

THE AGROFORESTRY SYSTEMS OF WEST AFRICA: THE CASE OF NIGERIA

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ABSTRACT

Notwithstanding the enormous revenues from oil, some of the factors fuelling the continuous economic stagnation in the Nigeria center around the neglect of renewable natural resource sector such as agriculture and forestry. While several efforts were made in the last decades of the 20th century through national agricultural programs to revitalize the sector, over dependence on massive imports of fertilizers and pesticides created policy failures and environmental deterioration in the form of reduced water resources, and migration of rural population to urban areas. In spite of these anomalies, agroforestry stands as a means of halting the vicious circle of deforestation, soil erosion and other environmental problems facing the ecological zones of the country. This technique as traditionally practiced in Nigeria has the potentials to address slash and burn agriculture and current anthropocentric forces that are responsible for degradation. It provides a tool for accelerated economic improvement in rural livelihood in a country where over half of the population reside in the countryside. So far, only limited effort has been made in current research to showcase the state of traditional agroforestry systems and practices in Nigeria. This paper examines the practice of agroforestry in Nigeria. Emphasis is on previous initiatives, success stories among communities. The environmental and economic benefits of the technique are also presented. This will be followed with a synthesis of the findings and policy recommendations.

Keywords: Agroforestry systems, environmental and economic benefits, communities, rural livelihood, policy, Nigeria

INTRODUCTION

Background Information and the Issues

Nigeria ranks among the most enterprising nations in Africa and her potential as an exporter of agro-industrial products and manufactured goods continues to draw major interests from the international business community. At the pinnacle of her economic power last century, Nigeria was one of the most highly sought destinations for Global multinationals in search of a vibrant terrain for investment. The ubiquitous energy radiated by her economic success prompted by oil revenues was felt on different areas within the orbit of international capital. The country accounts for 54 percent of West Africa's population and 51 percent of its Gross Domestic Product (GDP). In Nigeria oil generates 80 percent of government revenue and 10.6 percent of GDP at factor cost. However, three decades after the country's economic miracles, Nigeria is ranked as one of the poorest countries in Sub-Saharan Africa, despite the oil revenue it generates. At the same time, agriculture is still the activity of all Nigerians constituting 40 percent of the GDP. While the current policy framework emphasizes the development of non-oil sector, especially agriculture, Nigerian agriculture faces a set of challenges common across Sub Saharan

Africa such as limited capital, small size landholding, declining soil fertility, deforestation and unsustainable land use (WTO 2004).

Notwithstanding the enormous revenues generated from oil, some of the factors fuelling the continuous economic stagnation in the Nigeria center around the neglect of renewable natural resource sector such as agriculture and forestry and the focus on oil in the country. Nigeria was once covered by widespread vegetation comprising of humid tropical forests in the south and savannah grasslands in the north. A great percentage of this luxurious vegetation has been cleared by the pressures mounted by human activities. Presently, forest reserves cover about 10 percent of the nation, mostly of the savannah woodland type. The southern rain forest, the source of the country's timber resources, covers only two percent of the total land area of Nigeria. It is being depleted at an annual rate of 3.5 percent. The annual rate of change in total forest area from 1990-2000 stood at 4.0 million hectares (CIA 2000; FORMECU 1996; FAO 2001; Mantu 2001; UNEP 2002).

The continuous degradation of the forest reserve base has major effects on other segments of the economy. This can be manifested with the rapid disappearance of forest cover leading to erosion, loss of biodiversity, soil degradation, and unfavorable hydrological changes (Aweto 2000, 2001; Aweto and Ekuigbo 1994). The forest reserves have for sometime been seriously neglected and have received little or no improvement in terms of investment and management (FAMNR 1996b; FDF 1998).

