

**PURSUING SUSTAINABLE DEVELOPMENT THROUGH AGROFORESTRY IN NIGERIA:
GEODEMOGRAPHIC AND SPATIAL ANALYSES OF AGROFORESTRY
IMPLEMENTATION IN 36 STATES AND CAPITAL TERRITORY**

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ABSTRACT

The presence of 10 of the world's most rapidly deforesting nations in Africa adds to threats to sustainable development on the continent. Although Agro forestry is increasingly promoted for restoring forest, degraded environment, reducing green house gases, and gaining other co-benefits, its implementation in parts of Nigeria is poorly understood. Using geodemographic and spatial analysis, we show patterns of agro forestry implementation in Nigeria's 36 states and capital territory. We found that per capita implementation of agro forestry (populations of farmers and totals by states) have been low nationally and varies among constituent states/territory. We argue that Israel's reversal of about 400-year old desertification and Niger (Nigeria's northern neighbour)'s re-vegetation and environmental improvement through agro forestry present good practices and innovations in agro forestry for reversing Nigeria's 50-year old desertification. The implication of this paper for policy includes the adoption of agro-forestry for achieving multiple MDGs in Nigeria as urgent and imperative.

Keywords: agroforestry, Nigeria, deforestation, desertification, environmental degradation, poverty.

INTRODUCTION

The recent emergence of the global financial meltdown, which rapidly degenerated into economic recession in 2008, will certainly aggravate the existing challenges of climate change, poverty (Ingwe, Ebegbulem and Ikeji, 2009), environmental degradation especially desertification and deforestation (Salau, 1993, 1991, 1992, AMCEN/UNEP, 2008), unemployment (Ingwe, Ukwayi and Mbotto 2009) among others in Nigeria. Irrespective variation in estimates of the proportion of Nigeria's population

living in poverty, it is indubitable that it remains prohibitively high. Other reports have frequently disputed Nigeria's lower estimates of the poor e.g. 68.70 million in 2004 and 67.11 million in 1996 by official sources (NBS, 2006: 62). Estimates by International Governmental and Non-government organizations show that Nigeria's poor based on N395 (Nigeria's currency) i.e. people who could consume a minimum of FAO recommended calories per person per day and a minimum basket of non-food items were declined from 43 percent of Nigeria's total population in 1985 and 34 percent in 1992 (World Bank, no date, [http://web.worldbank/WEBSITE/EXTERNAL/TOPICS/TOPICS/EXTPOVERTY/EXTRA/0,](http://web.worldbank/WEBSITE/EXTERNAL/TOPICS/TOPICS/EXTPOVERTY/EXTRA/0,contentMDK:20204610xtisCURL:) contentMDK:20204610xtisCURL:). Using the measure of people living on less than US\$2/day), as a basis, surveys conducted in 1997 showed that poor Nigerians constituted 90.8% of the country's total population translating into the size of Nigeria's poor of about as large as: over 96 million people (UNDP, UNEP, World Bank, WRI, 2005: 189).

Employment potentials of agriculture under the context of unemployment

Total employment generation in Nigeria's agricultural sector increased from 79,540 in 1999 to 123,761 in 2005. This represented the sixth largest increase, in terms of ranking in employment generation after the following sectors: communications (1); education services (2); finance (3); building and construction (4); and transport (5). The unemployment rate in Nigeria rose from 12.50 in 1999 to 18.01 in 2000 after which it started declining as follows: 13.60 (2001), 12.60 (2002), 11.20 (2003), 11.00 (2004) and 10.80 (2005), 11.9 and (2006) (NBS, 2007: 35). Although there were marked contrasts between the unemployment rates involving consistently higher unemployment rates in urban areas compared to the rural areas over the years from 1999 to 2003, there emerged a convergence and then reversal of unemployment rates in the mid-2000s, especially 2004 when the rates became: 11 for urban and 12.10 for rural and in 2005 11.00 for urban and 11.50 for rural areas. The growth of Nigeria's labour force by 15.8% since 1999 has been attributed to high rhythms of population growth and graduation of the youthful population from schools (National Planning Commission, 2006: 60, (NBS, 2006:59). Economic planners in Nigeria have frequently ignored the rapid decrease in the population of employees in the nation's agricultural sector from as high as about 70% of the total in the 1960s and 1970s recently. Agro-forestry provides a means of increasing employment opportunities in Nigeria by providing the youthful population credit facilities and related incentives to enable them to engage in self-employment in agriculture.

The increasing pursuit of sustainable development is based on the belief that it is only by maintaining a sound environment the ecological basis for ensuring that economic growth and effective social institutions, which are capable of continuing harmonious functioning of various subsystems without conflicts. The worsening of the impacts of climate change and global warming by the more recent and unfurling impacts of the global financial meltdown and economic recession have compelled some nations like the USA and China, which were hesitant about vigorously responding to the debacle of climate change to pioneer the implementation of “green” economic stimulus packages (Robbins et al, 2009). Sadly, Nigeria, like most of Africa, lacks the capacity to emulate the new “green” “Green” economic stimulus packages, which are of course, environmentally friendly approaches to economic growth and development (Ingwe, Ebegbulem, and Ikeji, 2009).

The emerging climate of “Green” policy for recovery from the twin or triple crises

The literature on the adoption of “the new green deal” (describing the “green-coloured” stimulus packages for tackling the twin or triple crises: climate change and the financial meltdown and its rapid degeneration into the recent economic recession, is growing. It has been reported that the response of the USA and China, leaders of a number of countries, to the triple crises of the more recent global financial meltdown in August 2008, the global economic recession that resulted from the financial crisis, and the existing climate change debacle (which is likely to last longer than the other two crises) has been recognized as the creation of “green” policies designed to tackle all three crises. President Barack Obama recently fulfilled his promise of “change for America” by acknowledging the existence of climate change, a scientific finding that was consistently denied by former President George W. Bush, before proceeding to push through the US Legislature his administration’s economic stimulus package that involves serious investments in sustainable (renewable and efficient) energy technologies, systems and approaches as a means of creating jobs and sustaining existing jobs (http://news.xinhuanet.com/english/2009-02/10/content_10797232.htm). Robbins and colleagues (2009) report that global fiscal and economic stimulus packages constitute a total investment in climate change reduction of about USD43 billion. With a total investment of USD 2,796 Billion in carbon reduction activities, the USA and China are clear leaders of other nations. The USA has invested a total of USD973.0 in carbon reduction comprising USD186.0 for the USEESA Programme and USD787.0 for the USARRA Programme. China has invested a total of USD586.1 in carbon reduction activities

(Robbins et al, 2009). Notable economists, including Joseph Stiglitz and Lord Nicholas Stern, among others have more recently recommended to the G20 nations that adopting a number of measures including the new green deal would lead to the resolution of the two or three crises (Stiglitz and Stern, 2009). These issues raise agro-forestry to visibility as a promising agricultural activity that is capable of addressing several challenges including poverty, environmental degradation (desertification, deforestation).

