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Learning of Status of Physical Properties of Peat in Palm Oil, Areca and Coffee in Mekar Jaya Village

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ABSTRACT

The aim of the research was to see the differences caused by planting oil palm, areca nut, coffee and forest plantations. While the benefits to be achieved are to be able to make preventive recommendations so that the properties of peat soil will always be stable and peat soil can be used sustainably. The research was conducted in a field survey using Proportional Random Sampling Method on oil palm, areca nut, coffee and secondary forest soils. Samples were taken from each plant as many as 20 samples. Data were analyzed on land planted with oil palm, areca nut, coffee and forest soil. To see the differences in the physical properties of the soil, peat thickness, peat water level, organic matter content, c-organic content, r volume weight, water content in the Unpaired Median Value Test at the 5% level (Steel and Torrie, 1995). From the research results, the unpaired mean test results for oil palm, areca nut, coffee and forest soil were obtained at the depth of peat soil on oil palm plantations, which was significantly different from the depth of peat soil on areca palm, coffee plantations and with coffee plantation soil and forest soil. The organic matter content for pinnag and forest plants is the same, but significantly different for oil palm and coffee plants. Meanwhile, C-oganic levels differed between oil palm, areca nut, coffee and forest plants. The volume weight is significantly different from the volume weight in areca palm, coffee and forest plantations. The soil water content in oil palm plants has the same water content as coffee and is significantly different from that of areca nut and forest plants. The conclusion is that the physical properties of the soil on coffee plants are almost the same as forest soil.

Keywords: *Physical Properties, Status Physical Properties, Planting*

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INTRODUCTION

. The Jambi Province area has the charm of peatlands with a million benefits in a complete ecosystem structure. However, currently there are many secondary forest peatlands that are used as land for plantation crops and agriculture. So that many make peat soil threatened with land degradation and drought hazard. This is because a lot is done in the utilization of peat soil by removing the water that is in the peat soil by making excessive drainage ditches. Based on the characteristics of peat areas, they are generally in a saturated state because they are formed in swamps, basin areas,

confluence of river syngai and in the lowlands as well as in areas along the left and right of river flow. In addition, the formation of peat soil comes from the accumulation, weathering and decomposition of organic matter from plant residues in a water-saturated state so that the process of forming peat soil takes quite a long time, (Soil Survey Staff 2014)

In line with the increase in population, limited land has encouraged the conversion of peat forest into plantation land in order to support farmers' income to meet their daily needs by cultivating crops such as oil palm, areca nut and coffee. This is because the limited productive plantation land causes agricultural extensification to lead to marginal land such as peat soil

. Based on the taxonomy of peat soil (peat soil) or Histosol originating from the accumulation of plant debris that has a minimum thickness of 40 cm (Soil Survey Staff, 2014). Meanwhile, according to Noor, (20 07) peat soil is defined as material or organic material that naturally accumulates in excessively wet and water-saturated conditions, is incompressible or only partially weathered .

Based on the area of peatlands in Indonesia, based on surveys and recent calculations, there are 21 million hectares, which are spread across several islands in Indonesia, namely Sumatra (35%), Kalimantan (32%), Papua (30%), Sulawesi (3%) and the rest are scattered in a narrow area of Jambi Province which has a peat area of 554,902 Ha spread over 6 districts, one of which is Tanjung Jabung Barat Regency which has an area of 85,242 Ha (Central for Agricultural Land Resources BBSDLP, 2016).

The formation of peat soils is formed from a swamp environment or an environment that is inundated with water throughout the year (Najawati et al 2005). Meanwhile, the characteristics of peat soil include being easily subjected to irreversible drought, soil subsidence or ables. Peat soil has a low carrying capacity against the pressure or load given by low nutrient fertility, the number of micro-organisms in the stagnant peat soil is limited, because peat soil is always saturated with water, so the availability of oxygen levels is less for micro-organisms to breathe (Noor, 2007). Further explained by Amabk and Melling and Hartono (2010), that peat soils are formed from swamp environments or environments that are inundated throughout the year. Where peat is able to absorb water 100 – 1300% means that peat can absorb water 13 times its weight..

