Assessment of Agroforestry Practices in Ago-Owu Forest Reserve, Ayedaade Local Government area, Osun State, South-western Nigeria

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ABSTRACT: Agroforestry is a collective name for land use systems and practices in which woody perennials are integrated with food crop and forestry, either in a spatial mixture or in a temporal sequence and there are normally both ecological and economic interactions between woody and non woody components. This study investigated types of agroforestry practiced, the impact of agroforestry on the lives of people, assessed the impact of agroforestry on the environment, and identified possible problems associated with agroforestry system in Ago-owu Forest Reserve, Ayedaade Local Government area of Osun State, Nigeria by collecting samples from Mokore, Ajegunle and Alabameta villages using verified methods. Sampling intensity of 10% for population below 500, 5% sampling intensity for population between 500 and 1000 and 2.5% sampling intensity for the population above 1000. A total of eighty (80) questionnaires were administered, thirty copies of questionnaires were distributed both in Mokore and Ajegunle and twenty in Alabameta. The result was analysed using Descriptive Statistics such as frequency tables, percentages, bar chart and Chi square. The result showed that 47.5 % of the respondents are involved in Agri-silviculture. The benefits derived from agroforestry was also unfolded, they are medicinal (11.25%), Income generation (52.5%), production of food crop (33.75%) and non-timber forest products generation (2.5%). The impact of agroforestry to the environment includes Soil erosion control (48.75%), Soil stabilization (31.25%), and (Stable environment 20%).

Agroforestry systems often involve management of trees and shrubs and utilization of their products. The trees and shrubs have impact on other components in the land use system. Hence Agroforestry systems are normally characterised by ecological and economic interactions between woody perennials and crops or livestock (ICRAF, 1992; Agboola, 1980). Agroforestry has proved to be a potent means of tackling the challenges of global food production on a sustainable basis (ICRAF, 2000). Agroforestry shares principles with intercropping, both place two or more plant species (such as nitrogen-fixing plants) in proximity and both provide multiple outputs. Therefore, overall yields are higher and because a single application or input is shared, cost are reduced (Wojtkowski, 2002). Agro-forestry might simply be "tree on farm" hence agro forestry farm forest and family forest can be broadly understood as the commitment farmers, alone or in a partnership, towards the establishment of forest on their land (Oram, 1993). It enhances sustainable resource/utilization by improving the supply of food and being environmentally friendly (FAO, 1987; Spore, 1995) It has been described as a very old system which has been practiced by farmers, particularly those characterized by low level of technology and resource inputs and mostly in areas believed to be unsuitable for profitable monocropping

systems (Sekhwela, 1990). Agroforestry types are: Agrisilvicultural system, Silvopastoral system and Agrosilvipastural system. Agrisilvicultural system is the simultaneous husbandry of forest tree crops and food crop. Silvopastoral system it is the combination of trees and pasture or grazing of domesticated animals on pasture rangeland on farm. This study explored the types of agroforestry practiced, the impact of agroforestry on the lives of people and environment; and identified possible problems associated with agroforestry system in Mokore, Ajegunle and Alabameta villages within the Ago-owu Forest Reserve, Ayedaade Local Government area of Osun State.

