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ADAPTATION TO DESERTIFICATION AMONG RURAL HOUSEHOLDS: LOCAL INSIGHT TO ENHANCE COEXISTENCE IN THE REGION OF MARADI, NIGER REPUBLIC

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Abstract

People in the dry land environment whose livelihoods are often tied to subsistence agriculture and natural resource base have been known to adopt adaptation measures to build resilience and decrease vulnerability to multiple threats. Given the enmity and conflicts that do occur between and within settlements in an attempt to adapt to desertification and other environmental problems, it is essential to identify successful adaptation to attain development and intercommunity co-existence. In view of this, attempt is made in this paper to highlight household and community-level adaptations that can help to achieve coexistence among settlements in the region of Maradi of Niger Republic. It is recommended that a more holistic approach which situates Participatory Rural Appraisal (PRA) techniques at the centre of policy formulation and implementation should be adopted to ensure sustainability of rural livelihoods. There is need for strong livelihood diversification in order to reduce vulnerability and increase resilience. Similarly, there is need for mutual reinforcement of local and national policy to address the issue of desertification. In doing this, much emphasis should be placed on autonomous (bottom-up) adaptation to strengthen the linkages between stakeholders and thereby reinforce peaceful co-existence among the people.

Keywords: Adaptation; Desertification; Co-existence; Rural households; Maradi Region

Introduction

Adaptation to environmental hazards has long been recognized as inherent characteristics of human race throughout history. Desertification constitutes one of the environmental hazards of the arid and semi-arid areas of the world which had forced people to embark on adaptation measures as a way of decreasing vulnerability to multiple threats. However, the rate of reduced vulnerability depends on the level of adaptive capacity of individuals or regions. For instance, African continent has been highlighted as particularly vulnerable in the future, primarily due to its low adaptive capacity and its sensitivity to many of the projected changes (IPCC, 2007b).

Ecosystems in dry lands around the world appear to be undergoing various processes of degradation commonly described as desertification (Hillel and Rosenzweig, 2002). Rural people in these regions ultimately depend on the effective use of natural resources (Reynolds, 2001). However, it is widely recognized that desertification constitutes a serious threat to the environment, and welfare of more than one billion humans living in the arid and semi-arid areas of the world (Mainguet, 1994; UNSO, 1997; Reynolds and Stafford Smith, 2002). Given the potential threat of desertification, international communities have been forced to look more closely at development programmes in the arid and semi-arid environment of the world. This is evident in the Plan of Action to Combat Desertification (PACD), endorsed by the United Nations General Assembly in 1977. The responsibility for following up and coordinating the plan was given to the United Nations Environment Programme (UNEP). The desertification prone countries were urged to develop National Plans of Action to Combat Desertification. This was seen as a fundamental instrument for the implementation of the PACD recommendations (Thomas and

Middleton (1994). Similarly, massive endorsement was given by states, particularly those in Africa, to the United Nations Convention to Combat Desertification (UNCCD) in those countries experiencing serious drought and or/ desertification. With this, parties to the UNCCD that declare themselves affected by desertification are required to develop NAPs (National Action Programmes). The need for NAPs is embodied in the UNCCD (1994) text, which states that affected parties should highlight the key challenges they face in relation to desertification and drought, and present a strategy through which these challenges will be addressed.

The impact of desertification in arid and semi-arid regions is normally very severe due to the fragile nature of these lands. They are characterized by low, erratic and highly inconsistent rainfall levels, receiving between 100 to 600 mm annual rainfalls (FAO, 1978). The main feature of dryness is the negative water balance between the annual rainfall (supply) and the evaporative demand. The severe effects are remarkably seen in reduction of biodiversity, rangeland, forest and wildlife ecosystem. The most obvious impact of desertification, in addition to widespread poverty, is the degradation of 3.3 billion hectares of total area of rangeland, constituting 73 per cent of the rangeland with a low potential for human and animal carrying capacity; decline in soil fertility and soil structure on about 47 per cent of the dry lands areas constituting marginal rain fed cropland; and the degradation of irrigated cropland, amounting to 30 per cent of the dry lands areas with a high population density and agricultural potential (UNCCD, 1992). It is pathetic to note that many of the world's dry lands are grazing rangelands. All rangelands are characterized by the need to manage and cope with erratic events that constrain opportunities for development. Traditional nomadic pastoralist fully exploits these characteristics, typically by moving from one area to another in response to seasonal conditions. These forms of use were more economically efficient and less ecologically damaging than the sedentary systems that characterize the other landscapes (Squires and Sidahmed, 1998).

