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Soil Fertility Assessment of Selected Community-Based Forest Management Sites in Kalinga, Philippines

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Abstract: **This study was conducted to assess the soil fertility status of selected Community-based Forest Management sites in Kalinga. Soil samples were collected and analyzed for the different soil fertility indicators such as soil pH, Nitrogen (N), Potassium (K), and Phosphorus (P). Results showed that the CBFM project in Pinukpuk, Kalinga had higher Nitrogen (N) content compared to the CBFM site in Tabuk City, Kalinga with an average of 1.548 and 1.354 respectively. In terms of Phosphorus (P) content, Pinukpuk site had an average of 4.647 while Tabuk City had an average of 3.4. For the Potassium (K) content, Pinukpuk site had an average content of 194.90 while only 48.71for the Tabuk City site. In terms of pH, the sites revealed that almost the same pH value of 5.159 and 5.114 respectively. CBFM site in Pinukpuk, Kalinga tremendously overturn the CBFM site in Tabuk City, Kalinga due to its higher plant biodiversity coupled with the presence of native tree species in the area as compares to that in Tabuk City CBFM area.**

Keywords: **Community –based Forest Management, soil fertility, soil productivity, deterioration.**

1. INTRODUCTION

Soil is a natural body with its own dependent characteristics. It is formed by the interaction between parent material climate and vegetation.

Soil fertility refers to the inherent quality that enables the soil to provide power compounds in proper balance for specified plants, when other factors such as light, temperature, moisture and the physical condition of the soil are favorable. It is thus the capability of soil of producing a plant yield under defined conditions.

Soil productivity can be defined as the ability of soil to produce crop under a physically defined set of management practices. It is measured in terms of input of production factors in relation to outputs or harvests. Thus productivity is not itself an inherent quality of the soil. All the physical, chemical, and biological properties of a soil, together with the associated climate determine its response to management, inputs of labor and materials.

Soil productivity and yield productions are achieved in two principle ways:

(a) Through judgment based upon evidence afforded by actual yield data from sample areas of the soil unit,

(b) Through judgement based on the comparisons of the characteristics of the soil and basic knowledge of the plant requirements.

Soil fertility is influenced by countless of factors in an integrated way viz. Soil depth, soil texture, soil structure, soil pore space, soil temperature, soil compaction and tillage, soil reaction, nutrient content, humus content, humic and non-humic substances. Thus it is necessary to study both physical and chemical properties of soil in assessing soil fertility.

The productivity of soil is dependent on soil fertility. Normally, fertile soil gives good productivity. Every year soil is loosing natural fertilizer through the process of production. So it is necessary to study the fertility and productivity of soil carefully to use soil rationally as well as intensively and there by the agroforestry production would be able to keep pace in the increasing population.

In permanent agricultural systems, soil fertility is maintained through applications of manure, other organic materials, inorganic fertilizers, lime, the inclusion of legumes in the cropping systems, or a combination Of these. In many parts of the world the availability, use, and profitability of inorganic fertilizers have been low whereas there has been an intensification of land-use and an expansion of crop cultivation onto marginal soils. As a result, soil fertility has declined and it is perceived to be widespread, particularly in sub-Saharan Africa. Soil fertility decline is considered as an important cause for low productivity of many soils. It has not received the same amount of research attention as soil erosion; possibly as soil fertility decline is less visible and less spectacular, and more difficult to assess.

Assessing soil fertility decline is difficult because most soil chemical properties either change very slowly or have large seasonal fluctuations; in both cases, it requires long-term research commitment. There are several other confounding factors that make assessment of soil fertility decline complicated (e.g., spatial and temporal variation, soil analytical methods), and, for those reasons, other techniques have been used to estimate the rates and changes in soil fertility decline.

Continuous cultivation without addition of substantial amount of soil organic matter (SOM) in rugged hilly terraces causes the sharp decrease in SOC and nitrogen (Shrestha et al., 2006). Deterioration of soil by erosion, nutrient mining and fragmentation caused a decreasing trend in soil fertility (Tripathi et al., 1999). Farmers realized that continuous application of chemical fertilizers, without addition of FYM, resulted into soil degradation and ultimately, productivity decline. The low technical knowledge of farmers regarding these problems and resource-constraints to adopt rational management practices aggravated the problems of land degradation and soil fertility deterioration.

2. METHODOLOGY

Site of the Study:

The sites include the Community-Based Forest Management (CBFM) sites in Barangay Balong, Tabuk City and Barangay Ammacian of Pinukpuk, Kalinga with an area of 80 has. and 1,030 has respectively. The area was awarded to the Northern Balong Farmers Association (NBFA) on CY 2000 with CBFM Number 000005078 and Ammacian Taggay Upland Farmers Developers Association Incorporated (AMATUDAI) on May 23, 1997 with CBFM Number 000005016.

Like the rest of Northern Luzon, the Province of Kalinga is subjected to the northeast trade winds from November to March and the Southwest trade winds from June to October. The climate falls under type II with more or less evenly distributed rainfall throughout the year. On the average, June to January is the wet months while February to May is relatively dry. The highest rainfall occurs in August and the lowest in March.

The site ranges from flat to gently sloping particularly in Balong, Tabuk City and sloping to moderately steep in Barangay Ammacian, Pinukpuk, Kalinga.

Rapport Building:

Before the official conduct of the study, the researcher conducted courtesy calls to the CENRO officer of Tabuk City and Pinukpuk. The barangay captains and leaders of the community were also met to discuss the objective of the research and to obtain permission.

