

## EVALUATION OF TRADITIONAL AGROFORESTRY PRACTICES IN SOUTH-EASTERN NIGERIA

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### Abstract

Traditional agroforestry was traced from the holy bible as a divine creature given to Adam and Eve as their source of food, medicine, shelter, clothing and wood. Traditional agroforestry knowledge is based on experience often tested over long period of use, adapted to local culture and environment, dynamic and changing, and lays emphasis on minimizing risks rather than maximizing profit. Traditional agroforestry practices have the potential to actually help developing countries, particularly Nigeria to grow food, produce timber and conserved biodiversity with zero chemical input, minimized erosion, control pest and diseases, decrease dependency on fossil fuel, and provide for the needs for an expanding global population. The paper evaluates traditional agroforestry practices in South-Eastern Nigerian. The natural vegetation of the region is moist tropical rainforest with many tree species which include timber species and non timber forest produces. The farming system in South-Eastern Nigeria has shown a relationship between population pressures, land and intensity of tree cultivation. The agroforestry practices common in the region are homegarden shifting cultivation, management of multipurpose trees, living or live fence, boundary planting farmland trees etc. The main challenges in the adoption of traditional agroforestry system are the land tenure system, long gestation of tree and government policies.

**Keywords,** Evaluation, traditional agroforestry, homegarden, land tenure system,

### Introduction

Agroforstry is defined as a dynamic, ecologically based natural resources management system that through the integration of trees in farmland and range land, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels (ICRAF,1997). Agroforestry a popular concept among agricultural, forestry and environmental scientists can enhance the rural development needs in Africa. It is also an age-old approach to land use and old practice in many Africa and Asian countries, It popularity stems from increasing evidence that trees and shrubs can be managed to significantly enhance, and guarantee the sustainability of agricultural systems (Aju and Popoola, 2005).

A good agroforestry practice or variant must achieve mutual socio-cultural interaction as a condition for acceptability and sustainability. Aju and Popoola (2005) stated that proper understanding of agroforestry system should be seen as the first step in the evolution of any new agroforetry technology. Catterson (1981) stated that packaging of agroforestry techniques for dissemination to rural people should begin with a review of the traditional practice of the people. Traditional agroforestry is variously referred to as indigenous agroforestry (Udofia 2010). This paper mainly based on the traditional agroforestry systems practice in southeast geopolitically zone of Nigeria.

Hutterer (1984) stated that traditional agroforestry started in prehistoric time when hunting and gathering deliberately or accidentally dispersed seeds of highly valued fruits trees in the vicinity of their campfire. These seeds inter germinate and grow to produce fruits for food, and were managed in mixture of natural grown timber trees and other herbal plants. According to Udofia (2010) traditional agroforestry was traced from the holy bible as a divine creature given to Adam and Eve as their source of food, medicine, shelter, clothing and wood needs. Traditional agroforestry practices have been in place before the advent of the modern agroforestry systems. Traditionally, local farmers were combining trees + crops + animals on the same land at a time. Agroforestry is a new concept in Nigeria, which only improved the traditional farming systems (Ogar, 2009).

### Importance of traditional agroforestry

Consequent upon the threatening ecological problems resulting from inappropriate land management around the world there has been growing interests in finding alternative methods of farming to achieve sustainability in food, wood and environmental conservation as opposed to industrial farming methods, which were considered unsustainable. Industrial farming is considered destructive to the general environment, thus becoming less popular even in developed countries that are now clamoring for organic agriculture (Udofia, 2010).

Thus, one approach in reversing the trend was to build upon the existing traditional methods or indigenous knowledge in agroforestry, which

evolved over millennia of human acquisition of skills in diverse agro-ecosystems (Udofia 2010). Traditional agroforestry knowledge is based on experience often tested over long period of use, adapted to local culture and environment, dynamic and changing, and lays emphasis on minimizing risks rather than maximizing profit (Das and Roy, 2006). While modern agricultural practice are destructive to the environment by initiating soil erosion and being chemical based, traditional methods are able to sustain diverse culture for centuries. According to Udofia (2010), traditional agroforestry practices have the inbuilt potentials to actually help developing countries, particularly Nigeria to grow food, produce timber and conserved biodiversity with zero chemical inputs, minimize erosion, control pest and diseases, decrease dependency on fossil fuel, and provide for the needs for an expanding global population (Deshnukh, 1986). Traditional agroforestry practices in sustainable production of food, livestock production and wood, as well as conserving environment in Nigeria are outlined as follows: shifting cultivation, homegarden, nomadic pastoralism, shelterbelts, wind breaks, farmland trees, woodlots, fodder bank, Living fence, boundary planting, beekeeping, sericulture, aqua-forestry, multipurpose tree and helicultural practices (Udofia, 2010).

