

# Sustainable Intensive Farming and Climate Change in Africa

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*Climate change is a major physical factor that impedes sustainable intensive farming process in African development drive. This manifests in terms of temperature rise, declining rainfall, water shortage, drought and desertification. Intensive agricultural farming process which is the attribute of African farming system has taken a serious toll on the ecological balance of the environment. Using field research reports and data analysis, it was found that until some modern technique in intensive agricultural option are injected into the African farming process, the much needed sustainability may be a shadow chasing deep into the distant future. The paper concludes with proffering recommendations/paradyme for sustainable intensive farming process under increasing effects of climate change.*

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## INTRODUCTION

The need for enough food for feeding the world's ever increasing population has been a major concern in the developing as well as in the developed parts of the world. This problem has been man's number one problem in the past and present century. Several factors tend to affect agricultural production in an area. Such factors include the influence of topography, soil fertility, management practices and weather among others. Some of these have been overcome to a large extent by advances in technology. For example, the applications of chemical fertilizers, crop breeding and pest control. The only factor which has not benefited or has benefited meagerly is the influence of meteorological factors. This assertion was supported by a world meteorological organization statement in (1981) which noted that "Agricultural production is still dependent on weather and climate in spite of the impressive advances in agricultural technology".

While there are lots of things to appreciate and enjoy in the ecosystem or ecology in which we live, many pressing environmental problems plague our attention. Climate change and variability manifest in terms of temperature rise, declining rainfall, water shortage for both plants and animals, drought and desertification. Human populations have grown at alarming rates that affect our ability to produce enough food for everybody. Nearly 6 billion people now occupy the earth and we are adding about 90 million more each year (Cunningham 2000). Most of that growth will be in the poorer countries (including African countries) where resources (including food and services are already strained by the present populations.

Indeed, food shortages and famines already are too familiar in many African countries and may increase in frequency and severity if population growth, soil erosion, farming method and nutrient depletion continue at the same rate in the future as they are now. The ecological system of the African physical environment has, over many decades, undergone intensive and extensive manipulations as a result of various facets of developmental processes. Our present intensive farming process which affects our

ecology may not reach a sustainable level if machinery in terms of government policies, institution and legislation are not put in place to reverse the present trend. We are coming to realize, however, that food security which is tied to our farming technique often has more to do with poverty and equity distribution than it does with the amount of food available. Water deficits and contamination of existing water supplies threaten to be critical environmental issues in the future for agricultural (intensive farming) production as well as for domestic and industrial uses.

### **CLIMATE CHANGE AND AGRICULTURE**

The earth's climate reflects, in part, the presence of greenhouse gases in the atmosphere. These gases (including carbon dioxide, methane, nitrous oxide, and others) serve to trap energy reflected by the earth's surface and cause the planet to be much warmer than it would otherwise be. National Research Council report noted:

*“Greenhouse gases are accumulating in Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise. Temperatures are, in fact, rising. The changes observed over the last several decades are likely mostly due to human activities, but we cannot rule out that some significant part of these changes are also a reflection of natural variability. Human-induced warming and associated sea level rise are expected to continue through the 21<sup>st</sup> century”* (NRC, 2001).

The global average temperature increased between 0.4<sup>0</sup>C and 0.8<sup>0</sup>C over the past century, with most of the warming occurring prior to 1940 and over the past 25 years (Aldy et al., 2001). The historical climate record for Africa shows warming of approximately 0.7<sup>0</sup> C over the continent during the 20<sup>th</sup> century, a decrease in rainfall over large portions of the Sahel, and an increase in rainfall in east central Africa (Desanker and Magadza, 2001). Climate change scenarios for Africa, based on results from several general circulation models using data collated by the Intergovernmental Panel on Climate Change (IPCC) Data Distribution Centre (DDC), indicate future warming across Africa ranging from 0.2<sup>0</sup>C per decade to more than 0.5<sup>0</sup>C per decade. This warming is greatest over the interior of semi-arid margins of the Sahara and central southern Africa. Studies have shown that the Sahel zone has been experiencing declining rainfall since the turn of last century and more particularly since the 1950's (Lamb, 1985; Lamb and Pepler, 1991; Smith, 1992; Evans, 1993).

