

Research Article

Farmer's On-farm Traditional Mitigation, Techniques against Climate Change Impacts in Selected Lgas of Kano State

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Abstract: This study assessed the perceptions and observations of rural farmers in selected communities of two local government areas of Kano state on climate change and its impacts on their livelihood strategies over four decades. It explores some traditional initiatives or techniques taken by the local communities to minimize climate change impacts and effects. Focus Group Discussions (FGD) were organized to collect and analyze vulnerability context on climate change and its impacts on various sectors of the economy in the LGAs such as: agriculture, livestock, infrastructure, water sources etc. similarly, information on available service providers, Kano Agricultural and Rural Development Authority (KNRDA) and their contributions were sourced through secondary sources. It was observed that local communities of the selected villages/towns in Kano State were facing challenges of climate change overtime and were adapting traditional techniques as against it. Some of on-farm strategies such as zero or minimum tillage. Alteration of planting date, are environmentally friendly and socially acceptable. However, these traditional adaptive techniques of the villagers are not strong enough to cope with current scourge of climate change in the area.

Keywords: Agriculture, adaptation, climate change, livelihood, mitigation, perception, traditional techniques

INTRODUCTION

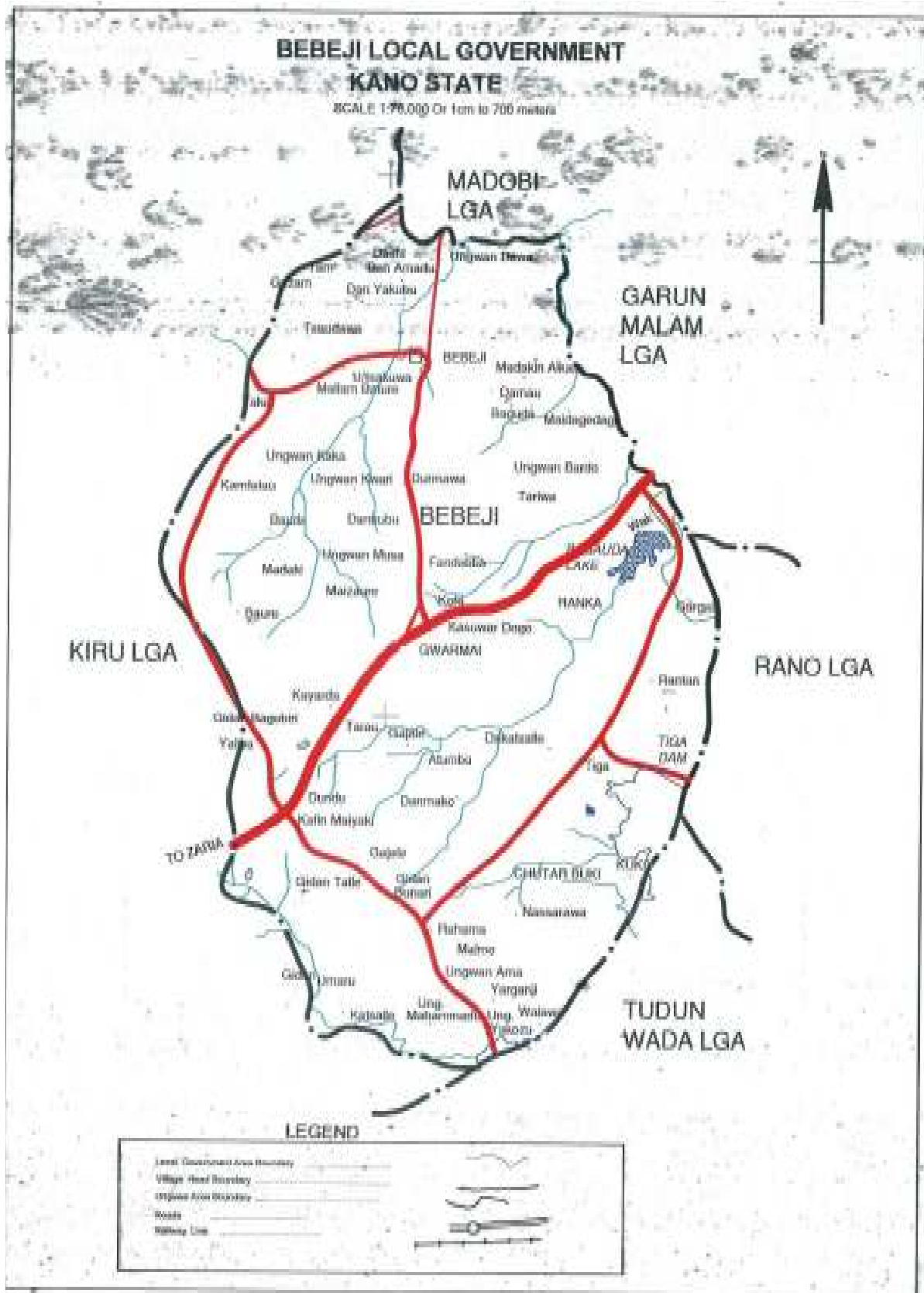
Climate change is expected to have severe environmental, economic and social impacts on Nigeria, particularly on rural farmers whose livelihoods depend largely on rain-fed agriculture. Agriculture primarily small-scale or subsistence agriculture remain the backbone of Nigeria's economy after crude oil, with the savanna zone being the largest grain producing zone of Nigeria. Agriculture contributes about 20-30% of Nigeria's Gross Domestic Products (GDP), generates about 20-30% of the foreign exchange earnings and employs over 60% of the population (Bryant *et al.*, 2000; Maddison, 2006; Gbetibouo, 2009). Despite, its significant contribution to the overall economy, the agricultural sector in Nigeria is challenged by many factors of which climate change-related disasters like long dry spells, drought, floods and outbreaks of pest and diseases (especially in dryland area of the north), are the major ones. In recent time, adaptation to climate change has become a policy concern to farmers, researchers and policy maker alike. Vulnerability to climate change and adaptation strategies are seen to be linked to poverty reduction measures (Berkes and Jolly, 2001; Abaje and Giwa, 2007; Halsnaes and Traenup, 2009). According to Bryant *et al.* (2000), agricultural adaptation is how perception of climate change is translated into agricultural decision making process.

