

Constraints of Resource Poor Farmers and Causes of Low Crop Productivity in a Changing Environment

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Abstract: In most sub-Saharan African countries, there is serious low crop yield as a result of use of poor planting materials, soil infertility, erosion problem and climate change. Also, the farmers attitude through improper use of agro-chemicals or excessive use of high external inputs causing damage and posing danger to the farmer, his crops, livestock, man and his environment. Government intervention is required to improve extension services, train farmers on proper use of agro chemicals, proper soil management and good methods of pest control techniques through monitoring. Adequate funding of research institutes and universities is required to help them find solutions to these mounting problems including climate change and to avert immediate occurrence of famine now and in the future. Organic agriculture is advocated for as it is sustainable and environment friendly. [Researcher. 2010;2(8):68-72]. (ISSN: 1553-9865).

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Introduction

Famine occurrence has always been the lot of man and his livestock including wildlife, and has not been restricted to the remote and distant parts of the earth. When it occurs, all are affected and the ecosystem is stressed up to overcome and sustain human and animal life. However, in order to survive, man has often strive to secure his harvest but the variations and changes that occur locally or globally, on and off season had restricted him to the control by environmental factors such as temperatures, rainfall, wind, pressure relative humidity etc including pests and diseases.

The activities of man in the pursuit of food, fiber and energy production are creating changes in our ecosystem. The carbon dioxide emission and other green house gases are on the increase and people are complaining of global warning or climate change. This is evident as state of the art equipments such as computer models using as much theoretical understanding of the earths weather behaviour and data as possible to confirm that global warning is occurring along with shifting patterns of rainfall and incidences of extreme weather events.

If this scenario continues unabated, the global community will witness serious changes in our environment otherwise called climate change. Thus, the global environment will have serious effects and consequences for natural and agricultural ecosystems and for the society as a whole. The objective of this paper therefore is to x-ray some of the constraints of resource poor farmers and causes of Low crop

productivity in a changing environment including those caused by the farmers themselves.

Changes in our agro-ecology

The changes in the ecosystems could alter the location of the major crops production regions on the earth. Hence, agricultural production and productivity is particularly vulnerable to disruption by weather (IFPRI, 2004). To contend with these happening induced by weather and climate changes, we have to produce more food, fibre and energy including other commodities and to secure them thereafter, to cope with increasing population under diminishing per capita arable land, water, degrading soil resources and expanding biotic stresses (Paarlberg, 2002).

In addition to all these stringent constraints, shifting from normal weather with its associated extreme events, zones of crop adaptation and cultural practices required for good crop production will surely change and problems will escalate. Also, plant responses to climate changes are not uniform and thus there will be winners and losers within a given agro-ecosystem and this marks variations and diversity within species and cultivars (Spore, 2008)

All these have implications for crop production and productivity within a given agro-ecology. Therefore, the induced instability by climate and weather in food, fibre and energy supplies will alter social and economic stability and regional competitiveness and global consciousness. Thus the developing and poor nations of the world will suffer more. For example, the global food crises recently

witness in 2008 saw dramatic rise in world food prices, creating global crises and causing political and economic instability and social unrest in both poor and rich countries.

The singular item “food” shows its strength in world politics, peace or war since one must eat to sustain life on earth. Therefore, mechanisms, ways and means to produce food fibre and energy and too sustain it, would be an arbiter to world peace because “a hungry man is an angry man”. Food production is therefore central to human development and world peace. In charting the future, scientists agree that more extreme weather pattern is on the horizon. A range of forecasts predict increased drought in some parts of Africa and flooding in others while rising sea levels and tropical cyclones threaten small island states. Thus nothing can stop the march of climate change, but there is still time to temper its effects (Spore, 2008).

The resource poor farmers and farms

In Nigeria, about 70-75% of the populations are farmers. Members of the family participate in cultivating family lands with the wealthy ones engaging in outright purchase from others or on lease to produce food and fibre. Generally, the people are poor and most of them are small scale farmers who produce majority of the food in Nigeria. They are said to be resource poor and practice small scale farming (0.1-2ha). As there are many poor and developing countries in the world today so also is the number of resource poor farmers who produce in small portions and hectares of land and the excess after family requirements and needs are met are pulled together for the markets to feed other families who cannot farm or have limited access to land resources. The small scale farmer is central in food and fibre production in the world. They play significant role in economy stabilization and in hunger mitigation. However, recent production trends in Africa indicate a serious farming lag (IFPRI, 2004). According to Paarlberg (2002); in developing countries as a whole between 1970 and 2000, per capita food production increased by 51 percent and this is reasonable if it were secured.

The only way out of the woods of hunger is through strongholds in family farms to produce food through confirmed experiments (adapted on farm research) which can sustain and drive small holder productivity forward. These family farms have lower labour related transaction cost and have more family workers per hectare, each motivated to work and each able to find, screen, and supervise hired workers (Lipton, 2005).

