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Analysis of Peat Soil Chemical Properties in Oil Palm Plantation in Simpang Kanan Village, Rokan Hilir Regency

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ABSTRACT

This ecosystem change results in changes in chemical, physical, and biological characteristics and properties. The fertility level of peatlands can be determined through an analysis of the chemical properties of the soil. Therefore, the analysis of the chemical properties of the soil, including the analysis of the main nutrient content, was carried out from November 2021 to January 2022 in Simpang Kanan Village, Simpang Kanan District, Rokan Hilir Regency, Riau Province. Farmers in Simpang Kanan Village use marginal land, that is peat soil to develop oil palm farming. This research was conducted using the free grid method at the semi-detailed 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 scattered at predetermined points. Farmers in Simpang Kanan Village use marginal peat soil to cultivate oil palm plantations. So far, no analysis of the chemical properties of peat soil has been carried out. Application of fertilizers and cultivation is only based on knowledge from the internet or from previous generations. Therefore, it is important to study the analysis of the chemical properties of soil from peatlands used for oil palm plantations. The results of research on the chemical properties of peatlands in Simpang Kanan Village, Simpang Kanan District, Rokan Hilir Regency, Riau Province showed that the peat soil planted with oil palm in Simpang Kanan Village had a pH of around 4.89, C-organic 6.07%, N-Total 1 ,67 mg/L , P-Total 34.08 mg/L , K-Total 11.54 mg/L. Thus, the chemical properties of the soil in oil palm plantations in Simpang Kanan Village, Simpang Kanan District, Rokan Hilir Regency, Riau Province. Still good, to increase fertility for oil palm cultivation, it can be done by increasing the pH in the soil so that it maximizes oil palm development and can be used as a recommendation for oil palm fertilization.

Keywords: *Peatlands, Soil pH, Chemical Properties, soil sampling*

1. INTRODUCTION

In the world, peatlands have an area of 400 million ha. The average area of peatlands in Indonesia is around 17.2 million ha (Saharjo, 2017). Peatlands in Sumatra are around 7.2 ha or 35%. Peatlands are part of natural resources that have functions for conserving water resources, reducing floods, supporting various life or biodiversity, controlling climate and so on (Wahyunto, 2003). Peatlands have unique characteristics such as subsidence, irreversible drying properties. That is poor in nutrients, high acidity and flammable when dry. Therefore, the role of water management is very important in the development of peatlands for agriculture (Daryono, 2009). Peatlands in Sumatra from 2000 to 2010 experienced a sharp increase in development of oil palm plantations and industrial forest plantations (HTI) (Supiandi & Sukarman, 2012). Good water management needs to be considered in the sustainable use of peatlands, if the peatlands are too dry, the peat will burn easily.

Peat soil is formed from a pile of organic matter, so the carbon content in peat soil is very large. The organic fraction of peat soil in Indonesia is more than 95%, less than 5% the rest is the inorganic fraction. The organic fraction consists of humic compounds of about 10 to 20% (Stevenson, 1994) and according to (Polak, 1975) In Indonesia, it has several chemical characteristics of peatlands and is dominated by mineral content in peat soil, thickness, types of peat constituent plants, species of peat. mineral on the peat bottom, and the level of peat decomposition. And he also said that peat in Sumatra and Kalimantan is generally dominated by woody materials, therefore the composition of organic matter is mostly lignin which generally exceeds 60% of dry matter, while the content of other components generally does not exceed 11%.

Peatlands in Indonesia store about 57 gigatons of carbon or 20 times as much as ordinary mineral soils, carbon stocks stored in peat soils will be released into the air when the peatlands dry out. Therefore, sustainable soil stabilization is needed, one of which is the use of oil palm. Oil palm can be used as a carbon sink from peat soil to oil palm plantations. Based on the results of research (Purba, Siagian, & Erna, 2019) the absorption of carbon from peatlands by oil palm is in the range of 24.91-68.86 tons/ha. Farm management that will be implemented has the potential for agricultural development in peatland areas, individual farmers in peatland management are still within the scope of low to moderate farm management, while in peatland management in the scope of state and private companies already use farm management With high productivity. Peatland productivity will be high if using high farm management rather than low or medium farm management (Nasrul, 2010). Research results Noor 2001

Simpang kanan sub-district, Rokan hilir district, which is included in the largest palm oil producer in Riau province, total production is 3,304 tons/year. Appropriate cultivation depends on the type of plant seed soil and climate. Therefore, it is important to conduct research on the characteristics of the chemical properties of the soil. This study aims to identify the chemical properties of peatlands in oil palm plantations belonging to the community in Simpang Kanan Village, Simpang Kanan District, Rokan Hilir Regency, Riau Province.

