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Original Research Paper

The Impact of Climate Change on Human Security in the Sahel Region of Africa

Rindap Manko Rose

Department of Political Science, Plateau State University, Bokkos, Plateau State, Nigeria

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The Sahel known as the semi-arid transition zone between humid tropical Africa and the arid Sahara desert, characterised by a high degree of temporal and spatial unpredictability in rainfall. The people in this region practice agriculture and cattle-herding, and their livelihoods mostly suffer the effects of climate change because of their reliance on rainfall. Changes in rainfall and temperature had the capacity to reshape the productive landscape of this region and exacerbate food, water and energy scarcities. Also, natural disasters like drought could make the entire area uninhabitable for the people and this could contribute to destabilising and unregulated population movements which could force previously separate groups to compete for the same dwindling resources thereby leading to conflicts eventually. Using the environmentalist's perspective to explain how natural and human activities had impacted negatively on this region, thereby making it unconducive for human sustenance. This paper explored the consequences of climate change on human well-being in the Sahel region; and the capacity of the population to adapt to the expected changes. It also recommended that there is the need to adopt new technologies and varieties in order to boost food production particularly.

Keywords: Climate change, Security, Adaptation, Drought, Conflict, Population.

INTRODUCTION

The Impact of Climate Change on Human Security in the Sahel Region of Africa

Climate change represents the latest in a series of environmental drivers of human conflict that have been identified in recent decades, following others, including drought, desertification, land degradation, failing water supplies, deforestation, fisheries depletion and even ozone depletion (Homer-Dixon 1991:1141).

The necessity of adapting to extreme climatic conditions is not new to Africans, particularly residents of the Sahel region. Climate variability in that region, which has always been significant by any standard, appears to have become particularly pronounced in the twentieth century (Hulme 2001:11). A period of unusually high rainfall from the 1930s to the 1950s was followed by extended drought for the next three decades. Mean annual rainfall and run-off dropped by as much as 30 percent-with devastating effects on local populations and livelihoods. The spatial extent of arid and semi-arid areas within the region has been expanding steadily in recent decades, likely through a combination of drought and intensification of land use (Wittig et al 2007:182). Relative to other parts of the world, a high proportion of the population is engaged in agriculture and cattle-herding.

The livelihoods of dry-land producers who lack access to irrigation are particularly sensitive to fluctuations in precipitation (Kurukulasuriya and Mandelsohn, 2007). Researchers have warned that should climate change

Corresponding Author: roserindap@yahoo.com

exacerbate current conditions, food production in the region could decline and the range of infectious diseases could spread (Butt et al 2005:355).

The Sahel is the semi-arid transition zone between humid tropical Africa and the arid Sahara desert, characterised by a high degree of temporal and spatial variability in rainfall and by alternating periods of relative humidity and aridity which may last for years to centuries (Brooks, 2004). It is characterised by low scattered vegetation and supports limited agriculture, for example, millet, peanuts, etc (New Webster's Dictionary, 1992). The area covers all part of 12 countries from the Atlantic coast to the Red Sea: Mauritania, Senegal, the Gambia, Mali, Burkina Faso, Niger, Nigeria, Chad, Sudan, Ethiopia, Eritrea and Djibouti (Heinrigs 2010:5). As noted by Nyong (2007) that;

> *"over the course of the twentieth century, decreasing rainfall in the Sahel has pushed northern pastoralists southwards into land occupied by sedentary farmers, leading to conflicts and widespread destruction of farmland and cattle. Meanwhile, to meet the growing needs for food, farmers are expanding into marginal lands traditionally used by pastoralists, heightening competition between livestock and agricultural production. In addition to making a transition from pastoral to agricultural production, the Sahel is a zone of cultural and linguistic transition, where the Islamic culture from the north mingles with the traditional cultures of the south. The region's large number of different ethnic groups as well as in-migration from several new ones creates the potential for conflict, as these groups have different interests in the resource base, possess different skills and claim rights over different resources and areas".*

Thus, climate change in the Sahel region reveals the connections as well as the frictions between the security of individuals and communities and the security and sustainability of ecosystems and species, including humanity (Richard et al 2010:4).

CONCEPTUAL CLARIFICATIONS

The concept of security in general refers to freedom from risk of loss or damage to a thing that is important to survival and well-being. In its influential and widespread interpretation, security refers to the security of the nation-state from attack from armed forces. It is largely in this context of the interpretation of security that the governments of the world spent US$1.339 trillion on their military readiness in 2007- an amount equivalent to 2.5 percent of global GDP (Stalenheim et al, 2008).