MATERIALS AND METHODS

Study location: Ago-owu Forest reserve in Ayedaade Local Government area of Osun State is located between latitude 779922°N - 829917°N and longitude 449955°E - 519948°E. Ago-owu Forest Reserve has 32,116 hectares in the high Forest area.
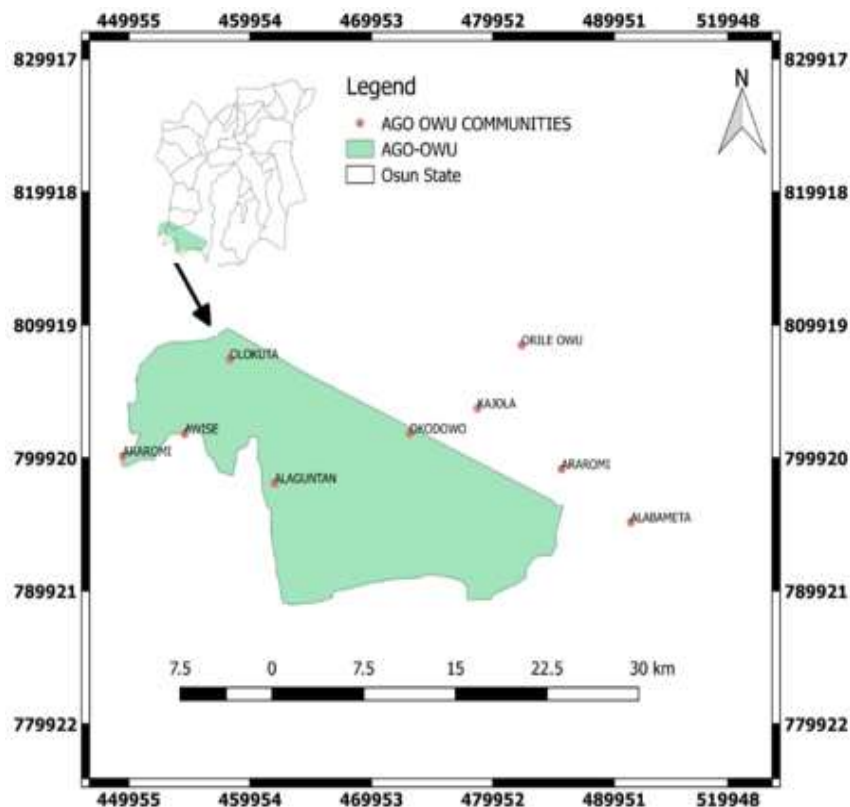

Fig 1: Map of the study area showing the surrounding communities

Sampling procedure, Data collection and Analysis: A preliminary study was carried out for this study, and six villages were identified in the communities (Fig 1). They are Mokore, Ajegunle, Alabameta, Elewe, Alaguntan and Okodowo. Purposive sampling was used to select three villages: Mokore, Ajegunle, and Alabameta because they are the areas where Agroforestry farming is being practised. With the population of 300 in Mokore, 300 in Ajegunle and 200 in Alabameta. Sampling intensity adopted by Diaw *et al*., (2002) was further used to select respondents for the study. This indicated that 10% sampling intensity for population below 500, 5% sampling intensity for population between 500 and 1000 and 2.5% sampling intensity for the population above 1000. In view of this, 30 questionnaire was administered in Mokore, 30 in Ajegunle and 20 in Alabameta, making a total of 80 respondents.

Data was collected from both primary and secondary sources. Primary data used for this study is structure questionnaires administered to the respondents in the study area. Secondary data were obtained from journals, internets, unpublished projects and proceeding of conferences.

Data analysis: The result was analysed using Descriptive Statistics such as frequency tables, percentages, bar chart and Chi square.

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RESULTS AND DISCUSSION

Table 1 shows the socio-economic characteristics of the respondents. It is revealed that majority (87.5%) of the responding farmers were males while 12.5% were females. This implies that there is dominance of male gender in farming activities, who adopted agroforestry practice, and this is an indication that male gender are more than the females in farming profession. This agreed with Alfred (2001) who stated that male headed household usually out-number female headed household in most communities in Nigeria. The study on age distribution showed that majority (43.8%) of the respondents are within the ages of 41-50 years, this was followed by respondents within ages of 31-40 years with 30%, while those within the ages of 20-30 recorded the least percentages of 6.3%. On the overall, it is discovered that most of the respondents are within the active age. This agreed with Salawu *et al.,* (2001) and Ayeloja and Adedapo, (2010) who stated that the highly productive age in agricultural and all forestry activities fall with the age group 31-50 years. Marital status of the respondents revealed that majority (81.8%) of the respondents were married while the least percentage of 1.3% was divorced.

Table 1: Socio-economic characteristics of the respondents

Characteristics	Frequency N = 80	Percentage %
Gender		
Male	70	87.5
Female	10	12.5
Total	80	100
Age		
20-30	5	6.3
31-40	24	30
41-50	35	43.8
Above 50	16	20
Total	80	100
Marital Status		
Single	8	10
Married	65	81.3
Divorced	1	1.3
Widow	6	7.5
Total	80	100
Educational Status		
No Formal Education	14	17.5
Adult Education	9	11.3
Primary Education	17	21.3
Secondary Education	36	45
Tertiary Education	4	5
Total	80	100
Religion		
Christianity	39	48.8
Islamic	38	47.5
Traditional	3	38
Total	80	100
Occupation		
Trader	15	18.8
Farmer	64	80
Civil Servant	1	1.3
Total	80	100

