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Distribution of Woody Plants on the Adapted Land Management Practices in Hong Local Government Area, Adamawa State, Nigeria

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Abstract

Economic activities of the rural communities have brought about differences in land management practices such as affected and restricted on which there exist differences in distribution of indigenous woody plant stands. The study was embarked upon to identify the differences in distribution of indigenous woody plant stands on the continuous cropping, fallow and reserve lands. The scope cover indigenous woody plants distributions on the affected and restricted land management practices. The data required was distribution of indigenous woody plant stands that were generated from the field using sample quadrats. The results were analyzed by comparing distributions on the three land management practices adapted. The result indicates that fallow land has the highest (99) woody plants distribution followed by reserve (79) while continuous cropping has the least (3). The difference is attributed to massive removal and few preservation of woody plants on the continuous cropping, and insignificant removal on the reserve lands. The result implies with increase in continuous cropping leads to decrease in woody plant distribution. The study recommends significant preservation of woody plants seedlings on the continuous cropping lands to encourage distribution.

Keywords: Distribution, Woody plants, Comparison, Affected and restricted lands, Human activities, Environmental resources

Introduction

From the concepts of Environmental Quality Bonnett (2008) and Crop Production Agboola (1979) the rural environment provide variety of opportunities from which individual may choose to exploit, based on his needs and norms. The communities use the environment for arable farming, and depend on it for the supply of woody plant products which degrade vegetation cover. The rotational bush fallow, continuous cropping, clean weeding; and fuelwood harvesting affect woody plants adversely.

Result of studies especially those of Craine (2009), Wright (2007), and Petros (1995) have identified the

importance of vegetation in contributing to the welfare of man, animals and the environment. Furthermore, it provides fuelwood for generating domestic energy, and its crowdedness provides habitat for a multitude of species of plants, animals and micro-organisms. Neba (2009) and Mabogunje (1996) observed that different landuses such as arable farming, pastoralism, settlement, mining and construction that exist in Africa adversely affects vegetation cover. For example, arable farming involves massive clearance of vegetation cover (Aina and Adepide, 1992); shifting cultivation have been widely practiced by peasant communities in Africa since the Neolithic period (Karthic *et al*, 2009); fuelwood harvesting remain a long-standing use of public land (Brown *et al*, 2009); intensive grazing affects seedlings and saplings of woody plants with less than 5cm girth because of browsing and trampling (Project Elgon, 2011); and bush fire depending on the duration, severity and species of woody plants are affected when heated to 50-100^{0}C (Cremer, 2004). Moreover, the establishment of Directorate of Food, Roads and Rural Infrastructure (1987), Agricultural Development Projects (1985) and Agricultural Innovations (2008) in Nigeria have increased crop production and expansion of roods with adverse effects on woody plants removal.

Results of studies especially those of Project Elgon (2011); Karthic *et al* (2009); Gudumbul (2006); and Olaniran (1995) are important by stating the importance of vegetation, the various human activities that affects woody plants, and that human being have been exploiting the environmental resources from time immemorial with adverse effects on vegetation degradation. However, the studies did not significantly assess the characteristics of vegetation that is affected adversely by human activities neither distribution of woody plants nor carried out a micro scale studies on vegetation cover of Hong Local Government Area of Sudano-Sahelian.

Results of field observations reveal that massive and prolonged removal of vegetation cover by the increasing and diverse human activities such as arable farming, vegetal products harvesting, and infrastructure construction have reduced the distribution of woody plant stands especially around the more populated settlements in Hong Local Government Area. More importantly, the most disturbing human activity on vegetation cover is the rotational bush fallow in which large areas of arable lands are massively cleared by slash-and-burn. The forward and backward clearing affects both the primary and secondary woodlands. Furthermore, it is observed that there exist differences in the distribution of

woody plants on the affected and restricted land management practices adapted.

In view of the above, the research was embarked upon to identify the difference in the distribution of woody plant stands on the continuous cropping, fallow and reserve lands. Comparison between the affected and reserve lands is an important aspect in determining the effects of human activities on the distribution of woody plant stands. Hence, distribution of woody plants was chosen because of the increasing fewness of woody plants cover. The scope covers Hong Local Government Area. The statistical populations of the study include restricted and affected lands, woody plants, and quadrat samples while the statistical sample is woody plants distribution. The woody plants are limited to indigenous which consist of trees, shrubs and herbs, but exclude exotic plant species such as *Eucalyptus camaldulensis*, *Azadirachta indica* and *Mangifera indica* that are managed by man. Furthermore, duration of the land management practices was not considered, but the quantity of woody plant stands that were available at the time of field study was counted.