Given its location in the tropical zone and its low altitude of generally less than 300m, Maradi region falls within the Sahel ecological zone of the arid and semi-arid regions. Most of the 35,100 km² of Maradi land is classified as 'Sahel'. It is a region of high temperatures, unreliable rainfall as well as low relative humidity (Mortimore, 2001b). The region is characterized by extensive flat dry lands on which transhumant livestock herders move several hundreds of kilometers north and south annually following rains and grazing for their herds. Similarly, more than 80 per cent of the population is composed of farmers practicing rain fed agriculture in an environment where rainfall has become unreliable and rainy season becoming shorter. In order to ensure their sustainability, communities generally settle for some coping mechanisms including social networking, solidarity and alternative livelihoods, small scale irrigation or migration. However, Adaptation may reduce risk at one (short) time scale yet cause an increase in exposure to risk in the long term (Adger er al., 2005). Furthermore, what may be effective adaptation for one community may undermine the ability of others to adapt through spatial spill-over and negative externalities. In view of this, an attempt is made in this paper to highlights household and community-level adaptations measures that can be pursued to foster intercommunity co-existence in the Maradi region of Niger Republic.

Geography of Maradi Region

The Region of Maradi is one of seven Regions of Niger Republic. It lies between latitude 130.30/ and 130.50/N and longitude 70.6/ and 70.1/E (Figure 1). It is located in south-center Niger, east of the Region of Tahoua, west of Zinder, and north of Nigeria's city of Kano. The administrative center is at Maradi which is the third largest city in Niger Republic. The region of Maradi has a total land mass of 41,796km2 of which 35,100km2 is classified as Sahel. The population of the region is put at 3,402,094 according to 2012 population census (Wikipedia, 2015). The Hausa, Tauregs and the Fulani are the predominant ethnic groups in this region with Hausa being the majority.

Maradi region spreads across three agro-ecological zones: Sahelo Saharian, sahelian and soudano sahelian zones. The Sahelo Saharian zone covers the main part of Dakoro, Tessaoua and Mayahi departments and it is limited by the Tarka Valley. The sahelian zone covers the rest of Dakoro, Mayahi and Tessaoua department including a small part of the northern part of Aguie department. This zone is between the Tarka Valley and the Goulbin Kaba. The soudano sahelian zone is located in the extreme south of the region and covers the departments of Guidan Roumdji, Madarounfa and Aguie and begins from Goulbin Kaba up to the border with Nigeria (Moussa, 2011).

