

Studies on the Nutritional Values of Some Kinds of the Soil from Paddy Field

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Abstract:- The main aim of this research work is to study the nutrient values and the fertility of paddy soil from Suetat village in Toungoo Township, Bago Region in Myanmar. The study was carried out from before cultivation and after cultivation. Soil samples were taken and dried in the shade. The physical properties of texture in soil samples were found sandy loam. Chemical properties like as pH, electrical conductivity, organic matter, nitrogen, phosphorus, potassium. The pH values were measured by 4A1-1:5 soil: water suspension method. Determination of electrical conductivity was made by 3A1-1:5 soils: water suspension method. The available nitrogen in the soil samples were determined by alkaline permanganate method. Available phosphorus in soil samples were measured by using 9C-olsen's P-Malachite green method. Determination of potassium in soil was used by 15A1-1N Ammonium acetate extraction method. Organic matter and texture of soil samples were measured by Walkley-Black method and Pipette method. In this study, the value of before and after cultivation of soil samples such as pH, electrical conductivity, available nitrogen, available phosphorus, available potassium and organic matter % found to be 7.24 and 6.31, 0.14 dS/m, 153 dS/Kg and 113 dS/Kg, 23.2 dS/Kg and 27.9 dS/Kg, 457 dS/Kg and 179 dS/Kg, 2.97% and 3.38% respectively.

Keywords:- Paddy soil, Nutrient, Values, Paddy field in Toungoo.

I. INTRODUCTION

In Myanmar 75% of the population are farmers cultivating mainly rice. Agriculture is a major component of the Myanmar economy, contributing 42% to its GDP with 65% of the labor force involved in agriculture [1]. Rice is staple food in most Asian countries and more than 90% of the world's rice is produced in Asia [2].

The total paddy cultivated land in Myanmar is about 5.26 million hectares. Rice is an important foreign exchange earner for the country is grown in almost every part of the country under the great diversity of climate and soils. The responses of rice to temperature differ with variety. Rice is normally transplanted at random with an optimum spacing varying between 0.15 x 0.15m and 0.30 x 0.30 m. Paddy is the main crop of Toungoo Township. It is cultivated not only as the subsistence crop but also grown an important

income cash crop. According to the growing season of paddy, the varieties of paddy are decided as summer paddy and monsoon paddy, which is grown in the rainy season. The monsoon paddy sown area is larger than the summer paddy sown area. The crop has a high tolerance to acidity with optimum pH between 5.5 and 6.0. To exploit existing natural resources, improved soil and crop management technologies are urgently needed [3].

Most of the soils in Myanmar suffer from improper land use practices during the past several decades. These include nutrient mining, leaching, improper land preparation, and inadequate erosion control. Much of the agricultural land in Myanmar land is vulnerable since agriculture has intensified and poor management is reducing soil fertility. Land degradation can be attributed to improper land use, misguided land management leading to unproductive farming and pollution in downstream water bodies [4].

The importance of soil quality lies in achieving sustainable land use and management systems, to balance productivity and environmental protection. Unlike water and air quality, simple standards for individual soil-quality indicators do not appear to be sufficient because numerous interaction of static and dynamic chemical, physical and biological factors need to be defined in order to identify different management and environmental scenarios [4]. Soil-quality assessment, based on inherent soil factors and focusing on dynamic aspects of soil system, is an effective method for evaluating the environmental sustainability of land use and management activities [5].

Weathering is the process of disintegration and decomposition of rocks and mineral. Two natural forces, physical and chemical, operate in this process. Physical weathering is a kind of mechanical disruption and is termed disintegration. It causes a change in shape, form and size of the rock and mineral debris. The agents of physical weathering are temperature, water, wind and glaciers. Chemical weathering causes a change in composition and is termed decomposition. Some of the decomposition products go into solution: others are split off as gases; and the bulk of them, as a rule, remain intact. The agents of chemical weathering are oxidation, carbonation, hydration and dissolution [6].

II. MATERIALS AND METHODS

In this research, soil samples were collected from Suetat village in Toungoo in Bago Region. Measurements were made before cultivation and after cultivation. The surface soil samples (0-20 cm-depth) were collected [7]. In each case a V-shaped was marked and soil samples were collected in plastic bags, which were sealed and label

properly. Soil samples were brought to the Department of Agricultural Research (DAR) Yezin Nay Pyi Taw [8].

Soil testing is needed for farmers to diagnose the nutrition problems. In this research work, soil samples were taken from paddy field of Suetat village in Toungoo Township, Bago Region. Table I was showed paddy field of soil parameters with their methods and apparatus used.



Fig 1:- Map of Toungoo Township
*Source: Geography Department, Toungoo University



Fig 2:- Before cultivation of paddy field soil sample



Fig 3:- After cultivation of paddy field soil sample

Figure 1 was showed the sample location area of Toungoo Township. Figure 2 and 3 were showed before and after cultivation of paddy field soil sample.