The distinctive potentials of Agro forestry to promote sustainable development

Although, the knowledge that agro-forestry has played a central role in promoting resilience in the quest for sustainable development, this point is being increasingly made by several activists and scholars. Some of the key benefits that agro-forestry puts into sustainable development programmes include: Biodiversity conservation, Environmental (watershed) Protection, and Climate change mitigation and adaptation. Therefore, its usefulness in promoting afforestation /reforestation and in the unfurling mechanism for forestry development: “Reduction of Emissions from Deforestation and forest Degradation (REDD)” has been recognized. Additionally, it is important in meeting (inter)national climate change objectives. Apart from the foregoing benefits, its role in traditional employment generation is well acknowledged. Most recently, the World Agro-forestry Centre (ICRAF) showed about 1,500 scholars, activists and practitioners drawn from around the world from 23-28 August 2009 to United Nations Environment Programme (UNEP) premises in Nairobi (Kenya) the distinctive contributions being made to sustainable development by agro-forestry in Malawi, one of Sub-Saharan Africa’s poorest nations. This was a story that profiled the transformation of a poor Malawian widow: Mary, from hopelessness of being HIV-positive, poor and trapped with eight children to prosperity when she and her colleagues engaged in agro-forestry. This and several case studies of agro-forestry’s potentials provided the base for the organization to urge the world to forge linkages, develop strategies for pursuing agro-forestry as the most viable land-use system for the future due to its promise to effectively and efficiently promoting the achievement of sustainable development (World Agro-forestry Centre, 2009).

To contribute towards Nigeria’s sustainable development, we, in this paper, propose an agro-forestry as a policy which maps closely with the emerging “green” policy currently implemented by advanced countries (including USA and China) in response to the global financial meltdown and economic

recession since August 2008 to the present. Agro-forestry has been recognized as a system which delivers several benefits (e.g. income generation for poor farmers, environmental and ecosystem stabilization including control of desertification and deforestation) that are described fully later under the literature review.

PROBLEM

Despite the fact that the quest for sustainable development in Nigeria faces several daunting challenges, there remains a void in the development of systems and approaches aiming to curb the three major (but threatened) components: rampaging poverty, environmental degradation and failure of the national society and its social institutions in the country. Several contributors to the literature and observers have expressed fears concerning the chances of achieving the Millennium Development Goals (MDGs) by Nigeria. The multiple benefits which agro-forestry is capable of providing to Nigeria are yet to be fully described to policy makers and farmers. While agro-forestry offers numerous benefits, which make it a prime approach for adoption as one of the “green” policies under the context of climate change, global financial meltdown, and economic recession, this is not yet fully described to the stakeholders, who stand to gain from its adoption and practice in Nigeria and beyond. Therefore, planners and managers of the Nigerian agricultural sector are yet to accord agro-forestry its pride of place in farming/agricultural systems programming and implementation in the country. Although there is increasing interest in understanding the geographical patterns of agroforestry, this has been limited to global-scale analysis (Zomer et al, 2009). This global overview is limited by failing to highlight detailed “pictures” of agroforestry at national and sub national levels. Despite Nigeria’s large size (area and population) and challenges, accurate information and knowledge essential for planning and managing sustainable development pertaining to agroforestry is grossly inadequate. This compelled us to undertake this study to provide information solutions.

METHODS AND DATA

To compute the share of agro-forestry among Nigerian farmers and people, we show ignorance and low level of application of agro-forestry, as a sustainable development strategy, nationally and regionally by employing methods of geo-demographic and spatial analysis involving computation of per capita agro-forestry shares among Nigeria’s populations (farmers and total) by 36 states and territory. To implement these computations, we appreciated the effectiveness of recent geodemographic and spatial analyses in

clarifying resource shares issues (e.g. information and communications technologies, and offensives by vessels in territorial waters) in Nigeria. Therefore, we followed some steps recently applied by scholars who applied these methods (Ingwe, Agi, Otu et al, 2008; Ingwe, Adams, Agi et al, 2009). We also used the methods of causation, survey and literature review for this study (Igwe, 2005). Data were obtained from reliable official sources such as government departments and agencies and international organisations. The context (social, economic and environmental) of sustainable development in Nigeria were described as a basis for showing the role agro-forestry can play in facilitating the achievement of sustainable development.

The study area: Nigeria

With an area of 909,890 square kilometers, Nigeria, one of the largest countries in Africa located between longitudes 3 ° and 14° east and latitudes 4° and 14° north and south of the Gulf of Guinea coast of West Africa (NBS, 2006: 1). The last 2006 census report of Nigeria's population of over 140 million people, makes her maintain her position as Africa's most populous nation and possessor of a fifth of the total population of Sub-Saharan Africa (732,512,000 people in 2005) (NBS, 2007a,b; WRI, 2005: 177). There is need to examine the background for agro-forestry in Nigeria. This requires answering the following minor questions: To what extent has agroforestry been implemented in Nigeria? How does agroforestry fare, in terms of land uses in Nigeria, compared to other land use types?

Nigeria's recent land use profile with reference to agriculture and agroforestry

Out of a total land area of 91,077,000 hectares, the proportion (in percent) of Nigeria's forests were only seven and 59 per cent based on MODIS remotely sensed imagery of 2,000 at less than 50% and less than 10% cover respectively. The Food and Agriculture Organisation of the United Nations (FAO) estimated at less than 10% cover that the nation's forests were: 15% in 2000 and 19% in 1990. Agricultural land uses in Nigeria comprising "arable and permanent cropland" remained unchanged at 36 per cent of the total land area within ten years (between 2002 and 1992) while there was a minor decrease in area under "permanent pasture" within the same period: from 44% in 1992 to 43% in 2002. A disproportionately large part of the national territory (58%) was classified as "dry-lands" using zonation criteria of aridity, semi-arid and dry sub-humidity. The criterion of hyper-aridity (i.e. bare sand deserts) was excluded.

Nigeria's land area was quoted to be 909, 890 square kilometers in 2006 ⁵, about one third of which was considered arable by applying minimal irrigation, was said to be one of the largest countries in Africa (South of the Maghreb or Sahara) (NBS, 2006:1-2). Moreover, the nation's wealth of natural or material resources (minerals, water, and vegetation among others) makes it to be widely described as a potential for greatness in the community of nations. Here population figure resulting from 2006 census) of over 140 million makes her retain the status of Sub-Saharan Africa's most populous nation (Okunmade, 1997: 6).

Reliable estimates of Nigeria's agricultural land-use potentials put the nation's arable and permanent cropland in 2002 and 1992 at 36% implying stability in this land use or cover. However, the nation's total area under permanent pasture declined from 44% in 1992 to 43% in 2002, while her dry lands (determined to include aridity zones: arid, semi-arid and dry sub-humid zones and excluding hyper arid (bare and sand deserts) was 58%. The nation's population density (describing people per square kilometer) in 2000 was 124 people the third highest in sub-Saharan Africa. Nigeria was surpassed on this demographic criterion by Rwanda with a population density of 293 people/km² and Burundi with 225. The small and narrow cucumber-shaped West African country: Gambia followed Nigeria closely with a population density of 116 persons per square kilometer (UNDP, UNEP, World Bank and WRI, 2005).