A review of studies on adoption of new technologies identified farm size, tenure status, education, access to extension services, access to market and credit availability as major determinants of the speed of adoption in Africa (Mendelsohn *et al.*, 2006). To enhance policy towards tackling the challenges that climate change poses to farmers perception on climate change, potential adaptation measures and factors affecting adaptation to climate change. There is need for extensive research on local traditional adaptation on measures being practiced by farmers in their immediate ecosystem.

The two selected LGAs (Gwarzo and Bebeji) of Kano State in the savanna region of northern Nigeria are among the grain producing area of Kano State and by extension Nigeria. To continue optimum production of grain in the face of climate change challenges, farmers would have to adapt to specified climate change challenge in the area. There is however little knowledge whether farmers in the area perceive climate change and have adopted adaptation measures. This study seeks to explore farmers perception and adaptation to climate change in the area.

LITERATURE REVIEW

The study area for this prevent work are Gwarzo LGA and Bebeji LGA (Fig. 1a and b). These two Local



(a)



(b)

Fig. 1: Study Point 2; Kano State Land and Survey Office, 2011

Governments are part of present Kano state. Kano state is located between latitude $12^{\circ}3'N$ and longitude $832^{\circ}1'E$. It has a land mass of about $21,000 \text{ km}^2$. It is about 90 km from the edge of the sahara desert and some 1,140 km from the Atlantic ocean. The state share a boundary with Jigawa state from the north east and from the west and southwest it borders kastina and Kaduna state, respectively. From the extreme south east it borders Bauchi state.

The present climate of the state is the tropical wet and dry climate, coded as Aw by W. Koppen. The variations in the amount and other aspects of rainfall in the state results to three rainfall regimes:

- **The wet regimes:** This is when the amount of rainfall received is larger than the long-term mean.
- **The moderate regime:** This is when both the amount and duration of rainfall are approximately normal with erratic rainfall pattern.
- **The dry regime:** This is when either any of the amount and the duration of rainfall is less than normal with erratic pattern, or both of the amount

and duration of rainfall are less than normal with or without erratic pattern of rain is steady.