Hong Local Government lies between latitude $09^0$57' and $10^0$32'N, and between longitude $12^0$08' and $13^0$16'E as shown on the figure 1. The area has shorter wet season (May to October), but longer dry season (November to April). Gandapa (2014) maintains that the mean annual rainfall is 1042.8mm while the monthly average is 86.9mm. Maximum temperature can reach 40^0C in the months of March and April due to mean monthly sunshine hours of 220 and high insolation while the mean monthly temperature is about 26.7^0C (Adebayo, 1999). With the short rainfall duration, longer dry season, and high insolation dense vegetation development is affected adversely due to accelerated soil desiccation. The area lies within the tropical ferruginous soils that are derived from the weathered basement complex and old sedimentary rocks (Areola, 1982). The soils are infertile, dry and hard which reduce the development of dense woody plant covers with the exception on the moist, fertile and deep soils along the floodplains of Fa'a, Dogwaba and Ngilang among others.

The area lies within the Sudano-Sahelian Zone characterized with short and sparse woody plant covers. The vegetation consists of trees, shrubs and herbs, and luxuriant tall grasses. The sparse woody plants are affected by arable farming; fuelwood, native vegetables and fruits harvesting. Other vegetal products harvested include round poles, fibre, herbs and hafts. Gudumbul (2006) reveals that the exploitation of these resources is the oldest and most

widespread economic activities of the people of Hong Local Government Area since the 13th century. The population of the area increased from 112,845 in 1976 to 170,452 in 2009 occupying an area of about 2,486sq. km. The density increased from 45 persons per sq. km. to 69 while the hectare per person decreased from 2.2 to 1.4 which led to expansion of farmlands and building sites with adverse effects on woody plants distribution.

Materials and Methods

The types of data required were land management practices and distribution of indigenous woody plants. Materials used for data collection include measuring tape, pegs and plastic nylon ropes. These were used to construct the sample quadrats measuring 100sq.m. within which the distribution of woody plant stands were observed. Vodopich (2010) reveals that square quadrat is the most widely used method to demarcate a sample plot in a terrestrial habitat to observe woody plants characteristics such as distribution. The uniform size (100sq.m.) and shape (square) of the quadrats were adapted because the plots were considered ideal to observe distribution of woody plant stands in Sudano-Sahelian zone characterized by sparse woody plants cover.

To cover the study area within a limited time, stratified sampling technique was adapted. The area was divided into six strata as shown on Figure 1. Concurrently, from each stratum three sample quadrats were purposively located with one each on the identified continuous cropping, fallow and reserve lands. Purposive sampling technique was adapted to select areas where woody plant stands were available for observations and measurements; to establish the eighteen sample quadrats (as shown on Figure 1) on the ear-marked point within the identified dissimilar three land management practices; and to avoid areas devoid of woody plant stands such as built-up areas, surface water body and hard rock surfaces. In each quadrat standing live woody plants were counted. Woody plant within this context applies to perennial plants (trees, shrubs and herbs) that have hard material beneath their bark which is the principal supporting tissue. The data were analyzed by comparing the magnitude of woody plant stands on continuous cropping, fallow and reserve lands.

