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Soil Classification Based on Morphology Characteristic in Multicropping Land at Sawit Rejo Village, Kutalimbaru District, Deli Serdang Regency

Kemala Sari Lubis[*1], Mukhlis[2]

[1]*Program Studi Agroteknologi, Fakultas Pertanian, Universitas Sumatera Utara, Medan, 20155, Indonesia*

[2]*Program Studi Agroteknologi, Fakultas Pertanian, Universitas Sumatera Utara, Medan, 20155, Indonesia*

[*]Corresponding Author: kemala_sari318@yahoo.com

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ABSTRACT

Multicropping is beneficial for maximizing land use and productivity, saving labor and costs for soil tillage. A field study (survey) has been conducted in Sawit Rejo Village, Kutalimbaru District, Deli Serdang Regency, North Sumatra which aims to classify the soil profile cultivated by multicropping. This study uses a descriptive method with a survey approach in the field. Soil observation was carried out through morphological characterization of soil profiles based on Keys to Soil Taxonomy. The results of soil profile observation show that the soil in this multicropping land has the order Inceptisol, the suborder Udic, the great group Humudept and subgroups including Typic Humudept.

Keyword: Soil classification, morphology, multicropping, sawit rejo

ABSTRAK

Multicropping bermanfaat untuk memaksimalkan penggunaan lahan dan produktivitas, menghemat tenaga kerja dan biaya pengolahan tanah. Telah dilakukan studi lapangan (survei) di Desa Sawit Rejo, Kecamatan Kutalimbaru, Kabupaten Deli Serdang, Sumatera Utara yang bertujuan untuk mengklasifikasikan profil tanah yang dibudidayakan secara multicropping. Penelitian ini menggunakan metode deskriptif dengan pendekatan survei di lapangan. Pengamatan tanah dilakukan melalui karakterisasi morfologi profil tanah berdasarkan Kunci Taksonomi Tanah. Hasil pengamatan profil tanah menunjukkan bahwa tanah pada lahan multikultur ini mempunyai ordo Inceptisol, subordo Udic, kelompok besar Humudept dan subkelompok termasuk Typic Humudept.

Kata Kunci: klasifikasi tanah, morphology, multicroping, sawit rejo

1. Introduction

Soil is the result of the weathering process of rocks that are constantly influenced by environmental factors. This process results in different layers of soil, with characteristics that are influenced by climate, organisms, parent material, and topography. Soil morphology is the study of the physical properties of soil that can be observed directly in the field. Observation of soil in the field is by studying the soil morphology from a soil profile or soil cross-section. In this way soils of the same properties can be included in the same class, and vice versa. Observation of soil morphological properties in the field is an effective method to study the physical properties and morphology of soil directly. The observed soil properties such as color, structure, texture and others are used as a determination of soil classification. The structure of the soil is an important factor in the soil. Soil structure has a complex formation process and involves organic matter and clay in its formation. The topsoil and the subsoil have different stages of soil structure formation, thus causing differences in structural

characteristics. This difference in soil structure characteristics causes fluctuations in the quality of soil structures both in the vertical and horizontal directions (Sukmawijaya and Sartohadi, 2019).

The structure of soil is formed from the merger of soil particles, organic matter, and minerals into larger groups. If these groups are separated, then the land is loosely structured. Conversely, if these groups stick together to form a bread crust, then the soil has a crumb structure. The crumb structure is excellent for agriculture because it allows the roots of plants to grow well and water and air to move easily in the soil. Soil with a clumpy structure, where soil particles stick very tightly to each other, is not good for plant growth (Susanto, 2005).

