

Adaptation Strategies to Climate Change among Rice Farmers in Katsina-Ala Local Government Area of Benue State, Nigeria

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Abstract: *Climate change has emerged as an important factor in agricultural production globally. Advanced countries are better placed to address the challenges posed by this phenomenon. Developing countries must also develop the capacity to tackle this problem in order to ensure sustainable agriculture. A foundational requirement is to access the knowledge, attitude and practice of local farmers in order to design a robust response to support their activities. The study was aimed at assessing the farmers' level of awareness of climate change and the strategies they adopt in response to it. The results show a high level of awareness of climate change, and that farmers employ various commonsense strategies to mitigate its effects.*

Keywords: *Climate change, Rice farmers, Adaptation, Mitigation, Awareness.*

I. Introduction

Climate change poses a very serious threat to sustainable agricultural production and food security in many parts of the world. It affects crop yield, prices, production, consumption, and nutrition. Studies have indicated that agriculture in developing countries is currently being affected by climate change (UNDP, 2006). Climate change, defined as any sustained alteration in the average daily weather pattern resulting from natural courses of events or human activity (Easterling et al. 2007, IPCC 2007). Climate change is a global phenomenon that had varied definitions depending authors' conceptions and perceptions. IPCC (2007) defined climatic change as a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. According to Olaniyi, Ojekunle and Amujo (2013), climate change refers to an increase in average global temperatures attributable to natural events and human activities leading to increase in greenhouse gases such as Carbon Dioxide (CO₂).

However, Olaniyi et al (2013) aligned themselves with the United Nations Framework on Climate Change (UNFCCC) which used the term "Climate Change" to refer to human-induced change while the term "Climate Variability" is used for changes due to external forces. The 'external forces' here entails the changes in climate caused by an alteration in the global energy balance as a result of fluctuations in the Earth's orbit, ocean circulation, and atmospheric composition. The humanly induced factors comprise all activities such as deforestation, fossil fuel consumption, urbanization, land reclamation, agricultural intensification, freshwater extraction, fisheries over-exploitation and waste production (Handmer et al, 2012).

The literature also dwell on the impacts of climate being felt by both developed and developing countries. In Nigeria, desertification has been identified as a particularly serious problem. Olagunju, (2015). The changing climatic conditions according to Food and Agricultural Organization (FAO) (2016) projections would affect food security as patterns of rainy season would be reduced, and the frequency and intensity of severe weather events such as floods, cyclones and hurricanes would increase; prolonged drought, shortages and changes in the location and incidence of pest and disease outbreaks would be experienced in some locations globally (FAO, 2016).

Climate change adaptation comprises all spontaneous and premeditated action taken to cope with the impacts of, or reduce vulnerability to, a changing climate. Adaptation should address immediate problems and anticipate future changes in order to mitigate adverse effects. Adaptation strategies can be preemptive or responsive private and public adaptation, and autonomous and planned adaptation. All adaptation strategies aim at promoting resilience and reducing vulnerability (IPCC, 2012)

Rice is one of the most important cereal crops in Nigeria. Its consumption is increasing rapidly in Nigeria because of urbanization, relative ease of preparation, and convenience in storage. With the increased availability of rice, it has become part of the everyday diet of many in Nigeria. There are many varieties of rice grown in Nigeria. Some of these are considered 'traditional' varieties, others have been introduced within the last twenty years. Rice is grown in paddies or on upland fields, depending on the requirements of the particular variety. New varieties are produced and disseminated by research institutes, or are imported from Asia. Nigeria

villages in the sample. Thus, Ahuhaalev, Gawa and Gbise were selected from Mbayongo council ward, Ngibo, Lunjo and Awule-gbev were selected from Ikurav-Tiev I council ward, Atov-huha, Gbayan and Zaan were selected from Ikurav-Tiev II council ward, TseAdanyi, TseWombo and TseUli were selected from Tiir council ward, TseAmenger, TseAnyiatse and TseApera were selected from Iwar, TseHaa, TseAlakali and TseTion-kwase were selected from Utange. The sampling frame for the study was obtained from Benue River Basin Development Authority from which a sample of 123 male and female rice farmers was selected. The data was analyzed using descriptive statistics

III. Results and Discussion

Rice farmers' level of Awareness of Climate Change

Table 1 revealed that 21.14 percent of respondents were highly aware of climate change and 39.02 percent were aware. Thus there was a high level of awareness of climate change in the study area. Farmers' awareness of changes in climate attributes is important for adaptation decision making (Madobi, 2012). Table 2 also revealed that the main indicators of climate change include 'too much sun,' 'too much rainfall' and variation in rainfall duration. Others include alteration in cropping calendar due to weather, prolonged dry and rainy seasons, thunderstorm and heavy rains and variation in daylight and day night length. The high level of awareness of climate change is based on a limited definition of climate change in terms of weather variability. In most developing countries illiteracy is often a barrier to a robust appreciation of the root causes of climate change and its global dimension (Acquah, 2011; Muzari and Mutumbara, 2014). A sound understanding of the dynamics of climate change is essential if effective attitudinal and behavior change programmes are to be designed and executed. Properly gauging farmers' level of awareness is a fundamental step toward such programmes.