Making drainage channels that are not suitable for clearing peatlands will cause a decrease in the groundwater level and changes in the ecosystem. These ecosystem changes result in changes in chemical, physical, and biological characteristics and properties (Sutarta, 2006). The level of fertility of

peatlands can be determined by analyzing the chemical properties of the soil. The analysis of the chemical properties of the soil includes analysis of the main nutrient content such as N and P, Acidity Level (pH), Cation Exchange Capacity (CEC), Organic Matter Content (C/N), Base Cations (K, Ca, Mg, Na) and Organic acid content (Nugroho, Oksana, & Aryanti, 2013). Based on the information, it is necessary to analyze the chemical properties of the soil on peatlands in Simpang kanan Village, Simpang kanan District, Rokan Hilir Regency, Riau Province. This research includes the analysis of C-Organic, pH, N-Total, P-Teredia, K.

This study aims to determine the chemical properties of peatlands in Simpang Kanan Village, which aims to provide information to the public for fertilization methods on peatlands in Simpang Kanan Village.

2. MATERIAL AND METHOD

The research was conducted in Simpang Kanan Village, Simpang Kanan District, Rokan Hilir Regency, Riau Province. The research was conducted from November 2021 to January 2022 (99° 14' - 35.93'' east longitude and 02° 26 – 29.24'' LU), at an altitude of 5 meters above sea level, on private plantations. Analysis of soil chemical properties was carried out at the Soil Biology Laboratory, Faculty of Agriculture, University of North Sumatra, Medan. Analysis of the chemical properties of peat soil, namely: soil pH using the H_2O(1:5) method, C-organic(%) walkley and black methods, N-total(%) using the kjeldahl method with H_2SO_4, P-total (%) using the Spectrophotometer method with HCl, K-total (%) with AAS method with HCl

The material used in this study was a sample of peat soil planted with oil palm in Simpang Kanan Village, Rokan Hilir Regency. The tools used are soil drill, Global Positioning System (GPS) and Ph Meter. The number of samples for soil chemical analysis was 3 samples. The method used in this research is a grid-free survey at the semi-detailed level (observation density level 1 sample sample every 100 meters). Implementation of 3 sampling points with a distance of 100 meters in the field with a randomly distributed method with an area that has been determined by guided by a base map (Rauf & Harahap, 2019) Soil sampling was carried out 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 with a depth of.

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

Sample	Parameter				
	pH Soil	C-Organic (%)	N-Total (mg/L)	P-Available (mg/L)	K-dd (mg/L)
A	4,89	6,04	1,40	32,42	10,58
B	4,89	7,04	1,97	33,42	11,48
C	4,89	7,04	1,65	36,42	12,58
Average	4,89	6,07	1,67	34,08	11,54

Source: Results of analysis in the laboratory (December 2021).

3. RESULTS AND DISCUSSION

pH Soil (Acidity)

From the results of this study, it was obtained from collecting samples from various coordinate points, so that the soil pH was 4.89. For peatland acidity, the standard for inland peatlands, as in the study (Agus & Subiksa, 2008) In general, peatlands have a soil pH of 3 -5 and the thicker the organic matter, the pH of the

peat soil will increase, coastal peat has a more acidic pH than inland peat. However, for the development of oil palm land in the right intersection area, it is still far from feasible for oil palm cultivation, where the suitable pH for oil palm plant growth is in the range of 6.0-7.0 where at that pH there is a very large availability of nutrients and also where at that pH young nutrients are dissolved in water so they are easily absorbed by roots (Krisnohadi, 2011).

The increase in the pH value of the soil which is still classified as very acidic is thought to be due to the ongoing decomposition process in peatlands. (Rini, 2009) states that the decomposition process that is taking place in peatlands produces organic acids that are acidic in nature.

Soil C-Organic Content

The results of the analysis of soil samples at the study site showed that the average C-Organic content of the soil was 6.07% and was classified as very high, according to research (Manurung, Gunawan, Hazriani, & Suharmoko, 2015) where peat soils that have C-Organic soil which is still high because the research location is still classified as raw peat and is slow in the decomposition process.