Rapid population growth and urbanisation

The population density (i.e. average number of people inhabiting one square kilometer of land) in 2000 was 124. The rather high rate of urbanization (i.e. the rate of change of areas that are rural into urban) as indicated by a nine percentage point increase in the percent of the population that was urban within ten short years: from 35 in 1990 to 44 in 2000. Nigeria presented the absolute largest proportion of people living in urban centers of various types in 2002 in Sub-Saharan Africa: 35% and 18% of Nigerians lived in cities with populations of over 100,000 people and more than one million people respectively. Sadly, the proportion of Nigeria's urban residents who lived under slum conditions was also the highest (79%), in absolute terms, in Sub-Saharan Africa. Although the percent of urban population who lived under slum conditions elsewhere in Sub-Saharan Africa were equally as high elsewhere in Sub-Saharan Africa (e.g. 99% in Chad, 90% in 83% in Angola, 84% in Benin Republic, and so forth (UNDP, UNEP, World Bank and WRI, 2005).

Research questions

How useful is agro-forestry under the context of increasing adoption of “green” “Green” development strategies by advanced economies (USA, China) in response to the global challenges: climate change, global financial meltdown and economic recession? To what extent has agro-forestry been employed by sub-national governments for resolving recent twin crises: climate-ecological and serious poverty? What factors impede agroforestry development in Nigeria? How can agro-forestry be implemented in an accelerated way as a means of gaining from its several advantages in Nigeria?

Objectives

The general objective of this paper is to promote the implementation of agro-forestry as a system that is capable of strengthening the pursuit of the achievement of some of the Millennium Development Goals in Nigeria by using the system for delivering numerous benefits to Nigeria’s poor majority of farmers and remediation of the degrading environment.

The specific objectives are:

To highlight the role that agro-forestry has been playing in promoting sustainable development in globally. (Note that three components of sustainable development are the potential of agro-forestry to improve: (a) income generation thereby reducing poverty of majority of peasant farmers, and curbing the rather rapid environmental degradation such as deforestation and desertification) in Nigeria; (b) To show the degree to which agro-forestry has been employed in sustainable development in Nigeria, i.e. as a means of tackling the problems of rapid deforestation and desertification in Nigeria; and (c) the usefulness of agro-forestry in revamping of local socio-cultural institutions common in Nigerian communities. To recommend ways that agro-forestry can be rapidly implemented by deploying existing resources in Nigeria’s banks and financial institutions in order to achieve the foregoing objectives: generating income for farmers and also reducing poverty in Nigeria.

Organization of the paper

We present a conceptual framework based on the review of related and relevant literature by elaborating concepts of agro-forestry, sustainable development aiming to highlight gains that they creates in terms of their enhancement of capabilities in environmental stabilization and remediation thereby providing solutions for environmental degradation (desertification and deforestation afflicting Nigeria), income

generation capacity for peasant farmers and unemployed youth. We also present the methods and approaches used for the study, data and analysis techniques applied and of course results of our study. Finally, we discuss the findings, make conclusions and recommendations for integrated development programming and implementation of cooperative-based agro-forestry in Nigeria.

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

This concept is suitable for framing the discussion of agro-forestry in Nigeria because of its reference to the more ethical development approach that strives to satisfy the needs of the present generation without compromising those of the future generations or our children's children to meet their own needs (UNEP, 2007:525). Therefore its stress on three prongs of the concept of sustainable development including the maintenance of ecological integrity or sound environment, harmonious social institutions while achieving economic growth beginning at the World Summit on Development has been amply documented. These features distinguish it from its conceptual forebears that emphasized other aspects of development namely or narrowly economic growth. Its origin was necessitated by the serious damage to the environment and eco(logical)- systems in the past centuries that were characterized by unbridled pursuit of strictly economic growth without due regard to the former. Economists led by Charles Chukuma Soludo recently described the development problems of Nigeria as stated in the recent National Economic Empowerment and Development Strategy (NEEDS) formulated in 2004 included: poverty, disruption of social institutions -arising from high levels of unemployment, corruption, vices and so forth (National Planning Commission, 2004). This article shows how environmentalists previously highlighted the serious environmental-ecological crises afflicting the country. Therefore, it is apposite for us to show below, the potential contribution of agro-forestry to sustainable development including the three aspects: environment, society and society in Nigeria.

Agro-forestry defined

Agro-forestry refers to the integration of two broad human activities: propagation of trees in a way that creates forest-like environments; and the undertaking of actions that use human culture to cultivate plants (and frequently mixed with animals) for the purpose of producing raw materials useful for satisfying various human needs (food, shelter, medicine, industrial manufacturing and so forth. Ed Verheij has stressed its concern with the role played by woody plants in farming systems and its particular concentration on mixed cropping (and frequently farming) systems within an enterprise or

establishment. Although it has developed into sophisticated farming systems with various combinations of crops and plants, further details have been profusely documented and do not bear repetition here (Verheij, 2003: 10). Agroforestry is becoming a popular proposition as a veritable rural development and poverty reduction strategy due to its several benefits: rural agribusiness enterprise development, income generation, cottage industrialization (Sao Paulo Government, n.d.; Garrity et al, 2006; Pandit, Albano and Kumar, 2008).

SUSTAINABLE DEVELOPMENT BENEFITS OF AGRO-FORESTRY

The literature is increasingly highlighting the benefits of agro-forestry in conformity with our earlier introduction that agroforestry supports the drive towards achieving sustainable development in terms of economic growth, maintenance of social harmony and conserving the environment in ways that needs of generations currently harnessing resources and those who would require same in future are not compromised. Ed Verheij has also reported the benefits of trees in agro-forestry to the environment regarding stabilization and protection of soils from erosion, amelioration of micro-climate, support to companion crops on the farm, and landscape diversification leading to enrichment of the environment and resources on it: including harbouring birds' nests by trees (Verheij, 2003:13).

Ecological Services and Environmental Remediation

Forests provide several ecological services. The FAO suggests that Nigeria's mangrove forests provide critical habitat for migratory birds and numerous endangered aquatic and terrestrial (AMCEN/UNEP, 2008:269). A new report by the FAO highlights the role played by agriculture in mitigating climate change. It is believed that ongoing work on afforestation and reforestation including the recent development of the Reduction of Emissions from Deforestation and forest Degradation (REDD) are considered to be significant ways of mitigating climate change through soil carbon sequestration from the agricultural sector. Moreover, the REDD methodology is considered to be simple-to-use and cost-effective. It has been revealed that it is inexpensive to apply (Mueller, Mann, and Lipper, 2009). These include: meeting international and national climate change objectives.