#### **Overview of traditional agroforestry practice in South east Nigeria**

South-Eastern Nigeria lies between longitude 6° 40' and 8° 30'E and between latitudes 4° 50' and 7° 2'N. The area is made of five homogenous Igbo speaking states (Abia, Anambra, Enugu, Ebonyi and Imo), the region falls within the high rainforest belt of Nigeria and is characterized by high population density and largely unconsolidated soils (Iheanacho and Udah 2010). The natural vegetation of the region is moist tropical rainforest with many tree species which include timber species such as *Chlorophylla excelsa* (Iroko), *Triplochiton scleroxylon* (obeche) and non timber forest products such as *Pentaclethra macrophylla* (oil bean), *Treculia africana* (bread fruit) *Dacryodes edulis* (native pear) and *Gnetum africanum* (Okazi).

#### **Homegardens**

Homegarden is described as agroforestry practice that combines physical, social and economic functions on the area of land around the family home (Udofia *et al.*, 2012). It is also an intimate multistory combination of various trees and crops around homestead (Nair, 1989). In South-Eastern Nigeria, homegardens are commonly located close to the households as one of the more intensively cultivated parts of the overall farm (Udofia 2010). Homegarden in South East region is similar to what is obtained under shifting cultivation except that more food

crops and possibly more woody species are found at a given piece of land. In addition, fodder, goat, sheep, poultry and pig may be integrated into the farming system. Homegarden is a low cost production system with a constant and relatively high productivity. The multi-story structure and species diversity of homegardens allows almost complete coverage of the soil, fertility are maintained by the household refuse, crop residue and animal manure (Okigbo, 1980, Udofia 2007). This implies that the structure of trees, shrubs and ground covered in the homegarden recreates some properties of nutrient recycling, soil protection and spaced above and below the soil surface to be found in forest (Fernandes and Nair, 1986).

The farming system in South-Eastern Nigeria has shown a relationship between population pressure, land and intensity of tree cultivation. The homegarden in this region contain a variety of tree species including oil palm, banana, plantain, breadfruit, oil bean, pawpaw, pear etc intercropped with cassava, yam, maize and other arable crops (Udofia, 2007).

In southeastern zone, growing population pressure is accomplished by decreasing farm size and declining soil fertility. Trees and Shrubs in homegardens provide cooler and more pleasant environment that is better than the physical working conditions. According to Arnold (1987) increases in population density and compound areas account for up to 59 percent of crop output and a growing proportion of total farm income. The proportion of income generated from tree crops rises to a share nearly equal to that from arable crop. Livestock becomes an increasingly important part of the compound system, both as sources of income and as manure. However, as population density continues to increase, yields and returns to labour eventually decline to the point at which farmers have to turn increasingly to non-farm sources of income. As labour has to move off-farm, a lower input management of the compound area is adopted, leaving them under a cover in which trees and other perennials predominate.

Homegarden plays very important socio-economic and cultural roles in rural and urban societies (Udofia 2011). Homegarden also help to fulfill dietary and social needs (Gillespie *et al.*, 1993, Okeke and Akachukwu, 2001). It is a way of producing fresh vegetable, fruits, others crops which are harvested when required and at very close proximity (Okeke and Akachukwu 2001). It is cheaper to grow one's own vegetable, fruits and other crops and even keep small livestock. It is also means of generating additional household's income. Input investment in homegarden is low and the surplus products are disposed of profitably to one's requirement (Greensill, 1975).

