



Assessment of Crop Farmers Perception of Climate Change and Indigenous Adaptation Strategies in Southern Part of Borno State, Nigeria

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ABSTRACT

The study assessed the perception of food crop farmers of climate change and indigenous adaptation strategies in southern part Borno State, Nigeria. Multi stage sampling procedure was used in drawing one hundred (100) registered crop farmers from Biu, Kwaya-Kusar and Bayo Local Government Areas. Frequencies, percentages and Pearson product moment correlation was used in analyzing the data. Result showed burning of firewood as energy, deforestation, over-grazing, gases emissions from factories and industries as some of the perceived causes of climate change in the study area. Change in planting dates, mulching and relay cropping were the leading indigenous strategies adapted to cope with changes in climate conditions for favorable agricultural cultivations. In determining the relationship between perception and utilization of climate change adaptation strategies, their value was found to be positive (0.7333) and significant. This indicated a strong relationship between perception and indigenous adaptation strategies to climate change. Food crop farmers in the study area adapted strategies that were indigenous in nature to mitigate the effect of climate change on agriculture. It was recommended that suitable and efficient indigenous adaptation strategies should be identified for optimal utilization, farmers should be informed on changes in weather conditions and also efforts should be made in educating farmers to knowing that climate change is a global problem beyond individual faith.

Keywords: *Crop farmers, Perception, Climate change, Indigenous and Adaptation strategies.*

INTRODUCTION

Food crop farmers rely solely on favorable climatic factors for optimal agricultural production. Natural resources such as land, water, air and vegetation when not altered, provides a lasting means of livelihood for food crop farmers. Indigenous food crop farmers in developing countries had over the years observed changes in their ecosystems that resulted to decreased in agricultural production. Food crops occupied about 94% of the already experienced decline in production rate of maize, sorghum, millet, rice and legumes due to adverse effect on climate change (Odjogo, 2009). Climatic factors like rainfall has not kept a regular pattern, temperatures are rising and forest has not been flourishing. Planting periods and harvest time kept changing over time and space. These changes compelled food crop farmers to adapt to some indigenous strategies in creative ways drawing from traditional

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adaptation knowledge to new technologies that proffer solutions to climate variability (Ishaya and Abaje, 2008).

Climate change has been defined as a significant variation in weather events that persist for an extended period of a decade or longer (Intergovernmental Panel on Climate Change, 2007). These variations manifest in a number of ways which includes; changes in average climatic conditions (drier lands, wetter lands, erratic rainfall patterns and extreme weather temperatures), depletion of the ozone layer and certain human activities such as deforestation and industrialization (Mohammed *et al.*, 2013 and Audu, 2003). Agriculture is however, affected by alteration of the ecosystem that resulted to depletion of soil water, distortion in carbon and nitrogen cycle and rise in temperatures (Smith and Skinner, 2002). These alterations, had adversely affected the social and economic means of food crop farmer's livelihoods.

Perception is the process in which people viewed events through interpretations, stimulations, evolutions and organizations of a practice. Perception strongly affects how farmers deal with climate-induced risks and opportunities, and the precise nature of the behavioral responses to the perception will shape adaptation options (Adger *et al.*, 2009). Perception to changes in climatic conditions varies across communities among food crop farmers. These variations are as a result of the perception views and interpretations based on distinct beliefs and understanding (Wolf and Moser, 2011). Adejuwon (2004) observed the effect of climate change on food crop farmers as not only in the changes on climatic conditions but on resilient methods employed based on perceived causes to achieve food production, viable environment, retained soil moisture and quality.

Adaptation to climate change referred to adjustment in natural or creative system in response to harm or exploits to the environment (IPCC, 2007b and Mustapha, 2014). To food crop farmers, it can be referred to as adjustment in practices, processes and structures that suits agricultural production (FAO, 2008). In northern Nigeria, the indigenous adaptation strategies to climate change used by farmers includes; use of wetlands, contour cropping across slopes, planting deeper than usual, intensive manure application, moving to new sites, change in planting dates, agro forestry and alternating animal and crop farming (Blessing *et al.*, 2011). These practices are called indigenous because they are readily available to farmers and requires little or no technology for implementation and adaptation. Adaptation helps farmers achieve food security, income and livelihood in the face of climate change through enabling farmers to engage in practices that are practicable under the "new" climate regime (Kandlikar and Risbey, 2000).