However, scholars from within the field of international relations and to a lesser extent, foreign policy makers, recognised that there are a wider range of risks to the sovereign integrity of the state than just that of military invasion (Richard et al 2010:5).

The concept of human security came to prominence through the 1994 Human Development Report, which defined human security as a "concern with human life and dignity" (UNDP ,1994:22) and which adopted a comprehensive approach by identifying economic, food, health, environmental, personal, community and political components to human security. The orientation is firmly on human beings and in this early formulation on basic needs (human life) as well as psychosocial elements of being (dignity) (Richard 2010:8).

The International Commission on Human Security (2003:4) defined human security as "to protect the vital core of all human lives in ways that enhance human freedoms and human fulfilment and which encompasses " human rights, good governance, access to education and healthcare… the freedom of future generations to inherit a healthy natural environment".

These definitions of human security therefore emphasize the protection and safety of individuals, their fundamental rights and freedoms and promotion of their welfare. Human security is therefore, people centred and goes beyond state protection to the security of individuals, empowering them and addressing the threats to their lives and freedoms and reducing their vulnerability to poverty, disease and natural disasters (Gyabaah 2010:239).

THEORETICAL FRAMEWORK

This work will be situated within the environmentalist perspective and is championed most notably by Muir Gifford Pinchot (1865-1914), Rachel Carson (1962), Thomas Malthus (1798). Theory of environmentalism is a reaction against the predicament we have created as humans to the environment through the combination of anthropocentrism and modernisation (science, technology, industrialization, materialism). Environmentalism believed that humans have wrongfully violated nature by attempting to become its master. They see nature as an economic resource to be nurtured and accommodated. As a result, humans have created an artificial, anti-natural world, one that fouls the air and water on which every living creature depends. The great rainforests that do so much to regulate the climate and oxygenate the air are disappearing under the treads of giant earth movers; global warming due to the greenhouse effects caused by gases released into the atmosphere has begun the dangerous melting of glaciers and the polar icecaps; and the ozone layer depletion because of industrial pollution threatens us with lethal solar radiation (Baradat 2006:278).

Muir Gifford Pinchot (1865-1914) was important in alerting people to the danger posed to the wilderness by human economic activity but it was not until the 1960s that people were made aware of the danger posed to human survival itself by industrialization (Baradat 20006:278). In 1962, biologist Rachel Carson published *Silent Spring,* principally about the deadly and broad effects of the pesticide DDT, the book awakened the world to the mounting problems of environmental degradation (Baradat 2006:278).

Also, there is a long tradition of concern over the relationship among humans, the environment and the potential for conflict. Thomas Malthus (1798) wrote an Essay on the Principle of Population, in which he argued that, "the power of population is indefinitely greater than the power of the earth to produce subsistence for man. The imbalance between human needs and food availability Malthus predicted, would lead to famine, disease and war" (Richard et al 2010:11). Fairfield Osborn (1948, 200-201) reiterated this concern; "when will it be openly recognised that one of the principal causes of the aggressive attitudes of individual nations and much of the present discord among groups of nations is traceable to diminishing productive lands and to increasing population pressures" (Richard et al 2010:11).

Hence, climate change creates an alternative path to scarcity and collapse (Dupont and Pearman, 2006). First, volatile weather patterns, swinging between extremes, coupled with changes in rainfall and temperature, have the capacity to reshape the productive landscape of entire regions and to exacerbate food, water and energy scarcities, as envisaged in traditional models. Second, climate change could contribute to destabilizing, unregulated population movements¸ most of which will be internal, but the ripple effects of which will be felt

beyond national boundaries. Third, more extreme weather conditions may lead to more serious natural disasters, stretching the resources and coping capacity of developing countries (Brown and McLeman 2009:1147). Thus, these assumptions became increasingly prominent from the 1960s onwards and have served as a common explanation, for example for famines in Ethiopia and the other parts of the Sahel.

IMPACT OF CLIMATE CHANGE ON HUMAN SECURITY IN THE SAHEL REGION OF AFRICA

The Sahel is characterised by strong climatic variations and an irregular rainfall that ranges between 200mm and 600mm with coefficients of variation ranging from 15 to 30 percent (Fox and Rockstrom, 2003). Agriculture is predominantly rain-fed and depends on 3 to 4 months of summer rainfall (Hengsdijk and Van, 2002). The succession of dry years and wet years is a typical feature of the Sahelian climate. Droughts with varying degrees of severity occur in two out of every five years, making harvests of the major food and cash crops highly uncertain (Hengsdijk and Van, 2002). Climate variability, therefore, poses one of the biggest challenges to human security and poverty reduction in the region (Serigne et al 2006:3).

