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Reducing Vulnerability and Increasing Resiliency to Climate Change: Learning From Rural Communities

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Abstract

Governments and the international development community generally have responded to various aspects of the global climate change crisis, but questions remain about whether the right actions are being pursued, how best to respond, and what the future holds. Though climate change is a global phenomenon, without doubt, it is not a new phenomenon to people living in rural communities in the tropics and sub-tropics. In Nigeria as well as other parts of Africa, rural people and their communities have over long periods of time built knowledge and developed elaborate strategies and coping mechanism in response to threats imposed by various environmental changes including climate change. Despite their vulnerability and facing greater risks, they have survived and continued to remain resilient. However, the wealth of knowledge in mitigation and adaptive strategies, which ensure the quality and sustainability of their livelihood under changing conditions is yet to be recognized in Nigeria's climate change policy formulation and implementation. While the crisis of climate change calls for an urgent response from national governments and the international community, debates revolve around the question and possibility of creating conditions and an economy that permits equitable and environmentally sustainable development. This paper highlights the importance of rural people's contributions as well as insights into the valuable lessons they have to offer in addressing the issue of climate change.

Keywords: *Vulnerability, rural communities, climate change, environmental sustainability*

INTRODUCTION

In the 21st century, the incidence of climate change constitutes one of the most severe threats confronting human societies world over. Climate change is a state of affairs involving alterations in climate conditions over time, brought about either by human-induced activities or natural variability. Climate change induced by human activity is characterized by high buildup of the sun's heat inside the atmosphere resulting from greenhouse gases (GHGs) discharged into the

atmosphere, thereby causing temperatures to rise and thus, counteracting the earth-atmosphere energy balance (Intergovernmental Panel on Climate Change (IPCC), 2001 and 2007; Irish Aid, 2004). This has resulted to variability in climate system and consequent effects on ecological processes and biodiversity (Department of Food and International Development (DFID), 2004; IPCC, 2007; Hunter, 2007). Concomitant effects of climate change include rise in sea levels, disappearance of glaciers, drastic changes in precipitation patterns, rising temperatures, increased frequency of extreme events such as erosion, drought, floods, high incidences of pest and diseases (Lambrau and Piana, 2006; Hunter, 2007). Climate change is occurring at an alarming rate and predictions about its impacts have been well reported. According to the reports of the Intergovernmental Panel on Climate Change (IPCC), the world's average temperature is anticipated to rise by 2°C by 2050 (IPCC, 2007). In relation, the International Fund for Agricultural Development (IFAD) has reported that about 49 million more people will be at risk of hunger by 2020 and 132 million by 2050 due to climate change; yields from rainfed agriculture may possibly be reduced by up to 50% by 2020 in a number of countries; and between 15% and 37% of land plants and animal species could become extinct by 2050 as a result of climate change (IFAD, 2008). While there is the growing knowledge about the impacts of climate change on ecosystems and species, it is widely accepted that climate change poses a considerable threat to rural people and their communities in developing countries, especially those living in the tropics and sub-tropics (IFAD, 2008; Low External Input and Sustainable Agriculture (LEISA), 2008).

Despite global concerns, climate change is not a new phenomenon to people living in rural communities in the tropics and sub-tropics. In Nigeria as well as other parts of Africa, rural people and their communities have over the course of history been confronted with the urgent task of adjusting to changing environmental conditions under which they have to survive (Musa, 2006). From time immemorial to date, rural communities of diverse origins and cultures in Nigeria and Africa alike have continued to rely heavily on a wide array of indigenous knowledge, resource complexes and innovative pathways to conserve the environment and deal with natural disasters including climate change. Despite their vulnerability and facing greater risks particularly those in hazard-prone areas, rural people and their communities have survived and continue to remain resilient. Conversely, the wealth of indigenous knowledge and strategies developed by them on climate change prevention and mitigation, early warning, vigilance and response as well as post-disaster resurgence, are not well recognized as potentials in Nigeria's climate change initiative. Given this context, this paper seeks to draw attention to the importance of rural people's contributions as well as give insights into the valuable lessons they have to offer in addressing the issues of climate change.