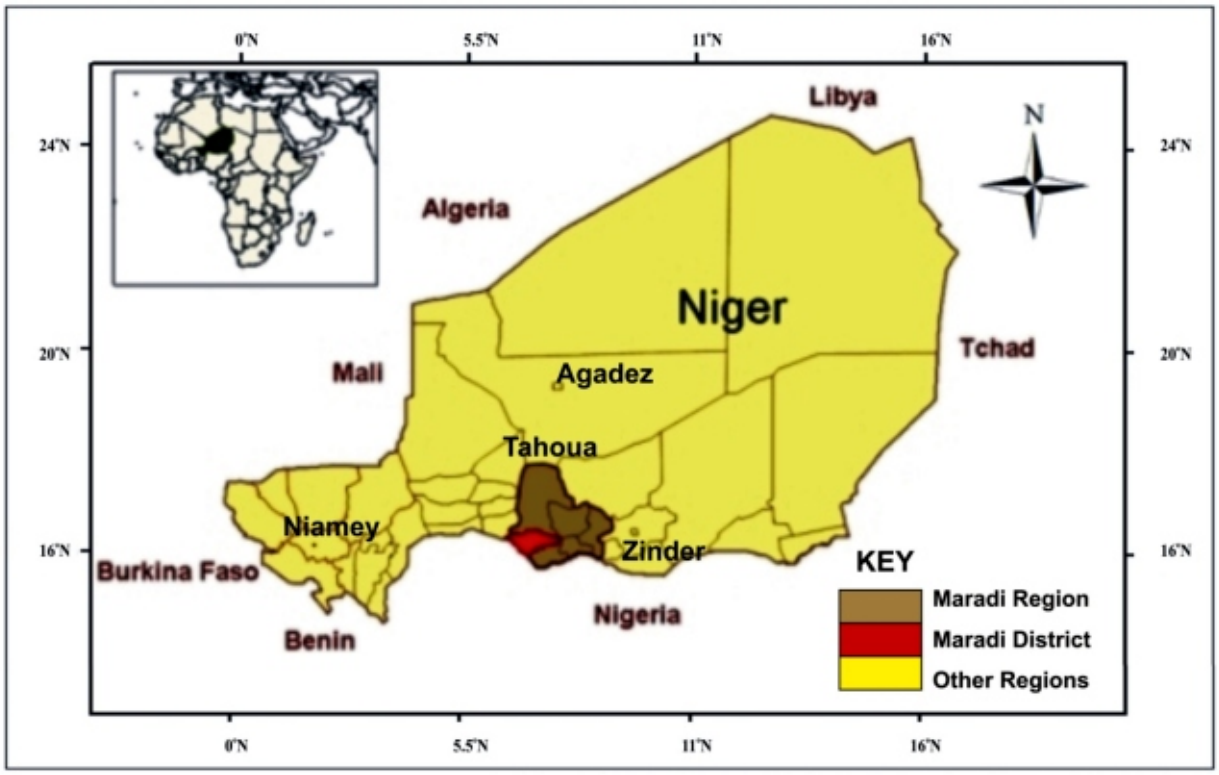

Figure 1: Location of Maradi Region within Niger Republic.

Maradi region is characterized by a north-south rainfall gradient ranging from 200 mm to 750 mm. In the extreme southern part of Maradi, the normal annual rainfall is 600-750 Mm and the raining season lasts 3 to 4 months from June to September, with maximum rainfall in august. The dry season, from September to June is followed by a 'mini-hot' season in October. Mean temperatures vary from 23.5°C to 32.7°C in April/May. Relative humidity achieves maximum rates (almost 100%) in August which is also the rainiest month.

The region's economy is focused primarily on subsistence agriculture and livestock grazing. In this region, as in other parts of the country, agriculture is largely rain fed. Agricultural production follows the rhythm of the seasons with most of the farming activities occurring during the rainy season which last between 3-4 months. The main agricultural crops are millet and sorghum, with rice and corn as secondary crops. The region is renowned for its groundnut farming business. The principal livestock raised are goats, sheep, cattle and camels. The region is characterized by extensive flat dry lands on which transhumant livestock herders move several hundreds of kilometres north and south annually following rains and grazing for their herds. The major constraints of agriculture reside in the insufficiency in water for the crops. This insufficiency really displays a weak capacity of surface water mobilization and access to underground water (Davies, 2008a).

The region of Maradi has one of the highest human poverty indices of 66.5% which is above the national average of 63.3% for Niger. The impact of poverty is most severe in the region. It is equally noted for high rate of youth migration which encourages risky sexual behavior and the spread of HIV/AIDS. In 2004, Maradi has gender-specific human development indices of 0.227 which is below the national average of 0.292. This shows that the poverty level in this region is highly dependent on gender and that women are most affected (ADF, 2006)

Desertification: Brief Overview of Definition and Concept

Desertification as an environmental problem became known in the 1930s, when parts of the Great Plains in the United States turned into the "Dust Bowl" as a result of drought and poor farming practices (Dregne, 2000). During the "Dust Bowl" period,

millions of people were forced to leave their farms in the American Great Plains (Thomas and Middleton, 1994). Desertification later became very popular as an environmental term during the widespread and severe drought as well as repeated crop failures that struck the sahelian regions in Africa from the late 1960s to 1970s (Lamprey, 1975). The word "desertification" itself was introduced by the French scientist Aubreville (1949) when he stated that there are real deserts being born today, under our very eyes, in the 700-1500 mm annual rainfall areas. The concept was however, discussed earlier by European and American scientists in terms of increased sand movements, desiccation, desert and Sahara encroachment and man made deserts (Hubert 1920, Boville 1921, Coching 1926, Renner 1926, Stebbing 1935, 1938, Lowdermilk 1935, Jones 1938). At this time, desertification meant the spreading of deserts or desert-like conditions. The symptoms of the phenomena were often related to sand movement and encroachment into oasis and desert margins.