Poverty in Nigeria and Income Generation Potentials of Agro-Forestry for Reducing Poverty

Owing to the enormity of poverty in Nigeria, in terms of its prolonged history and high intensity, several studies have been undertaken and reported in the literature. One of the most important findings concerning the serious poverty that has been afflicting a disproportionately large population of Nigerians pertains to the gross mis-management or spending of the large amounts of funds that the nation earned from the export of her crude petroleum oil since the discovery of commercial quantities of the fossil fuel in the late 1950s. Although some report that the mismanagement of funds is believed to have been most serious between 1972 and 1985 (Addison, 1996: 24), it has continued during the Obasanjo administration from 1999 to 2007, whose characterization by squandermania has been documented (Ingwe, Agi, Adams et al, 2009). Associated with the mismanagement of oil income, has been the flaring of natural gas that is found in association with the oil until recently when oil producing companies were compelled to place value on this variety of the fuel and refine same for sale, and similarly the mismanagement of incomes earned from the natural gas, whose export started more recently. The rather high intensity of poverty in Nigeria is believed to remain high and require several years of constant economic growth to bring about a reduction (Addison, 1996; Okunmade, 1997; Dozie, 1996; Ilori, 1996).

Poverty And Environmental Degradation In Nigeria

The increasing poverty in Nigeria has also been attributed to the rising degradation of the environment and resources occurring on it. The relationship between “(E)nvironmental Degradation and Human Welfare...”, was shown by Enuvie G. Akpokodje who drew from the UNDP report of 1996 using a poverty line of ₦3,290 per month the required amount of ₦15,000 to sustain a family comprising about five people was mostly unmet by most Nigerians. Poverty afflicted about 75 percent of the population of rural Nigeria based on the foregoing definition while about 50 percent of the nation’s public sector workers, whose basic minimum wage was fixed at ₦1,000/month, were poor. Between 1985 and 1992 poverty in rural Nigeria declined suddenly from 26.3 million people to 22.8 to urban poverty where the number of the afflicted rose from 9.7 million to 11.9 million people. The World Bank estimated the cost of losses of natural resources arising from major forms of environmental degradation (affecting Nigeria’s soil, land e.g. deforestation, desertification, pollution), water and atmosphere) to the national economy at about US\$5 Billion) (Akpokodje, 1998:19).

Table 1: Socio-economic conditions including poverty in Nigeria 2005

S. No	State/Territory	2006 Population	Poverty incidence 2004	Agric. Occupation	Poverty incidence (B)
1	Abia	2,833,999	22.27	20.28	28.01
2	Adamawa	3,168,101	71.73	31.23	68.91
3	Akwa Ibom	3,920,208	34.82	21.24	46.04
4	Anambra	4,182,032	20.11	24.27	30.36
5	Bauchi	4,676,465	86.29	27.76	76.51
6	Bayelsa	1,703,358	19.98	28.93	26.29
7	Benue	4,219,244	55.33	46.92	42.84
8	Borno	4,151,193	53.63	35.53	48.65
9	Cross River	2,888,966	41.61	29.97	51.64
10	Delta	4,098,391	45.35	20.09	62.28
11	Ebonyi	2,173,501	43.33	34.53	46.06
12	Edo	3,218,332	33.09	17.3	44.31
13	Ekiti	2,384,212	42.27	19.91	35.51
14	Enugu	3,257,298	31.12	28.28	33.89
15	Gombe	2353,879	77.01	24.5	66.34
16	Imo	3934,899	27.39	27.59	26.46
17	Jigawa	4348,649	95.07	38.34	89.54
18	Kaduna	6066,562	50.24	13.83	37.72
19	Kano	9383,682	61.29	10.59	46.70
20	Katsina	5792,578	71.06	24.54	60.42
21	Kebbi	3238,628	89.65	31.66	86.20
22	Kogi	3278,487	88.55	16.84	87.46
23	Kwarra	2371,089	85.22	8.34	79.85
24	Lagos	9013,534	63.58	0.79	64.05
25	Nasarawa	1863,275	61.59	23.32	48.17
26	Niger	3950,249	63.90	22.93	56.01
27	Ogun	3728,098	31.73	9.94	29.84
28	Ondo	3441,024	42.14	21.67	41.47
29	Osun	3423,535	32.35	7.93	22.66
30	Oyo	5591,589	24.08	10.56	19.28
31	Plateau	3178,712	60.37	31.95	46.78
32	Rivers	5185,400	29.09	15.94	43.12
33	Sokoto	3696,999	76.81	26.7	70.54
34	Taraba	2300,736	62.15	27.64	54.07
35	Yobe	2321,591	83.25	34.15	74.12
36	Zamfara	3259,846	80.93	30.33	73.38
37	FCT (Abuja)	1405,201	43.32	19.27	46.98
	NIGERIA, Federal Republic of	140,003,542	54.4	21.54	51.55

Sources: Authors' computation from data obtained from various sources (NBS, 2005: 69, Nigeria, 2007)

Notes: B=Poverty incidence measured using criterion of spending US\$1 per day based on adjusted purchasing power parity

Poverty and agriculture in Nigeria

The impact of poverty on agriculture in Nigeria is reflected in the use of very low levels of modern inputs in agricultural activities: a point that has earlier been made by scholars. For example, a comparison of the use of modern inputs in farming activities in Sub-Saharan Africa revealed that the amount of inputs (including use of small quantities (7.1 kilogrammes) of fertilizers per hectare of cultivated land and only 0.49 labour inputs (i.e. number of workers per hectare of land) by Nigerian farmers has been one of the lowest in the region (Ingwe and Okeme, 2009). It has been shown that agroforestry presents a solution to the problem of inadequacy of fertilizers by providing organic (contrasted to chemical) fertilizers.

Table 2: Agricultural inputs utilization in Nigeria

Input	Quantity of input used
Inorganic fertilizer	10.23
Organic fertilizer	12.76
Insecticides	3.69
Herbicides	1.19
Storage of crops	1.63
Purchased seeds	4.74
Irrigation	0.21
Bags, containers	8.84
Petrol	0.35
Spare parts	0.24
Hired labour	13.30
Transport of crops	9.32
Renting animals	1.12
Renting equipment	0.37
Local hand tools	14.11
Imported hand tools	1.07
Repairs and maintenance	3.15
Other crop costs	0.54
Animal feed	4.81
Veterinarian services	2.36
Paid labour for herding	0.53
Maintenance of pens	0.30
Transport of feed	1.28
Commission	1.04
Compensation	0.35
Other livestock	0.68
Hired labour	0.74
Fuel	0.15
Spare parts	0.06
Rent and maintenance	0.42
Hiring of equipment	0.04
Other inputs	0.16

Sources: NBS, 2005:84

ENVIRONMENTAL DEGRADATION AFFLICING NIGERIA POVERTY IN NIGERIA

Environmental and ecological challenges confronting Nigeria

Several authors have described the enormity of the ecological-environmental problems that Nigeria has been facing. AMCEN and UNEP recently reported that the major environmental challenges facing the country include: desertification; deforestation and biodiversity threats; and oil pollution (AMCEN/UNEP, 2008: 268-273). Ademola T. Salau discussed the relationship between “(E)nvironmental Crisis and Development in Nigeria”. He enumerated the ecological crises afflicting Nigeria to include various types of environmental resource degradation including: drought and desertification, deforestation, soil erosion, pollution of the terrestrial (land), atmospheric (air) and hydrospheric (water) sub-systems of the environmental system. For the purposes of this paper, we shall examine some of the problems that are relevant to this discourse.

