

FOREST MANAGEMENT TECHNIQUES AND PARTNERSHIP REQUIRED BY FARMERS FOR SUSTAINABLE DEVELOPMENT IN NORTH CENTRAL NIGERIA

BY

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Abstract

This study identified forest management techniques required by farmers for Sustainable Development in North Central Nigeria. Four research questions and one null hypothesis were developed to guide the study. Descriptive survey design was adopted for the study. The study was carried out in North Central States of Kogi, Benue and Nasarawa, Nigeria. The target population was 933 made up 512 registered farmers (foresters) and 421 extension agents. The sample for the study was 433 respondents purposively sampled to obtain 312 farmers and 121 extension agents were used for the study. A 35 items questionnaire titled “forest management techniques (FMT) was developed from literature and used for data collection. The instrument was face validated by three experts. Cronbach Alpha method was adopted to determine the internal consistency of the questionnaire items. Mean (\bar{x}) was used to answer the research questions and t-test to test the hypothesis. Findings from the study revealed that all the 35 skill items were required by farmers for forest management in North Central Nigeria. It was recommended that the identified techniques be packaged into workshop training program for farmers/foresters in North Central Nigeria to enhance Sustainable Development.

Key words: Forest management, partnership, farmers and sustainable development

Introduction

Forest is a complex ecological system dominated by trees which form a buffer for the earth against the full impact of the sun, wind and precipitation (Osinem and Mama, 2008). It is simply an area of land that is thickly covered with trees which also consists of a community of other living

things. Mama and Osinem (2007) stated that forestry is the art of planting, tending and managing large area of land covered with trees and bushes either growing wild or planted for some purposes. The authors explained forestry as a scientific management of forest resources for the continuous production of goods and

services as food, habitat for wildlife and also for recreation and therapeutic values to the surrounding population. According to Inyang (2000), agro forestry is a sustainable land management system which increases the yield of land, combines the production of crops (including tree crops) and forest plants and/or animals simultaneously or sequentially on the same unit of land, and applies management practices that are compatible with cultural practices of the local population. Agro forestry is thus a symbiotic cultivation of tree crops and food crops. In the context of this study, forest is plantations, some of which were established in existing forest reserves while many others have been established outside forest reserves as fuel wood plantations or forest covers on fragile hill slopes, and catchment areas. The plantations, tree crops and forest reserves requires proper management for maximum benefit by farmers.

Forest management in the view of Chidumayo and Gumbo (2010) is the science, art and the practice of managing and using for human benefit the natural resource that occur on, and in association with, forest lands. It is also concerned with acquiring, preserving, developing and utilizing forests and forest related values relies to some extent on the mental effort of the manager because of its multidimensional nature. Some forest products as stated by Marunda and Bouda (2010) are physical and have market determined values, for example, timber, poles, firewood. Other products are

intangible and have non-market values, which include recreation, amenity and environmental protection. In the management of forest resources, management is limited because forest is a biological resource and may be controlled by extraneous factors beyond man's control. However, when management is effective, it produces good result. Before now, forest management was limited to timber production. The current approach to forest management is based on sustainable management practices that balance the competing interest of land use to yield the greatest possible long-term benefits to the society.

In Nigeria, a lot of approaches are utilized in the management of forest plantation and forest reserves. The most commonly encountered management practices as reported by Khare (2000) are forest regulation, selective exploration regeneration, afforestation, Taungya system and reforestation. In the opinion of Saito-Jensen (2008), there are many values associated with forest, some of which are more easily and comprehensively evaluated in economic terms while others are not. Those that can be evaluated are timber, poles, firewood, pulpwood and wildlife. Those that cannot be easily quantified are protection and conservation purposes, example, aesthetic, cultural, religion, recreation, soil and water. The most valuable economic product from forest is wood which accounts for high percentage of forest product resources.

