

## The Adverse Impacts of Population Pressure and Agricultural Change on the Environment of South Eastern Nigeria: A Review

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**Abstract:** This paper examined the impact of the increasing population density and pressure and the resulting challenges in Agricultural practices on environment of South-eastern Nigeria. This was done through descriptive research. The expressions of population pressure and agricultural change in the region are found among others to be intensive cultivation of available farm lands resulting to over-cultivation, land fragmentation and absolute reduction in fallow periods. Their consequences on the environment of the region are environmental degradation in its diverse forms as land impoverishment, soil erosion, deforestation and biodiversity loss. Some measures enunciated to curtail these negative environmental challenges and enthrone sustainable agricultural practices include agro forestry, erosion control and soil conservation, organic farming and institutional/organizational measures. It is hoped that the employment of these measures will bring about sustainable rural environment and development in southeastern Nigeria.

**Key words:** Population pressure • South-eastern Nigeria and Agricultural changes

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### INTRODUCTION

The view point on the relationships between population, environment and development is longstanding. A chronological review of the relationships by the National Science Academy as cited by Madu (2007) [1] shows that throughout history and especially during the 20<sup>th</sup> century, environmental degradation has primarily been a product of human efforts to secure improved living standard of food, clothing, shelter, comfort and recreation for growing numbers of people. In 1966, Boulding made a significant contribution to the issue of the link between population growth, resource development and environmental crisis with the graphic argument that the earth is a closed system -a large 'spaceship' [2]. This notion gives a special significance to the resource-using and waste generation aspect of production and consumption activities in the face of increasing world population. It is maintained that population size and rates of growth remain key elements in environmental change. In developing countries as Nigeria, the fast increase in population and poverty represent a disrupting factor, coupled with increase in the population of young and old which profoundly modified

the age structure resulting in high dependency ratio, rapid increase of pressure on cultivated land, provoking either intensification of land use or a reduction in the fallow periods in areas where shifting cultivation is practiced.

Thus rapid growth in population and the concomitant food needs, fuel and shelter put excessive pressure on available resources leading to unsustainable practices, [3].

In Nigeria, the acceleration of population growth has strained the traditional system of agriculture. Land in some places has become over-used, while cultivation continues on unsustainable lands. According to Okafor (1991) [4], high population density is a general feature of southeastern states where some locations are especially notorious for their high population concentration. In some areas in the region, population density is over 1000 persons per sq. km. It has in fact been stated that apart from the Island of Mauritius, southeastern Nigeria is the most densely populated part of sub-Saharan Africa [5]. In his study on the spatial impacts of rural population pressure on agricultural land use in Nigeria, Madu (2011) [6] found the southeast experiencing the severest impacts of population pressure on agricultural land use because of high level of population concentration and density and intense concentration of socio-economic activities.

With a total population of 18.9million (1991 census) and a total of 5-8million ha of arable land which equals 0.306ha/person and a cultivated area of only 2.8 million ha given 0.136ha/person, the area is agriculturally disadvantaged [7]. This high level of population concentration in southeastern Nigeria accompanied by small land area and even smaller area of arable land has resulted into high population pressures and consequent multiple and enormous demand on the land resource. This enormous demand on arable land has equally resulted to various agricultural changes, many of which involved unsustainable agricultural practices. All these have culminated into all forms of environmental degradation in the area. For example, the abdication of the bush fallow system which hitherto was adopted to allow nature rebuild cultivated land has resulted in soil impoverishment and equally exacerbated soil erosion which are all indicators of environmental degradation.

Southeastern Nigeria comprises of the five Igbo speaking states of Abia, Anambra, Ebonyi, Enugu and Imo and is one of the six geo-political zones in Nigeria. It is located between latitude 4°80" and 8°47" north of the equator and latitude 6°67" and 7°13" east of the Greenwich Meridian. To the north, the study area is bounded by Benue and Kogi states, to the east it is bounded by Cross River state and to the West; it is bounded by Delta state. In terms of landmass, the study covers 22, 525 square kilometers [8].

According to [9 and 10], the manifestation of environmental degradation is greatest in southeastern Nigeria when compared to other regions. The incidence of population pressure and agricultural change on environment of southeastern Nigeria has become so visible that it is undeniable. Examining this scenario and the necessary combative measures is of outstanding urgency at such a time as this. For efficacy, this discourse is split out into the following sections, namely:

- Conceptual issues
- Expressions of population pressure and agricultural change
- Environmental impacts of agricultural change
- Grappling with the challenges of agricultural change.

**Conceptual Issues:** The optimum population concept in theory indicates that optimum population of an area is the number of people which working with all the available resources will produce the highest per capita economic return i.e. the highest standard of living and quality of life. If the size of the population increases or decreases from the optimum, the output per capita and standard of living

will fall. Under population occurs when there are far more resources in an area than can be used by the number of people living there. What this means is that, such area can support a larger population with the same resources, so increased population will raise the standard of living because resources will be more optimally exploited.