Analytical Item	Analytical Method	Apparatus used
pH	4A1-1:5 soil: water suspension	pH meter F-51 HORIBA
Electrical Conductivity, EC	3A1 -1:5 soil: water suspension	Cond meter DS-51 HORIBA
Available N	Alkaline permanganate method	-
Available P	9C-Olsen's P-Malachite green	UVVis Spectrophotometer PD-303 UV
Available K	15A1-1N Ammonium acetate extraction	Atomic Absorption Spectrophotometer AA- 7000, SHIMADZU
Organic Matter	Walkley-Black Method	-
Texture	Pipette method	-

Table 1:- Paddy Field of Soil Parameters with their Methods and Apparatus used

III. RESULTS AND DISCUSSION

A. Texture of Paddy Field Soil Sample

Soil Texture affects the soil sustainability. The sand silt and clay are the three components of soil texture. It affects absorption of nutrients, microbial activities, the infiltration and retention of water, soil aeration, tillage and irrigation practices [7]. The inorganic part of the soil is made up of particles ranging in size from that of fine clay to large rocks. Particle size distribution is the principal characteristic determining the water-holding characteristics of mineral soils [9].

In this research, the texture of the paddy soil can be classified as flow. The result was shown in Table 2.

Soil Sample	Texture (%)			Soil textural class
	Sand	Silt	Clay	
Before cultivation	93.1	4.3	2.6	Sand
After cultivation	93.2	3.6	3.2	Sand

Table 2:- Texture of Paddy Field Soil Sample

B. pH of Paddy Field Soil Sample

The soil pH of before cultivation and after cultivation were 7.24 and 6.31 respectively. The pH value beyond 9 is undesirable an account of alkali hazards. Neither is the pH value below 4.5 good as availability of nutrients of plants becomes a limiting factor [10].

The result was shown in Table 3.

C. Electrical Conductivity (EC)

The value of electrical conductivity was found by 0.14 dS/m. The soil is non-saline having electrical conductivity less than 1 dS/m which might be due to the removal of

bases by percolation or by water drainage [11]. The result was shown in Table 3.

D. Organic Matter of Paddy Field Soil Sample

Soil organic matter plays an important role in maintaining plant nutrients in the soil and soil structure. Organic matter, formed by the decomposition of plant and animal residues, affects the physical condition and fertility of the soil. It improves the water holding capacity of the soil, because it acts as a sponge to absorb and hold water that would otherwise percolate through the soil and becomes unavailable for plant growth. It also supplies nutrients, which are released and made available for plant growth as the organic matter decomposes [12].

In the research, the organic matter contents of before cultivation and after cultivation were 2.97% and 3.38% respectively. The organic matter contents of surface soil were noticed after cultivation period. The result was shown in Table 3.

E. Available Nitrogen "N" of Paddy Field Soil Sample

Nitrogen is an essential and important constituent of the plant's body. Nitrogen is absorbed mainly as nitrates dissolved in soil water. It is needed for synthesis of amino acids, proteins and other nitrogen containing compounds [7]. It improves the equality of leaf crops. Insufficient nitrogen results in poor plant's growth and yellow leaves. [13].

In this research, the available nitrogen contents of the soil sample were found to be 153 mg/Kg (very high) in before cultivation and 113 mg/Kg (high) in after cultivation. The result was shown in Table 3.

F. Available Phosphorus "P" of Paddy Field Soil Sample

Phosphorus is mobile within the plants and promotes flowering, root development, early flowering and ripening. Total phosphorus in soil is considerably related to the availability of phosphorus to plants [14].

In the research work, available phosphorus contents were found to be 23.2 mg/Kg in before cultivation and 27.9 mg/Kg in after cultivation. So, in each and every site of study area, the level of phosphorus is higher than the requirement for normal plant growth. It can be due to high fertilizer practice. The result was shown in Table 3.

G. Available Potassium “K” of Paddy Field Soil Sample

Potassium is a key element in soil chemistry. Because the amount of exchangeable potassium is critically low for

crop production in extensive soil throughout the more humid region. Potassium is absorbed by plants as the K^+ ion [13].

In the research work, available potassium levels were found be 457 mg/Kg in before cultivation and 179 mg/Kg in after cultivation. The result was shown in Table 3.

Soil Sample	pH		EC		Available N		Available P		Available K		Organic Matter	
	reaction	rating	ds/m	rating	mg/kg	rating	mg/kg	rating	mg/kg	rating	%	rating
Before cultivation	7.24	Slightly alkaline	0.14	Non saline	153	very High	23.2	High	457	High	2.97	Medium
After cultivation	6.31	slightly acid	0.14	Non saline	113	High	27.9	High	179	Medium	3.38	High

Table 3:- Results of Paddy Field Soil Quality parameters

IV. CONCLUSIONS

Toungoo Township is studied; the length of, from north to south, is about 15 miles and the width of the township from east to west is about 45 miles. Total area of township is about 663.152 square miles or 424.417 acres. There are altogether 253 villages in Toungoo Township. Agriculture is the leading occupation of Toungoo Township. The main agricultural products are paddy, oil crops, sugarcane, peas, pulses and others. The main area of paddy concentration occurs in the western part of the township. This research focused attention on paddy nutrient requirements; more systematic in successful activities of the farm procedure the farmer may boast greater production. Consequently, the Toungoo Township may be developed progressively.

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