While several efforts were made in the last decades of the 20th century through national agricultural programs to revitalize the sector (FAMNR 1996a), overdependence on massive imports of fertilizers and pesticides created policy failures and environmental deterioration in the form of reduced water resources, and migration of rural population to urban areas (Pro Natura 2001)

Notwithstanding these anomalies, agroforestry stands as a means of halting the vicious circle of deforestation, soil erosion and other environmental problems facing the ecological zones of the country. In the literature agroforestry refers to the combination of agriculture and forestry within a farming system. As a land-use formula, it serves the diverse needs of individual farmers in harnessing the natural resources around them, as this cannot be reconciled by the traditional crop system. It involves the combination of trees and crops that increase the medicinal, environmental, and economic value of land with the much-needed profit and food security (Arbor 2001; Griffiths et al. 1998; Huxley 1999; Zin.Ping and Dawson 2004)

Reconnaissance survey has been carried out within the ecological zones of Nigeria to evaluate the various land use practices in order to determine the agroforestry models most suitable to each of them (Mende 20003). In another study, Salami (2003) confirms that the traditional agroforestry system can be better maintained in the tropical countries such as Nigeria with different soil types to enhance fertility. He showed how soil mineral nutrients are effectively used in agroforestry through mycorrhizal inoculation and strategic pruning. Elsewhere, Adesina (1999) estimated the potentials of agroforestry in the mitigation of CO₂ emission in the country. Using a simulation model, Aturamu (2005), demonstrates the feasibility of a nation wide agroforestry policy option for Nigeria. This technique as traditionally practiced in Nigeria has the

potentials to address slash and burn agriculture and current anthropocentric forces that are causing degradation. Agroforestry has gradually enhanced the socioeconomic livelihood of rural Nigeria by boosting income earning potentials, human welfare, food and nutritional security as well as provision of fuel wood, fodder for animal consumption and employment (Mende 2003). In addition to these, the ecological benefits include watershed protection, soil stabilization and improvement and carbon sequestration.

Apart from these potentials, there exist several limitations. The choice of a suitable model in Nigeria is compounded by the location specific nature of the various models as a number of factors such as different ecological zones limit the adoption of a single model for the entire country (Mende 2003). So far, only limited effort has been made in current research to showcase the success stories and the state of traditional agro-forestry systems and practices in rural communities of Nigeria.

In light of these, recent interest in agroforestry has been generated against a background of rapidly deteriorating problems of forest exploitation, and conservation in the forest ecosystems of Nigeria. Considering that conventional methods of forest regenerations, were previously used as ways of combating the problems with dismal results (FAMNR 1996a,b; FDF 1998). The best approach is through a universal application of agro-forestry techniques in communities so that forest destruction is arrested at the source (NERC 2002; Aiyelaagbe 1998; Griffith 2000; Bohringer 2001; Klein 2002; Aweto et al. 1992).

PURPOSE OF THE PAPER

This paper examines the practice of agroforestry in Nigeria with emphasis on previous initiatives, success stories among communities. The environmental and economic benefits of the technique are also presented. The prime objective of the paper is to present a simple approach for analyzing agroforestry systems in developing nations along the West coast of Africa. The second objective is to update the literature on agroforestry issues with a special focus on Nigeria. The third objective is to provide a tool for decision-making.

METHODOLOGY AND THE STUDY AREA

The research methodology stresses a mix scale approach involving the descriptive analysis of the agroforestry issues, initiatives and brief descriptive statistics, and photographic display of field images on community efforts in some parts of the study area. The methodology involves a review and presentation of socioeconomic and environmental trends based upon secondary data sources. The methodological framework guiding this research also drew largely from a keyword literature search for the relevant documents on agroforestry in West Africa. As a result, much of the analysis in this paper has a descriptive focus. The literature search also relied on information from databases and abstracts that are presently available. Based upon keywords related to the agroforestry issues, community initiatives, and efforts, several articles were located. In addition, the information search relied on fieldwork related to the topic in Southern Nigeria and access to archives of the Federal Republic of Nigeria. From the author's field knowledge of West Africa

and study location of Nigeria, the writer then became aware of more articles with relevance to the topic.

