

Climate Variability and its Implications on Rural Household Food Security in Nigeria

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ABSTRACT

Some of the most important impacts of global climate change and food security will be felt among the rural household, predominantly in developing countries. Their vulnerability to climate change comes both from being predominantly located in the tropics and from various socio-economic demographic and policy trends limiting their capacity to adapt to change. Climate variability directly affects agricultural production, as agriculture is inherently sensitive to climate conditions and is one of the most vulnerable sectors to the risks and impacts of global climate change. However, these impacts will be difficult to predict because of lack of standard definition of the rural household farming system, intrinsic characteristics of these household particularly their location specificity and their integrated agricultural and non-agricultural livelihood strategies and their vulnerability to a range of climate related and other stressors. This study therefore, is on climate variability and its implications on rural household food security in Nigeria. The main aim is the assessment of the impact of the below normal rainfall and drought on food security in Nigeria. Based on the facts gathered, this study concludes that there is need for stakeholders in environmental management and agricultural sustainability in developing countries to come to terms with negative impact of climate change and likely positive and beneficial response strategies to global warming.

Keywords: *Climate Change, Climate Variability, Vulnerability, Food Security.*

INTRODUCTION

Food is defined by Mudambi and Rajagopal (1983) as anything eaten or drank (consume) by an organism and are absorbed as well as accepted by the body for providing energy, repairing and rebuilding body tissue, regulating the entire body functions and protecting the body from diseases etc. Kinton and Caserani (1984) define food as any substance, liquid or solid, which regulates the body process. However, scientifically food is defined as that which is needed for the healthy growth and normal functioning of living organisms or a collection of substances which are needed to keep one alive and functioning in the normal healthy way. While man can stay without clothing or shelter for many days, he can only go without food for few days. Even those that do dry fasting in the Christian or Moslem Religions take some water (which is food) and can only do that for few days. Intake of the right kinds and amount of food ensures good health which is manifested in good appearance and efficiency in performance. Foods are made up of a number of chemical component called nutrients. These nutrients are needed by the body in adequate amount in order to grow, reproduce and live a normal healthy life. A substance is only food if it contains at

least one of the nutrients. These nutrients include carbohydrates, fats, and proteins, mineral elements, vitamins and water. Based on the foregoing therefore, it is not out of place saying technically that air (oxygen) breath by man is food. Though it does not satisfy hunger of the belly, yet it satisfies hunger for life. Hence, it is high time air is recognized as the most essential food as one can do without any substance for some time but not without air. Hence, while all efforts are geared towards doing everything possible to ensure the availability of food as well as its hygienic condition, focus should equally not be lost on safeguarding the environmental conditions with regard to the quality of the surrounding air which the basic components of life, oxygen, is embedded. However, the demand for food is influenced by many factors among which are:

Social Classes/Status: The per capita income of an individual influences the type and quality of food he takes. The rich and affluent have the means to have the right diet they want and when they want them. However, most of them run into the problem of over-nutrition which increases the tendency of the individual to suffer from over-nutrition related problems of obesity; hypertension and blood related diseases like diabetes. The low income groups on the other hand do not have enough money to purchase the needed food in the right quantity and quality and as such are prone to under nutritional related problems like starvation, protein deficiency, malnutrition, kwashiorkor and many others.

Nutritional Education/Counseling: Many people may have the food in abundance but lack the knowledge of the choice combination, preservation and the right time to consume them. For example the people of Nsukka have snails in abundance, which is a good source of protein but lack of nutritional education and cultural inhibition prevents them from taking this good meal. There are also traditional taboos, in taking some good foods in many parts of Nigeria. According to Aderemi (1990), the populace should know the kind of food they require, the quantity required at a particular point in time. There should therefore be a well planned nutritional education by nutritional experts from the Universities, Polytechnics and Colleges of Education for the Nigerian people especially housewives, hotel proprietor and caterers who prepare and preserve foods. It is believed that with the right nutritional education, the Nigerian people would be able to get the adequate nutrients needed for their healthy growth and subsequent participation actively in societal development.

Importance of Food: It is obvious that good food produces good mind and hence good and articulate individuals that are the architect and engineers of the institution. The hydrolysis of food yields biological intermediates, which undergo oxidation to realize energy to the body. This energy is utilized in producing movement which enables its organism search for shelter; mate its partner for reproduction, respond to external and internal stimuli, growth and removal of undigested or un-metabolized or unwanted food particles. Food is needed for the repair of body cells and replacement of worn out tissue and body building in children. It is needed for the maintenance and regulation of body processes like water balance control, waste removal etc. It also provides both psychological and social satisfaction needed in the ever confused and insatiable world (Mudambi and Rajagopal, 1983). Food security, which became a catch phrase in the mid 1990's, can be defined as