Conversion of secondary peat forest into oil palm plantations resulted in the degradation of C-organic content and soil organic matter but was still in the very high category (17.66). Degradation in oil palms aged 6 years was 0.37% and 3.24% in oil palms aged 26 years, and at a depth of 50 and 100 cm had C-organic 17.57% and 21.87%, this is in accordance with the results research (Suwondo, 2010), thus peatlands that are used as oil palm plantations have very high organic C content.

Content (Nitrogen) N-Total

The results of the analysis of soil samples in the laboratory, the soil N content ranges between 1.67% (Very High), in Table 1 shows the results of the N-total analysis in each research sample belonging to the very high criteria, in accordance with the C-organic soil that has been examined in above which both have high criteria, the high total N content can be caused by the high organic matter content. As said (Noor, Peatland Agriculture Potential and Constraints, 2001) 0.3-4.0% is found in woody peat soils.

According to (Hardjowigeno, 2015) most of the nitrogen in the soil comes from soil organic matter, both crude organic matter and crude organic matter, binding by microorganisms from air N, fertilizers, and also rainwater.

Content (Phosphorus) P-Available Soil

From the three soil samples above, it can be averaged that the P-Total found at the research location in Simpang Right Village is 34.08, which means that the availability of P in Simpang Kana Village is classified as moderate, according to research (Manurung, Gunawan, Hazriani , & Suharmoko, 2015) where the criteria for availability of P-Available Soil range from 7-241 ppm, the low phosphate availability factor is due to PH, Aeration, Temperature, Organic Matter, and micro elements which can affect the availability of phosphate elements.

The decrease in available P value was caused by nutrient leaching, nutrient transport by plants, subsidence or compaction and low pH values. Similar to the statement (Darmosarkoro W., 2011) high rainfall and drainage systems on peatlands also have an impact on erosion and leaching of nutrients that are trapped in the soil. Soil conditions that are dominantly saturated, such as peatlands, not only wash alkaline cations, but also cause phosphate to become less available because it is bound by Fe and Al hydroxides. In addition to the washing process, the low pH also causes the low P-available soil content

Interchangeable Potassium (K-dd) Soil

The results of the analysis of soil samples in the laboratory showed that the potassium content of several samples obtained an average of 11.54% (Medium). The value of the K-dd analysis

of the soil in some of the soil samples analyzed can be seen in Table 1. The cause of the high and low potassium in the soil is influenced by the parent material and also the pH of the soil (Gunawan, 2019). Low potassium content can be caused by taking elemental potassium by plants, leaching of potassium by water, and erosion (McCarter CPR, 2018)

Acidic soil pH will cause an increase in potassium fixation, causing a decrease in the availability of K in the soil, in oil palm plants, K nutrients are useful for increasing disease resistance.

4. CONCLUSION

The results of the identification of soil chemical properties show that how many peatlands are in Simpang Kanan Village, Simpang Kanan District, Rokan Hilir Regency, Riau Province. Has Soil pH (4.89) Acid, C-Organic (6.07%) Very High, Total-Nitrogen(1.67) Very High, Phosphate-Available (34.08%) Medium, Potassium-dd (11.54) Currently. This increase is influenced by the further decomposition rate and the addition of nutrient sources in the soil, such as fertilization and other farmer activities. So from the results on peat land in Simpang Kanan Village for the development of oil palm cultivation, it is quite suitable, however, at that location it still requires the application of agricultural lime to increase the soil acidity so that the soil pH in Simpang Kanan Village becomes neutral, in order to obtain coconut FFB yields. good palm oil and even better in the future.

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REFERENCE

Agus, F., & Subiksa, I. (2008). Lahan Gambut: Potensi Untuk Pertanian Dan Aspek Lingkungan. *BPT-BPPP*.

Darmosarkoro W., I. Y. (2011). Pengaruh Kekeringan Tanaman Pada Tanaman Kelapa Sawit Dan Upaya Penanggulangannya. *Warta PPKS*, 83-96.

Daryono, H. (2009). Potensi Permasalahan Dan Kebijakan Yang Diperlukan Dalam Pengelolaan Hutan Dan Lahan Rawa Gambut Secara Lestari. *Analisis Kebijakan Kehutanan*, 71-101.

Gunawan, N. W. (2019). *Karakteristik Sifat Kimia Tanah Dan Status Kesuburan Tanah Pada Agroforestri Tanaman Sayuran Berbasis Eucalyptus Sp* (Vol. Vol. 10). Jakarta.