Desertification in Nigeria

The Food and Agriculture Organisation (FAO) reported that the Sahara Desert has been encroaching southwards into the country’s vegetation covered areas at a rate of one kilometer per year (FAO, 2001). The UNESCO estimates that this rapid desertification represents three-quarters of all environmental degradation in the country and estimated to be valued at US\$5,110 million per year (UNESCO, 2000). The Convention for Biological Diversity (CBD) states that Nigeria’s 7,856 plant species and 22,000 vertebrate and invertebrate species are threatened by the problem of rapid desertification (CBD, 2007). Although desertification might be occurring country-wide, as suggested by Ayaode (1988), some suggest that it affects northeast (semi-arid) region where large-scale agriculture, damming of rivers and drought combine to cause serious land degradation (AMCEN/UNEP, 2008: 268-273).

Previously, Salau quoted reports by Oladipo (1989), Salau reported that as of 1993, drought-driven desertification was a serious problem arising from the dwindling of rainfall around the country. He described the possible rapid rate of loss of arable land (in square kilometers per annum) to desertification in various parts of Nigeria as follows: 160-258 km² in Sokoto state; 78-125 km² in Katsina; 103-165 km² in Kano state and 171-274 km² in Borno state. Desertification was said to be a country-wide problem and by no chance restricted to the afore-mentioned states (Oladipo, 1989 cited in

Salau, 1993: 11). Salau similarly drew from earlier studies by Ayaode, 1988: 275) to show in greater detail how drought had caused enormous mortality of livestock population in Northern Nigeria, specifically Argungu and Gwandu areas of Sokoto state. He stated casually that the drought also caused widespread crop failures and quoted the New Nigerian (a Kaduna-based newspaper) as having reported that about five million metric tones of grain valued at =N=4.2 billion was lost to drought in 1982 harvest season. He also quoted (“T)he Punch (a Lagos-based newspaper) as reporting that several villages were buried by sand dunes, which result from the increasing desertification (Salau, 1993: 12).

Deforestation in Nigeria

The African Ministers Conference on the Environment (AMCEN) and the United Nations Environment Programme (UNEP) report that Nigeria presents the highest rate of deforestation of natural forest in the world. This problem affects Nigeria’s most bio-diverse ecosystems: old-growth forests. A disproportionately high percentage (79 %) of her old-growth forest was lost between 1990 and 2005 (AMCEN/UNEP, 2008: 268). The FAO reports that Nigeria’s deforestation rate of 3.3 per cent per year is the highest in Africa (FAO, 2005). AMCEN and UNEP suggest that the rapid deforestation has caused the loss of about 90 per cent of Nigeria’s original forest cover. The FAO suggests that due to the increasing local demand for fuel-wood and timber, Nigeria has become the largest producer of timber in Africa. Nigeria’s government measure aimed at curtailing deforestation by banning the export of unprocessed logs in 1976 was rendered ineffective by the rising for wood from timber (FAO, 2001). Deforestation has also caused the destruction of about 40 per cent in 1980 of Nigeria’s mangrove ecosystem (UNEP, 2002). AMCEN and UNEP state that deforestation, oil (and natural gas) production and exploration, development around coastal areas, erosion, and invasion of mangroves by other species of flora (e.g. nipa palm and water hyacinth) threaten the remainder of Nigeria’s mangrove ecosystems. Moreover, all these threats have adversely affected the position of Nigeria as the possessor of the third largest mangrove ecosystem area in the world (AMCEN/UNEP, 2008: 268-9). Aina and Salau reported that Nigeria’s Government estimated that sown timber was harvested at the rate of 1.5 million cubic metres in 1975 thereby leading to the projection that forests denudation of mature timber was expected occur in 25 to 30 years (Aina and Salau, 1992:36).

Energy poverty and deforestation

Other causes of deforestation in Nigeria are: over-reliance of the nation's poor majority on wood as fuel for cooking and heating; indiscriminate bush burning by peasant farmers applying rather primitive systems of cultivation and other people; increasing demand for wood for building and construction, and other uses such as newsprint production; high rhythms of population growth and increasingly changing social and economic circumstances of the population and so forth. Over 1,700 hectares of Nigeria's forest plantations were reportedly burnt in the 1982/1983 dry season. It has been reported that 75% of total cooking in northern Nigeria is done using fuel-wood derived from plant matter. A deficit of fire-wood of about five to eight million cubic metres has been reported in northern Nigeria.

Rapid Conversion of Forest Reserves into other land uses

One dimension of deforestation in Nigeria is the rapid de-reservation of areas that were previously designated as forest reserves by converting them into other land uses. Insights into the problem was provided by G.J. Osemebo's (1988) study in southern Nigeria as summarized in the following table (3):

Table 3: De-reservation of forests in Nigeria

Forest reserve/State (location)	Gazetted area (ha)	Extent of de-reservation (ha)	New uses of former forest and converter/user
Anambra			
Osomari	12,098	1,500	Food crop farming by dwellers of the enclave
Akpaka	450	100	Food crop farming By dwellers of the enclave
Anambra	14,575	500	Food crop farming By dwellers of the enclave
Bendel state			
Okomu	123,802	15,000	Oil palm project by Federal Government
Orie River	40,633	a) 60 b) 19,166	Petroleum pipeline Food crop farming
Iguobazuwa	26,936	1,810	Cocoa Board project
Ologholo-Emu Urho	14,996	145	Cattle Ranch
Ivi-Ada-Obi	18,002	580	Cattle ranch
Ogbe	5517	a) 720 b) 1,010	Urban development; airport; federal sawmill; forest research plot ? b) food crop farming
Obaretin	10,800	2849	State government oil palm project
Ehor	29,583	8	Cocoa project
Ologbor	19,425	1,280	Oil palm plantation project
Ebue	9,176	140	Food crop farming
Sakpoba	49,210	35	Oil exploration
Gilli-gilli	36,260	26	Oil exploration
Cross River & Akwa Ibom states			
Stubbs creek	31,080	11	Food crop farming
Ekimta	10,878	10,878	Food crop farming
Imo state			
Ubibia	755	106	Food crop farming
Achara Ihe	794	300	Oil palm project
Rivers state			
Upper Imo River	9,696	10	Food crop farming

Source: Adapted from Salau, 1993: 17 citing G. J. Osemebo 1988.

Erosion in Nigeria

It deserves mention that while the African Ministerial Conference on the Environment (AMCEN) and the United Nations Environment Programme (UNEP) (2008: 268-9) acknowledged the existence of the problems of desertification, deforestation and threats to biodiversity and oil pollution as major environmental threats in Nigeria, it excluded erosion, which is an enormous problem in the country. Various types of erosion have been afflicting the different ecological zones forming Nigeria's territory.

Sheet erosion, one type that seriously hampers agriculture and destroys the environment, was reported to be widespread across Nigeria thereby afflicting several parts of the country in one form or the other. In south-eastern Nigeria, one form of running water-related erosion or the other afflicts about 70 per cent of the region (Ofomata, 1981), estimated in some areas lead to the loss of infrastructure equivalent to about ₦350 million in 30 years (Aladejana and Adesiyan, 1982 quoting Niger-Techno Limited). In northern Nigeria, wind erosion caused by the North Easterly Trade Winds is widespread and is responsible for removing and transporting heavy cultural artifacts together with dust from the region to the southern part during the harmattan. The economic significance of soil erosion in Nigeria has been described as being responsible for reducing maize yields from 6.5 tonnes to one tonne (World Bank, 1987, World Bank. 1990).