THE STUDY AREA: NIGERIA

Nigeria occupies one of the largest land areas in the West African subregion and it covers a land area of 932,769 km (UNTCP1998). It shares boundary with the Republic of Cameroon and Chad in the east and Niger in the north, the Republic of Benin in the west, and the Atlantic Ocean in the south. Nigeria's population stands at more than 120 million (Pro Natura 2001; Nigerian Population Commission 1999; Mantu 2001; CIA 2004; UNPTC 1998), with an average density of 95.9 persons per square kilometer. The population density is, however, not uniformly distributed over the country's geographic area units. The population is chiefly agrarian, with almost 70 percent residing along rural areas with soils of high capability for farming.

Land is one of the major factors of economic production and it is accorded a high value in all parts of the country. The core categories of land use in the country can be grouped as forest land, grass land, woodland, agricultural land or farmland, and other lands. Other lands consist of land for urban consumption, mining, and for infrastructural development. Agriculture is responsible for about 40 percent of landuse and it is the major factor in deforestation. Nigeria's natural vegetation mirrors the nation's diverse climate and topography. The vegetation cover can be classified into two major types: the tropical forests, which cover one-sixth of the country and found mostly in the south, and the savannahs, located mainly in the north (Adesina 1999). Table 1 shows the current vegetation types of the country with some of the changes.

Table 1. The Status of Vegetation In Nigeria From 1976 to 1995.

Vegetation types along the ecozones	1976/78	1993/95	Changes (km ²)		Changes
	Area (km ²)	% of country	Area (km ²)	% of country	
Dominantly Shrub/Grasses	113880	12.5	81694	9.0	-32186
Dominantly Trees/Woodlands/Shrubs	151293	16.6	81386	9.0	-69907
Forested Freshwater Swamp	18316	2.0	16499	1.8	-1817
Undisturbed Forest	25951	2.9	12114	1.3	-13837
Dominantly Grasses	12549	1.4	11983	1.3	-566
Mangrove Forest	9994	1.1	9977	1.1	-17
Shrub/Sedge/Graminoid Freshwater Marsh/Swamp	16899	1.9	9248	1.0	-7651
Montane Forest	6762	0.7	6759	0.7	-3
Riparian Forest	7402	0.8	5254	0.6	-2148
Graminoid/Sedge Freshwater Marsh	4882	0.5	871	0.1	-4011
Alluvial	487	0.1	269	0.1	-218

COMMUNITY SUCCESS STORIES IN DEALING WITH THE PROBLEMS

Apart from the problems of deforestation and environmental degradation emanating from the agricultural practices in Nigeria, in the last several years communities at the margin in the southern states of Delta, Oyo, and Abia have undertaken various agroforestry related projects with a view to enhancing natural resources management and economic livelihood of their communities. Some of the efforts range from integrated farming, education, and peri-urban agroforestry.

Integrated Farming

There has been a growing effort among the communities along the Niger Delta area of Uroboland to promote integrated farming based upon the techniques of agroforestry. To actualize this initiative, the farmers in the community protect and integrate into their farms the oil palm tree (Aweto 2000, 2001). This tree is retained on the farm because of its economic importance. Oil palms also feature prominently in cultivated plots of cassava, maize, cocoyam and other field crops. While the retention of oil palms in cultivated arable land in the area serves agroforestry, however the beneficial value of the tree from an ecological standpoint is to protect the soil against erosion and provide communities with fuel wood. Considering the benefits, the community recognizes integrated farming as a tool for sustaining organic matter and nutrient buildup in the soil so as to improve soil fertility for posterity (Aweto and Ekuigbo 1994; Aweto et al. 1992).

Joint Venture in Education

Seeing the viability of sustainable agriculture for rural communities, in 1987 the Leventis Foundation through a joint program with the European Union established the Ilesha Agricultural School to boost interest in sustainability within the agricultural sector. The school located on 234 hectares of land that was previously cleared for farming offers training in basic farming practices and farm management. The institution integrates agroforestry techniques with the existing knowledge of traditional land use systems. Previous knowledge and hands on experience gained during the course helped provide farmers with the right skills for a successful practice. During the program, the farmers not only acquired land as part of the course requirements, but they raised money from the produce they sold. This enabled them to purchase the essential farm tools for finishing the program (Pro Natura 2001). See Table 2 for a summary of the benefits of the program.