Source: Field Survey, 2021

This indicates that most of them were of high responsibilities and thus expected to possess high level of commitment. Majority (45%) of the farmers had secondary education, while those who had tertiary education have the least percentage of 5%. The result on educational status of the respondents revealed that a large percentage of the respondents had primary and secondary education level while some had no formal education. Meanwhile, a very few percentages of respondent possess tertiary education. This supports the work of Swanson (2008) that education enable farmers to make decision regarding production and managing their lives successfully to cope with their everyday problems and their opportunity. In terms of occupation, 80% of respondents are full-time farmers, while the least percentage of 1.3% combined farming with civil service work. The involvement of traders and civil servants indicates the motivation of the whole Ayedaade Local Government Area population towards the production of agroforestry. This situation encourages the introduction and application of new technologies which will be easy with the civil servants and investment with the traders. Figure 2 show the types of agroforestry practiced by the respondents. It is evident that the respondents practice agroforestry and the types of agroforestry practiced are Agrisilviculture, Agrosilvopasture, Silvopasture in which agrisilviculture has the highest percentage of 47.5% of respondents while the least is silvopasture with the percentage of 18.8%. This could be observed in all parts of the territory, and this corresponds with the general situation in the savanna ecological zones of African (Torres, 1983; Raintree, *et al.,* 1984; Kerkhof, 1990; Nair, 1993).

Impact of Agroforestry on Livelihood: Table 3 reveals the impact of agroforestry on livelihood of the respondents in the study area. The Chi-Square analysis conducted indicated that the number of years that respondents practice agroforestry, depends on the types of agroforestry practiced. (Chi-Square = 14.57*, df = 6 and P-level = 0.024). All respondents practiced agroforestry. Out of 38 respondents that practiced Agrisilviculture only 3 have been practicing for 0-5 years, 24 respondents have been practicing for 6-10 years while 11 respondents have been practicing for 10-15 years. Fifteen (15) are doing Silvopasture out of which 2 have been practicing for less than 5 years, 11 for 6-10 years practices Silvopasture and 2 practicing for 10-15 years. Twenty-seven (27) respondents practiced Agrosilvipasture and out of which five (5) have been practicing for less than 5 years, 11 for 6-10 years, 6 for 10-15 years and 5 for 15-20 years. This indicates that the practice of agroforestry in the study area was real with different Agroforestry practices for over 10 years. This further explains the fact that

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livelihood in the study area have been enhanced in last 10 years. This agreed with the findings of Ogar, (1992) who confirms that livelihood depends on sustainable rural development in most places where agroforestry is being practiced.

Table 4: Chi- Square Table

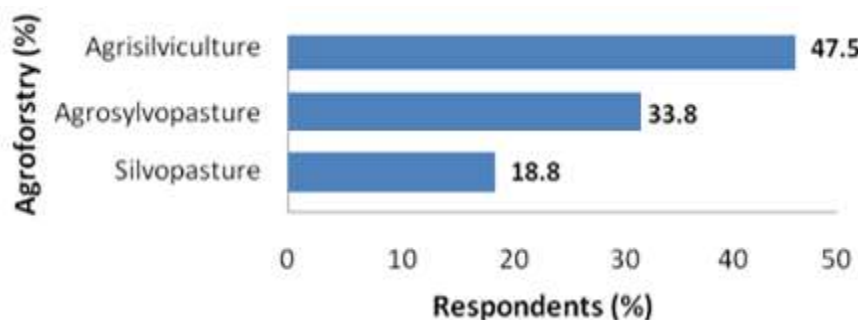| Do you practice agroforestry	Value	Df	Sig.
Pearson Chi-Square	14.579a	6	0.024*
Likelihood Ratio	15.816	6	0.015
Linear-by-Linear Association	0.881	1	0.348
N of Valid Cases	80		

*Significant (P≤0.05)

