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Review

Perceptions and practices of Agroforestry in sustainable land use systems in Nigeria

Onoriode G. Marculey[1]* and Rudolf A. C Esiri[2]

[1]Department of Social and Environmental Forestry, College of Forestry and Fisheries, University of Agriculture, Makurdi, P. M. B. 2373, Makurdi, Nigeria.

[2]Department of Forestry and Wildlife Management, Faculty of Agriculture and Agricultural Technology, Federal University , P. M. B. 5001, Dutsin-Ma, Katsina State, Nigeria.

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Agroforestry has been defined as a dynamic ecologically based natural resources management system that through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. This paper highlighted Agroforestry practices and concepts in sustainable land use systems. The benefit derivable from the interface between forest trees and agricultural crops are enormous. They include the optimal use of land for both agricultural and forestry production on a sustainable basis including the improvement of the quality of soil. This is in addition to the socio-economic benefits that are accruable from agroforestry. Indeed the advantage of agroforestry is all encompassing and germane to a sustainable production system and livelihood.

Key words: Agroforestry, practices, concepts, sustainable, land use systems.

INTRODUCTION

Agroforestry practices offer practical ways of applying various specialized knowledge and skills to the development of sustainable rural production systems. Agro-forestry is recognized as a land use option in which trees provide both products and environmental services. In agroforestry systems, the trees grown on different farmlands in the same locality when aggregated can bring about improved wooded situation thereby enhancing environmental protection (Otegbeye, 2002).

In most agroforestry systems, the trees grown do not have the usual silivicultural recommendations in terms of spacing (Owonubi, 2002). Given the reality of awareness among the farmers of multiple land use management, the need to improve on the existing agroforestry practices becomes necessary in the face of increasing population and limited nature of land. Rural people have been discovered to have a wealth of indigenous knowledge and have incorporated trees in production systems in areas where they lived for a very long period of time (Evans and Alexander, 2004). Agroforestry has both protective and social-economic benefit. Kang (1993) reported that besides direct agricultural benefit, trees exhibit social - economic values. The benefit of the tree components derived by farmers from agroforestry was evaluated from a social-economic and ecological perspective (Anderson and Sinclair, 1993). The social - economic benefits of agroforestry can be evaluated in terms of productivity, stability and sustainability.

The objective of this paper is to highlight the importance and concepts of Agroforestry as a veritable tool in sustainable land use systems.

*Corresponding Authors. Email: onos.gm22@yahoo.com

Table 1. Agroforestry practices among farmers in Lafia Local Government Area, Nasarawa State, Nigeria.

Types of agroforestry practices	Lafia North	Lafia South	Lafia West	Lafia East	Respondents	Percentage
Row/hedges	11	8	6	5	30	25
Trees on farm land	2	4	6	7	19	15.8
Scattered trees on farmland	13	10	16	14	53	44.2
Wind break	4	8	2	4	18	15
Total	30	30	30	30	120	100

Source. Alao and Shuaibu (2011).

TYPES OF AGROFORESTRY SYSTEMS

There are various types of agroforestry systems, some of which are listed as follows:

1. Trees on farmland: The farmers plant or retain trees on their farmland, both for food, income, soil improvement and environmental amelioration and for shade during the harsh weather period.

2. Parkland also known as scattered trees: Parklands are characterized by well grown scattered trees on cultivated and recently fallowed land (CTA, 2003). These parklands develop when crop cultivation on a piece of land becomes more permanent. The trees are scattered far apart so that they do not compete with their neighbours. Parklands consist of indigenous trees like *Parkia biglobosa, Vitellaria paradoxa, Tamarindus indica, Azadirachta indica,* etc.

Parkland trees have the following characteristics:They are deep rooting, preferably reaching ground water table. They have capacity to fix nitrogen Produce litter that decomposes well and add as much as possible to soil organic matter.

3. Alley cropping as described by (CTA, 2003) is a system in which strips of annual crops are grown between rows of trees or shrubs. Lining up the woody plants in hedges should ensure that there is little interference with cultivation of the field. The extension of alley cropping to include animal husbandry by the International Livestock Research Institute (ILRI) has led to the concept of alley farming (Okali and Submerge, 1985).

4. Wind breakers and shelter belts. Their major purpose is primarily to control wind erosion. The species used include, *Azadirachta indica, Anacardium occidentale, Mangifera indica, Musa species, Khaya senegalenses,* etc.

Alao and Shuaibu (2011) have shown that these practices are commonly practiced by farmers as shown in Table 1.

CONCEPTS OF AGROFORESTRY

Agroforestry has been defined as a dynamic, ecologically based natural resources management system that through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels (Leakey, 1996).

Agroforestry, generally refers to land used system or farming system in which trees or shrubs are grown in association with agricultural crops, pastures or livestock and in which there is ecological and economic interaction between the trees and other components. Agroforestry practice is a distinctive arrangement of components in space and time. It is a specific local example of a practice, e.g Taungya. It is characterized by environment, plant species, and arrangement, management, social and economic functions.