the success of local livelihoods to guarantee access to sufficient food at the household level (Devereaux and Maxwell, 2001). The failure of early solutions to the problem of food insecurity in the 1970' and 1980's was largely attributed to their technological bias, stressing production rather than equitable distribution, access, affordability and utilization. Since then, it has become clear that food security revolves around complex issues that encompass a wide range of interrelated environmental and climatologically, economic, social and political factors. Addressing food security, therefore, requires an integrated approach and challenges many religions ability to address food security adequately (Vogel and Smith, 2002; Clover, 2003). Early models projecting world food demand and supplies in the twenty-first century generally showed that global food supplies will match or exceed global food demand at least within the next two to three decades (Devereaux Edwards, 2004). One short coming of these models is that the scales models are very coarse and conceal regional disparities that are a major concern for already food-insecure regions (Stephens and Downing 2001).

Another shortcoming is that the models paid little or no attention to climate variability and change. Climate variability is a major threat to food security in many regions of the developing world, which are largely dependent on rain fall and labour-intensive agricultural production (Parry *et al*, 1999, 2004; Doos and Shaw, 1999; IPCC, 2001). Variability is a measure of the frequency distribution of the value of climate and precipitation is the climate variable most critical to measure with regard to food systems. Not only does the range between high and low values matter, but also the frequency at which these extremes occur and the intensity of the events.

The focus of this paper is the assessment of the impact of below normal rainfall and drought on food security. The third assessment report of the intergovernmental panel on climate change (IPCC, 2001), projects that areas that are currently dry might experience an average increased dryness with global warming. Variability is also expected to increase with more rain falling in intense-rainfall events, larger year-to-year variations in precipitation in areas where increased mean precipitation is projected and increased variability of Asia summer monsoon precipitation (IPCC, 2001). Although the issue of food security is directly linked to climate variability or change, it must be noted that climate is not the single determinant of yields, nor is the physical environment the only decisive factor in shaping food security (Parry *et al*; 2004). Despite understanding the multidimensional nature of food insecurity, it means a key concern affecting the livelihoods of marginal groups.

Therefore, understanding the impacts of climate variability as well as the possible changes in this variability on food security is critical to making improvements on food security. Food insecurity at the household level often results in resources being diverted. For example, resources that might have been used to support the development of livelihoods such as education, healthcare and employment, get reallocation to ensure that basic food needs are met. The acquisition of foods for marginal groups often entails a delicate balance of producing food for the rural household under stressed conditions at the same time as drawing on social and economic resources to access available food. When environmental conditions in vary (example, climate, soil and water characteristics, and land use changes), this can place an additional stress on food production (McConnell and Moran, 2000).

There are many levels at which a food system can be examined (Stephen and Downing, 2001). Food policy, trade and resource use are governed by decisions at national, regional and global levels. Global climate is part of a global system but influenced by the actions of individual large countries between these systems is not clear. And this is true for the impact of these global, regional and national systems.

Causes of Climate Change: Climate Change is a change in statistical distribution of weather over periods of time that range from decades to millions of years. It can be change in the average weather or a change in the distribution of weather events around an average. In recent usage, especially in the context of environmental policy, climate change usually refers to change in modern climate. By way of illustration, climate can be likened in to the southern part of Nigeria. The rainy season period is known to be between April and October in this region. But in recent times, this trend altered. The local farmers' experience these variations, but lack of a scientific explanation for it becomes necessary to put definitions of climate change in the perspective of the experiences of rural dwellers. Thus, any feasible definition of climate change will have to hinge on the need to highlight its importance and relevance in the context of agriculture and food production, and healthcare delivery. This is because the livelihood pattern of most rural Nigeria is agriculture based.

Climate change refers to any significant alteration in measures of climate such as temperature, precipitation, or wind lasting for an extended period. It is the permanent departure of climate patterns from mean values of observed climate indices. Climate change may result from natural factors such as changes in the sun's intensity or slow changes in the earth's orbit around the sun, or from other natural processes within the climate such as changes in ocean circulation. It may also result from human activities that alter the atmosphere's composition such as burning of fossil fuels and land use. Industrial activities, transportation system, urbanization and agriculture are among major human activities that contribute to the continuous increase in the concentration of green house gases in the atmosphere. Greenhouse gases naturally blanket the earth and keep it warmer than it will have been without gases. Each day, the sun emits rays of light on to the earth's surface. The earth absorbs part of the heat, reflects another share into the atmosphere, and sends into the third share in the form of infra-red rays, which in turn are cushioned by the clouds and water vapour which stabilize the earth's temperature. This process is commonly referred to as greenhouse effect. The problem today, is that the concentration of greenhouse gases mainly carbon-dioxide (CO₂), methane (CH₄), nitrous-oxide (N₂O), and chlorofluorocarbons (CFCs), by human activities has increased significantly. These greenhouse gases traps greater quantity of rays which are reflected on to the earth, and cause it to heat up, thereby creating a situation called global warming. The heat trap also causes many usual and dangerous alterations to the climate and weather systems, best describe as climate change.