Fig 2: Types of Agroforestry practiced in the study area

Table 3: Agroforestry and Livelihood

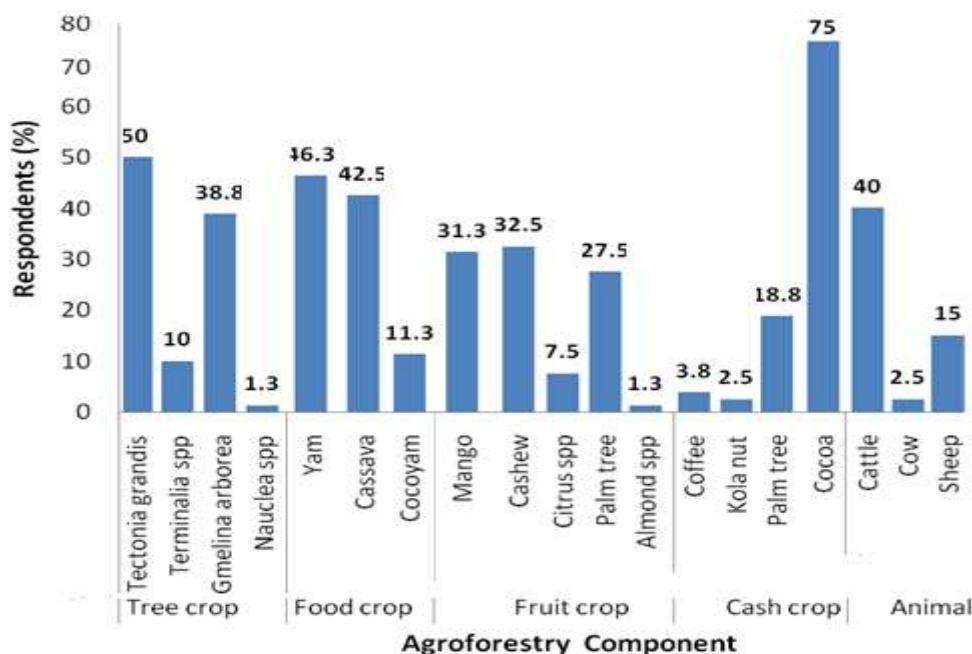| Do you practice agroforestry	Which type of agroforestry is practiced in this community	How long have you been practicing it				Total
		0-5	6-10	10-15	15-20	
Yes	Agrisilviculture	3(30)	24(52.17)	11(57.89)	0	38(47.5)
	Silvopasture	2(20)	11(23.91)	2(10.52)	0	15(18.75)
	Agrosilvopasture	5(50)	11(23.91)	6(31.57)	5(100)	27(33.75)
	Total	**10(100)**	**46(100)**	**19(100)**	**5(100)**	**80(100)**

Fig 3: Agroforestry components in the study area

The components of agroforestry in the study area are shown in the Figure 3. They include tree crops, food crops, fruit crops, cash crops and animals. The tree crops include *Tectonia grandis, Termilania spp, Gmelina arborea* and *Nuaclea spp* with 50%, 10%, 38.8% and 1.3% respectively. In which *Tectonia grandis* has the highest percentage 50% while *Nuaclea spp* has the least percentage of 1.3%. It is discovered that tree planting remains sources of timber and other economic purposes, the respondents in the study area

do not grow trees for the purposes of their produce but mainly to serve as shade, against erosion and demarcation of their farms. This supported the findings of Lasco (1992) who said trees may be easy to spot on the plains of Africa but often overlooked as a source of income for farmers. The major food crop of the respondents is yam with the percentage of 46.3% while the least is cocoyam with the percentage of 11.3% of the respondent. The major fruit crop of the respondents is cashew with the percentage of 32.5% while the least is almond spp with the percentage of 1.3% of the respondents. The implication of this is that there will be high supply and availability of cashew fruit crops within the community. However, due to the subsistent nature of the respondents the cashew may not be further processed to other products such as cashew nuts. By this result there ought to be increase in cocoa production and products such as tea and coffee in the study area but for the unavailability of processing machines, the raw materials are mainly collected to other parts of the Country where the processing machines are available. The major animal reared by the respondent in the study area is cattle with the percentage of 40% while the least is cow with the percentage of 2.5% of the respondent. The rearing of livestock was further incorporated into agroforestry by the farmers. The number of farmers keeping livestock and the types of livestock kept are summarized in figure 2 which revealed that a total of three livestock types consisting of different local species are reared. The cattle were the mostly reared in the study area. This could be because of availability of grazing field for the cattle and the waste from the cattle also serves as manure for the crops. This corroborated the work of Balogun (2009) that cattle (animal) wastes are used as manure for crops forming a quality ecosystem.

