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Research Paper

Farmers Perception of Soil Fertility Status in Different Land use and Management Practices in Daudawa, Southern Katsina State, Nigeria

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Food security in developing countries is largely depended on land productivity, which is controlled and managed by smallholder farmers who face multiple challenges in maintaining soil fertility in their farms. The aim of this study were to assess the effect of different land use and management practices on soil fertility base on the perspectives of the local farmers and to compare their views with the scientific assessment of the soil in the four land use practices. The result indicated that majority of the farmers believed that forest reserve is the most fertile followed by orchard, grazing land and cultivated land respectively. Soil analysis result shows similar pattern of fertility status as identified by the local farmers in the four land use practices. It is recommended that any soil management practices to be introduced for the farmers must be environmentally sustainable, economically viable and socially acceptable.

Keywords: Soil fertility, perception, land use, management practices

INTRODUCTION

Agriculture is the back bone of the Nigeria economy and the major occupation of the majority of the population. Successive government in Nigeria, economic and poverty alleviation program are always linked with the development of agricultural sector. Increase in agricultural production is largely achieved by bringing more land into production (Suleiman and Buchrothman, 2012) and is influenced by growing demand for agricultural products that are increasingly needed to improve the food security, provide employment and generate income not only to rural communities but also to encourage large scale investment in the agricultural sector. In large part of Nigeria, natural vegetation cover has given way not only to crop production but also to other uses. Conflict and civil strife have dramatically increased due to competing demand for land by different communities and other sectors of the economy. Studies by Hoffmann et al. (2001) and Hoffman and Muhammed, (2004) show increasing soil fertility degradation in much of the existing and potential productive land in Nigeria. Soil is an important component in farming process; its depletion will have profound impact on the rural communities and the welfare of the people in general. There is the need for proper monitoring and assessment of soil fertility changes to ensure its sustainable utilization. In addressing the challenges posed by soil fertility decline, policy makers and extension workers largely relied on ideas developed by the "experts" who

used inducement to influence and sometimes even compelled farmers to adopt certain soil fertility restoration and enhancement measures which are often unsustainable, in the long run result into more soil fertility decline (Ibrahim and Lawal, 2013). Indigenous knowledge system (IKS) of the rural farmers of their immediate environment was not give due consideration despite the rhetoric of participatory approach in planning development activities. Scientist largely ignores the understanding of local spatial and temporal process that affects farmers management decision (Winklerprins, 1999). In large part of Nigeria, IKS and its relevance in agriculture has not been widely and systematically documented and thus not well appreciated even by its holders (Lawal, 2017). Lack of documented information on farmers understanding and perception of soil and its fertility indicators denied the researchers, and policy makers and development planners to lay a solid foundation to plan appropriate and sustainable techniques of the soil management. The objective of this study is to assess the farmers' perception of soil fertility changes and compare it with scientific assessment in four agricultural land use practices in Daudawa village, southern Katsina state. It will allow development planners and researchers to integrate indigenous knowledge with scientific knowledge by helping rural farmers in enhancing soil fertility which in turn could lead to increase in food production.

MATERIALS AND METHODS

The study was conducted in Daudawa village, Faskari local government area of Katsina state. It is located 11.6298°N, 7.1577°E. The area is 624 metres above sea level with scattered rocks outcrop. The seasonal rainfall in linked to the movement of inter tropical convergence Zone (ITD), the annual rainfall sometimes exceed 1000 mm, the onset of rain, which marks the beginning of planting season start late March to early April (Abubakar, 2006). The duration of the growing season range between 95 to 140 days. The vegetation is typically Sudan Savanna type in which Butyrospermum paradoxum, Tamarindus indica, Khaya senegalensis, Vitex doniana etc dominate the tree strata and are scantly spread over bare land surface (Adegbehin et al., 1990). The soils are entisols, type derived from basement complex rock, but their development are influenced by aeolian process. The soil has been described as being fine sandy-loamy texture, slightly acidic in reaction and moderate content of organic matter (Abubakar, 2006).

Household survery

Information on farmers perception of soil fertility in four agricultural land use and the indicators used in assessing the fertility status of each land, use were obtained through structure interview and focus group discussion. The village head appointed two of his subordinates to assist in the identification of the most experience farmers. Thirty farmers were purposely select and divided into three sub-groups to reduce influencing each other answers. Each sub-group were taken round the four different land use, each member of all the sub-groups were called for semi-structured interview far away from the rest of the members of the other group. They were asked to assess the soil fertility status of the four land user by ranking them in order of soil fertility superiority and the reasons or indicators used in their assessment. Characteristic of four land use in terms of indicators pointed out in the interview were recorded and soil sample were collected for analysis in the laboratory.