On the components of the climate, such factors that can shape climate are often called climate forcing. These includes processes as variations in solar radiation, deviations in earth's orbit, mountain-building and continental drift, and changes in greenhouse gas concentrations. There are a variety of climate feedbacks that can either amplify or diminish the initial forcing. Some parts of the climate system, such as the oceans and ice caps,

respond slowly in reaction to climate forcing because of their large mass. Therefore, the climate system can take centuries or longer to fully respond to new external forcing. Some of this forcing includes plate tectonics, solar output, orbital variations, volcanism, ocean variability, and human influences. A brief technical discussion on some of these factors is presented below.

Evidences and Manifestations of Climate Change: Evidence for climate change is taken from a variety of sources that can be used to reconstruct past climates. Reasonably complete global records of surface temperature are available beginning from the mid-late 1800s. For earlier periods, most of the evidence is indirect. Climate changes are inferred from changes in indicators that reflect climate, such as vegetation, ice cores, dendrochronology, sea level change and glacial geology.

Climate Variability, Change and Food Security: Food security depends on availability of food, access to food and utilization of food (FAO, 2000). Food availability refers to the existence of food stocks for consumption. Rural household food access is the ability to acquire sufficient quality and quantities of food to meet all household members' nutritional requirements. Access to food is determined by physical and financial resources, as well as by social and political factors. Utilization of food depends on how food is used, whether food has sufficient nutrients, and a balance diet can be maintained. It is these three facets of food system that need to be met in order for food security to be realized. Each of these facets can be impacted by climate variability and these impacts are discussed below.

Impact of Climate Variability and Change on Food Availability: The consensus of scientific opinion is that countries in the temperate, high and mid-latitude regions are generally likely to enjoy increased agricultural production, whereas countries in tropical and sub-tropical regions are likely to suffer agricultural losses as a result of climate change in coming decades (Arnall et al; 2002; Devereux and Edwards, 2004). It should be noted that the favourable assessment for temperate and high latitude region is based primarily on analysis of changes in mean temperature and rainfall, relatively little analysis done to date takes accounts of changes in variability and extremes. Impact of climate variability on crop production should be a priority given that analysis of agricultural vulnerability indicates that the key attributes of climate change are those related to climatic variability, including the frequency of non-normal conditions (Bryant et al; 2000, Smith, 2000).

Climate variability directly affects agricultural production, as agriculture is inherently sensitive to climate conditions and is one of the most vulnerable sectors to the risks and impacts of global climate change (Parry et al, 1999). Many factors impact the type of policies implemented at a national level (such as domestic politics, redistribution of land/wealth, exchange rates, and trade issues, etc). Climate variability should be factored into these policies, as these policies can impact the availability of staple foods, for example, by providing incentives to grow crops appropriate for the climate conditions.

Impact of Climate Variability and Change on Food Access: Individuals have sufficient access to food when they have "adequate incomes or other resources to purchase or barter to obtain levels of appropriate foods needed to maintain consumption of an adequate

diet/nutrition level" (United State Agency for International Development (USAID), 1992). Food access depends on the ability of rural households to obtain food from purchases, gathering, current production, or stock, or through food transfers from relatives, members of the community, the government, or donors. Intra-household distribution of these resources is an important determinants of food security for all household members, food access is also influenced by the aggregate availability of food in the market, market prices, productive imputes and credit (USAID, 1992). Poor market infrastructure and an unfavourable policy environment may lead to high and variable process for food and imputes, further undermining agricultural productivity, food supplies and derived incomes. Access depends on the physical factors, as well as social and economic factors. After food is produced, it needs to be moved from the point of production to the point of consumption. This often depends on transport system. In many developing countries, inefficient and ineffective transport systems retard the delivery and increase the price of food. Climate change is expected to place a strain on transport system (IPCC, 2001a). For example increased heat stress may reduce the life of roads, and windstorms can impact transit in the air space, at sea, port terminals as well as damaging infrastructure which may create delays (Perry and Symons, 1994). During drought, people are known to move into marginal lands. Most of these marginal lands may not have good road access and transporting food from such marginal farms posses a huge challenge.