Several definitions and concepts of desertification have developed and been used by scientists, politicians and the international aid and development society. For instance, United Nations Environment Programme (UNEP) 1977 conceptualized desertification as the diminution or destruction of the biological potential of land that can lead ultimately to desert-like conditions…over-exploitation gives rise to degradation of vegetation, soil and water…(UNEP, 1977). According to Food and Agricultural Organization desertification is defined as "the sum of geological, climatic, biological and human factors which lead to the degradation of the physical, chemical and biological potential of lands in arid and semi-arid zones, and endanger biodiversity and the survival of human communities" (FAO, 1993). Among other definitions are those of UNCED, (1992), Oladipo (1993), and Mainguet (1994). It is defined as 'land degradation in arid, semi arid and dry sub-humid areas, resulting from various factors including climatic variations and human activities" (UNCED, 1992). Also, it is considered "a process of sustained land degradation (loss of primary production) that results in the inability of the environment to sustain the demands being made upon it by socio-economic systems at existing levels of technology and economic development and under prevailing climatic conditions, especially recurrent drought" (Oladipo, 1993) and Mainguet (1994) characterized desertification as the "ultimate step of land degradation to irreversible sterile land".

The most accepted definition up to date states that desertification is land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities (UN, 1994; Reynolds and Stafford Smith, 2002). In spite of the numerous and diverse nature of definitions and concepts surrounding desertification, three issues of concern are commonly emphasized. These are:

(i) decreasing productivity;

(ii) vulnerability of the arid and semi-arid regions; and

(iii) both climate and human activity as essential causal elements.

On this basis, desertification is recognized globally as one of the central problems in sustainable development of the dry lands ecosystem. It is generally viewed as an advanced stage of land degradation occurring in arid, semi-arid and sub-humid areas of the world that are characterized by variable climates. These regions are considered vulnerable based on their dependency on natural ecosystem in an environment where rainfall is inadequate both in time and space, coupled with inherent ecological fragility of the dry lands that weakens the resilience of the ecosystem and its ability to return to its original conditions. Desertification is mainly recognized by the significant reduction of available water resources, production level and extent of sandy areas. Not only climate conditions have an influence upon the degree of desertification but also the anthropologic pressure. Man, by its unreasonable action can start and amplify drought and desertification phenomena.

Understanding Adaptation in the Context of Desertification

Attempt to understand adaptation in the context of desertification specifically in relation to intercommunity co-existence in Maradi region would necessitate the need to define the term "adaptation" as used in literature. Adaptation is a process of deliberate change, often in response to multiple pressures and changes that affect people's lives. Smit et al., 2000 suggest adaptation to be the adjustments made in ecological–social–economic systems in response to actual or expected climate stimuli, their effects or impacts. Burton et al. (2002) consider it to mean the ability of social and environmental systems to adjust to change in order to cope with the consequences of change. According to

Inter-Governmental Panel on Climate Change (IPCC), adaptations are adjustments or interventions, which take place in order to manage the losses or take advantage of the opportunities presented by a changing climate (IPCC 2001). Adaptation is the process of improving society's ability to cope with changes in climatic conditions across time scales, from short term (e.g. seasonal to annual) to the long term (e.g. decades to centuries). The goal of an adaptation measure should be to increase the capacity of a system to survive external shocks or change. Adaptation is therefore a process of deliberate change in anticipation of or in reaction to external stimuli and stresses (Nelson et al., 2007).