Table 2. Some of the benefits of the Agroforestry Program in Ilesha.

Arboretum-to produce seeds and teach grafting techniques	Inter-cropped plot- to maintain soil fertility
Alley cropping practice	2 ha orchard planted
10 ha forest- to manage natural resources and collect wild seeds	Soil erosion control
Fuel wood production in the agro-pastoral systems	The beneficiaries of the program include 243 men and 64 women.

Agroforestry Efforts in Peri-urban Cities

The agroforestry practices used in the southeastern state of Abia includes multistory home gardening and border planting. The reason why this method is used more is the security it provides in food production, the variety of crops obtained, the capacity to boost soil fertility, and the much-needed income. The essence of border planting on private- and government-owned land is enormous. While it enhances the aesthetic beauty of the area through boundary allocation, it helps control water and wind erosion. The other benefits are that it encourages live fencing, the supply of fodder, and fuel wood. The choice of plants for this method includes timber species, fruit trees such as coconut, oil palm, mango, and bitter leaf. Under the labor division of production women and children focused their involvement in weed management, soil fertility maintenance and the watering of plants, while men helped in the production of multipurpose trees and shrubs (Odurukwe 2004). Table 3 contains a list of the prevailing agroforestry practices in the area.

Table 3. Forestry practices in Abia State.

Agroforestry Practice	Percentage of the Population
Multistory home garden	31
Woodlots	11
Amenity planting	39
Live fences	53
Alley cropping	0
Improved fallow	5
Taungya system	18
Dispersed multipurpose trees	68
Border planting of trees	76
Trees and shrubs on eroding sites	58
Wildlife agroforestry	9

FINDINGS AND DISCUSSIONS

The results indicate that prior to the emergence of agroforestry, some of the ecological zones in Nigeria have experienced considerable depletion of their forested areas over years and this may be attributed to a host of factors associated with anthropocentric activities in the use of land in the country. This problem is evident considering the growing incidence of environmental degradation emanating from sectors of the economy such as agriculture and the overdependence on oil revenues. Another important point to note is that the rural nature of the country and their dependence on subsistence farming and the ecological ramifications is quickening the gradual spread of agroforestry among communities in other to arrest the problems.

To deal with some of the problems, several research have been carried out including a reconnaissance survey on all the ecological zones of Nigeria to evaluate the various land use practices in order to determine agroforestry models most suitable to each zone. Community based efforts in the three southern states reveal a mix of similarities and divergence in their methods, priorities and accomplishments. The farmers in Uroboland area of the Niger Delta

practiced integrated farming that uses palm trees along side other crops to maintain soil fertility (Aweto 2000). In Ilesha, the Leventis Foundation through a joint venture provided a major boost to education when it backed up its commitment to sustainability by establishing Ilesha Agricultural School to educate farmers. One of their major accomplishments involves the design of agroforestry nursery that distinguishes medical, fruit, and wood trees (Pro Natura 2001). Elsewhere, a large majority of households in Abia State showed their awareness of the positive impacts that trees and agroforestry systems bring to their environment (Odurukwe 2004). They were involved in community-based efforts to improve soil fertility and reduce erosion as well as enhance food security and income earning.

In light of these findings, it is evident that analysis of agroforestry systems of West Africa with a focus on Nigeria stands as a valuable tool for decision makers and resource managers in gauging the problems posed by the activities prompting loss of forest cover, rural poverty and environmental degradation in the country's ecological zones. Given the lack of research in showcasing the potentials of community-based agroforestry in minimizing these problems, this study helps fill an important gap in the literature. The analysis of agroforestry practices in the three southern states, offers decision makers the tools to identify the environmental and economic benefits as a road map in the design of viable indices that will guide managers in crafting the appropriate strategies for dealing with the problems (Zinping and Dawson 2004).