Materials and Methods

Methodologically, data for this paper relied on the collation of secondary sources of information involving a systematic review and discussion of existing literature, case studies, reports and research findings that have significant bearings on the theme of the paper.

RESULTS AND DISCUSSION

Concept of Vulnerability and Resiliency to Climate Change

Within the framework of climate change, the concepts 'vulnerability' and 'resiliency' are indications of people's exposure to environmental threats, shocks and stresses and the extent to which they cope with and adjust from resulting impacts (DFID, 2004). The concepts permit an understanding of how rural people create their own room for manoeuvre under conditions of opportunities and constraints. According to IPCC (2007b), vulnerability is 'the degree to which a system is susceptible to, or unable to cope with adverse effects of climate change, including climate variability and extremes'. Brooks (2003) distinguishes between social and spatial vulnerability to climate change. While spatial vulnerability focuses on factors of external origins (e.g. heat waves, heavy precipitation, flood and drought), social vulnerability include factors such as poverty, inequality, marginalization and lack of food entitlements within a social system independently from external hazards. Communities which are suffering already from poverty, malnutrition and bad health conditions, marginalization and inequality are likely to become more vulnerable to climate change induced hazards (Macchi *et al.*, 2008). On the other hand, the notion of resiliency can be viewed as the adaptive capacity of a human-environmental system to adjust to changing conditions and reduce its vulnerability to potential damages for sustained existence. Human-environmental systems with greater diversity base are often less vulnerable to sudden environmental changes, and tend to reflect higher levels of resiliency (LEISA, 2008; Macchi *et al.*, 2008).

Rural Vulnerability and Climate Change

It has been argued that rural sectors of developing countries have less capacity to adapt to the negative impacts of climate change because they are poor, have limited financial resources and limited skills and technologies (IFAD, 2008; Irish Aid, 2004, DFID, 2004). Millions of rural people in the tropics and sub-tropics depend on climate-sensitive natural resources for their basic livelihoods. Such climate-sensitive resources and activities include agricultural land, sources of water supplies, arable farming, livestock husbandry, gathering of fuel wood and edible plant species (Koziell and Saunders, 2001; Shackleton and Shackleton, 2004; Hunter, 2007). Climate change can reduce the availability of these local natural resources, thereby limiting the options for rural households that depend on natural resources for consumption or trade. Thus, changes in agroecosystems resulting from soil degradation, drought, erosion and deforestation exacerbated by climate change has immediate and direct effects on the health and well-being of the rural people, leading to their vulnerability. In Nigeria, crop failures and livestock deaths due to drought events in several rural communities, especially in the north, are causing higher economic losses, contributing to higher food prices, increased poverty and undermining food security with ever-greater frequency. The magnitude of drought losses indicates the continuing vulnerability of the rural communities to drought. Similarly, the Irish Aid (2004) report have also noted that farmers and herders across the Sahel are increasingly having difficulty of providing for their families as rains dwindle and drought becomes an annual event. Without

question, continuous alterations in climate conditions will bring different changes to different rural areas. While land may become less fertile, in some areas, greater change in natural resources may be observed due to increased rainfall. Worse still, poorer and remote areas are most likely to suffer because they are least able to adjust to climate variability and extremes.

Rural Resilience and Climate Change

Rural people and their communities represent a valuable proportion of national population. Thus, the role of rural areas has been increasingly recognized as an important factor in national development. In Nigeria, they constitute about 80% of the farming population and account for over 95% of domestic food production (Musa, 2006). Throughout history, rural people and their communities have had historical relationships with their environment and are gradually adapting to it inadvertently or intentionally (Musa, 2006; Klee, 1980). In the process, they have accumulated over the centuries enormous indigenous knowledge on how to sustainably utilize their climate-sensitive resources using a variety of innovations to deal with environmental changes. As environmental change has already affected their livelihoods in the past, in many cases indigenous peoples have developed specific coping strategies to extreme variations of weather. Some examples of such adaptation strategies include:

Prediction, preparedness and early warning of disasters

In the field of prediction and early warning of disasters, findings reveal that rural people in the Luo community in the Lake Victoria basin had a large number of climate monitoring indicators that enabled them to tell such things as the right time to start planting in anticipation of the rains or to preserve and store food in anticipation of a dry season. These indicators included observation of the behaviour of animals, birds, reptiles, amphibians, insects, vegetation and trees, winds, temperatures and celestial bodies (UNEP, 2008). They observed bird species that they had never seen before, they became aware that the level of water in the rivers is higher/lower than usual for the season and that the traditional plants used as medicinal remedies can not be found anymore. In Swaziland, where drought and occasional floods are common disasters, it was observed that rural communities take precautions after predicting disasters. For example, they used the height of the nests of the *emahloko* bird (*Ploceus* spp.) on trees to predict floods. When floods are likely to occur, the nesting of the *emahloko* is very high up the trees next to a river and when floods are unlikely, the nests are low down. The Swazis also used the cry of certain birds to predict rain and yields of certain wild fruit plants to predict famine. Other indigenous methods used by the Swazis to predict natural hazards include wind direction, the shape of the crescent moon and the behaviour of certain animals (UNEP, 2008).

Among rural communities in the tropics and sub-tropics, indigenous traditions, customs, beliefs and cultural rites also played an important role not only in environmental and conservation of biodiversity but also in preparedness against climate change. For example, among the Hausa people in some rural communities in northern Nigeria, sacrifices by the slaughtering of animals such as bulls and offering of prayers are performed to ward off events of drought or erratic rainfalls,

pestilence and soil unproductivity (Musa, 2006). In southern and eastern parts of Nigeria, many rural communities maintained shrines and protected forests where certain trees or animals were considered sacred or totems so they were protected, and as a result have served useful in coping with climate change. Richards (1980), found that farming communities in southern Nigeria have environmental knowledge of the variegated grasshopper (*Zonocerus variegates*) relating to dates, severity and geographical extent of outbreaks. Based on their frequent observations, the communities reported that the incidences of the *zonocerus* population were related to climatic anomalies.

Crop diversification in order to minimize the risk of harvest failure

The existence and maintenance of a diversified resource base is an important factor which influences socioeconomic vulnerability and resilience to climate change. Diverse crops and varieties reduce the risk of crop failure. For instance, Thomas and Twyman (2005) noted that traditional Andean farmers in Peru have developed about 3800 varieties of potato which over centuries allowed them to adapt their crops to different biophysical parameters including soil's quality, temperature, inclination, orientation and exposure. In Nigeria, many rural communities face various natural hazards but the major ones are drought and floods. These invariably cause famine, food insecurity and poverty. However, the communities have devised a variety of measures such as growing drought-resistant and early-maturing indigenous crop varieties, gathering wild fruits and vegetables, wetlands cultivation, livestock diversification and splitting that have enabled them to survive climatic hazards.

Many of the indigenous knowledge approaches to environmental conservation included such technologies and practices as shifting cultivation, mixed cropping or intercropping, minimum tillage and agro-forestry, as well as transhumance. These technologies and practices were commonplace and were used with various other methods of land use and management to promote higher yields while at the same time conserving the environment. For instance, mixing or intercropping maize with other crops such as beans promoted not only efficient labour utilization but also lessened the risk of total crop failure since chances were that if one of the crops succumbed to environmental stress, others would survive. Mixed cropping or intercropping stabilized yields, preserved the soil and made it possible to harvest different crops at the same time. Other advantages were a reduction in susceptibility of the crops to pests and diseases and a better use of the environment where the combination of species grown had different light requirements or explored different depths of soil. The system also tended to provide a complete vegetation canopy at different heights and thus guard against heavy rainfall as well as protect the soil. Other practices adopted by rural communities include the complementary use of indigenous and modern farm technologies and practices, as in the case of combined use of organic and inorganic fertilizers to address soil fertility issues.