Table 1. Awareness of Climate Change

Variable	Frequency	Percentage
<i>Awareness</i>		
Highly Aware	26	21.14
Aware	48	39.02
Moderately Aware	21	17.08
Not Aware	28	22.76
<i>Climate Change Indicators</i>		
Variation in rainfall duration, pattern and intensity	27	21.95
Too much sun and too much rain	30	24.39
Alteration to cropping calendar due to weather	17	13.83
Variation in flood pattern, duration and intensity	07	5.69
Prolonged dry and rainy seasons	14	11.38
Thunderstorms and heavy rains	15	12.38
Variation in harmattan pattern and intensity	07	5.69
Variation in day light and night length	06	4.88

Source: field survey, 2014

Sources of information on climate change of the respondents

Table 3 shows that personal observation/experience, Radio/television, and fellow farmers were the major sources of information. Chen *et al.*, (2010) supported the significance of climate change information sharing in facilitating adaptation in China. The study also confirmed the accuracy of farmer's perceptions. These findings also concur with Isife and Ofuoku (2008), who documented that radio, has the highest audience and has the strength of reaching a large population of farmers and other rural dwellers faster than other means of communication. In Zimbabwe, however, Madobi (2012) reported that radio and television were not important sources of information on climate change because of the low credibility these sources commanded in that country.

Table 2: Sources of Information on Climate Change

Variable	Frequency	Percentage
Personal observation/Experience	36	29.27
Radio/Television	36	29.27
Extension Agent	8	6.50
Fellow Farmers	25	20.33
Newspapers	9	7.32
Internet	7	5.69
None	2	1.63

Source: field survey, 2014

Adaptation Strategies to climate in Rice Production

Table 3 presents the strategies that rice farmers adopted in response to climate change. The major strategies employed included the use of improved varieties. Almost 15 percent (14.63) of the respondents adopted this strategy. Another major strategy adopted by farmers was growing drought resistant crop varieties (13.82% of the respondents). Other strategies identified by rice farmers include out-migration from climate risk zones, prayers for God’s intervention, multiple cropping, adoption of recommended improved rice production strategies, recycling of waste product and improvement on farmers’ management skills. These strategies have also been adopted by farmers in other countries to address production and other challenges occasioned by climate change (Mburu *et al*, 2015; African Technology Policy Studies Network, ATPS 2013; Orindi and Eriksen 2005). Some effects of climate change cannot be handled by the farmers. Government would be required to take action in certain directions like enacting and enforcing the use of clean energy, and the drive towards reforestation (Faraut *et al*, 2011)

Table 3 Rice Farmers’ Adaptation Strategies to Climate Change

Variables	Frequency	Percentage
Use of improved varieties	18	14.63
Growing drought resistant crop varieties	4	3.25
Growing flood resistant varieties	6	4.88
Use of pest/disease resistant varieties	5	4.07
Crop diversification	2	1.63
Prayers for God’s intervention	3	2.44
Multiple cropping	2	1.63
Construction of drainage system	2	1.63
Use of suitable irrigation system	4	3.25
Out-migration from climate risk zones	15	12.20
Adoption of recommended improved rice production strategies	2	1.63
Adjusting the planting calendar	11	8.94
Moderate use of agro-chemicals and fertilizers	17	13.82
Recycling of waste product	5	4.07
Improvement on farmer’s management skills	2	1.63
Increase irrigation	4	3.25
Change use of chemicals, fertilizers, and pesticides	21	17.07

Source: field survey, 2014

IV. Conclusion

Rice farmers in the study area demonstrated a high level of awareness of the climate change phenomenon and have responded to it to the best of their abilities. The major source of information on climate change in the study area was the use of observation/experience and radio/television. Their knowledge and perception of climate change phenomenon substantially directed at the variation in rainfall duration, pattern and intensity, too much sun and too much rain, alteration in cropping calendar due to weather and thunderstorm and heavy rains. The adaptation strategies mostly used by the respondents were the use of improved varieties, change the use of chemicals, fertilizers, and pesticide, adjusting the planting calendar, out-migration from climate risk zones and moderate use of agro-chemicals and fertilizers. Extension services appeared to be contributing little to the awareness of the farmers on climate change hence the general awareness of variation in local weather patterns. The low impact of the agricultural extension services highlights the need for the reinvigoration of, and mainstreaming of climate smart agriculture extension service

Based on the findings of this study, the following recommendations were made:

- a. The extension service should be strengthened to provide adequate information on climate change to farmers in the study area.
- b. Adequate and regular information on current issues related to the effect of climate change on agriculture be provided to the respondents through mass media campaign especially radio.
- c. Agricultural policies must be overhauled to make them Climate smart. This will provide the template for all stakeholders to carry out robust mitigation strategies to counter the negative effects of climate change.
- d. Early maturing, drought resistant and flood resistant varieties of rice should be made available to farmers to enable them to cope with the vagaries of the climate.

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