**Table 1: Common tree and shrub crops in homegardens in South-Eastern Nigeria**

| Common name          | Scientific Names                             | Family          |
|----------------------|--|-----------------|
| Bread fruits (ukwa)  | <i>Treculia Africana</i>                     | Moraceae        |
| Banana/Plantain      | <i>Musa spp</i>                              | Musaceae        |
| Oranges              | <i>Citrus spp</i>                            | Rutaceae        |
| Pawpaw               | <i>Carica papaya</i>                         | Caricaceae      |
| Avocado pear         | <i>Persea americana</i>                      | Lauraceae       |
| Bush mango           | <i>Irvingia gabonensis, Irvingia wombulu</i> | Irvingiaceae    |
| Cashew               | <i>Anacardium occidentale</i>                | Anacardiaceae   |
| African pear         | <i>Dacryodes edulis</i>                      | Bursaceae       |
| Guava                | <i>Psidium guajava</i>                       | Myrtaceae       |
| Star Apple (Udara)   | <i>Chrysophyllum albidum</i>                 | Sapotaceae      |
| Jack fruit           | <i>Artocarpus heterophyllus</i>              | Moraceae        |
| Gmelina              | <i>Gmelina arborea</i>                       | Verbanaceae     |
| Mango                | <i>Mangifera indica</i>                      | Anacardiaceae   |
| Ogirisi              | <i>Newbouldia laevis</i>                     | Bignoniaceae    |
| Soursop (Spiny)      | <i>Annona muricata</i>                       | Annonaceae      |
| Oil bean seed        | <i>Pentaclethra macrophylla</i>              | Leguminosae     |
| Locust tree          | <i>Parkia bilgloboza</i>                     | Fabaceae        |
| Oil palm             | <i>Elaeis guineensis</i>                     | Arecaceae       |
| Coconut              | <i>Coccoloba nucifera</i>                    | Arecaceae       |
| Caster Seed          | <i>Ricinus communis</i>                      | Euphorbiaceae   |
| Kola                 | <i>Cola nitida, Cola acuminata</i>           | Sterculiaceae   |
| Bitter kola          | <i>Garcinia kola</i>                         | Sterculiaceae   |
| Bitter leaf          | <i>Vernonia amygdalina</i>                   | Asteraceae      |
| Monkey cola          | <i>Cola lepidota and Cola pachycarpa</i>     | Sterculiaceae   |
| Velvet               | <i>Dialium guineense</i>                     | Caesalpinaceae  |
| Aidan plant          | <i>Tetrapleura tetraptera</i>                | Mimosaceae      |
| Pepper fruit         | <i>Denettia tripetala</i>                    | Annonaceae      |
| Walnut               | <i>Plukenetia conophora</i>                  | Euphorbiaceae   |
| Uturukpa             | <i>Pterocarpus santalinoides</i>             | Papilionoideae  |
| Achi                 | <i>Brachystegia eurycoma</i>                 | Caesalpinioidea |
| Ubemgba              | <i>Canarium shweinfurthii</i>                | Bursaceae       |
| Pigeon pea           | <i>Cajanus cajan</i>                         | Fabaceae        |
| Scent leaf           | <i>Ocimum gratissimum</i>                    | Lamiaceae       |
| Yellow mombin        | <i>Spondias mombin</i>                       | Anacardiaceae   |
| Uda                  | <i>Xylopiya aethiopica</i>                   | Annonaceae      |
| Ehuru                | <i>Monadora myristica</i>                    | Anonaceae       |
| Uha                  | <i>Pterocarpus soyauxii</i>                  | Papilionoideae  |
| Uda (African pepper) | <i>Xylopiya aethiopica</i>                   | Anonaceae       |
| Akparata             | <i>Afzelia bella</i>                         | Leguminosae     |
| Jack seed            | <i>Canavalia ensiformis</i>                  | Leguminosae     |

Source: Balogun and Kalejeiye (2005); Umeh 2012

### Multipurpose trees

Multipurpose trees refers generally to all the shrubs and trees which are deliberately cultivated and managed perennially for more than one benefits or uses. Economic consideration and environmental services are usually reasons for growing or maintaining multipurpose trees in South-Eastern Nigeria. Essentially multipurpose trees provide products for food, fodder, fuel wood, medicine, timber, shade and windbreaks (Udofia 2010). In addition, they provide indirect benefits such as biological nitrogen fixation, vascular arbuscular mycorrhizal symbiosis, reduction in soil and increase in water protection (Pathak *et al.*, 2006).

The fundamental philosophy in growing multipurpose trees is the pursuit of sustainability of

products and increase total output while stabilizing the ecology of production system. This implies that multipurpose trees remain in functional production maximally for several years until they are felled and regenerated (Udofia, 2011). Some trees commonly used for their multipurpose in Nigeria include *Manifera indica*, *Cetrus spp*, *Psidium guajava*, *Carica papaya*, *Chrysophyllum albidum*, *Pentaclethra macrophylla*, *Moringa oleifera*, *Dacryodes edulis*, *Irvingia gabonensis*, *Irvingia wombulus* and *Garcinia kola*. Men are responsible for planting multipurpose trees.

### Living fences

Rural farmers in South-Eastern Nigeria have in the past centuries planted trees and shrubs as living

fences. These are more or less planted fortifications of permanent or semi-permanent nature used to protect cropland and pastures from marauding animals. They are also used to mark small cultivated plots, from livestock enclosure and to demarcate areas where general access is discouraged (Nuga and Ihenacho, 2011).

