Mapping Nutrient Status Of Phosphate, Soil Ph And Organic Carbon Of Paddy Fields In Meijan Village Balige District Toba Regency

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Abstract.

The purpose of this research is to survey and mapping nutrient status of total phosphate, available phosphate, soil pH and organic carbon at paddy fields Meijan Village Balige District Toba Regency and its influence on rice production. Soil samples was analyzed at the Analytical Laboratory of PT Socfindo Indonesia North Sumatera Province. Which began in October to December 2023 The method used is Free Grid Survey semidetailed level survey and analysis of nutrient data total phospate by Acid destruction method ($HClO_4$), available phosphate by Bray II method, soil pH by H_2O extraction and organic carbon by walkley & black method and then interpret to the map nutrient status. The result of research showing that status total phosphate classified by 3 status such as, medium (81,59 ha), high (81,15 ha) and very high (27,26 ha). Available phosphate classified in 3 nutrient status such as very low (39,11 ha), low (137,40 ha) and medium (13,49 ha). Soil pH classified in 2 status such as moderately acidic (30,16 ha) and strongly acidic (159,84 ha). Organic carbon classified by 3 nutrient status such as very low (3,06 ha), low (135,84 ha) and medium (51,10 ha). Available phosphate and organik carbon affect rice production in Meijan Village Balige District Toba Regency.

Keywords: *Land Degradation, Mapping Nutrient Status, Paddy Fields and Soil Survey.*

I. INTRODUCTION

Land surveys are describing the characteristics of land in an area, classifying it according to the raw classification system, plotting the type and availability of land on a map and making predictions about land properties. The information collected in land surveys helps develop land use plans and at the same time evaluates and predicts the impact of land use on the environment [1]. According to [2]., [3]. wildland is the soil used to cultivate wildbeans, either continuously throughout the year or alternating with palace plants [4]. Rice crop productivity in Meijan to date is 4.1 tons/ha [5], and well below national standards. The low production is likely to be due to several factors, such as the phosphorus content available and the level of soil organic material present in the wilderness [6].. Some farmers in the processing of the grass still haven't used chemical fertilizer for phosphate sources [7]. Also, some of the farmers in this village have the habit of burning the remaining grain after the harvest, although the habit has a negative impact on the availability of organic material in the wilderness [8]. Based on the above pattern, the researchers conducted research to find out the spread of total P, available P, soil pH and organic C in the wilderness in the village of Meijan so that further processing could be carried out [9].

II. METHODS

The research was carried out in the Meijan village of Balige district of Toba with an area of 190 ha and an altitude of ± 18 m above sea level. The soil samples have been analyzed in the Analytical Laboratory of the P.T. Socfindo Province of North Sumatra. The research was conducted from October to December 2023. The method used in this study is the Survey Grid Free Survey Method. (kerapatan pengamatan 1 sampel tiap 12,25 hektar). Soil sampling in the field using a cangul at a depth of 0-20 cm. Soil sample is taken from several points zig-zag and composited and then made into a single sample. From each sampling of the land, the coordinate readings are recorded on the GPS. The observed parameters include total P (acid destruction method (HCl4), available P (Bray II method), soil pH (H2O extraction method) and soil organic C (Walkley and Black method %). The data obtained was analyzed using spatial analysis using the Geographic Information System (GIS). The data obtained is grouped on the basis of the criteria of assessment of land properties made by the Land Research Center staff (1983) and BPP Field (1982).

Tabel 1. Kriteria Land Research Center staff (1983) and BPP Field

Unit Soil	Properties	Very Low	Low	Medium	High	Very Higj
P Total	%	<0,03	0,03-0,06	0,06-0,079	0,08-0,10	>0,10
P Tersedia Bray II	ppm	<8,0	8,0-15	16-25	26-35	>35
C Organik	%	<1,00	1,00-2,00	2,01-3,00	3,01-5,00	>5,00

Table 2. Soil pH criteria_

Criteria	Very Sour	Sour	A bit sour	Netral	Neutral	Alkalis
pH (H2O)	<4,5	4,5-5,5	5,6-6,5	6,6-7,5	7,6-8,5	8,5

Fig 1. Map of paddy field soil sampling point in the village Meijan

Research methods

This study used survey methods and laboratory analysis. The data used in this study are primary data and secondary data. Primary data is data obtained directly from the field and results of laboratory analysis, while secondary data is obtained from literature, map analysis and data from related agencies. The sampling method uses stratified sampling with land unit strata.

III. RESULT AND DISCUSSION

The village of Meijan is one of the villages in Balige district Toba district has an area of 14.88 km2 or equivalent to 1.488 ha. This area is at an altitude of ± 765 m above sea level (dpl) and has a rainfall of about 3000 - 3500 mm/year. The kind of land that exists in this village is the land of Ultisol.