Overpopulation occurs where there are too many people relative to the resources and available technology locally to maintain an 'adequate' standard of living. Overpopulation is expressed by a number of indicators such as low income, high level of unemployment declining living standards, famine, malnutrition, out-migration, small farm sizes, short fallow periods and land disputes [11].

Equally associated with optimum population is the Critical Density of Population (CDP) concept. This concept is defined as the human carrying capacity of an area in relation to a given land use system-expressed by population per km<sup>2</sup> or miles. It is the maximum population density which a system is capable of supporting permanently without damage to the land. This follows that the CDP is a function of several factors which are:

- Population in terms of number, quality, distribution and rate of change.
- Method and system of land use.
- Technology employed e.g. ploughing, tractors versus hoe, cutlass.
- Types of crops grown.
- Physical conditions of the area.
- Livestock population which is reduced to population equivalent measured in nutritional requirement.

So, the CDP is dependent on the combination of all these factors. Very often, people think of population in terms of absolute numbers or available densities only and so from such a view, Nigeria with an average population density of 96 per sq.km is under-populated and so much more capable of supporting larger population. However, there are factors which reduce habitable and arable lands as deserts and desertification, topography such as mountains, rugged valleys, steep slopes, poor soils and even livestock that compete with man for food in Nigeria as in many other places, thus Nigeria experiences high population pressure in many areas especially the southeast region [12].

In considering the population pressure, the physical environment, culture of the people, level of advance in technology, population growth and rate, man's attitude towards his environment and man's want- must all be taken into account. The technological component emphasize that population pressure is not static. In other

words, a region which is overpopulated at one time may not be over populated at another time and this is brought about by discovery and use of new technology and man's changing attitude towards formally held societal norms and values.

Rural response to population growth has taken many dimensions in various parts of Nigeria. For example, agricultural systems have been intensified to enable production of needed commodities from increasingly limited land space. The land tenure system has changed from general use right without permanent interest to increasing tenacity of tenure and persistent rights to cultivate land. Also land has been fragmented to permit individual tenure and permanent ownership. In some parts of Nigeria, new area hitherto neglected, have been settled and farmed and out migration has occurred to marginal land. Proper fallow lengths cannot be maintained and consequently the productivity is affected thus necessitating larger fields per capita to contain the demands for food and other necessities. This scenario is a running cycle in many parts of Nigeria and some further accelerates pressure on land resources [13]. All those have given way to diverse adverse environmental consequences.

**Expressions of Population Pressure and Agricultural Change:** According to Adinna (2001) [3], Agriculture has significant impact on population growth, distribution and structure. Improved agriculture positively resulted to better feeding and good health. This led to rapid population growth and the need for production of more food by intensifying the use of the soil, clearing of more forests and eventually agro-land scarcity resulted. This has equally resulted in further multifarious changes in agricultural practices constrained by population pressure and ecological conditions. It is noted that agriculture in south eastern Nigeria is in continuous process of change, driven by population pressure and ecological constraints. This has equally been echoed by [14] who maintained that the resulting farming systems were predicated on the need to deal with constraints of poor ecological conditions and the socio-economic impacts of unfavourable man-land ratio.

One obvious expression of agricultural change is agricultural land use intensification. This is one of the responses to the afore-described situation which has pushed the farmers to practice intensive cultivation of available farmlands. This has resulted to over-cultivation which is the continuous use of the same land for food or cash crop production sequel to land scarcity. Besides land scarcity sequel to population increase, land

fragmentation, ignorance of conservation measures, lack of alternative land for particular crops were also among factors of over-cultivation [15]. [16], recognized that where population pressure increased beyond the limits of agricultural systems, the fallow period is reduced from the earlier 100years to mere 5-6years in parts of West Africa. In other places, the fallow period is eliminated. In southeastern Nigeria, fallow period reduction is the most outstanding expression of agricultural change and/or land use intensification. According to [17], in most communities, land no longer lies fallow and where it is still practiced, it no longer exceeds 3years. Stretching this further, [18] maintained that the system of ensuring fertility through long fallow period is increasingly being compressed into a range with one year minimum and a three year maximum, with most farmlands clustering around 1-2years. [19, 20 and 21], illustrates relative fallow period (rfp) in southeastern Nigeria as presented in table 1 in which he shows that the further away the rfp coefficient of an area is from unity, the more agriculturally disadvantaged. This is because this implies less fallow period, more over-cultivation leading to soil impoverishment.