This study tried to look at the perception to climate change and the indigenous adaptation strategies employed by food crop farmers in Southern Borno State. Although the issue of climate change perception and adaptation strategies has been recently studied by Abdulhamid and Bamusa (2018), the study looked at farmers' perception of the influence of climate change on agricultural production. This study tried to look at the indigenous adaptation strategies employed by food crop farmers which was missing in the previous study. Thus the objectives of this study were to;

- i. Investigate the perceived causes of climate change by food crop farmers;
- ii. examine the indigenous climate change adaptation strategies utilized by food crop farmers;

- iii. determine the relationship between perception and utilization of climate change indigenous adaptation strategies.

METHODOLOGY

Southern part of Borno State, Nigeria consists of nine Local Government Areas (LGAs) which include; Askira Uba, Bayo, Biu, Chibok, Damboa, Gwoza, Hawul, Kwaya Kusar and Shani. It borders internationally with Republic of Cameroun to the east and nationally with Adamawa State to the south, Gombe State to the southwest, Yobe State to the west and Bama, Damboa and Maiduguri to the north intra-state. It lies between latitude 11⁰09'0''N and longitude 13⁰41'29''E of the equator and covers a land area of about 21,787.4 Km². The region has a projected population of about 1,759,900 persons as at December, 2016 (NPC, 2017). The annual rainfall in southern part of Borno State varies yearly but averages between 800mm-1200mm that lasted from May to October (IITA, 2009). Vegetation is Sudan savannah interspersed with tall trees and woodlands, arable lands and favorable weather for agricultural production. The people of the area are predominantly farmers that cultivate food crops like maize, millet, sorghum, rice, soybeans, cowpea and groundnuts as their major sources of livelihood (IITA, 2009).

Data from primary and secondary sources was used for the study. One hundred (100) respondents were selected using multi stage sampling procedure. In the first stage, three local government areas Biu, Kwaya Kusar and Bayo were purposively selected out of nine LGAs because of relative absence of security threats and accessibility. The second stage involved random selection of three communities from Biu being the largest LGA and two each from KwayaKusar and Bayo to give a total of seven communities. In the last and third stage, 12% of registered crop farmers obtained from the ADP were selected out of the seven communities to constitute 100 respondents. Descriptive tools such as frequencies and percentages were used to analyzed the data. Pearson Product Moment Correlation was also used to determine the relationship between perception and utilization of climate change adaptation strategies in the study area. The structured questionnaire covers respondent's perception of climate change and adaptation strategies. The PPMC is given as;

$$r = \frac{n \sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

Where:

r = Pearson correlation coefficient

x = Perception variable

y = Indigenous adaptation strategies variable

$\sqrt{\sum (x - \bar{x})^2}$ = variance of perception

$\sqrt{\sum (y - \bar{y})^2}$ = variance of indigenous adaptation strategies

The r value ranges between 0 and 1, when $r = 0$ it signifies no relationship and $r = 1$ indicates perfect relationship. A negative r value also indicates that increase in one variable, result to decrease in another.

RESULTS AND DISCUSSIONS

Farmers Perception to Climate Change

Table 1 presents results on perceived causes of climate change in the study area. Respondents were asked on their opinion regarding the causes of climate change in their environments. Majority (96%) of the respondents revealed that burning of firewood for energy was the major caused of climate change. Deforestation activities (75%), over-grazing (78%) was ranked 3rd, carbondioxide emissions from motor vehicles and motorcycles (75%) and continuous use of inorganic fertilizers (67%). Gases released from factories and industries (65%) although, there were no factories and industries in the study area, but crop farmers were aware through local media and extension agents that emissions from factories and industries have adverse effect on the ecosystem. Others causes of climate change identified were superstitious belief (42%), continuous cropping (34%) and religious beliefs (23%) ranked 7th, 8th and 9th respectively. Local farmers in the study area were either Muslims or Christians with few who are of traditional religion. Attributing climate change to their beliefs cannot be neglected as they believed that climate change occurred as a result of manifestation of their religious scriptures. This agrees with Cyprainet *al.* (2014) who found that superstitious and religious beliefs were some of the perceived causes of climate change among rural people in Cross River state, Nigeria.

Table 1: Distribution of Respondents by Perceived Causes of Climate Change (n=100)

Causes of Climate Change	Frequency	Percentage*	Rank
Burning of firewood for energy	96	96.0	1 st
Deforestation	93	93.0	2 nd
Over-grazing	78	78.0	3 rd
Emissions from vehicles and motorcycles	75	75.0	4 th
Continuous Use of inorganic fertilizer	67	67.0	5 th
Gases released from factories/industries	65	65.0	6 th
Superstitious belief	42	42.0	7 th
Continuous cropping	34	34.0	8 th
Religious belief	23	23.0	9 th

Source: Field Survey, 2016

* Multiple response.