It is believed that climate effects could be largely negative for Africa. For example, a report by the IPCC concluded that:

*The African continent is particularly vulnerable to the impacts of climate change because of the factors such as widespread poverty, recurrent droughts, inequitable land distribution and over dependence on rain-fed agriculture. Although adaptation options, including traditional coping strategies, theoretically are available, in practice the human, infrastructural and economic response capacity to effect timely response actions may well be beyond the economic means of some countries* (Watson et al., 1997).

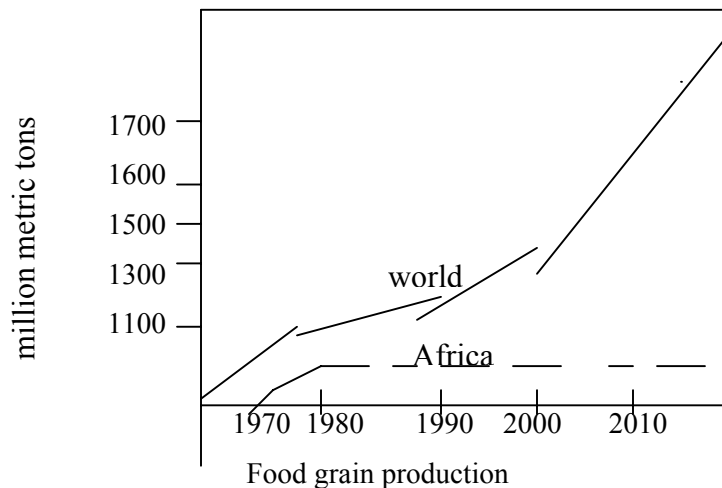
Drought decreases arable activities and yields. Each drought year has a different impact. The poorest are most susceptible to drought. There are many possible adaptation options for responding to climate change and variability in agriculture. Among these adaptation options are altered planting dates, change to a crop more adaptable to the new climate, application of irrigation, changes in levels of fertilization and changes in agricultural systems. Coping with agricultural crisis resulting from climatic variability and drought periods in Africa are generally characterized by a mix of technology, economic and social responses which can operate best for a short period. Mechanisms used for coping with drought and famine crises locally may be categorized into four groups, namely, agricultural adaptations, finding alternative ways of

making money in order to buy food and other essential needs, searching for alternative sources of food, and depending on other people or relief aids.

### AGGRESSIVE EXPANSION OF AGRICULTURE

The threat of population explosion has pushed man to search for improved food production process - that is maximizing yield per a given land space. In the developed economies of the world this has been achieved through modern farming techniques. Africa is still lagging behind hence huge importation of food from abroad. The African farming technique is the intensive farming option where production is through manual efforts hence low yields per given land space (See Figure 1).

Figure 1 World food grain production



Source: after D. Asthana, P. 47

While the world grain production was 1100 million tons by 1970, (Asthana, 2005) Africa by author's estimation within the same period produced less than 300million tons. This can only be explained by the farming technique and low yield per given land space. By the year 2000, the African yield had not increased drastically. Therefore there has to be a review of the input policy in the farming process if increased yield is to be achieved vis-à-vis sustainability in environmental land use.

### INTENSIVE CULTIVATION AND THE ENVIRONMENT

It appears to us that the only alternative to expansion of agriculture is the intensive cultivation option which is already the African way of farming. If we, the Africans are not ripe enough (technologically) to expand our crop-land, we should make full use of our existing ones. Mankind has so far been successful in producing more food than is actually needed by the exponentially rising human population if it is evenly distributed. Most of this enhanced productivity has come from intensive use of energy, chemical fertilizers, pesticides and high-yielding varieties which rapidly consume nutrients.

Indeed, as observed by Asthana (2005), natural productivity and nutrient regeneration capacity of our soils have been ignored. The biotic community of the soil which covers the nutrients, porosity, aeration and mixing of the soil is suppressed by intensive agriculture. Nutrients which the soil microbes could regenerate automatically have to be supplied from outside sources. More energy is needed to irrigate and provide suitable conditions to the crop plants to grow. Furthermore, more chemicals are needed to protect the monoculture - the single variety from pathogens, insects and pests.

### **INSENSITIVITY TO SUSTAINABILITY IN INTENSIVE FARMING PROCESS**

Our focus in this paper has been on intensive farming as a viable means of food production for the teeming African population. Intensive farming is mostly carried out in the rural domain by peasant farmers who are apparently ignorant of the need for sustainability in the process. A quick look at the adverse effect of intensive farming process shows that it has slowly been consuming the very resource base which sustains the human society. The agriculture of today depends heavily on: -

- Fertilizer and chemicals used in agriculture
- Large amounts of energy inputs
- New varieties with high yield and other useful traits.

