

Effects of Intensive Agricultural Production on the Environment in Benue State, Nigeria

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Abstract: *The past decades have witnessed a dramatic change in agriculture with food production soaring due to the Green Revolution. The Green Revolution entails agricultural intensification through excessive and sometimes inappropriate use of chemical fertilizers and pesticides which has polluted water bodies and degraded soils, led to biodiversity loss by killing beneficial plants, insects and other wildlife and in some cases poisoned farm workers. The study assessed the side effects of intensive agricultural production on environment in Benue State, Nigeria. The major objective of the study was to examine the side effects of intensive agriculture on environment, while the specific objectives were to identify major the problems caused by intensive farming, find out major benefits of intensive farming, ascertain the effects of intensive farming on the soil and examine ways of reducing intensive farming. Primary data were gathered by survey using structured questionnaire administered on 115 respondents (farmers/labourers working in intensive farms) were selected randomly from five different farms. Data gathered were analyzed through descriptive statistics which revealed that farm accidents with machines 87.9%, availability of food throughout the year 94.8%, destruction of soil organic matter 61.7% and practicing organic agriculture 33.95%. It is recommended that operators of farm machines should be trained before allowed to handle any machine for farm operations.*

Keywords: *Effects, intensive agriculture, production, environment, Benue State*

I. Introduction

Intensive agriculture has been practice for many years and has become a basic way of life globally. Gradually over the years, intensive agricultural processes have flourished and become more efficient. However, with research and technological developments, scientists have found the negative effects that intensive farms have had on the environment (Rodriguez, Sultan and Hilliker, 2004). All around the world, researchers have discovered the problems by which intensive farms have been plaguing our environment. Intensive agriculture has been a leading cause in the increase of carbon dioxide releases in the environment. Intensive agriculture has a lot of detrimental effects on environment. It is clear that intensive agriculture causes harmful levels of pathogens and chemicals in our water and increases levels of greenhouse gases in the air (Rodriguez, Sultan and Hilliker, 2004).

In recent years, the negative environmental and social impact of high external input on agriculture has become increasingly obvious. At the same time, many disadvantaged communities of small or holder farmers are being forced to exploit the resources available to them so intensively that here too, environmental degradation occurs (FAO, 1992). Despite the past improvements in food production, the most difficult challenges are just beginning. The world population will eventually reach 13 billion people soon. Even currently, at the lowest estimate and given current inequitable access and rights to resources there will be a need for agricultural production to increase sustainability if current levels of nutrition are to be improved upon and maintained. Without very considerable growth, the prospect for many people in poor countries and regions of the world is bleak (Elliott, 2010).

During the past 50 years, agricultural development policies have been remarkable successful at emphasizing external inputs as the means to increase food production. This has produced remarkable growth in global consumption of pesticides, inorganic fertilizers, animal feed, tractors and other machinery (Coen and Ann, 2001). These external inputs have however, replaced natural control process and resources, rendering them more vulnerable. Pesticides have replaced biological, cultural and mechanical methods for controlling pests, weeds and diseases. Farmers have substituted inorganic fertilizers for livestock manure, compost and nitrogen fixing crops, information for management's decision comes from inputs supplies and research rather than from local sources, and fossil fuels have replaced locally generated sources. The specialization of agricultural production and associated decline in mixed farm has also contributed to this situation, what were once valued internal resources have often become waste products (Coen and Ann, 2001).

Sequi and Indiati (2010) the effect of intensive agricultural production on environment is complex, expensive and significant on the economy. 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 plants and animals, drought and desertification. More than 9 billion people now occupy the earth and about 90 million more are added each year, most of the growth is in poorer countries (mostly African countries) where resources (food and other services) are already strained by the present population (Cunningham, 2000)

According to the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA, 2003), habitat loss due to intensive agriculture is the greatest, most serious of all threats to biodiversity. Intensive agriculture has led to an overall decline of approximately 2% in the world's forests and woodlands. In the developing regions, natural forest cover declined by 8%, intensive agricultural practices also contribute to loss of terrestrial and aquatic biodiversity within and around agricultural fields (Tilman, 1999; Tilman *et al.*, 2002). Intensive agricultural land use limits gene flow among population and fragment habitats available to any particular species. Where individuals of animal species are unable to move through agricultural fields, populations will become more isolated, further reducing effective population sizes and threatening the viability of these populations (Hanski and Ovaskainen, 2002).