Soil quality and fertility as a constraint in food production.

Soil is a natural body upon the earth on which crops grow, and its quality varies widely, ranging from very old, weathered and leached rocks to soils inherently low in nutrient because of their clay and organic matter content (DFID, 2002).

In sub-Saharan Africa, soil quality is classified as degraded on about 72 percent of arable

land and 31 percent of pasture land (Scott, *et al* 2000). In addition to the natural nutrient deficiencies in the soil, soil fertility is declining by the year through nutrient mining “whereby nutrients are removed over the harvest period and lost through leaching erosion or other means (Mark *et al* 2005).

According to UNU-INRA/World Bank report, (1999), nutrient levels have declined over the past 30 years, resulting in low levels of minerals like nitrogen (N), phosphorus (P) and potassium (K) because for an estimated 1 million square kilometers of cultivated land, the rates were 660kg ha^{-1} for N, 75 kg ha^{-1} for P and 450 kg ha^{-1} for K. they explained that in contrast farms in North America have actually increased the average nutrient level per hectare up to 2000kg for N, 700kg for P and 1000kg for K over the same period. The contrast is found in Nigeria where the tropical lush growth of the rainy season may give an illusion of a Garden of Eden where food production could never be a problem (Babalola 2002). The basic physical, chemical and biological limitations of both soil and its environment are not always realized by the ordinary man. Accordingly, Babalola (2002) and Eshett (1993) pointed out that our soils in Nigeria and indeed any other tropical soils are inherently infertile, highly weathered, leached and contain low activity clay minerals which make them behave like “sieves” retaining little water during rainfall and irrigation and little nutrients or plant food. Also, organic matter content of the soil, the seat of plant food is very low and this confers a weak structure on the soil. Thus, the soils are fragile and their aggregates collapse readily under the impact of raindrops making them highly susceptible to soil erosion (Babalola, 2002). Further to these problems, the too low soil moisture retention and the erratic and poor distribution of rainfall cause severe water stress in plants which reduces yield. The situation calls for cheap ways and means of ameliorating the degraded tropical soils of Nigeria and others especially, areas with high demographic pressure. Hence the use of dehydrated pig manure as recommended by Onweremadu *et al* (2003) and use of poultry manure as recommended by Ibeawuchi *et al* (2006) will help rebuild the water holding capacity of these soils by building up organic matter content and increase crop yields of the tropical soils.

Many of the soils in the semi-arid parts of Nigeria have a strong liability to surface crusting or sealing which reduces rainfall penetration into the soil encourages run-off and subsequent soil erosion (Babalola 2002). FAO (1991) has classified the Nigerian landmass as high productivity 0%, good productivity 5.0%, medium productivity 46.5% and low productivity 48.5%. Hence only about 50% of soils in Nigeria are considered to have medium to good productivity potentials for food, fibre and energy production and this is mainly on the account of their depth, and quality of clay content. It is obvious that majority of our low crop productivity can be traced to a large extent to soil infertility.

Table 1: National average yield t ha⁻¹ of some crops in Nigeria and the USA for 1993

Crops	Nigeria	USA	Percentage of USA yield	
Maize	1.25		8.60	14.5
Rice	2.28		6.71	34.00
Soybean	1.00	2.81		35.60
Sorghum	1.00		4.58	21.80
Groundnut	1.14		2.99	38.10
Sweet potato	8.00	18.14		44.10
Yam	11.00		-	-
Tomato	10.00	63.66		15.70

Source: FAO Year Book Vol. 48 1994.

The Table 1, showed some selected crops in Nigeria compared with those of the USA. The differences are largely due to differences in the nature of the soil clay fraction (Babalola, 2002) and too high technology farming with improved hybrid seeds and planting materials. Yields of maize, rice, sorghum and sweet potatoes per hectare in Nigeria were less than 40% of the average yields per hectare of crop yield in the USA (FAO, 1994). Several studies point to the possible causes of soil fertility depletion in Africa and elsewhere in the tropical and subtropical environment (Barret *et al.*, 2002).

The major factors commonly identified include:

- The limited adoption of inorganic fertilizer.
- Organic fertilizer replenishment strategies
- Limited adoption of soil and water conservation measures.
- Use of heavy machinery on soils with weak soil structure.
- The declining use and length of fallow periods
- The expansion of agricultural production into marginal and fragile areas such as cultivation on steep slopes or an arid area without proper anti-erosion measures.
- The use of animal dung and crop residues as fuel and feed rather than as soil amendments and
- The removal of vegetation through overgrazing, logging, development (urban and industrial) and domestic use.