However, fertilizers boost productivity by providing large amounts of nutrients while chemicals like insecticides minimize damages caused by pathogens, insects, and pests. Farmers have to use high-yielding, fast growing varieties capable of responding to the use of high levels of chemical nutrients. This therefore causes rapid rise in food-grain production. It also has been detrimental to our soils and traditional genetic resources base of plants which we cultivate at large scale. The disadvantage of intensive farming process equally stems from damage which it causes to the biotic community of the soil and the exclusive use of modern high-yielding varieties which adversely affect biological diversity.

### **TOWARDS SUSTAINABILITY IN INTENSIVE FARMING PROCESS - THE CONCEPTUAL FRAMEWORK**

Having seen the ill-effects of intensive farming process as depicted above and to come out with viable recommendations for sustainability of the process, it must be put within a conceptual framework. Sustainability, according to (Bisong 1994) lays emphasis on learning about the basic workings of the natural environment, their potentials and limits and how human development could be structured to work within these limits. Thus for agriculture to be practiced sustainably and progress with minimal damage to the environment, it should necessarily incorporate basic ecological principles by as much as possible mimicking the natural systems. Moreover, sustainable development demands a careful, planned and prudent use of resources such that we preserve them as much as is practicable in order to make it possible for the generations yet unborn to know and enjoy (Anijah- Obi, 2001).

Arising from the above, our traditional farming - the intensive option though suffering from a number of limitations as seen above was a sustainable agriculture. It was carried out under poor irrigation facilities. Moreover, this farming option utilized available resources more efficiently than modern agriculture.

### **GOVERNMENT POLICY**

Government policies, institution and legislation of various African countries emphasize production increase and diversification of arable sector. Government efforts are directed at increasing food production and at reducing food imports. Environmental considerations do not play an explicit role. Other measures are the combat against drought effects (e.g. food aid and strategic food supply) , the increased production of seeds and improved storage capacity. Some governments introduce Financial Assistance Policy to provide subsidy opportunities for farmers and some farming projects e.g.

horticulture. This policy provides subsidies on investments in productive activities and temporary assistance for running costs (e.g. labour, training).

## THE PARADYME

Our present intensive farming culture has to change into a sustainable system - a system which can be carried on without any threat to our soils, plant and animal communities and excessive drain on our energy and material resources. It is only by introducing elements of permanence in intensive farming that Africa can hope to survive and develop as the other developed countries. To do this, respective African nations must: -

- a. Review their agricultural policies that could encourage heavy fiscal investment in intensive farming and look to modern farming options.
- b. Encourage capital loans to the farmers at subsidized or long term rates,
- c. Maintain a healthy soil community which can automatically regenerate soil fertility by providing organic manures, increasing fallow periods, avoiding excessive use of chemical fertilizers and pesticides.
- d. Infuse bio-diversity in intensive farming by sowing mixed crops, crop rotation etc, and
- e. Intensify wide spread farming education in the rural farmers.

These will, no doubt, stimulate the agricultural economy and create employment opportunities to the teeming population and reduce poverty level in Africa.

## CONCLUSION

Climate change is complex as it operates on several spatial and temporal scales. Africa is prone to climate change and variability contributing to low level of socio-economic development and its implications in agriculture, forestry, drought, biodiversity and water supply. Effectively coping with and responding to climate change and events to ensure sustainable intensive farming process requires a concerted, combined response that include effective mitigation means of climatological and early warning systems, acquisition and analysis of relevant climate information as well as planned strategy that can effectively manage the outcomes of environmental disasters. Intensive farming has remained the farming option of Africans from time immemorial. The yield within a given land space has equally remained low - indeed too low to feed the teeming African population. Despite this traditional method used in African farming, problems still arise hence affecting high yield, soil depletion and employment opportunities. These have given rise to untold hunger in the continent hence importation of food. To overcome these, suggestions are put forward which if imbibed can spin the continent into a higher orbit in food production and stimulate the economy; it can open up opportunities in the employment sector and reduce poverty level of many Africans as well as ensure sustainable intensive farming process under increasing effects of climate change.

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