Soil Chemical Properties:

Soil samples were collected from the three (3) randomly dug pits in every lot with dimensions of 25 cm x 25 cm and 30 cm depth were mixed together and representative samples were obtained for air drying. A total of 69 samples (34 in Ammacian, Pinukpuk and 35 in Balong, Tabuk) were collected. These samples were placed in labeled plastic bags and transported to the soil laboratory of the Bureau of Soils- Department of Agriculture Tuguegarao City, Cagayan for the analysis of pH, nitrogen, phosphorus and potassium.

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3. RESULTS AND DISCUSSIONS

Soil Chemical Characteristics of the Selected Community-Based Forest Management Project:

The chemical characteristics of the soil in the study were analyzed according to site of the Community- Based Forest Management project site (Table 1). Brady (1978) noted that while soil analysis indicates the capacity of a soil to supply nutrients to the plants, it does not adequately and in some cases does not at all characterize the mobility of nutrients in the soil.

Table.1: Soil chemical analysis of the Community-Based Forest Management Project.

SOIL CHEMICAL PROPERTIES	CBFM PROJECT SITES	
	TABUK CITY	PINUKPUK
pH	5.114	5.159
Nitrogen (ppm)	1.354	1.548
Phosphorus (ppm)	3.4	4.647
Potassium (ppm)	48.71	194.90

Soil pH:

The most universal effect of pH on plant growth is nutritional. The soil pH influences the rate of plant nutrient release by weathering, the solubility of all materials in the soil, and the amount of nutrient ions stored on the cation-exchange sites. Usually the optimum pH is somewhere between 6.0 and 7.5 because all plant nutrients are reasonably available in that range. Comparison among the project sites revealed that almost the same pH value of 5.114 and 5.159 respectively. Based on FAO (1973) as cited by Gascon (1998) and Rodolfo 2012, the two community-based forest management project sites have moderately acidic soils. Using t-test, the computed t-value is 0.317 while the critical t-value is 1.996 which indicates no significant difference on the soil pH of the two CBFM Project sites.

Total Nitrogen:

Nitrogen is a primary nutrient needed by the plants. Its presence in higher amount indicated soil fertility (Thompson & Troeh, 1978, cited by Gascon, 1998; cited by Rodolfo, 2012). The study revealed that the project site in Pinukpuk, Kalinga had higher nitrogen in terms of organic matter to be 1.548 while of Tabuk City had 1.354. The Community-Based Forest Management project sites have nitrogen level described as moderate (FAO Staff, 1973, cited by Gascon, 1998). The study site is comparable to the study of Taye Belachew and Yifru Abera (undated) which is 1.34% to 2.92% indicates low to medium. The moderate level of nitrogen in the project sites is understandable because majority of the species planted are non-nitrogen fixing species. Significant difference exists when the means were compared with the use of the t-test because the computed t-value of 2.076 is higher than the critical value of 1.996.

Available Phosphorus:

In many natural ecosystems, phosphorus is the more likely limiting element (Odum, 1971 cited by Navasero, 1993; cited by Gascon, 1998).

The project site in Pinukpuk had higher level of Phosphorus with 4.647 while that of Tabuk city which is 3.40.

Based on Phosyn Chemicals Limited (1987, cited by Palijon, 1998), the guideline level for phosphorus is 50 ppm. The study sites were low in phosphorus. When the means are compared using t-test, the computed t-value of 1.139 is lower than the critical t-value of 1.996. This means that there is no significant difference in terms of phosphorus between the CBFM project sites.

Available Potassium:

Potassium (K) availability in the soil depends largely on the density of standing biomass (Raves 1978, Mohr & Van Baren, 1954 cited by Navasero, 1993; cited by Gascon, 1998).

Result of the study revealed that the project site in Pinukpuk had higher soil potassium content (194.853 ppm) than that in Tabuk City (48.714 ppm). This difference in soil potassium content between the two CBFM project sites is significant as revealed by computed t-value of 6.852 and the critical t-value of 1.996.

Based on Phosyn Chemicals Limited (1987, as cited by Palijon, 1998), the guideline level for potassium is 200 ppm. The study sites showed low level of potassium.

4. CONCLUSION

CBFM site in Pinukpuk, Kalinga tremendously overturn the CBFM site in Tabuk City, Kalinga due to its higher plant biodiversity coupled with the presence of native tree species in the area as compares to that in Tabuk City CBFM area.

Community- Based Forest Management site in Pinukpuk has higher soil chemical properties of nitrogen, pH, phosphorus and potassium than that of Tabuk City.

REFERENCES

[1] RODOLFO, R. 2012. Assessment of the Indigenous Forest Management System of the Iturkaw in Tulgao, Tinglayan, Kalinga, Philippines. Dissertaion, University of the Philippines, Los Banos, Laguna.

[2] TAYE BELACHEW AND YIFRU ABERA. (undated) Department of Plant Sciences, Wollo University, P.O. ox:1145, Dessie, Ethiopia Debre Zeit Agricultural Research Center, P.O. Box: 32, Debre Zeit, Ethiopia

[3] GASCON, C. S. 1998. Sustainabin lity Indicators of the Hanunuo Mangyan Agroforestry Systems, Sitio Dangkalan, Bulalacao, Oriental Mindoro. Ph.D. Dissertation. University of the Philippines Los Banos.

[4] PALIJON, A.M. 1998. An Analysis of Green Space Management Strategies in Metro Manila. Ph.D. Dissertation. University of the Philippines Los Banos.

[5] Shrestha R.K., Ladha J.K., Gami S.K. (2006), Total and organic soil carbon in cropping systems of Nepal. Nutr Cycl Agroecosyst, 75, 257–269.