RANGE AND CLASSIFICATION OF AGROFORESTRY

The range and classification of agroforestry practices are the following.

Agro silvicultural

Agrosilviculture was aptly regarded as a variant of taungya to be practiced outside of forest reserve (Nwoboshi, 1982). It envisages multiple land use involving arable and tree crops, but the emphasis here is shifted to the agricultural crops which are of dominant interest. Indeed, agrosilviculture could be likened to shifting cultivation (Nwoboshi, 1982) except that the fallow vegetation is planted with economic trees whose gestation period is equivalent to the fallow period.

Silvo – pastoral

These are mostly trees with pastures and livestock. It is essentially the practice of animal production along with trees and pastures.

Shifting cultivation

Shifting cultivation was the farming system widely

Table 2. Uses and Importance of Agroforestry to farmers in Lafia Local Government Area, Nasarawa State, Nigeria.

Uses of trees	Respondents	Percentage
Additional income	23	19.2
Human nutrition	8	6.7
Reduce weeding	6	5
Fuel, stakes and timber	34	28.3
Shade for livestock	9	7.5
Medicinal herbs	4	3.3
Wind break	9	7.5
Soil improvement	27	22.5
Total	120	100

Source. Alao and Shuaibu, 2011.

embraced by peasants in the tropics in the past (Greenland, 1974). This form of farming is no longer common, because rapid population growth has increased food demand tremendously to the level that fallow periods had to be reduced and the forestry sector had to give way gradually to agricultural needs. This has led to un-precedented deforestation, lowering of soil productivity, loss of biodiversity, increased soil erosion and weed infestation, and consequently lowered crop yield (Okigbo, 1984a).

Unfortunately, the continued relying on expanding cultivated areas has not been able to contribute substantially to resolving the food crisis, because not all the available land is equally productive (Okigbo, 1984b). It is not even economical on the long run. Utilization levels of land and water resources are close to maximum potentials and future growth will be possible only through better management of a fixed resource base (Banuri and Holmberg, 1992).

Intensive rather than extensive use would be the way out of the log jam (Fagbemi, 1997). In order to achieve the twin goal of satisfying increasing demands for food as well as retain the biologically beneficial effects of shifting cultivation, many workers have in the last two decades advocated the development of land use systems based on age-old practices of intentionally mixing trees in crop animal production fields (Nwoboshi, 1980).

Mixed farming

Mixed farming system practiced by majority of the farming communities indicated the existence of traditional agroforestry system common in the semi-arid zones of Nigeria (Oboho, 1989). Integration of trees into farming system and subsequent modification of the system could be easy with earlier understanding of the importance of trees in the farming system. Similarly, the practice of animal production could make the intensification of fodder bank system an easily acceptable agroforestry model. With soil fertility, maintenance as the major problem of the farming system, adoption of appropriate agroforestry system will be easy. Hayashi et al. (1995) opined that since trees have traditional value and importance among the farmers in the agro-ecological zone the modification of their integration within the farming system could be readily adapted and accepted by the farmers. Fruits, fodder and fire wood species are common on the farmlands. Improvement on these species will make it readily acceptable.

ADVANTAGES OF AGROFORESTRY

It should be noted that the attempts being made under agroforestry are to optimize the use of land for agricultural production on a sustainable basis at the same time meeting other needs from forestry (Fagbemi, 2002). Nitrogen-fixing and non-nitrogen-fixing trees thrive adequately in agroforestry with annual crops, presents a farming system in which arable crop yields can be enhanced. The tree rooting system brings about stability that can lead to soil conservation. What is needed would be mutual interaction and proper management techniques that would reduce the adverse effects that may result when trees are integrated into agro-ecosystem (Connor, 1983).

Various authors (Kang et al., 1990; Young, 1986; Rocheleau and Dianne, 1987) were of the view that successful agroforestry practices benefits the farmers in the following ways:

a. Consistent restoration of the fertility status of the soil through the recycled litter deposition and nitrogen fixing mechanism of trees.

b. A variety of products, firewood, poles, woodcraft, fodder, medicinal herbs and food for livestock and man respectively.

c. Prevention of wind and water erosion by trees acting as wind break and intercepting the raindrop impact on the soil respectively.

d. Improving the micro-climate effect of the immediate and adjourning environment.

e. Restoration of water table to an absorbable level for crops use.

f. Increased income opportunities.

g. Increased economic stability

h. Reduce cost for establishing plantation

i. Increased ability to manage for sustained yield.

Also, Alao and Shuaibu (2011) from their studies have shown in Table 2, the inherent advantages in agroforestry accruable to farmers

CONCLUSION

The role of Agroforestry in sustainable land use system cannot be over emphasized. Agroforestry practices offer

practical ways of applying various specialized knowledge and skills to the development of rural production systems. It evolves a synergy between agricultural production and forestry that is beneficial for increased food production, sustainable wood production and improvement of the quality of the soil. This is a win-win situation.

The advantages of Agroforestry are quite quantum. Agroforestry, among other benefits strive to optimize the use of land for agricultural production on a sustainable basis and at the same time meeting other needs from forestry.

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