Being a country that is one of the most well-endowed in terms of natural and human resources, and also being the leader of the 10 of the world's most rapidly deforesting nations and the most deforesting nations in Africa -a continent beleaguered by prolonged poverty and ignored by economically advanced countries which promised assistance- it is expected that Nigeria should lead the response to Kofi Anan (former UN scribe)'s charge that the world (read Africa) lacks environmental leadership. Although very important, this issue is beyond the scope of this paper.

LESSONS FROM SOME SELECTED COUNTRIES: ENVIRONMENTAL REVITALISATION SUCCESS STORIES

Several success stories on the revitalization of degraded land are being documented. Perhaps the most spectacular ones include the conversion of arid areas in Israel have been put into use as agricultural areas, from where large quantities of raw materials for food have been produced and even exported. In this paper, it was preferred to highlight or present success stories from Niger Republic due to several reasons. The land revitalization programme applied approaches and methods that involve low-level technologies; Niger Republic is Nigeria's neighbour, located immediately to the north of Nigeria, thereby offering a nearby place for cost-effectively drawing lessons for short-term implementation of similar land revitalization in Nigeria.

Land revitalization in Niger Republic

The revitalization of parts of Niger Republic provides lessons for (as well as encouragement to) Nigeria's quest for environmental remediation programmes. The Niger Republic is located almost directly to the North of Nigeria. The country's total surface area of 1, 267,000 square kilometers makes her Africa's fourth largest nation, most (65 per cent) of which remains largely uninhabited due its location within the rather unfavourable arid conditions of the Sahara Desert. Therefore, most of the Nigeriens' (i.e. nationals of Niger Republic) total population of 14,426,000 people in 2006 have to congregate to the more favorable areas around the country's southern areas such as the semi-arid the small tropical zone located within the edges of the River Niger Basin and small sections of the Lake Chad basin, which Niger shares with Nigeria. This increasing concentration of the people around a small portion of the national territory and the rapid rate of urbanization (5.5 %) between 2000 and 2005 has resulted into serious slum development in Niger. The magnitude of the population of slum dwellers as a percentage of the total urban population increased from 96% in 1990 to 96.2% in 2004.

Niger's marginal land has suffered serious environmental crises including rapid depletion of its vegetation mostly through burning of bush and grass as part of land preparation for agriculture (planting of crops), overgrazing of rangelands and wood fuel and construction materials harvesting involving tree cutting. Others are increasing desertification and soil erosion.

Land revitalization has been reported in the Tahou Province of Niger Republic. This has resulted from the employment of a combination of projects and farmer agroforestry initiatives: planting and protection of trees, prohibition of (and adherence of farmers) clearance of trees saplings from farmer fields, which was a usual practice preceding planting of crops. There has been increasing practice of protection and nurturing of trees, careful ploughing around trees during the sowing of crops such as millet, sorghum, peanuts, and cowpeas (beans). It was reported, following recent studies applying satellite remote sensing, that three southern provinces of Niger Republic gained 10 to 20 times more trees as at 2005 than were available in the 1970s. This land revitalization has reduced the vulnerability of the region to drought; caused increased diversification of the livelihoods of the people thereby reducing the people's sole reliance on crops cultivated based on rain-fed agriculture.

In the 1970s, the climatic and environmental conditions of the three provinces in southern Niger, where a disproportionately large number of the people were concentrated were dire: it was semi-arid, the climate faces considerable variability and is therefore highly susceptible to change; the ecology was frail; all posing threats to the people's livelihoods. The response of the dynamic demographic factors to worsening climatic conditions led to the expansion of rain-fed farming into areas of more fragile ecological conditions with lower precipitation (rainfall, among others) and practice of livestock farming (AMCEN/UNEP, 2008: 262-267).

In Niger, progress towards environmental sustainability, as defined by the UN Millennium Development Goal 7) has been indicated by the following (which contrasted with the lack of such progress in Nigeria):

- (i) The stabilization of the proportion of the nation's areas put under protection, as a percentage of the country's total land area at 6.6 from 1990 to 2005 (i.e. 15 years).
- (ii) The proportion (in percentage) of the total population of Nigeriens using improved drinking water sources rose from 39% in 1990 to 46% in 2004; while those using improved sanitation facilities rose from 7% in 1990 to 13% in 2004;

Carbon dioxide (CO²) emissions, in metric tones per capita, declined steadily from 0.1341 in 1990, 0.1065 in 2000, and 0.0947 in 2004 (AMCEN/UNEP, 2008).

THE SCOPE FOR AGRO-FORESTRY IMPLEMENTATION IN NIGERIA

There are several factors in Nigeria that beckon for the adoption of agro-forestry as a good strategy for poverty reduction and environmental revitalization in Nigeria. These include the following conditions in the country: high intensity of poverty affliction; environmental resource depletion, environmental degradation; low-level of implementation of agro-forestry, and the potentials of agro-forestry to contribute towards reforestation and aforestation as income generation and poverty reduction measures, among others. Some of these reasons are outlined below using various tables. The total area that was devoted forest reserves in Nigeria was 7959017 hectares (Ha) while that for agro-forestry in Nigeria was as little as: 812537 hectares; representing a total (i.e. national) percentage proportion of agroforestry to forest reserve of 574574.

High reliance on solid fuels (biomass)

There was a rather high reliance on solid fuels (wood that is unprocessed, animal dung, charcoal and so forth) for cooking and for heating. The range was: 90.3, with the lowest level of solid biomass (fuel) use in Lagos state, where it was 9.1%, to Benue state (being the highest intensity of use of solid fuels of 99.4 %). Table 4 shows the degree of use of solid fuels, especially wood-fuel, by states/territory in Nigeria.

Table 4: Desertification-related socio-economic conditions (e.g. use of solid fuels) in Nigeria

S. No	State/Territory	2006 Population	Use of solid fuels for cooking (in g)	Access to credit
1	Abia	2,833,999	77.1	4.4
2	Adamawa	3,168,101	97.4	6.9
3	Akwa Ibom	3,920,208	88.8	19.6
4	Anambra	4,182,032	73.9	4.8
5	Bauchi	4,676,465	99.4	5.1
6	Bayelsa	1,703,358	53.5	8.7
7	Benue	4,219,244	95.0	19.6
8	Borno	4,151,193	90.4	7.9
9	Cross River	2,888,966	74.9	13.8
10	Delta	4,098,391	53.5	11.9
11	Ebonyi	2,173,501	82.5	13.7
12	Edo	3,218,332	79.5	8.3
13	Ekiti	2,384,212	69.9	20.7
14	Enugu	3,257,298	80.4	8.7
15	Gombe	2353,879	87.4	1.8
16	Imo	3934,899	85.5	11.7
17	Jigawa	4348,649	95.3	3.6
18	Kaduna	6066,562	87.8	5.3
19	Kano	9383,682	91.6	6.4
20	Katsina	5792,578	98.0	6.1
21	Kebbi	3238,628	99.1	7.1
22	Kogi	3278,487	79.8	13.2
23	Kwarra	2371,089	82.3	19.2
24	Lagos	9013,534	9.1	8.7
25	Nasarawa	1863,275	94.9	9.8
26	Niger	3950,249	84.1	19.9

