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Physical Characteristics of Peat Soil in Oil Palm Plantation, Simpang Kanan Village, Simpang Kanan Subdistrict, Rokan Hilir

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ABSTRACT

Farmers in the village of Simpang Right use marginal land, namely peat soil, to develop oil palm farming. So far, the analysis of the physical properties of peatlands in Simpang Right has never been carried out. The application of fertilizers and oil palm plant care is only based on knowledge from social media and from the knowledge of parents first, so it is important to analyze the physical properties of the soil from peatlands that have been used for oil palm cultivation. This research was conducted from September 2021 to January 2022 on oil palm agricultural land cultivated by the community in Simpang Right Village, Simpang Right District, Rokan Downstream District, Riau Province. The method used is a free grid survey method at the semi-detail survey level. The implementation of taking soil samples from 3 sample points with a distance of 100 meters in the field using a random method spread over predetermined points. The results of the research on the physical properties of peatlands show that the peat soil used for oil palm plantations in the Simpang right village has Bulk Densty.0.15gr, Total Pore Space 44.68%, Field Capacity 254.25%, Withering Point 128,88%. Overall, the physical properties of the soil in oil palm plantations in Simpang Right Village, Simpang Right District, Rokan Downstream District, Riau Province are in good condition. To increase fertility for oil palm cultivation, it can be done by providing manure and chemical fertilizers with the required dose so that it can provide growth to oil palm plants.

Keywords: *peat land, soil physical, organic matter, soil sampling*

1. INTODUCTION

Indonesia has a peatland area of about 20.6 million hectares or almost 10.8 percent of Indonesia's land area. The island of Sumatra has a peatland area of 682,913 ha (Indonesia, 2002). Peatlands are formed from parts of vegetation that have been decomposed and flooded over the years (CIFOR, 2017). According to (Radjagukguk, 2000) Peat soil is a source of planting media that is easily degraded and has different characteristics from mineral soils, peatland reclamation for oil palm development includes drainage and land clearing which has an impact on the physical properties of peat soil. Selection of plantation crops that can live and grow on peatlands is very important to produce high crop productivity. The selection of commodities is adjusted to the adaptability of plants, economic value, capital capabilities, and farmer skills (Masganti et al., 2014). According to Subiham and Sukarman (2012), the use of peatlands As agricultural land, including oil palm plantations, it requires special attention and proper agricultural management. This is because the status of soil fertility is strongly influenced by the development of agriculture in an area. Inappropriate conversion of peatlands will have an impact on land damage and also the surrounding ecosystem and will affect the environment, ranging from loss of diversity, flooding, drought and affecting greenhouse gases (Agus F. Hairiah, 2011) (Agus, 2008).

Oil palm (Elaeis Guineensis Jacq.) is an agricultural crop that is able to grow and develop well in several types of land, including peatlands (Sabiham & Sukarman, 2012). According to (Giorgio Budi Indrarto, 2014) During the last two decades logging for new oil palm land has been very dominant. The high price of palm oil and high demand for crude palm oil (CPO) have driven the conversion of forest land into oil palm land, according to palm oil data. watch, the area of oil palm plantations reached 8,430,026 million hectares in 2014. According to research (Supiandi & Sukarman, 2012) Constructive – adaptive peatlands for sustainable oil palm development need not be doubted, especially in areas that have land extensive peat.

The key to determining the quality of land and the environment can be seen from the physical properties of the soil. If a land has good physical properties, it will provide good environmental quality as well. To consider a good land for agriculture, it is necessary to know the physical properties of the soil (Yulnafatmawati, 2007). In addition, according to (Suswati, 2011) the most important soil morphology in providing plant growth facilities is the physical nature of the soil. The physical characteristics of the soil must be the main focus, especially in the calculation of soil and water management, so that the sustainability of the peatland which is the place for oil palm plantations is guaranteed. Physical properties of peat which include bulk density, total pore space, field capacity, and wilting point (Situmorang, Wawan, & Khoiri, 2015).

According to (DKPP, 2017) Simpang right sub-district is one of the sub-districts in Rokan downstream district which is the largest producer of palm oil in Riau province, with a total production of 3,304 tons/year. Appropriate cultivation techniques depend on plant seeds, soil type and the surrounding climate including the physical characteristics of the soil. Therefore, it is important to conduct research to observe the physical characteristics of the soil. To find out the conditions for growing oil palm in a location and provide recommendations for care and cultivation of oil palm. This study aims to identify the physical characteristics of peat soil in oil palm plantations owned by the community in Simpang Kanan Village, Simpang Kanan District, Rokan Hilir Regency, Riau Province.

2. MATERIALS AND METHODS

This research was carried out from November 2021 to January 2022. The research location is located in Simpang Kanan Village, (99° 14' - 35.93'' East Longitude and 02° 26 – 29.24'' North

Latitude), Simpang Kanan District, Rokan Hilir Regency, Riau Province. The research location has a flat topography with a slope of 0% and is located at an altitude of 5 m above sea level. Sampling was carried out in tertiary peat forest withThe free grid survey method at the semi-detail survey level consists of 3 sample points with a depth of 0-20 cm. Analysis of soil physical properties was carried out at the Soil Biology Laboratory, Faculty of Agriculture, University of North Sumatra. Analysis of the physical properties of peat soil, namely: Bulk Density with a ring sample, Total Pore Space with the porosity method, field capacity with the oven method at 105°C, wilting point with the flooding method.