Diversification and Migration

Diversification and migration are among many survival strategies also used by rural communities in times of climate change. Systems of livelihood diversification allow rural communities to draw on various sources of food and income and in doing so, reduce the risks of vulnerability to climate change. Diversification of livelihoods include using food reserves, seeking local non-farm employment, selling livestock, borrowing food, or selling household and farm equipment. A link between migration and climatic factors, such as temperature and precipitation, has been documented in several rural regions of developing countries. For example, in East Africa, pastoralists take decisions on the movement of their herds in response to a range of different risks, including livestock disease, conflict, market prices, access to land, government and Non-governmental organization (NGO) services, as well as climate (DFID, 2004). Among rural communities in Burkina Faso and Ethiopia for example, residents of dry, rural areas are likely to migrate to rural regions with greater rainfall (Henry *et al.*, 2004; Hunter *et al.*, 2007). Similarly, in Nigeria, in the face of climate-related environmental change such as drought or the decline of productive agricultural land, many rural people are forced to migrate in search of work in urban areas. Migrants who find work often remit portions of their earnings back home. Their families in the rural communities may use the remittances to buy substitutes for goods previously produced or harvested from the local environment. For example, store-bought food may substitute for food previously grown on homestead plots (Meze-Hausken, 2004).

Conservation measures

Over thousands of years, rural communities in various geographical and climatic regions of the world have evolved diverse indigenous regimes of rainwater harvesting and management as an adaptation to climate change. In Bolivia, the people of the Aymaran rural communities have been coping with water insecurity and scarcity over centuries, due to climate variability. It was found that they have developed a sophisticated system of rainwater harvesting by way of constructing small dams (*qhuthañas*), in order to collect rainwater in the mountains and pampas (United Nations framework on Climate Change Convention (UNFCCC), 2007). This traditional system of rainwater harvesting has proved to be vital not only to people but also to livestock in times of droughts. Furthermore, it has been found that these water reservoirs serve as thermo-regulators of humidity and help reduce the risk of skin cancer as they diffuse harmful sun-rays (UNFCCC, 2007; Macchi *et al.*, 2008). In South Asia, early rainwater harvesting systems required simple scooping of the earth and erecting elongated soil heaps along farm boundaries (Pandey *et al.*, 2003). In Nigeria, rainwater harvesting involve basin construction and digging of wells. Seed selection for next planting season and storage of farm products in '*rumbu*' (locally constructed silo) are practices widely used by rural farm communities in northern Nigeria. Conservation systems reflect the behavioural response of rural communities to extremities of climate change. This demonstrates the resilience of rural communities to absorb shock, learn and build on historical adaptive processes.

Implications for Policy Formulation and Implementation

Increasingly, rural communities in Nigeria are already experiencing the impacts of climate change and are doing their best to cope. In order to assist rural communities reduce vulnerability and increase resilience to climate change, a single approach is not likely to work. Addressing climate change would require integrated, multi-dimensional and multi-sectoral approaches. In this regard, developing supportive policies and policy instruments at the national, regional and local levels are needed which takes into consideration the environmental, social, demographic and economic issues, as well as the interests of rural communities. Essentially, there is the urgent need to consult and strengthen cooperation with rural people and their communities with a view to incorporating their values, strategies, knowledge base and practices in national policies and programmes in the areas of sustainable management of climate change.

CONCLUSION AND RECOMMENDATIONS

Although climate change is occurring and will continue, challenges are that policy actions are needed that will safeguard the livelihood options of rural communities in terms of reducing their vulnerability and enhancing their resilience despite climatic changes. While there is an increasing awareness that poor natural-resource dependent rural communities are more vulnerable, there is lack of action taken by government in the understanding of the role that rural communities have to play in the mitigation and adaptation to climate change. The wealth of knowledge in the mitigation and adaptive strategies which have ensured the quality and sustainability of their livelihood under changing conditions can offer strategic action points. Thus, to help rural people and their communities prepare for future challenges of climate change, it is recommended that policy is needed to explore and build on local coping mechanisms, local innovations and local practices based on the specific cultural background of rural communities.

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