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Agroforestry Technique and Its Influence on Maize Crop Yield in Gombi Local Government, Adamawa State, Nigeria.

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Abstract: *This work compared maize crop yield of agroforestry with non agroforestry plots in Gombi Local Government Area of Adamawa State. Data on farmers' experience, size of farm plots, number of tree species per hectare, and yield of maize per hectare were obtained from farmers in four districts of Gombi Local Government. Farmer's plots were grouped into agroforestry and non-agroforestry, depending on the number of trees found within the farm. Maize grain yield for the years 2000, 2001 and 2002 cropping seasons were obtained from the farmers. Data analysis using T-test at 5% significant level was employed. There was a significant difference in maize yield between agroforestry and non agroforestry plots. The average maize yield for the agroforestry plots and non-agroforestry plots were 10.41Kg and 7.19Kg respectively. The percentage increase was 30.9 over and above non- agroforestry plots. Farmers were then advised to avoid clear felling of trees technique in their farms. Recommendations to help the local farmers adopt the agro forestry system were given.*

I. Introduction

The international council for research in Agroforestry (ICRAF) (1981) defined agroforestry as "a collective word for all land use practices and systems where woody perennials, annual crops/or animals are deliberately grown/raised on the same land management area".

Agroforestry is not entirely a new concept, because trees, crops and animals have been traditionally raised together on farms throughout the world. However, in modern day agricultural specialization, trees, crops and animals have been separately managed on a large scale. This has led to the destruction of large areas of forests for large-scale agriculture and other specific uses. Therefore, the rate of forest destruction and the loss of the multitude of natural products from the forest is of great concern to the earth ecosystem (Richard et al 1988).

Agroforestry is a functional mimicry of natural ecosystems. (Ian Nuberg et al 2009). According to Ong and Huxley (1996), the concept of agroforestry as a defined land use to be promoted, adapted and researched emerged in the mid 1970s. Before this time, the progress of agriculture and forestry into intensively managed monoculture did much to deflect and obscure agroforestry. Hence Gholz (1987) observed that the recent resurgence of the concept is primarily derived from the recognized failure of large-scale agriculture and forestry monocultures in the less developed world. Therefore where soils are marginal or degraded or where trees are now absent and their products missed, increasing reliance on tree/crop/animal mixtures is inevitable. Acording to Ian Nuberg et al (2009), trees protect dryland crops and soil. Hence Kerkhof (1990) stressed that the use of agroforestry techniques to boast crop production has been the explicit aim of several projects. Up till now however, none has been able to provide hard proof that this can be achieved under field conditions. Results from the project Agro pastoral (PAP) in Rwanda are promising but this has not yet been confirmed in the farmers field.

According to Akosim (1999) an alarm on the manifestation of drought in Adamawa State was raised by a consultative and fact-finding mission set up by the Minster of Agriculture in 1990. The report showed that drought was manifesting in nine Local Government Areas of Adamawa State. These include Gombi , Song, Hong, Guyuk, Maiha, Michika, Shelleng and Madagali. These Local Government Areas are all located in the northern part of Adamawa State between latitude 10^0 and 11^0. The drought manifestation has led to decline in agricultural production and vegetation degradation. Agroforestry is a strategy that can help reverse the trend. This research was therefore set to find out the extent to which agroforestry technique can influence maize output. Thus this study (a) examined the difference in maize output between agro and non-agro forestry farm plots and (b) made appropriate recommendations in line with the findings of this study to encourage more adoption of agroforestry technique by framers to enhance increased crop output for rural development.

II. Materials and Methods.

The study was carried out in Gombi Local Government Area, located in the northern part of Adamawa State between latitude 7^0 and 11^0 N of the equator and longitude 11^0 and 14^0 of the Greenwich Meridian. The landform has been described as uplands (Tukur,1999) The vegetation is the Northern Guinea Savanna, which is

also prone to drought (Akosim 1999). The mean annual rainfall is between 700 and 900mm. Strong devastating wind storms normally accompany the onset of the rainy season, which lasts from May to October.(Amadi 2002).

The traditional occupation of the people is farming, but they also practice metal works, calabash decoration, wood carving and leather works (Sahabo 1999). The major agricultural crops grown include maize, millet, cowpea, Soya bean and groundnut. Gombi Local Government Area is made up of 4 districts namely Garkida, Guyaku, Gaanda and Fotta. It has a total land area of 2232.6km^2 (Nwagboso and Uyanga 1999).

Primary data on farmers' experience, size of farm plots, number of tree species per hectare, and output of maize were collected through the use of questionnaires. Personal field visits and direct enumeration of trees per hectare were done. The crop output considered was for the year 2000, 2001 and 2002. All plots (one hectare each) with sixty dispersed tree species and above were grouped as agroforestry and their yield were compared with nearly barren plots containing fewer tree species. The output in (kg) of maize grain harvested from each plot were then determined using a hanging balance.

Method of Data Analysis

The plots sampled were then grouped into 1, 2, 3 and 4 hectares of agroforestry and non-agroforestry plots and their yields were compared using T-test at 5% significant level.

III. Results and Discussion

Out of the fifty questionnaires distributed in each of the four district of Gombi Local Government Area, 39 (78%) were returned from Guyuk, 40 (80%) from Gaekida 35 (70%) from Ga'anda and 30 (60%) from Fotta.

Sources of Tree Seedling For Agroforestry.