RECOMMENDATIONS

To address some of the concerns that were identified in the current research, four recommendations ranging from education and research to policy reform are hereby made as part of the remedies.

1. Promote Education and Research Efforts

Forested land areas in Nigeria's different ecozones have experienced enormous degradation due to human activities for decades. This threat can be minimized by building upon the success stories of these communities by providing training and assistance in managing the forests for sustainable uses (NERC 2002). This can be attained through education and research programs to acquaint farmers with the right practices to boost food security and techniques suitable for their respective ecozone in addressing the problems. The authorities and institutions can also work closely with these communities to develop action plans anchored on local needs in the areas of soil management and host of other priorities (Franzel et al.2001).

2. Encourage Local Involvement

Nigeria's population is predominantly rural in close proximity to forested areas and the most fertile soil. The extent and nature of forest decline and number of agricultural programs that failed to revitalize the food sector of the economy in the past are clear indications of the negation of rural communities who are much closer to the problems. The authorities should involve local communities in agroforestry programs in the areas of harvesting and processing of forest products by offering assistance that can help develop village tree plantations in wood poor areas dependent on wood fuels for cooking and on poles and timber to meet local fencing and building

needs. This will be quite viable in communities that are yet to embrace the techniques of agroforestry (Haggar 2001).

3. Provide Financial Support and the Right Climate for Income Generation

The successful implementation of agroforestry programs as shown in this research requires availability of seedlings. The provision of adequate funding to secure a prompt supply of seedlings is highly indispensable in that it enables communities procure seedlings for tree planting initiatives. This effort can be supplemented by instituting programs that help farmers and agroforestry teams gain knowledge and the skills to market their products in order to improve the sociophysical and economic situation of people living on forests and farming activities. This will enhance income-earning potentials from small holder production and sale of products (Bohringer 2001).

4. Policy Reforms

The history of program design and implementation with regards to agriculture and forestry in Nigeria show that they are adhoc and reactionary in nature. Urgent matters such as deforestation, food scarcity and rural poverty are only accorded topmost priority on the policy agenda when these problems have reached a calamitous proportion. This can be attributed to over reliance on obsolete policy instruments that are out of sync with the emerging ecological uncertainties. The country's ministry of agriculture lacks a sophisticated network of policy infrastructure capable of eradicating problems facing agriculture and forestry. The right instruments such as incentives for rural farmers in agroforestry programs as well as a command and control mechanism to regulate land use activities should be incorporated in existing policies as part of the reforms (Mande 2003; Aturamu 2005; FAMNR 1996a, b).

CONCLUSIONS

This paper has explored agroforestry systems of West Africa with a major focus on the experiences of three southern states of Nigeria. The paper reviewed the issues and role of anthropocentric activities such as farming practices and land use in fueling the growing incidence of environmental degradation in the area. Considering the rate at which the country has been losing her forested land areas, agroforestry has gradually emerged as a viable tool to minimize the trend. To analyze these issues the paper used a mix-scale approach involving the descriptive analysis of agroforestry trends from governmental sources and field images. The results indicate that prior to the emergence of agroforestry, some of the ecological zones in Nigeria experienced considerable depletion of their forested areas over the years and this may be attributed to a host of factors associated with anthropocentric activities in the use of land in the country.

The analysis of community-based efforts in agroforestry reveals the growing adoption of agroforestry among some of the communities in Uroboland, Ilesha, and Abia state with sustained environmental and economic benefits. To build upon the successes stories in the communities in order to minimize the problems of poverty, food scarcity and environmental degradation, the paper offered four recommendations based upon education and research, local involvement, funding, and policy reform. Having gone this far, it is evident that that this paper offers resource

managers and the decision makers the appropriate tools and an essential road map for the design of a viable index for tracking community efforts in environmental protection. This is necessary in dealing with the problems of poverty and lack of economic opportunities at the margin in rural Nigeria.

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