Soil sample

In all the four sites, a quadrant of 50 × 50 m was chosen. The quadrant was divided into 25 equal size grid squares, fifteen soil samples were collected from depth of 0-20 cm and 20-40 cm of each quadrant. A total of 120 samples were collected (fifteen sample from depth of 0-20 cm and 20-40 cm). 12 sub-samples were derived from the composite sample. Before taking samples, litter grass, dead plant and other foreign materials were removed from the soil. Wet spot, old manure spots, harrows and area near trees were avoided.

Soil sample analysis

All soil samples were air-dried crushed and pass through a 2 mm sieve, soil pH was determined in 1:2.5. Soil water ratio using EL model 720 pH meter. Available phosphorus was determined according Bray and Kurtz method. Organic carbon was assessed using Walkley and Black dichromate method. Total Nitrogen by Micro Kjedhal digestion method Exchangeable cation was estimated by 1 m ammonium acetate extraction. Cation Exchangeable capacity was estimated at pH 7 using acetate as exchange cation: Exchangeable bases (Ca, Mg, K and Na) were generated using 1 M NH_4OAC extraction texture estimate using hydrometer method.

Statistical analysis

A descriptive statistics was used in the analysis of the data given by the household. A student test were used to compare the soil properties of the four land used types.

RESULTS AND DISCUSSION

Majority of the farmers (37%) believed that forest reserve

Table 1. Famers ranking of soil fertility in four land use practices.

Land use	Frequency	Percentage	Ranking
Forest reserve	11	37	1
Orchard	09	30	2
Grazing	06	20	3
Cultivate land	04	13	4

Sources: Field Work, (2017).

Table 2a. Soil physical status in four land use practices.

	Physical Properties			
Land Use	**Clay**	**Silt**	**Sand**	
Forest Reserve	18	17	65	Sandy Clay loams
Orchard	14	18	68	Sandy clay loams
Follow land	10	15	75	Sandy clay loams
Cultivated land	11	11	79	Sandy Clay loams

Source: Laboratory analysis (2017).

Table 2b. Soil chemical status in four land use practices.

	Chemical Properties										
Land Use	**PH**	**PH Kcl**	**ECMS/Cm**	**OC 1%**	**TN %**	**AV PPM**	**CEC**	**Na**	**K**	**Mg**	**Ca**
Forest Reserve	6.9	5.4	0.05	1.44	0.22	4.0	7.2	0.37	0.60	1.42	1.2
Orchard	6.1.	5.2	0..3	1.1	0.19	3.85	6.6	0.19	0.45	1.35	1.0
Follow land	6.5	5.1	0.3	1.2	0.15	3.33	6.7	0.24	0.52	1.40	1.3
Cultivated land	6.2	4.9	0.02	0.9	0.14	4.74	6.3	0.21	0.45	0.95	0.90

Source: Laboratory analysis (2017).

is the most fertile among the four land uses. They indicate moderate fertile or low fertile. They reached a consensus of using 3 indicators i.e. soil characteristics, agricultural management requirement and biological indictors, since only one out of the four land use practices is a cultivable land. Table 1 shows large percentage (37%) of the farmers indicted that forest reserve is the most fertile among the four land use types. In soil characteristics assessment in the forest reserve, they believe that soil is dark-brown in colour, loamy in texture and has good water holding and infiltration capacity. On biological indicator, the farmers believed many weed species and presence of earth worm and bettle larve are signs of high fertility status of the forest reserve soil. On physical assessment of the four land use practices, the farmers indicated that there is little or no sign of erosion or signs of physical degradation in all the land use practices.

Soil chemical and physical properties

The result shown in (Table 2a and b) indicated the mean organic carbon across the four land use range between 1.44-0.9. It could be regarded as medium, because values <1% are regarded as low and 1-1.5% are regarded as medium (Adamu and Dawaki 2008). The Ca values in all the four land use types are generally low because values of 5 cml/kg and below are generally considered as low (Landon, 1991). The Mg values are within the medium range in all the four land use. Salinity status of the soil across the four land use as shown in (Table 2a and b) shows that the mean pH in water ranged between 6.1 and 6.9 and pH in salt ranged from 4.9 and 5.4, which means they are within the slightly acidic range. The physical condition of the soil was assessed for particle size distribution in the soil and translated into textural classes. The result as shown in (Table 2), sand values ranged between 65-77% silt values ranged between 11-18% and clay values ranged between 1-18%. The highest (77%) sand context was recorded at cultivated land, this may be due to little vegetation cover and its exposure to wind and water erosion processes. Sandy texture are very susceptible to erosion because low silt and clay contents which are important in binding particles and creating stable structure to reduce the effect of erosive power of wind and water (Adamu, 2013). The highest concentration of clay (18%) in forest reserve may be due to the influence of vegetation cover which probably reduce the erosion and aided concentration of clay.

Conclusion

Farmers are aware of the fertility status in different land

use, they also knew the root causes of the variation. The study depicts land management challenges experienced by the smallholders' farmers. Hence documentation of the farmers experience and using it to devise improve method of land management strategies will help in increasing farmers' productivity.

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