According to Evans (1992), trees are planted close together (0.15 – 0.5 meter) to maintain the fence role and yield firewood, fodder, vegetable and other products. Udofia (2010) reported that the practices are common in the tropic, using tree and shrub species which propagates easily from cutting. Apart from their protection functions, living fences may impose the productivity of small plots through soil enhancement abilities (Nuga and Ihenacho, 2011). Popular living fences shrubs and tree species includes *Lasienthera africana*, *Pterocarpus erinaceus*, *Vernonia amygdalina*, *Persea americana*, *Gmelina arborea*, *Moringa oleifera*, *Albizia lebbek* and *Psidium guajava*.

### Boundary planting

This is a systematic live planting along farm boundaries. Apart from its use in demarcation of lands, boundary trees supply small poles, fodder and fuelwood when pruned or thinned. *Newbouldia leavis*, *Eleais guneensis*, *Dacroydes edulis* and *Mangifera indica* have been good choice across various agro-ecological zones including South Eastern Nigeria (Udofia 2010).

### Shifting cultivation

In southeast Nigeria, shifting cultivation has traditionally been practiced and is the most efficient use of farmer resources. Trees and other vegetation are felled to lie uniformly to form a fuel bed, which is allowed to dry for three or more weeks. The fields are then burned a few weeks before the end of dry season and varieties of crop such as *Manihot esculenta*, *Discorea spp*, *Tetracapidum conoformum*, vegetables, etc are planted as soon as the rain set in (Udofia 2010). The essence of shifting cultivation according to Whitemore (1993) is to clear a patch of forest or bush, allow it to dry to a point where it will burn well and then set it on fire. The plant nutrients thereby become available to plant in the ash. After one or two cropping seasons when the field begin to fall in yield the patches as abandoned to allow secondary forest grow (bush fallow). The fallow vegetation maintain soil productivity and the process of clearing and burning provide conditions for crop cultivation, recurring minimal inputs for soil preparation and weeding (Arnold, 1987).

In southeast Nigeria, during the bush fallow period some root crops, plantain, fruit trees, fodder, banana, spices, fodder and shrubby trees are planted to provide firewood, food, medicine and building materials. Planting of *Cocos nucifera*, *Elaeis guineensis*, *Irvingia gabonensis*, *Pentaclethra*

*macrophylla*, etc are common. Through indigenous agroforestry knowledge, shifting cultivators have great skill and sophistication (Boerboom and Wiersum; Denslow and Padoch, 1988) they know when the field should be left fallow for successful regrowth and when to return for another cycle of cultivation after a few years. Traditional agroforestry are also able to select compatible crop tree/combination.

### Farmland trees

The practice of growing farmland, trees is quite old and does not seem to change for centuries (Pattak *et al.*, 2006). In most farming communities in South east, it is a common traditional farming practice to isolate a few individual trees or shrubs when clearing the land. The trees left are mainly those of economic and environmental importance (Udofia, 2010). Apart from the fact that trees on farm land provide fuel wood and some shade to crops, they also help to improve soil quality for improve crop harvest. Agroforestry is found to impact significantly upon soil fertility (Edwards, *et al.*, 1990). Farmland tree commonly allow to stand in this system are *Elaeis guineensis*, *Dactyladenia baterii*, *Chrysophyllum albidium*, *Mangifera indica* *citrus spp*, *Gmelina arborea*, etc.

### Heliculture

Heliculture is the practice of snail farming. Traditionally snails have featured prominently on the menu of rural people of Nigeria, particularly the southeastern. Snails provide an important source of protein. According to Cobbinah (1993) snail meat contains 12.16% protein and all the amino acid needed by humans. Snails are found in abundance in high forest zones, therefore, people living within and around such forest-rich areas have basically depended on snail meat as a major ingredient in their diet (Akinyemi *et al.*, 2003). Heliculture is a popular traditional agroforestry practice because of its low initial investment cost, limited skill, small space of land, short reproductive cycle, thus, creating opportunity for small scale income generation activities to rural farmers. Common snails reared include *Achatina fulica*, *Achatina achatina* *Archachatina marginata*. *Helix pomota* (Omolse, 1998).

### Beekeeping

Beekeeping is a very popular traditional agroforestry practice in Southeast especially Enugu State, as small land holders or peasant farmers can easily incorporate bee hives in their farming systems. Simple hives made of wood which require little capital input and low maintenance are used and beekeeping does not compete seriously with forest crops since it occupies very small space (Arowosoge and Ajewole, 2005). More so, bees contribute immensely in agroforestry crop

production through pollination service to produce large, well formed fruits, vegetable, nut and seeds (Ayers, 1992).