Another obvious expression of agricultural change resulting from population pressure is fragmentation of holdings consequent upon land scarcity. It is evidenced small sizes of farm holdings, the average being below the national average of 1.2ha [13]. In the study of Okafor (1991) [4], it is shown that among the sampled villages in southeastern Nigeria, no locality has a farm size of up to 1ha.

Table 1: Relative Fallow Period (rfp) of Selected Locations in Southeastern Nigeria.

S/NO	LOCALITY	RFP
1.	Njikoka	0.0
2.	Idemili	0.3
3.	Nnewi	0.4
4.	Aguata	0.0
5.	Ihiala	0.3
6.	Orlu	0.0
7.	Olu	0.3
8.	Nkwere	0.0
9.	Mbaitolu/Ikeduru	0.4
10.	Mbano	0.2
11.	Ekiti	0.2
12.	Mbaise	0.2
13.	Umuahia	0.4
14.	Ngwa North	0.3
15.	Ngwa South	0.4

Table 2: Population Density and Farm sizes in Selected Locations in Southeastern Nigeria.

S/NO	LGA	Average pop. Density of sample villages (per sq.km)	Average farm size per farmer
1.	Ihiala	887	0.84
2.	Oru	1037	0.81
3.	Orlu	1094	0.83
4.	Mbano	1184	0.63
5.	Nnewi	1184	0.48
6.	Njioka	1384	0.13

According to Madu (2003) [17], the activities of various research institutions and some government agencies has resulted to increase in the use of chemical fertilizers, pesticides and adoption of some improved crop varieties which has equally given rise to a more frequent and intensive cultivation of the farmland for e.g. the successful development of improved cassava that matures in less than one year as against local varieties that takes 1-2years to mature.

There is also the practice of inter-cropping where the farmers engage in simultaneous operations as well as sequential use of farmland throughout the crop growing season. In this practice, farmers grow as many different crops as possible, both food and cash crops. The crop combination is varied to suit the farmer's socio-economic and environmental conditions [17].

There is equally the so called "feminization" of agriculture which is an increasing aspect of agricultural change in the region. Eze (2014) [12] found rural-urban migration abundantly expressed in the region and also confirmed preponderance of younger males in migration streams. The exit of younger men from rural areas of the region means that agricultural activities are increasingly left in the hands of women and consequently land which does not require much clearing is used repeatedly with its dire consequences on soil fertility.

**Environmental Impacts of Agricultural Change:**

Botkin and Keller (1997) [7] categorized the effect of farming activities on the environment into three: local, regional and global. Local effects are those that occur at or near the site of the farming, regional effects occur over large areas while global effects include climatic changes as well as potentially extensive changes in chemical cycles.

The major impact of intensive cultivation in southeastern Nigeria as indicated by over-cultivation, drastic reduction or total elimination of fallow period and fragmentation of farm holdings resulting from population

pressure is discussed in its diverse forms as land impoverishment, soil erosion, deforestation and bio-diversity loss.

Often land impoverishment is the consequences of over-use of land resource through continuous cultivation with none/or inadequate application of manure and chemical fertilizers. According to Mbagwu (1978) [19], this has resulted in most lands in southeastern Nigeria becoming ineffective. This results to low agricultural yield.

Soil erosion is significantly the most obvious and serious form of land degradation in southeastern Nigeria. The rate of erosion is determined by climate, soil type and vegetation cover, but it is accelerated by poor farming practices. [19], estimates that of the total area of 78,612km<sup>2</sup>of southeastern Nigeria, 70% is affected by one form of soil erosion or another. [20], affirms that the damage caused by gully erosion is quite extensive in Anambra, Enugu, Imo and Abia states of the region. Specifically, writing on areas of Anambra state,[ maintained that in Abagana, bush burning has destroyed soil microbes that facilitates humus formation and so decrease soil cohesion. Adinna (2001) [3] maintained that as soil erosion progresses, infiltration reduces and eventually the water table is hardly recharged. The soil remains dry sequel to rapid unobstructed run-off and evapo-transpiration. All these encourage sheet erosion in the area. It is estimated by Obi (1982) [20] that soil loss through sheet and rill erosion on cultivated land, over sandstones, the most erosive soils in the area is between 35 and 55 tons per ha per year, if the soil is left bare on 5% slope. Of the factors of soil erosion, anthropogenic factors connected with agricultural practices are deemed salient. Madu (2003) [17] identifies consequences of soil erosion in the area in terms of productivity and sustainability as two-folds; namely: general decrease in soil fertility and diminution of cultivable land.