Soil texture refers to the relative composition of the different sizes of particles that make up the soil, i.e. particles that are less than 2 millimeters in diameter. Based on their size, soil particles are classified into sand, dust, and clay. To determine the texture of the soil in the field, it is usually done by touching the soil using a finger to feel the level of roughness or smoothness (Gunawan et al., 2020). Soil color is the most visible feature of soil and is often used as an initial clue in identifying soil type. Although soil color is not a direct determining factor in plant growth, soil color can provide information about the physical properties of the soil such as soil temperature and aeration which are very important for plant growth. Optimal soil temperature and aeration will support root growth and soil microorganism activity that is beneficial to plants (Susanto, 2005).

A representative soil profile is key in this study because it will produce data that can represent the characteristics of the soil in the observed area so that appropriate soil classification can be carried out. The classification of soils based on soil morphology makes it possible to organize knowledge about soils and predict their potential use. Thus, we can avoid the use of land that is not in accordance with its natural nature, so that soil productivity can be maintained (Rajamuddin and Sanusi, 2014). Soil classification is very closely related to pedogenesis or the process of soilformation because different processes will produce different soils (Gunawan et al., 2020).

The use of land for plant cultivation on land that has been classically determined makes it easier for land users to determine their land cultivation system as efficiently as possible. The land in Sawit Rejo Village, Kutalimbaru District has been cultivated in a mixed manner, namely palawija plants (cassava, soybeans) planted side by side with woody plants (durian, guava, avocado, rambutan). There are spice crops such as ginger, lemongrass, turmeric and pandanus. In general, palawija plants can grow well and produce even without regular fertilization applications. Researchers are interested in knowing the classification of soil up to sub-orders, to predict the extent to which soil properties, especially the physical properties of soil, are able to support plant growth and how to manage, especially soil tillage, which should be carried out next.

2. Method

This research was conducted in Sawit Rejo Village, Kutalimbaru District, Deli Serdang Regency, North Sumatra in November 2024 until it was completed, at an altitude of ± 175 meters above sea level. The tools used in this study are a hoe to scrape the profile, a bucket to drain the water at the profile location, a meter to measure the depth of the profile, a knife to make a boundary line for each horizon, a camera for documentation and stationery. The materials used in this study are profile cards to record observation results, the Munsell Soil Color Chart (Munsell Color, 2009) book as a guideline for determining soil color, plastic bags as a place for soil samples to be taken to the laboratory.

This study uses a descriptive method through a survey approach to determine the morphology and characteristics of soilfor soil classification. This research began by conducting a preliminary survey to the location of the observation land, followed by excavation of the soil profile for more observation :

1. Reviewing the location and state of the profile holes in the field.
2. Make a profile hole with a size of 1 m x 1.5 m x 1.5 m.
3. Scrape the side of the soil profile to be observed using a hoe.
4. Orient the entire soil profile and pay attention to the differences in soil properties in each soil layer.
5. Use a knife in the right hand to pierce or pry the wall of the profile to be described, to find out the difference in hardness or density of the whole profile.
6. Draw boundaries based on perceived and perceived differences. If the color and texture are the same, then the difference in structure, consistency and coarse material content is used as the basis for drawing the layer boundary.
7. Install a meter to find out the depth and thickness of each layer and then give it a number.
8. Describe and record observations.

The observed research parameters are as follows:
1. The layer/horizon that has been determined in depth and thickness, by giving a number, for example I (0-25 cm). This means the 1st layer, the depth is between 0 - 25 cm.
2. Determine the boundaries of each layer/horizon and its topography.
3. Determine the color, texture, structure, consistency, and rooting of each layer/horizon based on the units in the Munsell Soil Color Chart color standard book.
4. Determine the texture based on the texture of 12 classes.
5. Determine the observed soil structure including shape, size, and level of development.
6. Consistency is determined based on wet, moist or dry conditions.
7. Observing the roots includes fine, medium or coarse grains with a small, medium or large amount.
8. Fill in the symbols of each layer/horizon.

3. Hasil dan Pembahasan

Based on the data obtained from the observation of soil profiles in the field, soil classification can be carried out using a soil classification system guided by the twelfth edition of the Keys to Soil Taxonomy (Soil Survey Staff, 2014) can be seen in the following Table 1.