Benefits of Agroforestry on Environment: Table 5 Shows Agroforestry benefits and the kinds of benefits derived from the practice by the respondents in the study area. Majority 52.5% of the farmers indicated that agroforestry practice brings income while the least 2.5% indicated non timber forest product.

Table 5: Benefits derived versus Agroforestry benefits

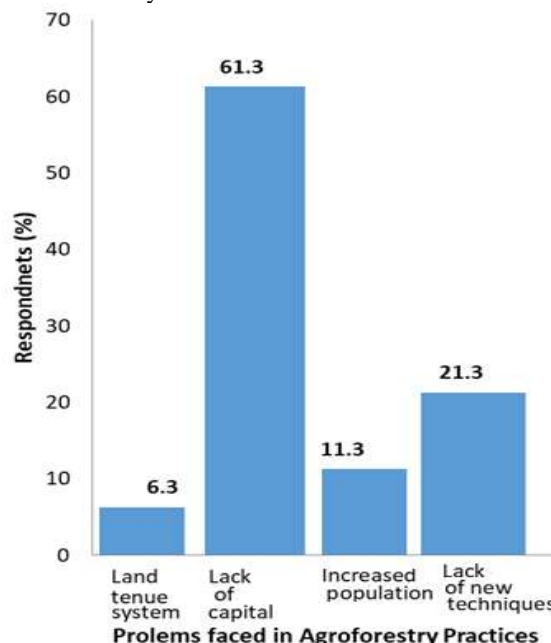| Do you derive any benefits from the practices of Agroforestry?	Benefits Derived				Total
	Medical benefit	Income generation	Production of crop	Non timber food forest produces	
Yes	9	42	27	2	80
No	0	0	0	0	0
Frequency Total	9	42	27	2	80
Percentage	11.25	52.5	33.75	2.5	100

All these benefits make the practice of Agroforestry sustainable in the study area. Agroforestry practices hold more benefits which result into diversification of income such that if one of the benefits failed there is possibility to be secured by other benefits. This finding was also supported by Thangata and Alavalapati, (2003) who stated that farmers were interested in planting food crops on their farms because of their short-time cultivation and income availability.

Impacts of Agroforestry on Environment: Table 6 showed the impacts of Agroforestry on Ayedaade environs. Farmers affirmed that Agroforestry practice have various positive impacts on their immediate environment such as Soil erosion control, Soil stabilization, and stable environment. This is in support of Abujamin *et al.,* (1984) that agroforestry impacts their environment through mulching to control soil erosion for organic matter to maintain soil fertility.

Table 6: Agroforestry practices and Influences

Agroforestry influences	How does it influence			Total
	Soil Erosion Control	Soil Stabilization	Stable Environment	
Yes	39	24	16	79
No	0	1	0	1
Frequency Total	39	25	16	80
Percentage	48.75	31.25	20	100

Problems encountered n Agroforestry practices: In the practice of agroforestry, there are problems encountered by farmers.

Fig 4: Problems encountered in agroforestry practices

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Figure 4 reveals various problems encountered by farmers in the study area, among which are the problems of land tenure system, lack of capital, increased population, and lack of new techniques. It is evident from this study that lack of capital is a major (61.3%) problem. This study suggests that farmers in the study area needs fund to survive the practice of agroforestry likewise new techniques. This agreed with the findings of Okorio and Nsita, (2000) who stated that lack of capital and inadequate knowledge on new techniques was the major problems facing agroforestry and can be solved by improving agroforestry extension services to the farmers.

Conclusion: Agrisilviculture system was mostly practiced in the study area. All respondents in the study area practiced agroforestry with different types for over 10 years. The highest impact of Agroforestry on the environment is soil erosion. Males are more involved in agroforestry practices, the highest educational level of most of the respondents is secondary education. This explains why most of the farmers merely operates subsistence farming while a very few or no respondents carry out farming for commercial purposes. The major problem encountered by the farmers is lack of capital. It is recommended that government should assist farmers to enhance adoption of agroforestry practices by granting the farmers loans and other credit facilities. By providing seedlings of trees to farmers, government can encourage the practice of agroforestry among the farmers.