27	Ogun	3728,098	59.2	10.4
28	Ondo	3441,024	73.5	17.6
29	Osun	3423,535	64.0	24.9
30	Oyo	5591,589	64.0	23.9
31	Plateau	3178,712	89.1	4.4
32	Rivers	5185,400	56.2	4.7
33	Sokoto	3696,999	96.1	5.9
34	Taraba	2300,736	95.9	7.1
35	Yobe	2321,591	96.6	2.0
36	Zamfara	3259,846	98.1	20.8
37	FCT (Abuja)	1405,201	60.4	9.3
	NIGERIA, Federal Republic of	140,003,542		10.7

Sources: Authors' computation from data obtained from; Nigeria, 2007; NBS, 2007a: 31; NBS, 2007b: 74.

Forests as carbon sinks and carbon trading

Owing to the fact that forests serve as a means of absorbing excessive carbon dioxide (CO₂) in the earth's atmosphere, it was recently agreed that forests can be counted as one of the resources that can be traded (i.e. bought and sold) under the global carbon trade sector. Although the details of the buying and sale of forest credits as carbon sinks are yet to be finally elaborated and disseminated, there are reports that some forest communities have started benefiting for this transaction. This provides an opportunity for scaling up afforestation or reforestation programmes in Nigeria, a country that experiences one of the most rapid rates of deforestation in the world.

RESULTS AND DISCUSSION

The findings of this study were that agroforestry is yet to be implemented at a level commensurate to the seriousness of challenges that have been facing Nigeria: socially, environmentally and economically. Per capita agro-forestry practice for farmers and total population by states/territory in Nigeria, as shown in tables (6 and 7), recent (2006) shares of agro-forestry for farmers and total populations by 36 states and Federal Capital Territory (Abuja) as well as the national average were consistently less than a hectare. This provides ample scope for the adoption of agro-forestry by farmers in Nigeria. Additionally, the rapid decrease in the proportion of Nigeria's population employed by or involved in the nation's

agricultural sector seems to have been frequently ignored or downplayed by economic planners in Nigeria. While as high as about 70% of the total population were employed in agriculture in the 1960s and 1970s, a combination of factors perhaps including the promotion of other secondary, tertiary and quaternary (information and communication technologies (ICTs) and related services, the percentage of the nation's total population engaged in agriculture has declined recently to considerable levels (see tables 6 and 7). Considering our knowledge that young people constitute a large proportion of Nigeria's population, the per capita agroforestry for the total population indicates the unexploited potential for agroforestry development i.e. including unemployed youth, who are not currently engaged in agriculture, among other strata of the population. Therefore, it shows that if agroforestry is made attractive through incentivisation schemes, it is capable of attracting unemployed and underemployed youth thereby contributing towards rapid achievement of sustainable development.

Table 5: Forestry and agroforestry land use and population in Nigeria

S. No	State/Territory	2006 Population	Forest reserve (Ha)	Agroforestry (Ha)	% Agro forest to forest reserve
1	Abia	2,833,999	8700	2051	25
2	Adamawa	3,168,101	10011	2374	24
3	Akwa Ibom	3,920,208	31857	25800	80
4	Anambra	4,182,032	32457	5332	16
5	Bauchi	4,676,465	840280	1200	0
6	Bayelsa	1,703,358	na	Na	Na
7	Benue	4,219,244	60175	2234	4
8	Borno	4,151,193	582820	432052	74
9	Cross River	2,888,966	610129	19000	65
10	Delta	4,098,391	78506	2000	3
11	Ebonyi	2,173,501	na	Na	Na
12	Edo	3,218,332	482047	150000	31
13	Ekiti	2,384,212	na	Na	Na
14	Enugu	3,257,298	8524	7498	88
15	Gombe	2,353,879	na	Na	Na
16	Imo	3,934,899	1525	1160	76
17	Jigawa	4,348,649	92000	3000	3
18	Kaduna	6,066,562	613484	6146	1
19	Kano	9,383,682	77702	2186	3
20	Katsina	5,792,578	245100	18900	8
21	Kebbi	3,238,628	340289	17750	5
22	Kogi	3,278,487	540360	5000	1
23	Kwarra	2,371,089	460350	6000	1
24	Lagos	9,013,534	12579	2000	16
25	Nasarawa	1,863,275	na	Na	Na
26	Niger	3,950,249	756906	4956	1
27	Ogun	3,728,098	273118	35000	13
28	Ondo	3,441,024	337336	27153	8
29	Osun	3,423,535	86057	6381	7
30	Oyo	5,591,589	336563	8031	2
31	Plateau	3,178,712	402500	6800	2
32	Rivers	5,185,400	25000	231	1
33	Sokoto	3,696,999	602631	10943	2
34	Taraba	2,300,736	10011	1359	14
35	Yobe	2,321,591	na	Na	Na
36	Zamfara	3,259,846	na	Na	Na
37	Abuja, FCT	1,405,201	na	Na	Na
38	NIGERIA	140,003,542	7959017	812537	574

Sources: NBS, 2006: 311; Nigeria, 2007

Table 6: Per capita agroforestry based on farmers' population in Nigeria by states

S. No	State/Territory	2006 Population	Agric. Population (% of total)	Agroforestry (Ha)	Farmer population	Per capita agroforestry (in Ha)
1	Abia	2,833,999	20.28	2051	574735	0.003569
2	Adamawa	3,168,101	31.23	2374	989397.9	0.002399
3	Akwa Ibom	3,920,208	21.24	25800	832652.2	0.030985
4	Anambra	4,182,032	24.27	5332	1014979	0.005253
5	Bauchi	4,676,465	27.76	1200	1298187	0.000924
6	Bayelsa	1,703,358	28.93	Na	492781.5	
7	Benue	4,219,244	46.92	2234	1979669	0.001128
8	Borno	4,151,193	35.53	432052	1474919	0.292933
9	Cross River	2,888,966	29.97	19000	865823.1	0.021944
10	Delta	4,098,391	20.09	2000	823366.8	0.002429
11	Ebonyi	2,173,501	34.53	Na	750509.9	
12	Edo	3,218,332	17.3	150000	556771.4	0.26941
13	Ekiti	2,384,212	19.91	Na	474696.6	
14	Enugu	3,257,298	28.28	7498	921163.9	0.00814
15	Gombe	2,353,879	24.5	Na	578818.8	
16	Imo	3,934,899	27.59	1160	1085639	0.001068
17	Jigawa	4,348,649	38.34	3000	1667272	0.001799
18	Kaduna	6,066,562	13.83	6146	839005.5	0.007325
19	Kano	9,383,682	10.59	2186	993731.9	0.0022
20	Katsina	5,792,578	24.54	18900	1421499	0.013296
21	Kebbi	3,238,628	31.66	17750	1025350	0.017311
22	Kogi	3,278,487	16.84	5000	552097.2	0.009056
23	Kwarra	2,371,089	8.34	6000	197748.8	0.030342
24	Lagos	9,013,534	0.79	2000	71206.92	0.028087
25	Nasarawa	1,863,275	23.32	Na	434515.7	
26	Niger	3,950,249	22.93	4956	905792.1	0.005471
27	Ogun	3,728,098	9.94	35000	370572.9	0.094448
28	Ondo	3,441,024	21.67	27153	745669.9	0.036414
29	Osun	3,423,535	7.93	6381	271486.3	0.023504
30	Oyo	5,591,589	10.56	8031	590471.8	0.013601
31	Plateau	3,178,712	31.95	6800	1015598	0.006696
32	Rivers	5,185,400	15.94	231	826552.8	0.000279
33	Sokoto	3,696,999	26.7	10943	987098.7	0.011086
34	Taraba	2,300,736	27.64	1359	635923.4	0.002137
35	Yobe	2,321,591	34.15	Na	792823.3	
36	Zamfara	3,259,846	30.33	Na	988711.3	
37	Abuja, FCT	1,405,201	19.27	Na	270782.2	
38	NIGERIA	40,00?		812537	30318019	0.0268