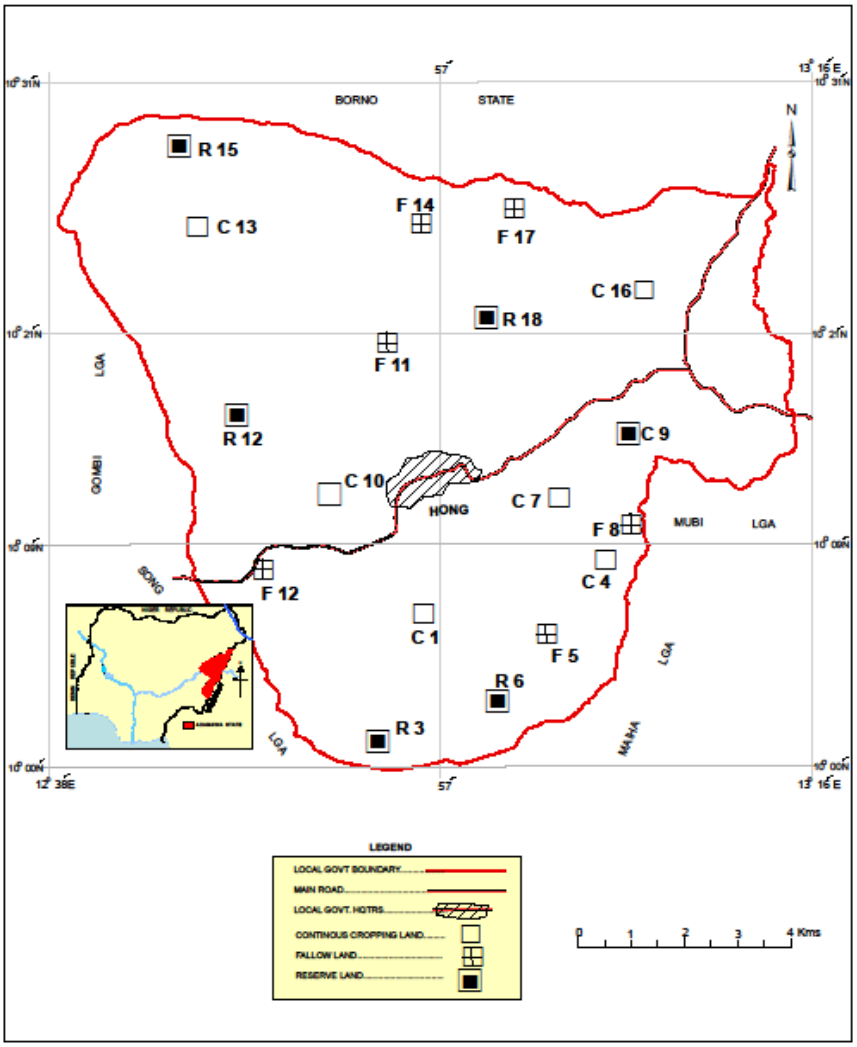

Figure 1: Sample Quadrats

Results and Discussions

The results of field observations and measurements on the distribution of woody plant stands per land management practices shows there are 181 woody plants per 18 quadrat samples. Table 1 shows the distributions and densities of woody plant stands per the adapted land management practices.

Table 1: Distributions and Densities of Woody Plants per Land Management Practices

Land Management Practices	Quadrat No.	Distribution (100sq.m.)	Percentage	Density (sq. m.)
	2	12	6.63	0.12
	5	18	9.94	0.18
	8	21	11.60	0.21
Fallow Land	11	27	14.92	0.27
	14	15	8.29	0.15
	17	6	3.32	0.06
Total	**6**	**99**	**54.70**	**0.99**
	3	6	3.32	0.06
	6	12	6.63	0.12
Reserve Land	9	12	6.63	0.12
	12	30	16.58	0.30
	15	18	9.94	0.18
	18	1	0.55	0.01
Total	**6**	**79**	**43.65**	**0.79**
	1	1	0.55	0.01
Continuous	4	-	-	-
Cropping	7	-	-	-
Land	10	1	0.55	0.01
	13	-	-	-
	16	1	0.55	0.01
Total	**6**	**3**	**1.65**	**0.03**
Grand Total	**18**	**181**	**100.00**	**1.81**

Source: Field Study, 2014

From the table, fallow land has the highest distribution of woody plants with 99 stands per 600sq. m. forming 54.70%, reserve has 79 stands forming 43.65% while the least is continuous cropping has 3 stands accounting for 1.65%. Furthermore, there is insignificant difference in density per 600sq.m. between fallow (0.99) and reserve (0.79) lands compare to continuous cropping land with almost zero (0.03).

The distributions of woody plant stands on the three dissimilar land management practices were subjected to variance analysis. The emphasis is on the difference in woody plants stands on the affected and restricted land management practices. The assumption is that there is a significant difference in woody plant stands on continuous cropping, fallow and reserve lands. The result of the

test at 0.05% confidence limit indicates that the computed 'F' value (- 2.45) is lesser than the critical 't' (2.48). This indicates that there is no significant difference between the woody plant stands on the three different land management practices compared.