Government, NGOs, and generous individual should provide modern machines to farmers if not free incentives but at a subsidized rate. This will enable farmers to process their raw materials into finished and refined products and enhance the farmers various agroforestry businesses. Farmers' awareness in agroforestry technologies should be improved through mass media programmes.

REFERENCES

Abujamin, AS. Abdurachman, and Suwardjo, M. (1984) Contour grass strips as low cost conservation practice. In proceedings soil erosion and its countermeasures. 11 19 November 1984, Chiang Mai, Thailand

Agboola, AA (1980) Effect of different cropping systems on crop yield and soil fertility Agroforestry. Science Publishers. ISBN 978-1-57808-217-9.

Alavalapati, JRR; Luckert, MKG; Gill, DS (2003). Adoption of Agroforestry Practices: A case study from Andhra Pradesh, India. *Agroforestry Systems* 32 (1): 1-14

Alfred SDY. (2001). Socioeconomic and psychological factors affecting the adoption of Agricultural innovation by farms household in Kogi state Nigeria. Dissertation. Federal university of Technology, Akure Nigeria; 2001.

Ayeloja and Adedapo Ayo (2010): Assessment of Willingness to Participate In Urban Forestry Development In Yenagoa, Bayelsa-State J. Food. Agric. 6: 84-96.

Balogun, F (2009). Agroforestry and its impact http/www.Fao.Org/Ao145.

Diaw, K. Blay, D and Adu Anning, C. (2002). Socio - Economic Survey of Forest Fringe Communities: Krokosua Hills Forest Reserve. A Report Submitted to the Forestry Commission of Ghana. 86p

FAO (Food and Agricultural Organisation) (1987). Tree growing by Rural people, Forestry Paper No. 64, FAO Rome, Italy.

ICRAF, 1992. A Selection of Useful Trees and Shrubs for Kenya: Notes on Their Identification, Propagation and Management for Use by Agricultural and Pastoral Communities. Nairobi: ICRAF.

ICRAF (International Center for Research in Agroforestry). (2000) Path to Prosperity through Agroforestry. ICRAF's Corporate Strategy 2001-2010. ICRAF, Nairobi, Kenya. 43p.

Kerkhof, P. (1990) Agroforestry in Africa: A Survey of Project Experience, ICRAF, Nairobi, Kenya

Losco, R. (1992). Fundamental agroforestry syllabus. UPLB, College, Laguna.

Nair, PKR. (1989). *Agroforestry Systems in the Tropics.* Kluwer Academic publisher, Dordrecht. The Netherlands. 491pp.

Nair, PKR. (1993). *An introduction to Agroforestry*. Kluwer Academic publisher. International Centre for Research in Agroforestry (ICRAF).

Okorio J, and Nsita S. (2000). The role of agroforestry in wood and energy production in Uganda.

Ogar, W.N. (1992). "Agroforestry: The Key to Sustainable Rural Development in Cross River State", Proceedings of the 22nd Annual

Conference of the Forestry Association of Nigeria, Kano, pp.98-105

Oram, P (1993). Global Perspective on Population, Resources and Agricultural. Production. Keynote Paper, proceedings of the 7th Australian Agronomy Conference, Adelaide: Australian Society of Agronomy.

Raintree, JB; Thomson, J; Van-Maydell, H (1984). Agroforestry in the West Africa Sahel, National Academy Press, Washington DC

Sckhwela, M. (1990). Agroforestry: Technical Aspects and Benefit Analysis in the Contest of land.

Spore, (1995) No. 47 Technical Centre for Agriculture and Rural Cooperation (CTA). Pp 5 – 7. The Netherlands.

Swanson, F. (2008). Global review of good agriculture extension and advisory service practical, pq3135

Torres, F. (1983). "Agroforestry: concepts and practice". In Hoekstra, D.A., and Kuguru, F.M. (eds) Agroforestry Systems for Small-Scale Farmers. Proceedings of the ICRAF/BAT Workshop held in Nairobi in September 1982, ICRAF, Nairobi, Kenya, pp.27-32

Wojtkowski, PA (2002) Agro-ecological Perspectives in Agronomy, Forestry, and *National Agroforestry Centre. USDA National Agroforestry Center (NAC).* 2nd edition.