Sources: Computed by this author using data obtained from NBS, 2006; Nigeria, 2007. Notes: B=Poverty incidence measured using criterion of spending US\$1 per day based on adjusted purchasing power parity

Table 7: Per capita agro-forestry by total population (including farmers and others) by states /territory

S. No	State/Territory	Agro forest (Hectares)	2006 Population	Per capita agro forest (Hectares)	Per capita agroforestry (in Ha)
1	Abia	2051	2,833,999	0.000723712	7.23712
2	Adamawa	2374	3,168,101	0.000749345	7.49345
3	Akwa Ibom	25800	3,920,208	0.006581283	65.81283
4	Anambra	5332	4,182,032	0.001274978	12.74978
5	Bauchi	1200	4,676,465	0.000256604	2.56604
6	Bayelsa	na	1,703,358	0	0
7	Benue	2234	4,219,244	0.000529479	5.29479
8	Borno	432052	4,151,193	0.104078996	1040.78996
9	Cross River	19000	2,888,966	0.006576748	65.76748
10	Delta	2000	4,098,391	0.000487996	4.87996
11	Ebonyi	na	2,173,501	0	0
12	Edo	150000	3,218,332	0.046607994	466.07994
13	Ekiti	na	2,384,212	0	0
14	Enugu	7498	3,257,298	0.002301908	23.01908
15	Gombe	na	2,353,879	0	0
16	Imo	1160	3,934,899	0.000294798	2.94798
17	Jigawa	3000	4,348,649	0.000689869	6.89869
18	Kaduna	6146	6,066,562	0.001013094	10.13094
19	Kano	2186	9,383,682	0.000232958	2.32958
20	Katsina	18900	5,792,578	0.003262796	32.62796
21	Kebbi	17750	3,238,628	0.005480716	54.80716
22	Kogi	5000	3,278,487	0.001525094	15.25094
23	Kwarra	6000	2,371,089	0.002530483	25.30483
24	Lagos	2000	9,013,534	0.000221889	2.21889
25	Nasarawa	na	1,863,275	0	0
26	Niger	4956	3,950,249	0.001254604	12.54604
27	Ogun	35000	3,728,098	0.009388165	93.88165
28	Ondo	27153	3,441,024	0.007890965	78.90965
29	Osun	6381	3,423,535	0.001863863	18.63863
30	Oyo	8031	5,591,589	0.001436264	14.36264
31	Plateau	6800	3,178,712	0.002139231	21.39231
32	Rivers	231	5,185,400	4.45482E-05	0.44582
33	Sokoto	10943	3,696,999	0.002959968	29.59968
34	Taraba	1359	2,300,736	0.000590681	5.90681
35	Yobe	na	2,321,591	0	0
36	Zamfara	na	3,259,846	0	0
37	Abuja, FCT	na	1,405,201	0	0
38	NIGERIA	812537	140,003,542	0.005803689	58.03689

Sources: Computed by the author using data from NBS, 2006: 311; Nigeria, 2007.

CONCLUSION

Irrespective of the enormous challenges hampering the achievement of sustainable development in Nigeria, agroforestry is yet to be employed at a level high enough to address the seriousness of the problems (economic: poverty, unemployment, environmental degradation; deforestation and desertification; and disharmonious social institutions). Per capita agroforestry, based on populations of farmers, all people and land area have been and remain very low compared to the seriousness of these challenges. This has been so despite the fact that several trees have proved to be effective in agroforestry practice in the country (see table 8). The near ubiquity of environmental degradation affecting almost all ecological-climatic zones in Nigeria and widespread socio-economic problems provides ample scope for adopting agroforestry to resolve these problems.

Table 8: Selected primary crops commonly cultivated in plantations by zones in Nigeria

Primary crop grown in last 12 months	South South	South East	South West	North Central	North East	North West
Avocado pears	0.5	1.01	0.5	0.45	0.64	0.53
Bananas	1.05	1.07	0.47	0.2	0.11	0.15
Coconut	0.03	0.39	-	0.11	0.04	0.03
Coffee	0.02	0.03	0.11	-	0.02	-
Cotton	0.36	0.14	0.08	0.29	0.63	1.98
Cocoa	1.29	0.34	21.59	0.14	0.03	0.11
Kolanut	0.09	0.25	1.09	0.17	0.15	0.27
Mangoes	0.07	0.86	0.12	0.61	0.1	0.41
Oil palm	1.88	7.3	1.13	0.54	0.06	-
Oranges	0.13	0.83	-	0.49	0.21	0.01
Pineapples	0.09	0.12	0.1	-	0.02	0.02
Plantain	1.54	1.12	0.52	0.02	-	-
Rubber	0.05	0.04	-	0.12	-	-
Sugar cane	0.08	-	-	0.14	0.07	0.14
Wood	0.23	0.05	0.29	-	-	0.02
Paw paw	0.15	0.15	-	0.07	-	-

Sources: NBS, 2005: 79

RECOMMENDATIONS

To successfully implement a vibrant agroforestry programme using agroforestry in Nigeria, the following steps need to be undertaken:

- (i) Undertake mapping of local institutions as a means of identifying existing cooperative organizations and also local institutions that are amenable to transformation into cooperative farmers associations;
- (ii) Enlightenment programmes of local institutions and cooperative organizations on the benefits of engaging in agroforestry;
- (iii) Partnership with stakeholders (especially Nigerian commercial banks, ministries, departments and agencies i.e. MDAs responsible for developing agroforestry, the environment, climate mitigation and adaptation, among others) to scale-up agroforestry development in Nigeria as a means of linking agroforestry development with climate change mitigation and adaptation schemes e.g. carbon trading based on afforestation or reforestation;
- (iv) Creation and management of special agroforestry programmes, and so forth. There is need to explore the regional characteristics of agroforestry development in ways that are capable of matching the level of agroforestry with seriousness of sustainable development challenges. Similar analysis could use land area and related variables (type of trees and their suitability to specific problems among others).

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