### **Mycosilviculture**

Mycosilviculture involves the combine production of mushroom and trees under a single land management. Right from ages edible fungi have continued to form part of human nutrition. According to Etukudo (2000), mushroom are potential contributors to the world's food supply because they have the ability to transform nutritionally valueless waste into highly usable nutritionally foods. In southeast Nigeria mushroom cultivation is managed on dead shrubs and trees that were failed during land clearing operation. During growing season of crop plants, farmers commonly collect edible mushrooms from their farms as long as the dead wood remain in place and this may last throughout the cropping season.

### **Challenges of traditional agroforestry**

In the South East geopolitical zone, Farming system comprise smallholder but land use is based on the customary land tenure system of communal (family) and individual ownership. Food crops are produced through shifting cultivation a system in which land is cultivated and continuously for two or three years and left to fallow for five or more years to enable soils recuperate (Gbadebo, 1995). Farm unit vary in size between 0.4 – 4ha but are not contiguous. Farms generally have low energy inputs and low operating capital causing land to receive unstable prices for their products (Osemeobo, 1987a). In production of cocoa, rubber, oil palm, groundnut which is grown in the Southeast region faced the problem of unstable price. For example, the slump in rubber price (1980 -1989) and cocoa (1984 – 1999) made farmers destroy large area of rubber and cocoa to provide land for food crop production in Abia State. The farming system faces mounting problems: shortage and high cost of pesticides, unstable price for the products, scarcity of farm labour and low crop yield due to the stagnation in Agricultural production technology (Gbadebo, 1985).

According to Gbadebo (1995) challenges of traditional agroforestry was inability of agroforestry to compete with sole cropping system and inherent abilities of trees to compete with food crop for light, water, space and soil nutrients and its limitation to only lands under individual ownership. It insures extra costs in terms of labour, protection and maintenance (pruning and thinning).

The fallow periods are no longer long enough to support short rotation tree production for domestic needs. Even though agroforestry is suitable land use management strategy for the poor , smallholders are unable to meet the financial burden of land reform. Because trees tie down agricultural land, there appear little market for industrial based

plantation trees at the moment. Osemeobo, (1984; 1987b) have confirmed that farmers are not willing to plant trees for industries except when there are regular market for the products, and incomes from trees compare favourably with agricultural crops like cocoa, rubber and oil palm. Extension officers are inadequate to take information forward to the farmers. They do not know the silviculture and ecology of trees to be introduced into farming systems. Most of them are not trained on the job on how best to sell agroforestry packages to farmers.

### **Prospect**

Traditional agroforestry is an appropriate form of land use in southeast Nigeria that introduce tree plantation into traditional farming systems. The reason why this method is used more is food security it provides, the variety of crop obtained, the capacity to boost soil fertility and the income. The essence of boundary planting on private and government owned land is that 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, as well as supply of fodder and fuel wood. The choice of plants for this method include timber species, fruit trees such as coconut, oil palm, mango and bitter leaf (Deshmukh, 1986) which is the only means of conserving the biodiversity.

Under the labour division of production women and children focused their involvement in wood management, soil fertility maintenance and the watering of plants, while men help in the production of multipurpose trees and shrubs (Odurukwe, 2004). Tree selection favoured trees with thin crowns and characterize for fast growth, fire resistance, coppicing and nitrogen fixation. Contiguous tree planting definitely hold farmers land. (Edmund, 2005). The gestation period for trees and the length of fallow period the farmer can afford would assist in planning such land use because farmers usually own up to 3 to 10 farms units in different location (Osemeobo, 1987b).

### **Conclusion and Recommendation**

The practice of integrating wood perennial crops with arable crop production is a common practice among the farmers of Southeast Nigeria. Traditional agroforestry practice, practiced in southeast Nigeria are home gardens, multipurpose tree, farm land tree, boundary planting, heliculture, mycosilviculture, beeking and living fencing, practiced for its security in food production, reduces soil erosion, enhance the soil fertility and income generated through sale of products. It is recommended that interventions through introduction of improved woody species for agroforestry purposes in the zone should recognize the local people's agroforestry needs and how land tenure and how the farmer obtain the trees the plant, and recognition of traditional agroforestry as an

investment option. The government should develop traditional agroforestry policy that should not be confined to the agricultural or forest sectors; it needs a place of its own. More emphasis should be placed on traditional agroforestry research and development of the homegarden system that is presently been much utilized in Southeast,

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