Table 1 shows where the farmers obtained most of the tree seedlings which they planted in their agrofosrestry plots. It was generally found that farmers were having problems in the procurement of tree seedlings for agroforestry practices despite their interest in the system. Majority of the farmers (65%) obtained their tree seedlings from the extension agents. While only about 24% of the farmers got their tree seedlings directly from Department of forestry Nursery. This may be attributed to far distances of the Department of Forestry Nurseries. Farmers had to rely more on Extension Agents for Extension Agents for seedling procurement, while Fotta had two major sources of seedlings supply these are Extension Agents and Dept. of Forestry Nursery. Some farmers in Garkida and Gaanda also made personal efforts to raise some seedlings.

Yields from Agroforestry And Non-Agroforestry Plots

Tables 2 and 3 show the number of dispersed agroforestry and non-agroforestry plots sampled and their yield. The result of the t-test shows that there was a significant difference in maize yield between agro forestry and non agro forestry farm plots. The t-calculated values are 2.604 and 2.663 agroforestry and non-agroforestry plots respectively while the t-critical values are 0.060 and o.056. Tables 2 and 3 show that a total of 120 ha of agro forestry plots had 1249 kg of maize grains, giving a mean yield per ha of 10.41 kg while a total of 120 ha.

Of non-agroforestry plots had a total maize yield of 863 kg, giving a mean yield per ha. of 7.19 kg. In the same Vein, The standard error of mean are 191.845 and 130.390 for agroforestry and non-agroforestry plots.. Yield from Agroforestry plots were generally higher than yield from non-agroforestry plots by a percentage increase of 29.9. This result agrees with the finding of the Forestry Research Institute of Nigeria (FRIN) (1980) in Kano, where the results of experiment conducted in 3 years period showed that shelterbelt areas had increased the yield of millet by over 200%, groundnut by over 100% and cowpea by over 20%.

According to Tripathi and Psychas (1992), it is recognized that one of the challenges facing research is the development of farming systems capable of ensuring increased and sustained productivity with minimum degradation of soil. Julie (2007) reported that forests, wooded areas and scattered trees have provided food, fuel, medicines, filtered water, shelter and building materials throughout time. Agroforestry has the potential to address this because this study has shown that there is a significant difference in crop output between agroforestry and non-agroforestry farm plots at 5% level. Also Kerhof (1990) observed that the use of agro forestry to boast crop production has been the explicit aim of several projects. Therefore the increase in crop output coupled with many other tree products from agroforestry, including the improvement made on soil fertility by trees is enough to outweigh the argument that trees take up land which might be used for crop growing. Moreover, Julian (2009) emphasized that trees accumulate carbon during their life and often enrich soil surface and subsoil carbon stocks with recycling organic matter. On the other hand, some of these tree products like oils, honey, nuts, tannins, gums, resins and charcoal also help to sustain the traditional occupation of the people such as calabash decoration, wood carving and leatherwork. Therefore, agroforestry principles should be adopted as a defined land use, especially for marginal, degraded and lands prone to drought.

IV. Conclusion and Recommendation

This research has been able to show that there is a significant difference in maize output between agroforestry and non-agroforestry farm plots. Agroforestry is therefore beneficial, especially in drought prone areas not only in terms of improved agricultural yield, but offers a wide range wood and wood products such as wood for fuel, construction, tools, fiber for mats, baskets, ropes, medicines, dyes, tannin, cosmetics and glue. Trees in agroforestry farms also help to check soil erosion, replenish the soil and act as wind breaks, hence stabilizing the environment for rural development. Agroforestry practice need to be encouraged and the following recommendations are given in other to encourage more farmers to adopt the practice in Adamawa State.

The department of forestry should extend their nursery services to all Local Government Areas, to enable farmers acquire tree seedlings with ease for planting in their farms. With such encouragement, farmers will plant more trees instead of relying on naturally growing ones on their farm plots.

Extension workers should now encourage farmers to adopt scientific application of agroforestry practices by planting trees in particular agroforestry orientation.

The Ministry of Agriculture should organize some form of awards to agroforestry farmers based on number of trees planted annually.

Tables

Table 1. Sources of Tree Seedlings For Agroforestry

Districts	Dept of forestry Nursery Yola	Farmers personal Nursery	Extension agents	Local Gov't Nursery
Guyuk	-	-	40 trees	-
Garkida	13 seedlings	15 seedlings	30 "	14 seedling
Ga'anda	13 "	15 "	30 "	-
Fotta	25 "	-	25 "	-
Total	51 "	30 "	125 "	14 "

Source: Field Data. (2003)

Table 2: Agroforestry plots and their maize grain yield.

Districts	Total Ag plots(ha)	Total Yield (Kg)	Yield per Ha (Kg)
Guyuku	30	332	11.06
Garkida	30	338	11.26
Gaanda	30	163	5.43
Fotta	30	416	13.87
Total	120	1249	10.41
X		**10.41**	

Source: Field data (2003) Ag = Agro forestry.

Table 3: Non-Agro forestry plots and their maize grain yield.

Districts	Total Non Ag Plots (Ha)	Total Yield (Kg)	Yield Per Ha (Kg)
Guyaku	30	227	7.57
Garkida	30	211	7.03
Gaanda	30	152	5.40
Fotta	30	273	9.10
Total	120	863	7.28
X		**7.19**	

Source Field Data (2003) Nag = Non Agro forestry Plots

Table 4 Summary of Tables 2 and 3

Disctricts	Agroforestry plot Yield	Non-Agroforestry plot yield
Guyaku	332	227
Garkida	338	211
Gaanda	163	152
Fotta	416	273
Total	1249	863

Source Field Data 2003

Table 5 T-test Table

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Ag	5	499.60	428.979	191.845
NonAg	5	347.20	291.562	130.390

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Ag	2.604	4	.060	499.600	-33.05	1032.25
NonAg	2.663	4	.056	347.200	-14.82	709.22

Source: Data Analysis

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