Agricultural intensification through excessive and inappropriate use of chemical fertilizers and pesticides, has polluted water bodies and degraded soils, led to biodiversity loss by killing beneficial plants, insects and other wildlife and in some cases poisoned farm workers, to mention but just a few (Kughur, 2012). Local extinctions are common where insecticides are frequently used. Such insecticides have been shown to eliminate important predators and parasitoid species from agricultural systems (Pimentel *et al.*, 2005).

II. Methodology

Benue State is one of the 36 states in Nigeria, it lies in the north-central region of Nigeria and share boundaries with five other states; Nassarawa to the north, Taraba to the east, Cross-River to the south, Enugu to the south-east and Kogi to the west. The state also shares an international boundary with the Republic of Cameroon in the south-east. It is made up of 23 local Government Areas, occupying a landmass of 30,955 square kilometres and has a population of 4,219,244 (NPC 2006). The state experiences tropical climate with two distinct seasons, the rainy season which last from April to October with annual rainfall of 1500-1800mm and the dry season which begins in November and ends in March, temperature fluctuates between 23°C and 38°C in the year. The state is made up of several ethnic groups. Most of the people are farmers, while the inhabitants of the riverside areas engage in fishing as their primary or secondary occupation (Anon. 2004).

Majority of inhabitants are peasant farmers; few people are involved in large scale farming. There are few commercial farms in the state. Multistage selection was adopted for selection respondents; four commercial farms namely Oracle, Moji, Lobi and Imande farms were purposively selected. From the farms selected 40 labourers were randomly selected from Oracle farm, 30 from Moji farm, 25 from Lobi farm and 20 from Imande farm making a total of 115 respondents. The difference in sample size among farms was based on the size and number of staff employed by each farm. Data were collected through primary and secondary sources. Primary data were collected through structured questionnaire administered on the respondents (labourers working on the farms). Secondary data were collected from books, journals, proceedings and documents. Data gathered were analyzed through descriptive statistics. The major objective of the study was to examine the negative effects of intensive agriculture on environment, while the specific objectives were to identify major problems caused by intensive farming, find out the major benefits of intensive agriculture, ascertain the effects of intensive farming on the soil and examine ways of reducing intensive agriculture in the study area.

III. Results And Discussion

Table 1: Distribution of Respondents by Major Problems Caused By Intensive Farming

Problem	Frequency	Percentage
Farm accidents with machines	101	87.9
Pollution by agrochemicals	22	19.1
Release of poisonous gasses (machines)	6	5.2
* Multiple responses	*	

Results in Table 1 show that farm accidents with machines 87.9%, pollution by agrochemicals 19.1%, release of poisonous gasses (machines) 5.25%. A major proportion (87.9%) of the respondents stated that intensive agriculture is associated with farm accidents. This could be attributed to the use of unskilled manpower for operation of farm machines. Operators of farm machines are required to acquire some essential skills before they are allowed to operate machines. However, in situation where machine operators are not

adequately trained but allowed to operate machines, that could result to farm accidents. Farm accidents with machines could cause two major things; injury to the operator; some injuries caused by farm machines could leave the operator with permanent disability on one hand, on the other hand spoilage of farm machine. Trained farm machine operators are required for proper and efficient operation of farm machines to avoid unnecessary accidents. This finding is similar to (Repetto and Rolmes, 2001) who reported that despite providing us with cheap food there are a number of problems associated with intensive agriculture. This also collaborates (Kughur, 2012) who reported that the introduction of agricultural chemicals have significantly increase crop yield in the short term by limiting damage by pest, competition for water and nutrients from weeds and by providing large amounts of nutrients in a form that is easily available to plants. In the long run this process can lead to serious depletion of soils because the natural processes of converting organic matter and the balance of microorganisms in the soils have been disrupted. (Kughur, 2012) also reported that agrochemicals used against control of grasses can kill beneficial insects like lady bugs, aphids, among others. When the beneficial insects are gone, there is no more natural control of pest, so their populations can increase much more quickly after the initial application, requiring further applications of more pesticides to control the original pest. Herbicides can kill butter flies, moths, spiders, and bees which play other roles in the environment such as pollinating plants. Operators of farm machines should be given adequate training before they are allowed to operate machines to avoid farm accidents.

