	(%)
Early onset of rainfall	34	12.9
Late onset of rainfall	230	87.1
Shorter than normal rainfall	242	91.7
Decrease in rainfall days	242	91.7
High sunshine intensity	216	81.8
Increase in crop yield	20	7.6
Decrease in crop yield	232	87.9
Unusual rainfall	234	88.6
Above normal rainfall	24	9.1
High humidity	90	34.1
Low humidity	242	91.7
Rise in temperature	241	91.3
Drought	202	76.5
Erratic wind	160	60.6
Loss of soil fertility	48	18.2
Increase in erosion	50	18.9
Early harmattan	86	32.6
Late harmattan	130	49.2

Source: Field Survey, 2022

Adaptation Strategies Used by Rice Farmers

The results in Table 5 show that 88% and 87% respectively changed from farming to non- farming activities, and changed from crop to livestock production. The strategy to grow number of different crops ranked third. The least measures adopted were

water recycling (37.2%), change of time for fertilizer application (40.2%) and crop rotation (42%). The results are in consistent with some of the findings of Nhamo *et al*. (2014), who revealed that planting early maturing varieties of seeds, usage of chemical fertilizer, early planting, crop diversity, and mulching, tillage and water conservation were the strategies adopted by farmers in the Volta Region of Ghana to combat the effect of climate change.

Table 4: Distribution of Respondents Adaptation Strategies Adopted

Parameters	Frequency	%
Early planting and harvesting	148	56.1
Use of early maturing variety	208	78.8
Alter frequency of irrigation	108	40.9
Growing a number of different crops	216	81.8
Using different varieties	138	52.3
Use of water harvesting and storage	190	72.0
Changing from farming to non- farming activities	232	87.9
Moving from crops to livestock	226	85.6
Relocation	164	62.1
Paying attention to disaster warning	130	49.2
Changing water use practice to save water	194	73.5
Changing time of labor	164	62.1
Changing time of fertilizer use	106	40.2
Using crop rotation	112	42.2
Recycling water	98	37.1

Source: Field Survey.2022

CONCLUSION

Rice farmers devised different strategies of adaptation to climate changes based on their perception on climate change which was obtained mainly from informal sources of information. Majority of the respondents perceived effects of climate change to be change in rainfall, increase in temperature and decreased in crop yields. The main adaptation strategies include, changing from farming to non-farming activities and moving from crops to livestock farming.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made;

1. Farmers should be encouraged to change and improve their management practices in line with sustainable climate change demands.
2. The training of extension workers on efficient selection of adaptation strategies should be regularly carried out.
3. Policy makers should device avenues to ensure timely availability of reliable climate related information to guide the farmers agricultural activities.

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