Indigenous Adaptation Strategies to Climate Change

Table 2 presented results on indigenous adaptation strategies employed by food crop farmers to mitigate the effect of climate change in the study area. Change in crop planting dates ranked 1st, mulching 2nd, relay cropping 3rd and contour cropping across slopes 4th. Others were mixed farming, intensive manure application to farm lands, expansion of cultivated areas, inter cropping, agro-forestry practices, planting deeper than usual, change in harvesting dates, prayers to God(s) and use of wetland/river valley. Popular among the indigenous adaptation strategies employed by food crop farmers were change in planting dates and mulching. Change in planting dates by local farmers in the study area ranges from early

planting to delay in planting depending on nature of the perceived cause. Mulching was done to mitigate adverse temperatures, sun intensity and help crops to retain moisture. This strategy was mostly used in rain fed agriculture especially when rainfall declined. This is however labor intensive as observed by most of the farmers and commonly practiced in legumes and other cover crops. Otitoju and Enete (2014) observed mulching as one of the strategies to mitigate the effect of adverse temperature on food crops in Nigeria. Use of wetlands/river valleys for planting was found to be the least employed strategies. This is because wetlands and rivers were scanty in the study area and farmers rarely use such for crop planting especially during dry season, except the few who resides close to riverbanks.

Table 2: Utilization of Indigenous Climate Change Adaptation Strategies by Food Crop Farmers. (n=100)

Use of indigenous adaption strategies	Frequency	Percentage *	Ranks
Change in planting dates	78	78.0	1 st
Mulching	76	76.0	2 nd
Relay cropping	74	74.0	3 rd
Contour cropping across slopes	71	71.0	4 th
Increased weeding	71	71.0	4 th
Mixed farming	68	68.0	5 th
Intensive manure application	67	67.0	6 th
Expansion of cultivated areas	65	65.0	7 th
Prayers for God's intervention	65	65.0	7 th
Intercropping	56	56.0	8 th
Multiple cropping	51	51.0	9 th
Agro-forestry practices	48	48.0	10 th
Planting deeper than usual planting depth	45	45.0	11 th
Moving to a different site	43	43.0	12 th
Change in harvesting dates	40	40.0	13 th
Use of wetland/river valleys	34	34.0	14 th

Source: Field Survey, 2016

* Multiple responses.

Correlation between Perception and Indigenous Adaptation Strategies

In Table 3, perception was found to relate significantly to adaptation strategies in the study area and is because farmers were aware on climatic changes in their environment. This implies that the first step towards adaptation is the perception of the problem. The knowledge on perceived causes of climate change has determined the extent and appropriate strategies for adaptation. It can be deduced from this finding, that farmers experiences to climate change in their environment overtime has increased their awareness and adaptation strategies for mitigation.

Table 3: Correlation between Perception to Climate Change and Utilization of Climate Change Indigenous Adaptation Strategies (n=100)

		Perception	Indigenous Adaptation Strategies
Perception	Pearson Correlation	1	.733**
	Sig. (2 tailed)		.000
	N	100	100
Climate Change	Pearson Correlation	.733**	1
	Sig. (2 tailed)		.000
	N	100	100

** . Correlation is significant at the 0.01 level (2-tailed).
Field Survey; 2016.

CONCLUSION

This study has explored the perception of food crop farmers to climate change and how indigenous adaptation strategic methods was used to mitigate changes in climate in the study area. The findings has shown that climate change was perceived to have been caused by factors ranging from burning of firewood for energy to religious and superstitious beliefs. Change in planting date was found to be the leading strategy adapted by food crop farmers in the study area. Others are mulching, relay cropping, mixed farming and some various indigenous methods that are readily available to food crop farmers. Perception and utilization of indigenous adaptation strategies was found to correlate, indicating that various adaptation methods were used by the farmers.

RECOMMENDATIONS

Metrological agencies and extension agents should sensitize farmers on changes in weather conditions and appropriate farming activities including time for planting. Efforts should be made by government and non-governmental Organizations to educate local farmers to know that climate change is a global problem that requires collective actions beyond individual faiths. Additionally, awareness of the use of alternative energy sources other than fuel wood should be focused on. In addition, government should support the practice of ranching to avoid indiscriminate livestock grazing.

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