Another manifestation of environmental degradation in the region is deforestation which is described as a search for fertile ground to replace exhausted or damaged poor yielding soils. The forest lands are being converted to non-forest uses including permanent agriculture, human settlement and road construction at a very alarming rate. Cleaver and Schreiber (1994) [9] computed the total deforestation rate for Nigeria as 400, 000 ha/year and Atta and Adinna (1997) [5] are of the view that it is much higher in southeastern Nigeria. Forest degradation results to removal of protective influence and function of the forest on the soil which accelerates soil erosion and loss of soil fertility. Loss of biodiversity is also another

off shoot of environmental degradation in southeastern Nigeria. This is especially a result of deforestation from bush burning for grazing and cultivation, over grazing etc.

This gives rise to adverse impacts on wild life habitat and it is maintained that in sub-Saharan Africa about 64% of the original wildlife habitat have already been destroyed which leads to loss of biodiversity. Kendall (1996) [15] chose the term biotic devastation to describe the Wanton loss of species of living things in the tropics.

**Grappling with Environmental Challenges of Agricultural Change:** It is now clear that in an attempt by man to better his lot, he has engaged in several activities that are harmful to his environment. One of such activities as examined in this paper is intensification of agricultural activities, so called agricultural change. The welfare of the people of the future demands that we should adopt a more rational view with respect to the use of land resources in southeastern Nigeria. This implies engaging in acts of sustainability which as ICUN, (1980) [14] puts it requires maintenance of essential ecological processes and life support systems, preservation of genetic diversity and sustainable utilization of species and resources.

Rising to the challenges of sustainable environment and development in southeastern Nigeria, involves exploring ways of exploiting the rural resource base in such a way that productivity will be increased to meet the sky rocketing human demand while reducing to the lowest ebb resource degradation and negative environmental changes. This section highlights the various ways or strategies of curtailing these negative environmental challenges and enthroning sustainable agricultural practice that will lead to sustainable rural environment and development in the region. Some of these measures include agro forestry, erosion control and soil conservation, organic farming and institutional/organizational measures.

**Agro Forestry:** This is the combination of cropping, forests and animals in the farm as against farming specialization in one of the above [3]. Among the justifications for agro forestry according to Madu (2003) [17] is that agricultural production system in southeastern Nigeria is traditionally oriented towards subsistence farming in which food crops are grown alongside commercial woody perennials such as mango, oranges, oil palm and cocoa. The underlying principle is that the prevailing local ecological and socio-economic conditions should be utilized in ways that will improve agricultural productivity and sustain the environment in the area.

Government should therefore take all necessary measures to encourage, enforce and implement this strategy. This is because it discourages deforestation and encourages crop rotation thereby preventing soil erosion and soil exhaustion. In employing this strategy, only useful trees are allowed to grow as crops, forest, fodder, cover crops, shelter belts or hedges.

**Erosion Control and Soil Conservation:** Cheap and affordable soil erosion measures should be emphasized and encouraged. It is clear that soil erosion poses farm management problems for the farmer. Agronomic methods of contour ploughing, strip cropping and strip reclamation, limitation of tillage, mulching, organic fertilizing and multiple cropping help other cropping systems and village technologies in sustaining the soil and soil yield [16]. When awareness is properly created through extension workers of these local methods, it will go a long way to preventing costly approaches later. The soil must therefore be carefully tilled, continually replenished and periodically rested (not necessarily by allowing it to fallow) to make sure that it remains in good tilth, fertile and productive.

**Organic Farming:** Organic farming involves the use of organic manure from green leaves, animal droppings and kitchen organic wastes as against the use of artificial (chemical) fertilizers. It favours therefore the use of only animal and green manures (compost) and mineral fertilizers (rock salt, fish and bone meal). These natural fertilizers put organic matter back into the soil enabling it to retain more moisture during dry periods and allowing better drainage and aeration during wetter spells. Organic farming is less likely to cause soil erosion or exhaustion as the soils contain in comparison with non-organic farms, more organic materials (humus), earthworm and bacteria [4]. This strategy is already in practice in the region especially on farms close to family compounds but it should be more emphasized and encouraged.

**Institutional Set Ups:** The various governments and her agencies in the region should step up the making and enforcement of laws on agro and forest land use. They should equally generate policies on sustainable land tenure, land rights and land use approaches as well as forest and water harvesting strategies. Institutional set ups should equally generate policies to control prices of land and water resources such as crops, rent etc [3]. Such laws and policies should not remain as toothless bull dogs; their implementation must not be trivialized.

## CONCLUSION

This write-up has demonstrated that the ever abounding and increasing population density and consequent pressure on agricultural land resources has resulted to unsustainable uses of arable and cultivable land in southeastern Nigeria. This unsustainable uses has given birth to adverse environmental conditions in the region particularly land degradation in its various facets as soil erosion, deforestation, loss of biodiversity etc. combating these negative environmental changes through engaging in sustainable use of agricultural land as enunciated in this paper will guarantee sustainable environmental and rural development in the area.

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