Drought was originally seen as an exception: an unpredictable disruption of 'normal' rainfall patterns (Devereux and Maxwell 2001:68). Ethiopia, Eritrea and Somalia have suffered more deaths through drought over the last century than any part of Africa (Brown and Crawford 2009:13). The Sahel has suffered countless famines mostly triggered by natural disasters such as drought, locusts or livestock disease. A drought-triggered famine occurred in Ethiopia as long ago as 253BC, and more than 40 mass mortality famines have been recorded during the past thousand years (Webb and Von Braun 1994:21). The worst food crisis in Africa's history was the 'Great Famine' of 1888-92, which killed one-third of the Ethiopian population and inflicted almost equivalent suffering on neighbouring Somalia and Sudan and on Tanzania. The Great Famine was particularly severe because three natural triggers acted simultaneously across large geographical areas: a severe drought, a Rinderpest epidemic that destroyed 90 percent of Ethiopia's national cattle herds and infestations of locusts and army worms (Devereux and Maxwell 2001:117).

In such environments, uncertainty is the key constraint to which farmers and herders must adapt. Mobility (including the migrations of herders with their animals, and the wage labour migration of individuals) is one key to survival (Devereux and Maxwell 2001:68). Migration itself is not inherently problematic and it can be an important way of adapting to the impacts of climate change. However, experience shows that migration can increase the likelihood of conflict in transit and target regions (Brown and Crawford 2009:19). Barnett and Adger (2005) argued that the influx of migrants into new areas have been a significant factor in many 'environmental conflicts'. What does seem to be the most important factor in violent conflict are the political and institutional responses to migrants. For example,

> *In the 1970s and 1980s hundreds of thousands of Malians and Burkinabe travelled to Cote d'Ivoire to find work and food and to escape the threat of desertification caused by severe drought. Although, originally welcoming, government policy changed in the 1990s when a policy of Ivoirian was established. The resulting tension between the indigenes and the migrants contributed to the Civil War that broke out in 2002* (Mabey, 2008).

Conflict has become a critical influence on food security and has grown rapidly in Africa in the last three decades, and is now widespread in the arid and semi-arid areas, as well some humid zones (Kratti and Swift, 1999). Pastoralist populations modify their movements during extreme dry periods by moving larger numbers of animals into more wetter (Southern) parts of their range for longer periods of time, a practice that may bring them into conflict with sedentary farmers (Nyong et al 2006:223). Nyong and Fiki (2005) argued that,

> *"Recurrent droughts interacting with other social and economic factors have resulted in conflicts among rural populations in the West African Sahel. These conflicts, they argued have increased in their frequency, intensity and the magnitude of the destruction caused by them".*

Also, given Africa's dependence on rain-fed agriculture, food production on the continent is intimately tied to rainfall (Brown and Crawford 2009:16). Climate change will have the effect of 'shifting' agro-climatic zones and the length of the growing season is likely to change due to a combination of temperature and precipitation changes (Devereux and Maxwell 2001:96). As global temperature rise, rainfall will decline in already dry areas such as the arid and semi-arid Sahel. Global warming will reduce water availability for agriculture, affecting both crop yields and the carrying capacity of the land in respect of livestock (Devereux and Maxwell 2001:127).

> Canon (1991:306*), argued that environmental hazards (such as drought) act on entitlements to reduce the resource base of those who rely on land and water as part of their productive assets, and indirectly for those who rely on the purchase of food at prices which give adequate nutrition on their normal wages or through other exchange entitlements. So, environmental changes can also lead to increased vulnerability for some by generating shifts in their entitlements. In this sense, the environment must be seen as integral to food systems and not as something external and outside them.*

The Ethiopian and the Sahel famines of the early 1970s, for example, were preceded by six or seven years of low rainfall. In most cases where drought has led to famine, several years of sequential droughts have preceded the food crisis (Devereux and Maxwell 2001:128). The particular manifestation of this insecurity varies between groups. Pastoralists are vulnerable to declining pasture availability which reduces milk yields and hence food security. Landless labourers will be affected by the falling demand for casual labour resulting from declining yields. It is important to map out the different impacts of food and environmental vulnerability on different social actors.

Failure to do so can lead to policy prescriptions which disproportionately disadvantage these groups (Devereux and Maxwell 2001:99). The projected impacts of climate change in the Sahel region of Africa do indeed hold the potential to cause food and water supplies to become more unreliable and to increase the frequency and severity of droughts in these areas. In turn, livelihoods may be undermined, key resources may become scarcer, and an overall decline in the quality of life may result (Brown et al 2009:1148).