These regimes of rainfall occur at random. The occurrence of the dry regime for two consecutive years means a major droughts.

METHODOLOGY

The needed data and information used in this study were collected from a direct field study based on the results of 315 questionnaire that were administered in 10 selected villages (five in each LGA) in the two (2) selected local governments of Kano State. Information used in this article were generally qualitative in nature based on field observations, household survey (structured questionnaire), Focus Group Discussions and information discussion conducted between May 2010 and July 2011. Only villages/settlements that were accessible were randomly selected within the two LGAs. Questionnaire were purposively administered to only adults above 25 years. An average of 30 questionnaires were administered to each village/settlements and only to willing household heads

Table 1: Perceived climate events as observed in the study areas

Threaten events	Economic sectors					
	Crop	Livestock	Vegetation	Infrastructure	Human causality	Its sources
Flood	10	6	8	6	8	7
Dry spells	10	10	7	7	5	7
Drought events	10	8	7	6	5	8
Erosion	7	10	10	7	4	6
Pest and disease	9	7	9	6	5	8
Total	46	41	41	32	27	36
Rank	1st	2nd	2nd	4th	5th	3rd

Field work 2011

and individual adults. The reason for this to pay better attention to those more interested and concerned by the incidence of climate change in the area. Approximately 20-35 min per individual were spent in giving to the questions. The study was conducted at the face to face level and obtained a response rate of approximately 83.5%. Out of the 35 questionnaire to each village, 30 were analyzed, because not all administered questionnaire were completely returned or answered. The analysis were based more on descriptive statistics and presentation.

During FGD, particularly tools like matrix ranking (impacts of risk and disasters vs livelihood assoits) and local knowledge documentation (documenting local knowledge, technology and practices related to coping and adaptation strategies) were applied. In addition, qualitative data related to crop losses, climate change impacts on different sector were collected through informant interviews.

RESULTS AND DISCUSSION

Perceived climate risk in the selected LGAs Attempts were made for respondents to compare present climate to the past four decades. Past and present climatic indices and frequencies of such indices were analyzed using time line over the 40 years. Such subjective perception of farmers revealed how the selected communities are affected by climate stress over the years. According to the respondents, perceived climate risk are increasing in the area, in terms of frequency and severity of impacts are high as compared to past climatic events for example, discussing and drawing time line with community in all the selected villages, almost 78% of the respondents perceived that, uncertainty of the climate has increased. The time line showed that occurrence of such events as long dry spell, drought, flood (after a major storm), soil erosion has increased in recent years compared to about 40 years ago. Similarly, based on time line drought and frequent dry spells were seen as most prominent climatic events in the study area.

Farmers observed long term drought in all the community at time of monsoon rain which affect on late planting of crops. They also attest to abnormal rainfall (heavy rainfall within a short period) which impact losses in agriculture, livestock, infrastructure and sometimes human casualties. In all the villages,

80% of respondents agreed that agriculture is the most impacted sectors, since more than 90% of the people engaged in agriculture for their livelihood. This is followed by livestock, infrastructure, water sources and human casualties (Table 1).

OBSERVED CLIMATE CHANGE IMPACTS

Impacts on crop production and livelihoods:

Impacts on agriculture is critical to human survival. This is because it is the main source of sustenance, livelihood and economy (particularly among rural farmers) and possibly the human enterprise most venerable to climate change. The communities/villages in the selected LGAs are also facing the problems due to changes in climatic patterns. Uncertainty and uneven occurrence in rainfall, that is drought is impacting untimely planting and harvesting date (Table 1).

Those has led do decrease in production per unit land. In addition, when flooding occurs, it impacts huge agricultural lost even agricultural land (due to erosion) based on farmer's perception, changed cropping pattern, decreased soil fertility, introduced new crop varieties and observed new pest and diseases, declined productivity and altered management practices were some of the observed changes due to climate change.

Impact on livestock: Based on perception of farmers in the selected LGAs, in livestock, climate change has direct and indirect impacts, loss or decrease in livestock number either due to injuries/outbreak of new diseases are direct impacts of climate change whilst decrease in grazing land, feduction in fodder and forages are indirect impacts induced by climate change.