Having define what adaptation is all about, there is need to discuss adaptation in the context of desertification. This becomes necessary because of the vulnerability of arid and semi-arid regions (dry lands) in the process of desertification. Dry lands cover roughly 40 per cent of the earth's land surface and are inhabited by over 2 billion people, approximately one third of the world's population. About 90 per cent live in developing countries. A large share of the dryland population depends on crop and livestock production for their livelihoods (MEA, 2005). By implication, most rural communities in this region depend majorly on agricultural sector as a source of livelihood. This important sector is however sensitive to climatic conditions, and is among the most vulnerable sectors to the risks and impacts of global climate change (Parry and Carter 1989). Adaptation is certainly an essential component of any policy response to desertification. Adaptation will likely play a key role in reducing vulnerability and give room for multiple opportunities to be realized. For the purpose of this paper, adaptation in the context of desertification can be defined as thus "a process of adjustments made in ecological-social-economic systems in response to land degradation (loss of primary production) that affects livelihood sustainability in the arid and semi-arid areas of the world that are characterized by variable climates".

Given the geographical location of Maradi region among the arid areas of sub-Saharan African, desertification (land degradation) is among the primary threats to natural resources in Niger Republic. The Maradi region of Niger, which comprises the country's agriculturally productive area, is already threatened with looming desertification. The Millennium Ecosystem Approach (MEA, 2005) observed that an estimated 10-20% of dry lands are being degraded through reduction or loss of biological or economic productivity. Such desertification is caused by various factors, including climate variations and human activities. For example, the inter-annual and inter-seasonal climatic variability have caused annual rainfall decrease of 30% between 1932 and 2006 in Maradi region (Atlas, 1998; Moussa, 2011). Changes in the water table and salinization of areas surrounding irrigated agriculture also contribute to decline in productivity of the health of the overall ecosystem. Also, with 40 years period of persistent drought, the country's natural resources base was threatened by desertification and the expansion of Sahara. Climatic negative effects on the natural resources are worsened by human activities. Increased human activities in already degraded areas put pressure on the strained watershed systems, on the remaining flora and fauna, and on the human activities themselves (David, 2008a). Another aspect aggravating the ecological imbalance is the large percentage of Niger population that live in Maradi and other southern region. This part of the country which contains the essential of agriculture and breeding potential is thus submitted to intense human and animal pressure which is expressed by lands extension, overgrazing and clearing. The degraded natural environment has pushed communities to move into the remaining rain-fed, verdant areas that support agriculture and raising livestock. The phenomena of lands extension also generate countless conflicts among farmers and breeders and the reduction of classified and protected spaces. On the basis of this development, adaptation is thus essential in dealing with desertification and is also likely to play a key role in reducing the multiple pressure and threats that affects people's livelihood. Indeed, studies have shown that adaptation to desertification can help reduce vulnerability and increase resilience overall of rural smallholder farmers (Hermann et al., 2005; Stringer et al., 2009).

Approaches to adaptation can either be policy-driven or local-driven. Most international policy and conferences through National Action programme (NAP), Plan of Action to Combat Desertification (PACD), United Nations Convention to Combat Desertification (UNCCD), United Nations Conference on Desertification (UNCOD), has historically focused on the development of measures to combat desertification and as such represent policy-driven approach. Local driven approach on the other hand are thought of as reactive and strategic. Local level adaptations are regarded as responses undertaken autonomously by the local

communities as a regular part of structural changes made in ecological, social and economic systems for their survival. This includes a change to the dominant livelihood activity, land use and crop types. For the purpose of this paper, our discussion will focus mainly on local level adaptation in the context of desertification. Local level adaptation through research reported in literature has shown that the people of Maradi region have developed a variety of survival mechanisms to the hazards of desertification and other environmental problems. For instance, the drought of 1983-1984 imposed certain new constraints on the agricultural system in the region. The farmers responded to these by replacing traditional varieties with earlier ones and abandoning water-demanding cultures and the compacted soils between hillocky dunes in favour of mixed dunes with less pronounced hydrological constraints (soils on these areas are able to bridge interruptions in precipitation lasting 2-4 weeks). Furthermore, such soils are easier to work. The reduction of the livestock herds due to drop in pastoral resources represents another adaptation (Koechlin, 1989 cited in Mainguet, 1999). In general, other adaptive strategies reported in literature include among others: liquidating accumulated assets, such as animals, crafts etc; social networking involving cooperation at the extended family, village or community level to search and obtain food at district level particularly from inter-community cereal banks; irrigation practices, and migration into cities and neighbouring countries to conduct income generation activities (Moussa, 2011). The question now is: how do we manage such autonomous local level adaptations in a way to promote a peaceful intercommunity co-existence in the region of Maradi, Niger pepublic? This is the main aim of this paper and will be discussed in the section below.