Forest ecosystems have come to be seen as the most important component of the biosphere and forestry has emerged as a vital applied science, craft and technology. Forestry is practiced in plantation and natural stands. A practitioner of forestry is known as forester. Foresters as explained by Thomas and Racklam (2003), improve tree genetics, combat insect infestation, disease and grassland wildfire. Foresters have been mainly concerned with timber management, especially reforestation, regeneration, maintaining forests at prime conditions and fire control. Forest serves the crucial role of protecting watershed and ensuring perennial fresh water supply. By checking erosion in the form of wind and run-off, forests reduce sedimentation and improve water tables of reservoir, streams and rivers (Das,2011). Forests reduce flooding too. However, the recreational values of forest are currently observed in ecotourism, which has tremendous potential for the generation of foreign exchange. The objectives of forest management as enumerated by Osinem and Mama (2008) include sustaining productivity, increasing productivity and for yield regulation. In spite of these objectives, forests have been subjected to clearing for agriculture, which has greatly affected their spatial integrity. In addition, Schackleton (2006) reported that logging and wood harvesting for fuel have exacerbated this fragmentation process, due to rapid changes in land use resulting from intensification and increased population pressures. The author stressed that this phenomenon has the tendency of

influencing the overall goal of sustainable development which are to reduce poverty, increase income growth and satisfy basic social and economic needs of the population.

Development refers to the ability of a nation to improve the lives of citizens. Measures of improvement may be materials, such as an increase in the gross domestic product, or social, such as literacy rates and availability of health care (Agih,2011). Sustainable development as explained by International Institute for sustainable development (IISD,2011) refers to the development that meets the needs of the present without compromising the ability of future to meet their own needs. Oguama (2012) asserts that sustainable development means solving the needs of today in such a way that society and environment are not harmed. The development process must be visualized in this broadest context if it is to meet the expectation of the citizenry for a more elevated standard of living. Accordingly, the most all- encompassing goal of development is the progressive realization of the abilities and talents of each individual for the enhancement of the good of the community and the nation. In this study, sustainable development refers to forest management techniques that would enhance farmer's income through increased productivity of forest in partnership with relevant government agencies. Partnering for forest management involves the coming together of two or more bodies to work for the achievement of specific goals. The idea is for each party to

contribute effectively to meet stated objectives. Partnership in this context connotes the involvement of ministry of agriculture, non-governmental organizations that specialize in agricultural development and extension agents in the management of forest. Partnership involves collaboration of different agencies (be it governmental or non-governmental) with farmers and extension agents in order to assist farmers in using appropriate forest management techniques (Ekele, 2015). Extension agents are trained agricultural officers in new innovations and best practices in agricultural extension education. In the context of this work, extension agents have the responsibility of educating the farmers on forest management techniques for sustainable development.

More often than not, the extension agent negotiates and seeks assistance from these non-governmental organizations and ministry of agriculture on management of forest with the farmers as primary target in terms of benefit. Extension agents are trained agricultural officers in new innovations and best practices in agricultural extension education. In the context of this work, extension agents have the responsibility of educating the farmers on forest management techniques for sustainable development.

A firm foundation for improving the management of forest that could contribute to sustainable livelihoods and national development is essential. However, there is

a knowledge gap that exists about the inherent ability and capacity of forests to regenerate, especially in the face of climate change and land-use extension and intensification. The situation in north central Nigeria as observed by the researcher is such that forest trees are indiscriminately felled without replanting. Besides, farmers in the course of cultivating the soil destroy young trees that could have grown into mature trees which would invariably help control erosion and prevent excessive evapo-transpiration from seedling on the farm. The researcher through interaction with the farmers/foresters observed that forest management practices used by them cannot strategically maintain and improve the productivity of forests and woodlands to meet the ever-growing demand for forest products and services in a dynamic global environment. There is an urgent need therefore, to investigate partnership in forest management techniques required by farmers for sustainable development in North Central Nigeria. Specifically, the study determines

1. Techniques in plantation forest management
2. Techniques in savanna plantation management
3. Techniques of shelter-belt management
4. Challenges in forest management in North Central Nigeria

Research Questions

The following research questions guided the study;

1. What are the techniques required by foresters in plantation forest management?
2. What are the techniques required by farmers in Savanna plantation management?
3. What are the techniques required by farmers for shelter belt forest management?
4. What are the challenges confronting farmers in forest management in North Central Nigeria?

Hypothesis

HO₁: There is no significant difference in the mean ratings of the responses of farmers and extension agents on the techniques required for plantation forest management in North Central Nigeria.