Table 1. Description of Soil Profile in Multicropping Land

Location	Sawit Rejo Village, Kutalimbaru District, Deli Sedang Region, North Sumatera		
Code of Land Unit	-		
Coordinates	3°54”N, 98°54”E		
Classification of Soil Taxonomy	Ordo : Inceptisols Sub ordo : Udept Great Group : Humudept Subgroup : Typic Humudept		
Physiography	Plain		
Slope	< 3% (flat)		
Elevation	175 meters above sea level		
Effective depth	78 cm		
Land use	Multicropping		
Parent material	-		
Diagnostic horizon	Umbric (0 – 30 cm), Cambic (30-66/78 cm), (66/78 – 95 cm), (95 – 135 cm)		
Characterizing properties	Udic		
Observation Date	01 November 2024		
Profile	Horizon	Depth (cm)	Description
	Ap	0 - 30	Very dark brown (10YR 2/2), sandy clay, grain structure, medium, weak, very loose consistency, many coarse roots, straight real boundary
	Bw_1	30 - 66/78	Dark yellowish brown (10YR 3/6), sandy clay, angular lumpy structure, smooth, rather strong, firm consistency, medium fine rooting, wave gradual boundary

Bw_2	66 – 78/95	Dark grayish brown (10YR 4/2), loamy sand, grain structure, medium, weak, loose consistency, straight blend boundary
Bw_3	95 - 135	Very dark grayish brown (10YR 3/2), sandy, loose structure, smooth, weak, loose consistency, straight blend boundary
Bw_4	>135	Light yellowish brown (10YR 6/4), sand, loose structure, smooth, no structure , loose consistency, straight blend boundary

Figure1. Soil Profile

In the observation of soil profiles in the field, there were no characteristics that corresponded to the soil orders Gelisol, Spodosol, Andisol, Oxisol, Vertisol, Aridisol, Ultisol, Mollisol, and Alfisol. However, a characteristic was found that corresponds to the order Inceptisol because a cambic horizon was found at a depth of 30 – 135 cm. This is in accordance with one of the characteristics that Inceptisol soil has a kambic horizon whose upper limit is within 100 cm of the mineral soil surface and the lower limit is at a depth of 25 cm or more below the mineral soil surface. In addition, the presence of umbric epipedons was found at a depth of 0 – 30 cm.

This is in accordance with the characteristics of Inceptisol, which is to have one of the pholistic, histic, mollic, plagen, or umbric epipedon. The observed soil profile was determined to have the order Inceptisol and subsequently a sub-order was classified. The observation results showed characteristics that did not correspond to Aquepts, Gelepts, Cryepts, Ustepts, and Xerepts. Based on the results of observations, great groups of the land are determined by looking at the appropriate conditions or elements. It is known that the soil does not meet the elements of Sulfudepts, Durudepts, and Fragiudepts.

The land is included in Humudeptts because it is characterized by the presence of umbric epipedon. This is in accordance with the characteristics of humudepts, which are to have umbric and mollic epipedon. The observation continued by looking at the characteristics of the subgroups of humudepts and it was known that there were no characteristics of Lithic Humudepts, Vertic Humudepts, Aquandic Humudepts, Andic Oxyaquic Humudepts, Andic Humudepts, Vitrandic Humudepts, Fluvaquentic Humudepts, Aquic Humudepts, Oxyaquic Humudepts and others. Because no suitable characteristics were found, the land was classified into other humudepts and named Typic Humudepts.

4. Conclusion

Multicropping land in Sawit Rejo Village, Kutalimbaru District, Deli Serang Regency has the Inceptisol Order, the Udept Sub-order, the Great Humudept Group and the Typic Humudept Subgroup.

5. Acknowledgment

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6. Conflict Interest

More careful observation is needed in observing soil profiles so as to reduce errors/inaccuracies in determining horizon boundaries, textures, structures, consistency and other soil properties.

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