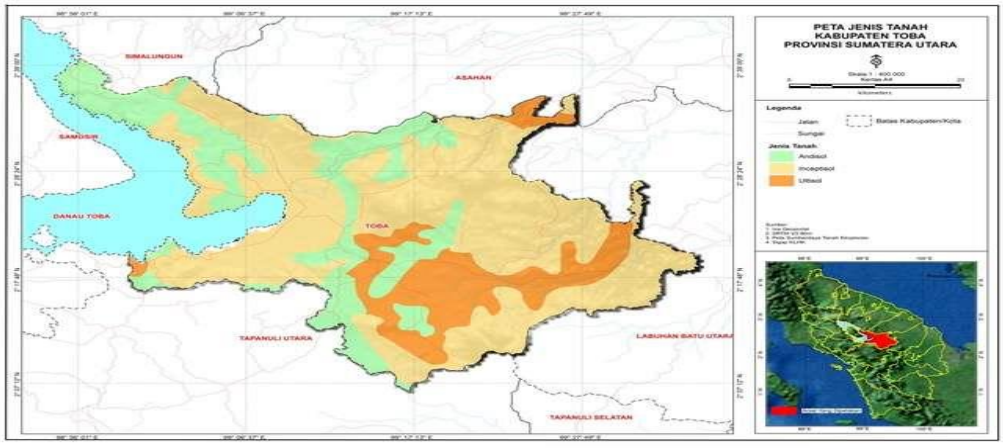


Fig 2. Beijing Village location map is one of the villages in Balige District, Toba Regency

Land Management

From the results of the questionnaire given to farmers, land management data (phosphorus fertilization and organic matter) was obtained. Based on the data obtained, it is known that the majority of farmers do not fertilize phosphorus in their paddy fields, namely 93.33%, while those who do fertilize phosphorus amount to 6.67%. Farmers who collect/burn leftover straw from the harvest are 63.33%, while those who leave leftover straw on the land are only 36.67%. Land management data (phosphorus fertilization and organic matter) in the study area is presented in Table 2 below:

Table 2. Data on Land Management by Farmers

Pengelolaan Lahan		Total	%
Phosphorus Fertilization	Fertilization is carried out	2	6,67
	Are not done Fertilization	28	93,33
	Total	**30**	**100**
Material Management Organic	Left	11	36,67
	Collected/burned	19	63,33
	Total	**30**	**100**

Results of analysis of Total P, Soil pH and Organic C.

From the results of total P analysis of soil samples and evaluation of soil chemical properties according to Soil Research Center Staff (1983) and BPP Medan (1982) which can be seen in Appendix 1, a total P nutrient status map was obtained (Figure 2) with medium, high and very high status. tall. Total P in rice fields with medium criteria has the largest area compared to other criteria, namely 81.59 ha (42.94%), high criteria is 81.15 ha (42.71%), while very high criteria has a smaller area. compared to other criteria, namely 27.26 ha (14.35%). The total P nutrient status in the area is dominated by medium criteria due to land processing carried out by farmers, especially regarding the introduction of phosphorus which is not carried out by the majority of farmers (Table 3) [10]. Fertilizing with a source of phosphorus nutrients can increase the total P content in the soil and phosphorus status with moderate criteria. In paddy fields, at least SP 36 fertilizer must be applied as a source of phosphorus with a recommended dose of 75 kg/ha. This is in accordance with the [11] which states that the recommendation for P fertilization for lowland rice plants with medium P nutrient status class is 75 kg/ha SP 36. The moderate total P nutrient status in rice fields in Meijan Village, Balige District, Toba Regency could also possibly be caused by the burning of straw carried out by most farmers in rice fields. Because burning straw can cause up to 39-59% of the P element in the straw to be lost, where the P element should be returned to the soil. This is in accordance with the literature of Husnain (2010) which states that the percentage of nutrient content lost when burning straw is 33-35% for Si, 36-47% for K, 34-59% for P, 38-44% for Cam 42 -48% for Mg and 55-61% for Na. The area for total P nutrient status is presented. Soil pH

pH analysis

From the results of the pH analysis of the sample soil and evaluation of soil chemical properties according to the Soil Research Center Staff (1983) and BPP Medan (1982) which can be seen in Appendix 1, obtained a soil pH status map (Figure 4) with slightly acidic and sour status. Soil pH in paddy fields with acidic criteria dominates, namely 159.84 ha (84.12%) while slightly acidic criteria has an area of 30.16 ha (15.88 %). Soil pH status in the study area is dominated by acid criteria, covering an area of 159.84 ha (84.12%). This can be caused because the type of soil found in the research area is Ultisol soil. Ultisol soil generally has disadvantages, one of which is a high level of soil acidity. This is in accordance with the literature of Prasetyo and Suriadikarta (2006) which states that Ultisol soil has an acid to very acid soil reaction (pH 5-3.10), has a high potential for Al poisoning and is poor in organic matter content. The area for soil pH status is presented in