Methods

Four research questions and one hypothesis guided the study. Descriptive survey design was adopted for the study. It is that in which the same information is gathered from an unbiased representative group of interest. Emaikwu (2011) asserts that it assesses opinion from representative group of population being investigated. Survey research is suitable for this study because it is used to collect information from a few people considered to be representative sample of the entire population. The study was carried out in North Central States of Nasarawa, Benue and Kogi. The population of the study was 933 made up of 512 registered farmers (foresters) and 421 extension agents from the three states (ministry of Agriculture, 2015). The sample

for the study was 433 respondents purposively sampled by using random sampling technique in which 312 farmers and 121 extension agents were selected. A 35 items forest management questionnaire (FMQ) was developed from literature and used for data collection. The instrument has a four (4) point response scale of highly required (HR), averagely required (AR), slightly required (SR) and not required (NR) with a corresponding value of 4,3,2 and 1. The instrument was subjected to face validity by three experts, one from the Department of Forestry and two from the Department of Agricultural Education, all from University of Agriculture, Makurdi. The corrections and suggestions of the validates were used to produce the final version of the questionnaire. Cronbach Alpha method was adopted to determine the internal consistency of the questionnaire items. A reliability coefficient of 0.96 was obtained. Three research assistants were involved in administering the questionnaire to the respondents. Four hundred and thirty three (433) copies of the questionnaire were administered to the respondents while three hundred and ninety one (391) were retrieved and analyzed using mean (\bar{x}) and standard deviation, while t-test was used to test the hypothesis at .05 level of significance. Any item with a mean value 2.50 and above was regarded as required while any item with a mean value below 2.50 was regarded as not required. If the t-calculated is less than the t-tabulated, the hypothesis of no significant difference was accepted while the hypothesis of no

significant difference was rejected if the t-calculated is greater than the t-tabulated.

Results:

Research Question 1: What are the techniques required in plantation forest management?

Hypothesis 1:

HO₁: There is no significant difference in the mean ratings of the responses of farmers and extension agents on techniques required for plantation forest management in North Central Nigeria.

Table 1: Mean, standard deviation and t-test analysis of farmers and extension agents on techniques required in plantation forest management N₁=312 (farmers), N₂=121 (Extension agents)

S/N	Item statement	\bar{X}_1	SD ₁	\bar{X}_2	SD ₂	\bar{X}_G	t-cal	t-crit	Remarks	HO
1	Forest regulation	3.02	0.13	2.89	0.20	2.95	0.32	1.98	Required	NS
2	Selective exploration	2.86	0.25	3.12	0.41	2.99	0.24	1.98	Required	NS
3	Deforestation	2.94	0.43	2.87	0.35	2.90	0.34	1.98	Required	NS
4	Regeneration	2.78	0.31	2.61	0.40	3.06	-	1.98	Required	NS
							1.37			
5	Afforestation	3.00	0.81	3.02	0.17	3.01	0.45	1.98	Required	NS
6	Taungya system	2.82	0.41	2.90	0.53	2.86	0.17	1.98	Required	NS
7	Reforestation	2.66	0.73	2.81	0.70	2.73	0.20	1.98	Required	NS
8	Forest mensuration	2.98	0.77	3.13	0.40	3.05	0.59	1.98	Required	NS
9	Rehabilitating bad lands	3.25	0.65	3.04	0.52	3.14	-	1.98	Required	NS
							1.26			
10	Using forests as natural barriers against disasters such as desert encroachment and erosion	3.08	0.91	2.56	0.61	2.82	0.72	1.98	Required	NS

Key: X₁ = Mean of farmers, X₂= Mean of extension agents SD= standard deviation, XG=Grand mean, t-cal=t-calculated, t-crit=t-tabulated. HO=Null hypothesis, NS=Not significant.

Data in Table 1 revealed that all the 10 items on plantation forest management had their mean (x) values ranged from 2.61 to 3.25 and were above the cutoff point of

2.50. This showed that farmers required all the 10 skill items in plantation forest management. The standard deviation ranged from 0.13 to 0.81 which indicates

that the respondents were not too far from the mean and from one another in their response.

Hypothesis tested further revealed that there is no significant difference in the mean rating of the responses of farmers and

extension agents on all the ten (10) items on plantation forest management. This is because the t-calculated values are less than the t-critical value of 1.98 at .05 level of significance with 431 degree of freedom. Hence, the null hypothesis was accepted for all the ten items.

Research Question 2

What are the techniques required by foresters in Savanna plantation management?