Table 2: Distribution of Respondents According To Major Benefits of Intensive Farming

Benefit of intensive agriculture	Frequency	Percentage
Availability of food throughout the year	109	94.8
Timeliness in farm operations	4	3.5
High revenue	1	0.9
Availability of food	1	0.9
* Multiple responses	*	

Results in Table 2 show that availability of food throughout the year 94.8%, timeliness in farm operations 3.5%, high revenue 0.9% and availability of food 0.9%. Majority (94.85) of the respondents were of the opinion that intensive agriculture makes food available all year round. Under intensive farming a small piece of land could be use for the production of several crops and livestock at the same time in a year which make food available even during the off-season. This is because recent technologies are applied for production, conservation and processing of food to ensure that food is available at anytime in the year. This is an indication that intensive farming if adapted is capable of providing food for the increasing population to prevent food shortage. It is good that individuals, private organizations, multi-national corporations and government of different countries especially in Africa which is been ravage by hunger to adapt agricultural innovation especially intensive farming to prevent food shortage problems. This finding confirms (Kughur, 2012) who observed that due to the geometric increase in population of human beings the need to increase food production to feed large number of people led to the advent of technologies like machines, herbicides among others. New production technologies designed to revamp the agricultural sector and boost agricultural production has led to marked increase in crop yields. Intensive agriculture should be practised especially in countries ravage by hunger.

Table 3: Distribution of Respondents Based on Effects of Intensive Farming on the Soil

Variable	Frequency	Percentage
Destruction of soil organic matter	71	61.7
Destruction of soil structure	31	27.0
Cause soil erosion	5	4.3
* Multiple responses	*	

Results in Table 3 show that destruction of soil organic matter 61.7%, destruction of soil structure 27.0% and cause soil erosion 4.3%. Majority (61.7%) of the respondents were aware of the bad effects of intensive farming with reference to destruction of soil organic matter. Though intensive farming is beneficial to the society as it makes food readily available to human beings all year round; it also has bad effects as it destroys soil organic matter. The practice of intensive farming impacts negatively on soil organic matter; this could result to irreversible losses including compaction. Most intensive farmers use a lot of chemicals, pesticides and burning of agricultural waste which is harmful to the environment and other people in general and those involved in intensive farming in particular. This collaborates (Rodriguez, Sultan and Hilliker, 2004) who stated that agriculture causes harmful levels of pathogens and chemicals in our water and increases levels of greenhouse gases in the air. There is a severe effect to the health of humans as a result of the practices of

intensive agriculture. The primary concerns to human health include toxic gases and liquids, such as phosphorus and ammonium. Also, accumulation of nitrates and salts in drinking water and waterborne pathogens, this calls for alarm for human health (Coppock, 1994). Intensive agriculture provides food for the increasing population, it also creates many problems including environmental and health problems.

Table 4: Distribution of Respondents According To Ways of Mitigating The Effects of Intensive Farming

Variable	Frequency	Percentage
Practicing organic agriculture	39	33.9
Establishment of waste recycling plants	36	31.3
Strict adherence to laws on environmental pollution	33	28.7
Awareness creation on dangers of intensive agriculture	6	5.2
Reduction in excessive use of agrochemicals	1	0.9
Total	115	100

Results in Table 4 depict that practicing organic agriculture 33.95%, establishment of waste recycling plants 31.35%, strict adherence to laws on environmental pollution 28.7%, awareness creation on dangers of intensive agriculture 5.2%, reduction in excessive use of agrochemicals 0.9%. A reasonable proportion (33.9%) of the respondents stated that organic agriculture should be practiced. This is an indication that organic agriculture is one of the ways capable of reducing the side effects of intensive farming on the environment. Organic farming does not have side effects on either the environment or human beings. Organic farmers protect their soil from erosion by soil bunds and terraces, minimum tillage and contour cultivation. Planting cover crops, mulching, intercropping and agroforestry play an important role in protection against erosion and landslides. Further, these technologies increase the organic matter content of the soil, which also has positive effects on water-holding capacity. Additionally, the vegetation cover conserves humidity by protecting the soil from direct solar radiation. This finding confirms FAO/WHO (1999) which stated that organic agricultural production system is designed to enhance biological diversity within the whole system; increase soil biological activity; maintain long-term soil fertility; recycle wastes of plant and animal origin in order to return nutrients to the land, thus minimizing the use of non-renewable resources; rely on renewable resources in locally organized agricultural systems and promote the healthy use of soil, water, and air, as well as minimize all forms of pollution thereto that may result from negative agricultural practices.

IV. Conclusion and Recommendations

Intensive agriculture evolved as a need to feed the large population of human beings. It has served the purpose of producing large quantity of food to feed human beings but it is not free from side effects as it can cause 87.9% accidents to farm operators, 94.8% provide food to human beings throughout the year, cause 61.7% destruction to soil organic matters and 33.9% suggested that the way out of intensive agriculture is to practice organic farming. It is recommended that machine operators should be trained and sustainable agricultural practices should be adopted.

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