Also, erosion of soil by water and wind reduces the fertility of rangeland and cropland. For the rangelands that supports the nearly 3.1 billion head of cattle, sheep and goats come from the overgrazing that destroys vegetation, leaving the land vulnerable to erosion. Rangelands, located mostly in semi-arid regions of the world are particularly vulnerable to wind erosion

(Evans, 1993). In farming, erosion comes from plowing land that is steeply sloping or too dry to support adequate soil protection with ground cover. Steeply sloping land that is not protected by terraces, by perennial crops or some other way, losses soil when it rains heavily. Land that is excessively dry, usually receiving below 25 centimetres (10 inches) of rain a year, is highly vulnerable to wind erosion once vegetation, typically grass, is cleared for cropping or by overgrazing. Under cultivation, this soil often begins to blow away (Evans, 1993).

Nigeria, Africa's most populous country, is losing 351,000 hectares of rangeland and cropland to desertification each year as a result of overgrazing and overplowing. While Nigeria's human population has increased from 30 million in 1950 to 130 million in 2004, a fourfold expansion, its livestock population has grown from roughly 6 million to 65 million head, a tenfold increase (Brown 2004:87). With the forage needs of Nigeria's 15 million head of cattle and nearly 50 million sheep and goats exceeding the sustainable yield of the country's grasslands, the country is slowly turning to desert (Brown 2004:87). The conflict between farmers and herders in Nigeria is a war for survival. As the New York Time reported in June 2004, "in recent years, as the desert has spread, trees have been felled and the populations of both herders and farmers have soared, the competition for land has also intensified" (Sengupta, 2004).

Another typical example is Sudan, where it has been independent since 1956 and has a population of 39 million (Richard 2007:170). The Darfur conflict has been attributed to anthropogenic climate change related to drought (Borger 2009:297), because drought-related scarcity created competition for land, water and food resources between rival groups of pastoralists and sedentary agriculturalists in Sudan (Brown, Hammil and McLeman 2007:1148). As captured by Jeffrey (2005),

> *Failures of rainfall contribute not only to famines and chronic hunger, but also to the onset of violence when hungry people clash over scarce food and water. When violence erupts in water-starved regions such as Darfur, Sudan, political leaders tend to view the problems in narrow political terms. If they act at all, they mobilize peacekeepers, international sanctions and humanitarian aid. But Darfur, like Tigre, needs a development strategy to fight hunger and drought even more than it needs peacekeepers. Soldiers cannot keep peace among desperately hungry people.*

The conflict has matured into a government-supported genocide perpetrated by Arab *janjaweed* (armed horsemen) against black farmers, who have antagonized the government by forming two dissident groups-the Sudan Liberation Army (SLA) and the Justice and Equality Movement (JEM) (Richard 2007:172). The region suffers from severe food shortage. As the market serving the region has collapsed, poverty and malnutrition have intensified, and local residents have become highly vulnerable to diseases including malaria, yellow fever, cholera and diarrhea. Hundreds of thousands of people have died or been displaced (Richard 2007:172).

The advent of a drought continues to be received as an unexpected event, and there is virtually no planning or preparation in place prior to its arrival. A typical drought year begins with an initial rainfall that moistens the fields sufficiently to plant. Crops and native pasture species germinate, but in the absence of further rainfall eventually wither without production, and the lower thorny shrubs and trees fail to produce leaves (Timothy and Donald 2009:342). The sources of water for animals and human consumption are not replenished and soon drinking water becomes scarce. For the rural household, the experience of drought is a lack of basic staple foods, lack of water for household use. At the same time, market merchants respond to drought conditions by increasing prices and many off-farm employment opportunities are drought-sensitive and disappear during a crisis (Timothy and Donald 2009:342).

Climate change is perhaps best seen as a 'threat multiplier' that intensifies existing problems and vulnerabilities (Brown and Crawford 2009:22). Government and communities in this region will need to manage these shifts to mediate competition for resources and minimise tensions over climate-induced migrants.

ADAPTATION TO CLIMATE CHANGE IN THE SAHEL REGION

Adaptation is a broad concept informed by both the natural and the social sciences, usually implying a process of adjustment to survive and ideally, thrive in the face of change (Brown and McLeman 2007:1149). In the context of climate change, adaptation refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (Adger et al 2009:135). The adaptive capacity can take such diverse forms as strategic migration decisions. The case of drought and water scarcity in northern Nigeria for instance, in these arid and semi-arid area, rainfall levels vary significantly within the growing season; they also vary from one year to the next and from one locale to the next within the region (Hulme, 2001). Thus, rural livelihoods must be inherently flexible and adaptive (Brown et al 2007:1152).