Hardjoamidjojo, P. N. (2001). Kajian Sifat Fisik Lahan Gambut Dalam Hubungan Dengan Drainase Untuk Lahan Pertanian. *Buletin Keteknikan Pertanian*, 87-96.

Hardjowigeno, S. (2015). *Ilmu Tanah.* Jakarta: Akademika Pressindo.

Krisnohadi, A. (2011). Analisis Pengembangan Lahan Gambut Untuk Tanaman Kelapa Sawit Kabupaten Kubu Raya. *Perkebunan Dan Lahan Tropika*, 1-7.

Manurung, R., Gunawan, J., Hazriani, R., & Suharmoko, J. (2015). Pemetaan Status Unsur Hara N,P,K Tanah Pada

Perkebunan Kelapa Sawit DI Lahan Gambut. *Pedon Tropika*, 89-96.

McCarter CPR, W. T. (2018). Competitive Transport Processess Of Chloride, Sodium, Potassium, And Ammonium In Fen Peat. *J Contam Hydrol*, 17-31.

Nasrul, B. (2010). Penyebaran Dan Potensi Lahan Gambut Di Kabupaten Bengkalis Untuk Pengembangan Pertanian. *Agroteknologi*, 1-7.

Noor, M. (2001). *Pertanian Lahan Gambut Potensi Dan Kendala.* Yogyakarta: Kanisius.

Noor, M. (2010). Peningkatan Produktifitas Lahan Gambut Dan Perluasan Lapangan Kerja. *Sumber Daya Lahan*, 60.

nugroho, t. c. (2013). *analisis sifat kimia tanah gambut yang dikonversi menjadi perkebunan kelapa sawit dikabupaten kampar*, 25-30.

Nugroho, T. C., Oksana, & Aryanti, E. (2013). Analisis Sifat Kimia Tanah Gambut Yang Dikonversi Menjadi Perkebunan Kelapa Sawit Di Kabupaten Kampar. *Jurnal Agroteknologi*, 25-30.

Polak, B. (1975). Character And Ocurrence Of Peat deposits in The Malaysian Tropics. *Modern Quartenery Reserch In Southest Asia*, 188.

PPKS Medan, P. P. (2010). Budidaya Kelapa Sawit. *Badan Penelitian Dan Pengembangan Kelapa Sawit-Balitbangtan*.

Purba, I., Siagian, M., & Erna, M. (2019). Kandungan Karbon Di Perkebunan Kelapa Sawit Pada Lahan Gambut Di Desa Berumbung Baru Kecamatan Dayun Kabupaten Siak Provinsi Riau. *Ilmu Lingkungan*, 90-96.

Rauf, A., & Harahap, F. S. (2019). *Optimalisasi Lahan Pertanian Menggunakan Agen Biomassa.* medan: USU Press.

Rini, N. H. (2009). Pemberian Fly Ash Pada Lahan Gambut Untuk Mereduksi Asam Humat Dan Kaitanya Terhadap Calsium (Ca) Dan Magnesium (Mg). *Jurnal Teroka*, 143-154.

saharjo, b. h. (2017). Pemanfaatan Lahan Gambut Dan Emisi Gas Rumah Kaca. *Jurnal Pertanian*, 110.

Sabiham, S., & Sukarman, S. (2012). Pengelolaan lahan gambut untuk pengembangan kelapa sawit di Indonesia. *Jurnal Sumberdaya Lahan*, *6*(2).

Stevenson, F. (1994). Humus Chemistry Genesis, Composition, and Reaction. *John Wiley and Sons.Inc*, 433 hal.

Supiandi, S., & Sukarman. (2012). Pengelolaan Lahan Gambut Untuk Pengembangan Kelapa Sawit Di Indonesia. *Sumberdaya Lahan*, 55-65.

Sutarta, E. S. (2006). Potensi Lahan Untuk Kelapa Sawit Di Indonesia. *Pusat Penelitian Kelapa Sawit*, 50-62.

Suwondo, S. S. (2010). Analisis Lingkungan Biofisik Lahan Gambut Pada Perkebunan Kelapa Sawit. *Jurnal Hidrolitan*, 20-28.

Wahyunto, D. M. (2003). *peta luas sebaran lahan gambut dan karbon dipulau sumatra.* bogor: wetland international.