Way Forward to Foster Intercommunity Co-Existence

While people, through different coping strategies, try to adapt to the effects of desertification in the vulnerable regions, Government and policy makers respond to desertification situations through National policies, Institutional and Legislative Framework, and Multi-Sectoral Programmes. These among others include Arid Zone Afforestation Project (AZAP), National Policy on Environment, National Resources Conservation Action Plan, Greenbelt Projects, National Adaptation Programmes of Action (NAPAs). Public approach has generally been confronted with challenges among which are top-down approach to environmental resource management, lack of proper co-ordination and monitoring, frequent policy shifts, neglect of indigenous technology in the development process and consists of basically single set remedial and ad hoc measures. In finding a solution to these challenges, it will be proper to study the local level adaptations and incorporate them to existing development strategies. In view of this, it is being suggested that the following measures as a way of achieving peaceful intercommunity co-existence in the region of Maradi taken into consideration.

A more holistic approach which situates Participatory Rural Appraisal (PRA) techniques at the centre of policy formulation and implementation should be adopted to ensure sustainability of rural livelihoods. By using the PRA technique, people whose lives are directly affected become part of the decision making process and will be able to make significant contributions to achieving peaceful intercommunity co-existence. An autonomous locally driven adaptation is essential to strengthen the linkages between stakeholders and foster peaceful coexistence among the people of different settlement in the region. This can be in form of a change to the dominant livelihood activity, abandoning or replacing water-demanding varieties of crops with less pronounced hydrological constraints. There is also the need for increased investment and improvements in soil and water conservation techniques building on traditional knowledge. Additionally, efforts should be intensified at bench terracing and other techniques of water harvesting to restore rangeland and land for agricultural production. This technique, when used with land-conservation techniques can successfully restore vegetation in this region.

The key to resolving issues of conflicts between pastoralists and crop farmers is to operate a sensible land-use system. This can be done by operating agro-pastoralism system of agriculture. It is a form of farming that combines the growing of crops with the rearing of animals. It can be used as a way of managing pasture land more effectively, thereby reducing pastoral expansion and face-off with crop farmers. It will also be good to provide several boreholes and water points in the region. Also considered important is adaptation through shifts in planting timing and shifts to other available crops and increased irrigation using existing systems. There is need to understand the start of the rainy season so that farmers can adapt to the timing of plough and

planting accordingly. Lastly, government commitment to reduce rural poverty and improve household welfare is highly essential. A hungry man they say is an angry man. People should be encouraged to participate in the setting up and operation of savings and credit mobilization systems in rural environment. If poverty is not greatly reduced it will be difficult to curtail face-off between communities competing for farmlands as a survival mechanism in the process of adaptation. All the above are issues of concern that must be addressed if we must have a peaceful intercommunity co-existence in the region of Maradi.

Conclusion

It is obvious that desertification is not of recent origin in Niger Republic and the problem of loss of primary production is becoming a sensitive issue in this region. The climate of Maradi region is of Sahelian type which makes it one of the most vulnerable areas to desertification and constitutes a great disadvantage for agricultural production. On this note, desertification will continue to pose a threat to the socio-economic development of the region. However, whether or not desertification leads to conflicts among communities competing for farmlands depends on how people respond to it and how they manage their adaptation measures.

The degradation of land will not really be a problem where financial resources and techniques are sufficient, when an analysis of the natural and human situation has been carried out, when the political situation is quiet, and when there is equilibrium between the population density and agricultural production. Hitherto, government policies and responses have not been able to address all these issues. It would therefore be naïve to take into account under these notes of hope only the policy-driven approach (public policy). As a matter of fact, the policy driven adaptation will remain ineffective if they are not accepted, integrated and assimilated by the rural population into the local socio-economic systems of resources and production management. Since natural resources are severely limited and population increases continually in the region of Maradi, sustainable solutions to resolving conflicts and foster peaceful intercommunity co-existence should be developed as suggested in this study.

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