These migration patterns can create conflicts between pastoralist and agricultural communities. Nyong et al. observed that incidents of violence and conflict do occur periodically between farmers and herders, particularly during the dry season, and especially around sources of water and cattle fodder (Nyong et al, 2006).

In dryland areas of West Africa, for example, complex migration patterns have emerged as rural populations adapt to both seasonal variability in precipitation and extended periods of drought. In many sedentary agricultural communities, dry-season migration to regional urban centres by young men and, in some cultural groups, also by young women has become commonplace (McLeman 2007:297). During extremely dry periods, children may be moved out of drought-stricken areas to the homes of extended family members. Pastoralist population modify their movements during extreme dry periods by moving larger numbers of animals into wetter parts for longer periods of time, a practice that may bring them into conflict with sedentary farmers.

In Sudan, conflicts are triggered by inequitable access to natural resources, continuous failure of development programmes concerning natural resource management, and misuse of natural resources (overgrazing and over cultivation in marginal areas which are not capable of biological productivity), in addition to natural crisis. All of these lead to more pressure on resources and more marginalized areas less capable of biological productivity. Although resource-based conflicts vary in time, space and intensity, their common consequences include genocide, displacement, homelessness and destruction of socio-economic structures in the affected region (Wadi et al, 2005).

A common form of economic diversification by households in response to increasing risk and variability is to add livestock to the farming portfolio. This creates a range of livelihood adaptations involving animals, from simply keeping a few animals around the house (Swift and Hamilton 2001:70). One

of the advantages of animals in ecologically risky and variable environments is their mobility, which allows them to move away from places that don't have pasture and water towards places that do. Mobility gives households with sufficient animals much greater flexibility to respond to threats of all sorts and is often an essential condition of livelihood security in the drylands (Swift and Hamilton 2001:70).

Also, people in the Sahel depend on trees for maintaining soil fertility and for firewood, food and other essentials of life… so the loss of trees directly harms people's livelihoods. Farmers in the region are already being forced to alter their techniques in response to changing climate. Many are already practising natural regeneration-where they select, prune and raise small trees to maturity in their fields, as an adaptation to climate change (Busani, 2011). Improved seeds like cowpea made to thrive in such areas have been embraced by these farmers to boost food production.

These strategies adopted by this region can help prevent or minimise climate-related conflicts and insecurity. This can help the people to protect and diversify livelihoods in order to ensure access to and availability of key natural resources.

CONCLUSION

Rainfall variability is a major driver of variability in the Sahel. Climate variability has made agriculture and livestock farming highly unproductive. The spatial extent of arid and semi-arid areas within these regions have been expanding steadily in recent times, likely through a combination of drought and intensification of land use (deforestation, continuous cropping and overgrazing), reduced and erratic rainfall have contributed to transform a large proportion of the Sahel into barren land, resulting in the deterioration of the soil and water resources.

This has the potential to reduce the reliability of food and water supplies, this in turn affects livelihoods of the people because key resources may become scarcer and violent conflict may result between users of these scarce resources thereby undermining their security. Although, these populations have over the years developed coping strategies and adapted livelihoods to the region's climate constraints, like nomadic pastoralism, development processes are accompanied by changes to ways of life. The Sahel remains an environmentally sensitive region and climate change is likely to increase the vulnerability of its ecological and socio-economic systems.

RECOMMENDATION

(1) Making people aware in the Sahel region of disaster risk resulting from the complex interaction of socio-economic factors with climatic and environmental change and variation.
(2) Provide substantial and predictable financial support from development partners to help meet the additional costs of adaptation.
(3) Rainfall variability is a major constraint to human sustainability in the Sahel. Using seasonal climate forecasts to inform farmers, herders and other users will be necessary. The collaboration with regional and international climate research centres needs to be reinforced to acquire timely weather information.
(4) There is need to adopt new technologies and varieties in order to boost food production particularly. These include the use of drought-tolerant crops/varieties in areas where there is water deficits.
(5) Agro-forestry needs to be strengthened. Policies should be put in place to plant trees and shrubs so as to serve as windbreaks for wind induced soil erosion control, and reduce soil losses.
(6) Communities within this region must create local platforms to mediate on or manage conflicts which may arise between herders and farmers as a result of competition for these scarce resources.

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