Impact of Climate Variability on Food Utilization: Adequate food utilization is realized when "food is properly used, proper food processing and storage technique are employed, adequate knowledge or nutrition and child care techniques exist and are applied, and adequate health and sanitation services exist" (USAID, 1992). Food utility involves how food is used. This can include how often meals are eaten and of what they consist. Constraints of food utilization include loss of nutrients during food processing, inadequate sanitation, improper care and storage, and cultural practices that negatively impact consumption of nutritious foods for certain family members. In many areas where food is produced and consume locally, food utility changes throughout the year. The hungry season is the time before the planted crops are ready to be eaten. Similarly, at harvest time, there might be festivals and a lot of food consume. Where there has been a drought, food availability is low, the range of food availability often decreases, and so the meal frequency decreases and the balance of nutrients can equally be inadequate. This can lead to malnutrition in children. It is also important to note that climate change have an impact on food utility indirectly. For example, if there are hot dry days, crops and vegetables may be dried so that they can be used later in the year. At the same time as seasonal crop production, many rural households face fluctuations in cash and in kind income, both within a single year and from year-to-year fluctuations in income can result from varying agro climatic conditions and climate variability.

Rural Household Food Security and Livelihoods: Livelihoods can be considered as the combined activities and available social and physical assets that contribute to the rural household's existence (Carney, 1998). Each individual has his or her own means of securing

a livelihood and together, the individuals make up the rural households packages of livelihoods assets and strategies. These strategies are pursued within a larger context that often determines whether these strategies will succeed or fail. The livelihoods approach is useful for understanding food insecurity as it emphasizes the importance of looking at an individual's capacity for managing risks, as well as the external threats to livelihood security, such as drought (Chambers, 1989; Scones, 1998, Carney, 1998, Moser, 1998). It enables the agency of individuals to be captured in their decision-making process. For example, if one rural household has a member who works in the city and remits to his/her household at home, and they have a productive field, they spread their access to food sources through their own production and purchasing food. If there is a drought and crops fail, they may still have access to food if money continues to be remitted. If a rural household absorbs more children through the death of family members, the utilization of the food sources may result in a family being forced to remove children from school so that they can work to try and increase access to food that will result in improved utilization. A government grant may ameliorate this impact. It is clear that food insecurity depends on the agency of individuals and the components of rural households' livelihoods that are interlinked with the three facets of food security, as explained above.

Livelihoods of rural households can be compared if similar characteristics and activities in rural household livelihoods are grouped together to cluster livelihood typologies. Examples of typologies might include small-scale farming livelihoods or informal trade based livelihoods. These help focus on an intermediate system level that draws from the local but has a unit of analysis greater than the local. Recognizing livelihood typologies is a useful construct for comparing livelihood systems between regions (Dixon, Gulliver and Gibbon, 2001). A number of livelihood typologies can coexist and can vary in their geographical extent. In some instances, a livelihood typology may draw upon certain environmental resources, such as coastal resources for fishing, and in other instance, they may cross national boundaries, such as livestock - based livelihoods.

CONCLUSION AND RECOMMENDATIONS

Agriculture places a heavy burden on the environment in the process of providing humanity with food. It is recognized that agriculture has positive externalities such as the environmental services and amenities that it provides, for example through the creation or maintenance of rural landscapes which is given high priority by some developed countries. Trade-offs between food security and the environment is what is being practiced in most developing countries. There are strong indications and already evidence that the agriculture and food system as well as the rural areas across the world are experiencing major changes. This change has drastically reduced soil fertility and poor agricultural output particularly in sub-Saharan Africa. This is evidenced in some notable towns and communities in South Eastern Nigeria that is noted for the production of a peculiar agricultural commodity. Recently, these commodities are gradually going into extinction and the community involved cannot explain why this is so, majority of the farmers attach this incidence to spiritual dimension and not changes in climate.

Also, there is need for the construction of access road for save transportation of food items across the country. With due consideration to what has been discussed so far, climate is the primary determinant of agricultural productivity, interest in this issue has motivated a substantial body of research on climate change and agriculture over the past decade. Many factors impact the type of policies implemented at a national level (such as domestic policies), redistribution of land/wealth, exchange rates, and trades issues, etc) climate variability should be factored into these policies, as these policies can impact the availability of staple foods, for example, by providing incentives to grow crops appropriate to the climate conditions, poor market infrastructure and unfavorable policy environment may lead to high and variable prices for food and inputs, further undermining agricultural productivity, food supplies and derived incomes.

These factors have to be considered both physically and socially. After food is produced, it needs to be moved from the point of production to the point of consumption. This often depends on transportation systems. In many developing countries, inefficient and ineffective transport system retards the delivery and increase the price of food. Climate change is expected to place a strain on transport system. For example increased heat stress may reduce the life of roads and windstorms can impact transit in the air space, at sea, ports terminals as well as damaging infrastructure which may create delays. During drought people are known to move into marginal lands which may not have good road access, and transporting food from such marginal farms poses a huge challenge. However, this study concludes that there is a need for stakeholders in environmental management and agricultural sustainability in developing countries to come to terms with negative impacts of climate change and likely positive and beneficial response strategies to global warming.

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