Impact on infrastructure: Climatic risk and hazards, especially flood, drought, windstorms etc. have severe impacts on infrastructure like buildings, bridges, roads. For example, in Kasa Kijin area of Gwarzo to Local Government Area, flood incidence had severe impact leading to suspension of local bridge across its stream which obstructed farmers movement especially for agricultural and market purposes during the rainy season.

Impact on water sources: The selected area form part of the dry land areas of Kano State. Water sources are great problem in both area to farmers, both for irrigation and domestic purposes. According to

respondents (farmers) in the area, climatic stress enhance contamination of water sources (especially during the peak of the rain) and lack of irrigation water is severe in long dry periods due to high temperature and exclusive evaporation.

TRADITIONAL ADAPTIVE MITIGATIONS ADOPTED BY FARMERS IN THE AREA

Farming communities with their traditional skills and local knowledge are gestodian regarding the use and management of natural resources. They are also experiencing climate change impacts at gross reet level and they are mere enger to deal and adapt with these changes with their own knowledge, resources and ascribed information at their own level. Farmers in Gwarzo and Bebeji LGAs of Kano state as survivors at time of malaria, danque fever and other diseases outbreak, ever rich in traditional knowledge for climate change adaptation.

Farmers in the study areas also adapted some initiations based on their own knowledge and skills in their crop and livestock management owing to climate change. A total of about 9 on-farm traditional techniques or coping strategies to climate change can be identified in the area. Broadly, they can be group into the following:

- Techniques for combating soil erosion
- Techniques for conserving water
- Techniques for labour saving
- Techniques for risk minimization
- Techniques for minimizing or questioning short tem impacts

Study area include, on-farm selection of seeds. Cross-ridging, wider crop spacing, reduced use of inorganic fertilizer, altering of planting date, dry season irrigation (where available).

CONCLUSION AND WAYFORWARD

Adaptation is the best way to tackle climate change impacts in developing countries like Nigeria. Farming communities in rural areas had already experienced these adaptation initiatives in their own local condition and with their traditional knowledge and skills. Rural communities, in Gwarzo and Bebeji are facing

climatic stress year in year out and they are adapting to these changing climate with the traditional skills and techniques. These adaptive initiations have some logics and ethics that should be documented, validated and shared and disseminated to other farming communities in the state as well as wider geographical areas in dry land region of northern Nigeria.

REFERENCES

- Abaje, I.B. and P.N. Giwa, 2007. Urban flooding and environmental safety: A case study of Kafanchan town in Kaduna state. A Paper Presented at the Golden Jubilee (50th Anniversary), Proceeding of the 49th Annual Conference of the Association of Nigerian Geographers (ANG). Department of Geography, University of Abuja, Gwagwalada-Abuja, October 15-19.
- Berkes, F. and D. Jolly, 2001. Adapting to climate change: Socio-ecological resilience in a Canadian Western arctic community. *Conserv. Ecol.*, 5(2): 18.
- Bryant, R.C., B. Smit, M. Brklacich, T.R. Johnston, J. Smithers, Q. Chiotti and B. Singh, 2000. Adaptation in Canadian agriculture to climatic variability and change. *Climatic Change*, 45: 181-201.
- Gbetibouo, A.G., 2009. Understanding Farmers' Perceptions and Adaptations to Climate Change and Variability. The Case of the Limpopo Basin, South Africa. IFPRI Discussion Paper 00849.
- Halsnaes, K. and S. Traerup, 2009. Development and climate change: A mainstreaming approach for assessing economic, social and environmental impacts of adaptation measures. *Environ. Manage.*, 43(5): 765-78.
- Maddison, D., 2006. The Perception of and Adaptation to Climate Change in Africa. CEEPA Discussion Paper No. 10. Centre for Environmental Economics and Policy in Africa, University of Pretoria, South Africa.
- Mendelsohn, R., A. Dinar and L. Williams, 2006. The distributional impact of climate change on rich and poor countries. *Environ. Dev. Econ.*, 11: 159-178.