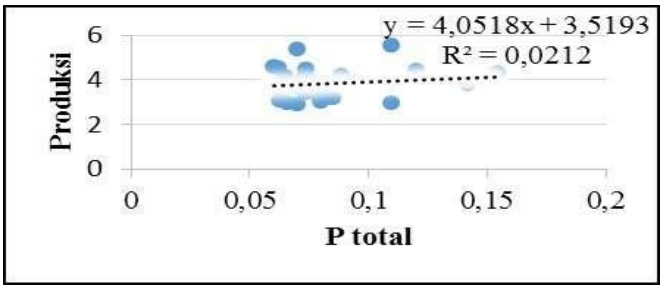
C organic

From the results of organic C analysis of soil samples and evaluation of soil chemical properties according to the Soil Research Center Staff (1983) and BPP Medan (1982) which can be seen in Appendix 1, an organic C status map was obtained (Figure 5) with very low, low and medium status. . Organic C in rice fields with low criteria has a larger area compared to other criteria, namely 135.84 ha (71.49%), medium criteria is 51.10 ha (26.89%) and very low criteria has more area. low, namely 3.06 ha (1.62%). The organic C status in the study area is dominated by low criteria with an area of 135.84 ha (71.49%). This is due to the habit of farmers who always collect/burn rice straw after harvest and do not return it to the rice fields. Farmers who collected/burned straw remaining from the harvest were 63.33%, while those who returned (left) the straw to the fields were 36.67% (Table 3). This is supported by research by Sumarno et al (2009) which states that rice straw can actually be used to increase the organic matter content of the soil, which

farmers often burn after harvest, which results in a decrease in the organic matter content of paddy fields. Sumarno et al added that this behavior occurs because farmers' awareness and understanding of the importance of the role of organic material in paddy fields is still low. Area for organic C status

Analysis of the Relationship between Total P, and Organic C on Rice Production in Rice Fields in Meijan Village, Balige District, Toba Regency

Total P correlation value to production is 0.146 and is positive. Even so, it is because of its significance value 0.443 > 0.05, so it can be concluded that there is no relationship between total P and rice production. Then the simple linear regression equation obtained between total P and rice production is y = 3.5193 + 4.0518x (Figure 6). However, because the t count obtained is < from the t table (0.779 < 2.048) and the significance is > 0.05 (0.443 > 0.05), it is found that P total has no effect on production. the level of closeness of the relationship is at a medium level. Then the simple linear regression equation obtained between available P and rice production is y = 3.1889 +0.066x (Figure 7). The calculated t value obtained > t table (3.302 > 2.048) and significance < 0.05 (0.003 < 0.05) means that available P influences production. This is supported by the literature of [8] which states that for rice growth, large amounts of phosphorus (P) are required for growth activities and high grain production. The coefficient of determination (R2) is 0.2803, which means that available P has an influence of 28.03% on production, while 71.97% is influenced by factors other than available P. The correlation between organic C and production has a coefficient value of 0.438 at a significance level of 0.05. With this coefficient value, it can be said that the level of closeness of the relationship is at a medium level. Then the simple linear regression equation obtained between organic C and rice production is y = 2.926 + 0.5168x. The calculated t value obtained is > t table (2.577 > 2.048) and the significance is < 0.05 (0.016 < 0.05), so it is found that available P influences production. This is in accordance with the literature [11] stated that there is a positive correlation between organic matter content and lowland rice plant productivity, where the lower the organic matter content, the lower the productivity. The coefficient of determination (R2) is 0.1917, which means that organic C has an influence of 19.17% on rice production.



IV. CONCLUSION

Total P is classified into 3 nutrient statuses, namely medium (81.59 ha), high (81.15 ha) and very high (27.26 ha). Available P is classified into 3 nutrient statuses, namely very low (39.11 ha), low (137.40 ha) and medium (13.49 ha). Soil pH is classified into 2 statuses, namely slightly acidic (30.16 ha) and acidic (159.84 ha). Organic C is classified into 3 nutrient statuses, namely very low (3.06 ha), low (135.84 ha) and medium (51.10 ha). Available P and organic C influence rice production in the rice fields of Meijan Village, Toba District, Toba Regency.

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