Table 2: Mean rating and standard deviation of farmers and extension agents on techniques required in Savanna plantation management? $N_1=312$ (farmers), $N_2=121$ (Extension agents)

S/N	Item statement	\bar{X}_1	SD ₁	\bar{X}_2	SD ₂	\bar{X}_G	Remarks
1	Practice normality in even-aged stands in Savanna plantation	3.08	0.18	3.03	0.22	3.05	Required
2	Carryout silvicultural treatments on tree stands	3.20	0.12	3.17	0.19	3.18	Required
3	Practice technical rotation in savanna plantation	3.26	0.31	3.01	0.44	3.13	Required
4	Carryout silvicultural rotation	2.99	0.43	2.78	0.73	2.88	Required
5	Use financial rotation in Savanna plantation.	2.46	0.25	2.34	0.15	2.4	Not-Rqd.
6	Prepare a written working plan for Savanna plantation management	2.70	0.51	2.66	0.45	2.68	Required
7	Plan the objectives of Savanna plantation to include timber for sale, farm use and firewood	2.64	0.29	2.70	0.51	2.67	Required
8	Design the shape and size of the woods to be in keeping with the landscape	2.85	0.27	2.89	0.34	2.87	Required
9	Practice nature conservation by having a variety of ages and crop types including coppice	3.02	0.53	3.22	0.47	3.12	Required

Keys; Not-Rqd=Not Required, \bar{X}_1 = Mean of farmers, \bar{X}_2 = Mean of extension agents SD= standard deviation, \bar{X}_G =Grand mean,

Data presented in Table 2 showed that all the 9 items had their mean values ranged from 2.64 to 3.96 and were above the cutoff point of 2.50 except for item 5 which has mean less than 2.50 which implies that the

item is not required. The Table further showed that respondents required 8 skill items on the techniques used in Savanna plantation management. The standard deviation ranged from 0.12 to 0.73 which is

an indication that respondents are close to one another in their responses.

Research Question 3

What are the techniques required by farmers for shelter belt forest management ?

Table 3: Mean (\bar{x}) and standard deviation of farmers and extension agents on techniques used for shelter belt forest management. $N_1=312$ (Farmers), $N_2=121$ (Extension agents).

S/N	Item statement	\bar{X}_1	SD ₁	\bar{X}_2	SD ₂	\bar{X}_G	Remarks
1	Use appropriate initial decision about establishment and layout methods for trees	2.96	0.31	3.00	0.86	2.98	Required
2	Target the timing for pruning operations	3.06	0.61	3.14	0.17	3.1	Required
3	Employ appropriate thinning operation techniques	2.88	0.81	2.56	0.34	2.72	Required
4	Protect trees against fire outbreak	3.04	0.43	2.84	0.60	2.94	Required
5	Protect trees from indiscriminate felling or harvesting and grazing	2.90	0.35	2.55	0.19	2.72	Required
6	Avoid interrupting the growth pattern of forest	2.62	0.41	2.66	0.38	2.64	Required
7	Put in place proper shelter belt composition of desirable plant species such as show growing and fast growing trees	2.77	0.60	2.71	0.40	2.74	Required
8	Put in place belt structure of 12 times as long as they are all in order to eliminate turbulence along the sides	2.98	0.71	2.65	0.78	2.81	Required
9	Use triangular spacing of trees in belts in reducing the setting effect of wind between the stems	2.96	0.81	2.88	0.69	2.92	Required

Keys; X_1 = Mean of farmers, X_2 = Mean of extension agents SD= standard deviation, X_G =Grand mean,

Data in Table 3 revealed that 9 items had their mean(\bar{x}) values ranged from 2.62 to 3.14 and were above the cutoff point of 2.50. This is an indication that the

respondents required all the 9 skill items on techniques required for shelter belt forest management. The standard deviation ranged from 0.31 to 0.86 which indicates

that the respondents were not too far from the mean and from one another in their response.

Research Question 4

What are the challenges confronting farmers in forest management in North Central Nigeria?