The assumption that there is a significant difference in the woody plant stands among continuous cropping, reserve and fallow lands is not statistically accepted. From the table, fallow and reserve lands are less varied and more uniform in the distributions of woody plants than the continuous cropping land all still in approximately one per 100sq.m. This similarity in the distributions of woody plants is due to intervention by man in form of wood products (fuelwood, round poles, yokes, flails and hafts) harvesting.

The result implies that reserve lands should be exclusively avoided from any kind of woody plant exploitation to increase distribution of woody plants. Furthermore, on continuous cropping lands, seedlings should be preserved to encourage regeneration with positive effects on distribution. The implication of this result in the study area is that with decrease in rural resources harvesting such as soil fertility and wood products that adversely affects woody plants there will be significant increase in woody plant stands.

Distribution and Density of Woody Plants per 100sq.m.

Table 2 presents the distributions and densities of woody plant stands per 100sq.m.

Table 2: Distributions and Densities of Woody Plants per 100sq.m.

Land Management Practices	Distributions	Percentage	Density (sq. m.)
Fallow land	17	54.84	0.17
Reserve land	13	41.93	0.13
Continuous cropping land	1	3.23	0.01
Total	**31**	**100.00**	**0.31**

Source: Field Study, 2014

From Table 2, fallow land has the highest distribution of woody plant stands per 100sq. m. forming 54.84%. The density per square metre between fallow (0.17) and reserve (0.13) lands are less varied than the continuous cropping land with 0.01. The reasons for the occurrence of the highest woody plant stands (17) on the fallow land is unplanned, but due to loose soil structure owing to cultivation that took place on the area before abundance, and absence of matured tree stands that could smother both

the seedlings and saplings favour the survival of the new invading plants such as '*shafa mala*', *'shikidi sa*' and *'shafa sal*' among others.

Reserve land is the second with 13 woody plant stands forming 41.93% and the density is 0.13. The reasons for the lower (13) distribution compared to fallow land (17) is due to selective harvesting of some preferable species of woody plants for fuelwood and round poles; and the primary woodlands are better adopted to the environmental conditions, hence, deprive any newly invading species from survival. Based on the findings of this research, to increase and maintain the distributions of woody plants on the reserve land there should be exclusive harvesting and bush burning which will protect the desired and susceptible species.

More importantly, continuous cropping land has the least distribution of woody plants with single (1) stand forming 3.23% with a density of 0.01. The reasons for the least distribution is attributed to annual cropping and clean weeding, the unwillingness of farmers to preserve seedlings, and the adaption of inputs such as mechanical plows and non-selective herbicides that eliminate all plant seedlings thereby inhibit woody plants regeneration. Based on the results of this study, to increase the distributions of woody plants on the continuous cropping land, seedlings such as *Anogeissus leiolarpus, 'Shafa mala', 'Shikidi sa' and 'Shafa sal'* that are common and better adopted to the environment should be preserved at each cycle of annual clearance and clean weeding. To this end, the result of this study is in line with those of Aina and Adepide (1992); Karthic *et al* (2009); Brown *et al* (2009); and Project Elgon (2011) that human activities such as arable farming reduces woody plants distributions on the affected land management practices.

Conclusion

Based on the findings of this study, it can be concluded that increase in population associated with high and diverse environmental resources exploitation are the major causes of reduction in the distributions of woody plants. Both the affected and restricted areas have insufficient distributions. Fallow lands have the highest distributions followed by reserve while continuous cropping has the least. More importantly, continuous cultivation is the most single contributing factor responsible for reduction in distributions of woody plant stands. Because the annual weeding eliminates plant seedlings thereby inhibit regeneration of woody plants.

Recommendations

Based on the findings of this study, the following recommendations are

made for sustainable management of woody plants distributions in the study area. Stringent population policy should be enacted to address population explosion especially as it relates to woody plants degradation. The policy should also gear towards awareness creation on the implications of population increase in the rural areas such as Hong Local Government Area and elsewhere. Besides, during massive clearance of woody plants for arable farming some species that are valuable to the community should be preserved. Furthermore, on continuous cropping lands, seedlings of economic woody plants should be preserved at each cycle of farmland clearing and weeding. More importantly, meaningful rural development should be embarked upon by providing basic needs to the rural populace to reduce their over dependence on the environmental resources such as soil fertility and vegetal products.

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