The material used in this study was a sample of peat soil planted with oil palm in the village of Simpang Right. The tool used is a ground drill,*Global Positioning System*(GPS). The number of samples for soil physics analysis is 3 samples. The method used in this study is a free grid survey method at the semi-detail survey level (observation density of 1 sample per 100 meters). Implementation of taking 3 sample points with a distance of 100 meters in the field with a randomly distributed method with a predetermined area based on a base map (Rauf & Harahap, optimization of agricultural land using biomass agents, 2019). Soil samples were taken in a zigzag manner at a depth of 0-20 cm. The coordinates are read on the GPS and the effective depth of the soil is measured at a depth of 4-5 meters above sea level

3. RESULTS AND DISCUSSION

Based on the results of this study, peat soil in Simpang Kanan Village is located in the interior of Simpang Kanan District, Rokan Hilir Regency, Riau Province. is peat soil that is found in the interior far from the coast and is never submerged by the tides of sea water so that the soil is classified as good for agriculture but still lacks nutrients.

Table1.Data Result of Analysis of Physical Properties of Peat Soil Planted with Oil Palm

Sample	Parameter			
	Bulk Density (g)	Total Pore Space (%)	Field Capacity (%)	Withering Point (%)
A	0.15	43.60	253.22	127.22
B	0.18	44.22	244.32	125,22
C	0.14	46.22	265.22	134.22
Average	0.15	44.68	254.25	128,88

Source: Laboratory analysis results (December 2021)

One of the recommended commodities is oil palm, because oil palm is a plant commodity that has resistance to the surrounding environment and is able to compete with other plants around it.

(Moore & Bellamy, 2017) Ombrophilous swamps (ombrophilous) that develop in stagnant groundwater areas and all of the water supply comes from rain that falls directly on it, also ombrophyll swamps have high H and sulfate ions, he also said that ombrophyll swamps in also called tertiary peat.

Bulk Density (Weight of Contents)

The weight value of the observations in the village of Simpang Right is obtained by the average weight of the sample taken in Sample A (0.15 g), Sample B (0.18 g), Sample C (0.14 g) and obtained the average of the three samples is 0.15 gr/cm3 including low criteria. According to (Subagyono, T, & IPG, 2010) peat soil has a low bulk density between 0.05-0.25 gr/cm3, the lower the density value, the weaker the decomposition rate, or the lower the peat maturity, because there are still many contain organic matter. So

that the bearing capacity of the load on it such as plants, irrigation buildings, roads, and agricultural machinery is low. Meanwhile, peat that has been reclaimed will be denser with a bulk density between 0.1-0.4 gr/cm3.

The low density value is caused by the presence of cavities in the peat caused by the presence of plant roots and from tree wood, the high density value is caused by compaction and the influence of the clay layer.(Coal, 2009). According to (Susandi, Oksana, & Arminudin, 2015) said that low peat density can result in low soil bearing capacity so that plants experience difficulties in propagation of their roots, therefore many annual plants that grow lean and fall.

Total Pore Space

Based on the results of the study, for the total pore space in Sample A (43.60%), Sample B (44.22%), Sample C (46.22%) of the three samples, it was found that the average content of total pore space was classified as low range of 44.68% (Table 1).

According to(Hanafiah, 2007) Porosity or pore space is a cavity between soils which is usually filled with water or air. The higher the total pore space, the lower the density (BD) of the soil, and vice versa. (Harist A., Wawan, & Wardati, 2017) states that the total pore space value is inversely proportional to the bulk density (BD) value of the soil. In addition to the density of soil texture, it can also be used as a reference for the total amount of pore space in the soil.

Field Capacity

Based on the results of the research that the peat soil planted with oil palm in the Simpang right village has a field capacity content of Sample A (253.22%), Sample B (244.32%), Sample C (265.22%) which is relatively minimal. of 254.25%. Kurnian (2018)*in*(Harist A., Wawan, & Wardati, 2017) Said that peat soil is composed of an organic matrix with very loose particle bonding strength, so it has a very light weight and large total pore space, therefore peat soil has the consequence of holding water that is very low. very large.

The availability of peat soil water is not only based on maturity, but is also influenced by rainfall or irrigation water, the ability of the soil to hold water, evapotranspiration, and groundwater level are also factors that can withstand the availability of peat water.(Saribun, 2007) while according to (Mardiana, 2006) soil water content is also influenced by soil density, because the soil will hold little water

Withering Point

Table 1 shows that the results of the analysis of the wilting point (%) of the soil at all observation points include the low criteria with an average of 128.88%. According to(Rauf, Sustainable Oil Palm Cultivation, 2019) To prevent further peat damage, it is necessary to maintain the soil water content (>273%) and the recommended water content of 300%.

With the results of the analysis above, it is necessary to plant peatland cover crops (legumes or legumes) to be able to maintain the groundwater of the peatlands to prevent the soil from drying out which results in harmful peatland fires. In addition to functioning to maintain soil moisture, the function of the peatland cover also functions to restore fertility or maintain soil biomass. The risk is that if there is a severe drought on peatlands, among them peatlands will be difficult to get back wet. This is because peat cannot absorb water again because it has a dry nature (*irreversible*) therefore peat land is difficult to use for agriculture in case of excessive drought according to Hardjowigeno from (Nurlaili, 2003)

4. CONCLUSION

Peat soil in Simpang Kanan Village, Simpang Kanan District, Rokan Hilir Regency, Riau Province, has an average physical property of 0.15 gr (Low), Total Pore Space 44,68 % (Low), 254.25 Field Capacity %(Medium), and Withering Point 128.88%(Low). For the next follow-up, so that it can become an area with the best palm oil production, it must need sustainable management, especially in terms of peat maturity so that it is not

completely degraded, either through the management of the groundwater level and the need to plant peat cover crops such as nuts or legumes. so that there is no saturated water content, as well as the need for socialization to the community so that they are more concerned about sustainable peatland management.

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