Table 4: Mean (\bar{x}) and standard deviation of farmers and extension agents on challenges in forest management in North Central Nigeria. $N_1=312$ (Farmers) $N_2=121$ (Extension agents)

S/N	Item statement	\bar{X}_1	SD ₁	\bar{X}_2	SD ₂	\bar{X}_G	Remarks
1	Inadequate knowledge of silviculture.	2.68	0.38	3.20	0.53	2.94	Agreed
2	Inadequate finance and poor timing of their release.	2.64	0.55	2.80	0.72	2.72	Agreed
3	Low resource base that cannot meet future demands for forest products.	2.60	0.63	2.97	0.80	2.78	Agreed
4	Acute shortage of technicians and poor management techniques.	2.98	0.91	3.06	0.51	3.02	Agreed
5	Inadequate skilled human resources.	3.08	0.51	3.16	0.28	3.12	Agreed
6	There is no plan that is made once and for all, circumstances always change.	2.84	0.35	3.04	0.82	2.94	Agreed
7	The growing stock may not develop as expected nor match the results obtainable from other species and new techniques.	2.76	0.40	2.70	0.18	2.73	Agreed

Keys; X_1 = Mean of farmers, X_2 = Mean of extension agents SD= standard deviation, X_G =Grand mean,

Data presented in Table 4 showed that 7 items had their mean (\bar{x}) values ranged from 2.60 to 3.08 and were above the cutoff point

of 2.50. This showed that respondents agreed on all the 7 items challenges in forest management in North Central Nigeria. The

standard deviation ranged from 0.35 to 0.91 which further indicates that the respondents are not far from the mean and from one another in their response.

Discussion of Findings

The following findings emerged from the study based on the research questions answered and hypothesis tested. Findings from Table 1 revealed that 10 skill items on plantation forest management are all required by farmers. These items include forest regulation practices, selective exploration, deforestation, practices, regeneration, afforestation, taungya system, reforestation, forest mensuration and rehabilitating bad Lands. The findings were in consonance with the findings of Wynberg (2006) who found out that reforestation and selective exploration were among best practices identified in forest management and non-timber forest product. The findings were also in agreement with the work of Chundama and Gumbo (2009). The authors confirmed that forest regulation and afforestation were part of plantation forest management techniques. Testing of null hypothesis in Table 1 revealed that there was no significant difference in the mean ratings of the responses of farmers and extension agents on techniques required for forest plantation management. The hypothesis was thus accepted.

Findings from Table 2 showed that 8 out of 9 skill items in Savanna plantation management were required by farmers. This include silvicultural treatments and

rotation, written working plant, plan the objectives and design the shape and size of the woods according to land scape amongst others. The findings was in line with study by Bwalya (2007) who affirmed that nature conservation and the practice of technical rotation and financial rotation in Savanna plantation are parts of the technique utilized in Savanna plantation management by farmers.

Findings from Table 3 showed that the 9 skill items on techniques used for shelter belt forest management were required by farmers. The items are timing for pruning operations, appropriate thinning operations, avoid interrupting growth pattern of forest, protect trees from fire and indiscriminate felling, harvesting or grazing, use of triangular spacing and put in place belt structure. The findings were supported by the work of Marunda and Bouda (2010). The authors stressed that timing for pruning and thinning operations are essential shelter belt forest management techniques.

Findings from Table 4 further revealed that the 9 item statements on challenges encountered by farmers in forest management in North Central Nigeria were all agreed to by respondents. The challenges are inadequate knowledge of silviculture, inadequate finance, low resource base, acute shortage of technicians and inadequate skilled human resources. The findings were in agreement with study by Bird and Dickson (2005). The authors found out that poverty is caused by inadequate knowledge and skilled human

resources and exacerbated by low resource base.

Conclusion

Activities such as seed collection, seed preparation, storage of seed, testing of seed and seed purity are important in forest management. A plantation is a growing resource and central to its management is that the farmer or forester does not allow stands to grow from year to year unintended. Forest exists to serve some definite objectives, therefore, forest management should be regarded as any other industrial management with the aim of being profitable and to enhance national development. Since forest are biologically renewable, they can grow and regrow after harvesting on the same site which calls for forest management to be biologically and economically sound.

Recommendations

1. The skills identified in plantation forest management should be packaged into a workshop training programme for farmers (foresters) on a quarterly basis.
2. Extension agents should utilize the techniques identified in Savanna plantation management to upgrade the knowledge of farmers for enhanced performance.
3. State and Federal government should provide sufficient fund and enabling environment for farmers involved in forest activities.
4. The identified techniques in shelter belt management should be demonstrated regularly on TV screens in rural areas

for farmers to have first-hand information.

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