Soil fertility depletion can also be related to many socio-economic, institutional and policy related factors. Rapid population growth as witnessed in Nigeria in the last 30 years can help give an insight on land resources management and use. Limited access to agriculture related technical assistance and lack of knowledge about profitable soil fertility. Management practices can lead to expansion into less-favoured lands according to (Pender, *et al* 1999).

Access to fertilizer can also be constrained by:

- Market liberalization and trade policies that increase fertilizer prices relative to commodity prices.
- Limited access to market and infrastructure
- Limited to development of output, input and credit markets and
- Poverty and cash constraints that limit farmers' ability to purchase fertilizer and other inputs and cause them focus on the short term.

However, a number of approaches have been adopted to deal with soil infertility in sub-Saharan Africa. These include approaches such as organic farming, High external input agriculture, low external input sustainable agriculture, and integrated soil fertility management (Pender and Mertz 2004, Mokokha *et al* 2001)

Excessive Use of High External Inputs

Most farmers (the small scale or resources poor farmers) apart from being poor are mostly illiterates who do what pleases them to the detriment of the environment and high yield of crops. The improper use of chemicals such as pesticides and herbicides is a major environmental concern in sub-Saharan Africa, although majority of them have limited access to these chemicals and often cannot justify their need and use. Those of them who come in contact with these chemicals over use them to the detriment of their lives, and crops including animals and man. According to Hijmans *et al.* (1999), farmers in some sub-Saharan countries spray their potato fields up to 15 times during a single growing season of 4-6 months in order to combat late blight potato disease caused by *Phytophthora infestans*. The problem with pesticides is that as one uses them on these organisms, they emerge to be renewed emerging more virulent to the fact that the chemicals cannot do them any harm again. This problem of misuse of agro-chemicals is a serious constraint to farmers in Nigeria and elsewhere in sub-Saharan Africa.

Furthermore, on the other hand, excessive or incorrectly proportioned doses of chemical fertilizer represent various forms of environmental risk (Scott *et al.*, 2000). For instance, too much fertilizer application

to the soil may result in residues, contaminating local water supply including ponds otherwise available for fish farming. Conversely, too little fertilizer application can result in low yields, declining soil fertility and eventually soil exhaustion. At any point or anywhere, inefficient use of fertilizer causes problems to the environment and contributes to environmental pollution. In fact, the spread of fertilizers or pesticides residue into water supplies through irrigation systems (*fertigation*) or field run-off attract a growing problem to human habitation especially in the southeast agro ecological zone of Nigeria where there is high rainfall, erosion problems and destruction of the ecosystem in search of the liquid gold i.e. petroleum resources. These chemicals that escape into our environment damages plants, insects (non-target organisms) and livestock and poses great threat to the source of human drinking water in many farming communities. However, looking at it from different angles, water pollution is not restricted to production only but also includes post harvest activities (Scott *et al* 2000).

Pest and diseases

The aspect of pest and disease in reducing crop productivity cannot be over emphasized. Pests are all organisms causing significant economic damage to crops while diseases are disorders or physiological disturbances of the normal functions of plants caused by physical, chemical or biological factors. These pests and disease reduce the income of the farmer, crop yield, market prices and value of the affected crop. Food and cash crops constitute the bulk of agriculture production and the productivity is generally known to be low in most parts of Nigeria. This is partly due to losses from pests and diseases which nearly all crops suffer. These losses in most cases begin with the planting of the seed and continue throughout the filed phases of production, storage and processing. They range from hidden losses due to soil inhabiting nematodes, insects, fungi, bacteria, viruses and other organisms. According to Ume *et al* (2000), diseases are estimated to cause about 20-30 percent loss of annual agricultural production in developing countries.

Conclusion

This paper looked at some of the constraints our farmers have in producing healthy food in a changing agro-ecosystem. The farmer is central to food production and causes some damages to the soil which is the base of production through improper use of farm machines, farm inputs and improper soil management. The farmer also is implicated in the use of excessive or incorrect doses of chemical inputs which affect the targeted and non-targeted organisms and pollute the environment. All these problems reduce the soil fertility and cause low productivity. Hence, farmers should be taught proper external input management, proper soil management and good methods of post harvest activities. By these shortcomings, organic agricultural production is advocated for at this point which has been proved to be more sustainable and environment friendly. Farmers have to be on alert as

better observations at the local levels will help produce more accurate forecasts of climate and weather to enable them target planting and harvesting dates of crops to escape pests and disease and the effect of climate change.

There should be improved extension services to farmers through government support. Also, government should support the farmers for improved planting materials and environmental friendly high external inputs for increased yield of crops. This should be done through increased funding of research institutes and the universities to help them find solutions on the way out of impending flood, drought and possible future famine at the global scale as climate related disasters, are already taking heavy toll, and causing massive damage to crops, livestock and infrastructure.

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