Peat soil that has been used for plantation land or for agricultural land. Generally, this is done by disposing of excess water in peatlands by constructing drainage channels or water disposal channels. Such as for oil palm plantations , areca nut plantations and coffee plantations . Then made drainage ditches primary, secondary and tertiary and worm ditches with rectangular channel type.

Peat soil that has been drained for plants will cause changes in the physical properties of the soil, including high unit weight, large total pore space, easy to experience land subsidence. As the results of Dariah's research, et al (2014), that the unit weight value of soil peat ranges from 0.1 - 0.2 g/cm 3 depending on the degree of maturity of the peat and its organic matter, the volume weight of hemic peat ranges from 0.07 to 0.18 g/cm3 and sapric peat ranges from > 0.2 g/cm 3 and fibric peat which is <0.1 g/cm3 . Furthermore m According to Dariah et al, (2014), that the height of the ground water level in peatlands must be regulated to a minimum limit where plants are still able to grow well. One important component in regulating peatland water management is a control structure in the form of a sluice gate in each canal. The sluice

serves to regulate the groundwater level so that it is not too shallow and not too deep. Poor drainage will cause irreversible dry conditions (TNugroho and Budi 2012) .

According to Setiadi (1999), on peat soils in the drainage the volume of water will shrink, as a result there will be a decrease in the groundwater level and peat compaction will also occur. In addition, subsidence occurred due to the processing of peat soil. This will cause the process of decomposition and erosion to occur in peat soils. This advantage can be seen from the results of research by Agus et al, (2021)., that in the first 2 years after the peat in the subsidence drainage reaches 50 cm per year. Meanwhile for the following year the subsidence is around 2-6 cm per year. This depends on the depth of the drainage canal and the maturity of the peat. It can be seen that there is subsidence of the peat soil, so the roots of the plants hang upwards.

One of the locations that manages peatland as a plantation business is Mekar Jaya Village, which is located in Betara District, West Tanjung Jabung Regency. In general, Mekar Jaya Village is seen as an area that is flowed by the Betara River and the Bram Itam River. Based on the profile book of Mekar Jaya Urban Village Where in the management of peat water, the people of Mekar Jaya Village make drainage ditches in mutual cooperation. The trenches made are primary ditches with an average depth of 3 meters and a width of 6 to 8 meters. Making drainage or ditches aims to reduce excess water in peat soil so that mustard greens, bananas, coffee can be planted

On peat soils planted with oil palm, areca nut and coffee are expected to play a role in the properties of peat soil. This is due to the function of the crown, roots and plants. Where in the areca palm and coffee plants that can function for the good of peat soils, they are from the shape of the crown, the percentage of land cover, the return of organic matter from fallen or dead leaves and branches (Utomo, 1989), While there is a working power of the roots that can hold the grains of peat soil and create pores by the working power of the roots and fruit production to be achieved (Noor, 2014). Because of this, the management of peat soil must be in accordance with the characteristics of peat soil and the need for conservation of peat soil so that it does not easily decrease the carrying capacity of peat land and the fertility of peat soil from peat forest which has been converted to plantation crops. The benefit of the plant canopy is one of protection against the impact of rainwater on the soil. This is very dependent on the shape of the crown, vegetation, number , density of plants, and quality of growth, but also rainfall and season.

The effectiveness of plants in reducing erosion as a whole is very dependent on how much heavy rain occurs as long as the protection provided by plants and the least management system (Dariah et al . 2014) . Setting cropping patterns in erosion control aims to maximize land cover, thereby reducing the impact of raindrops directly to the ground surface Utomo et al., (2016) .

From the explanation above, this research wants to research with the title Status of Peat Soil Physical Properties in Oil Palm Plants, Areca Nut, Coffee in Mekar Jaya Village, Betara District, West Tanjung Jabung Regency

METHODS

This research was carried out on peat soil in oil palm, areca nut, coffee and secondary forest in Mekar Jaya Village, Batara District, West Tanjung Jabung Regency. Soil analysis was carried out at the Soil Laboratory, Faculty of Agriculture, Jambi University, for 4 months in 2022. The materials used were soil samples from oil palm, areca nut, coffee and secondary forest and. equipment used in the laboratory and in the field

The research was conducted by means of a field survey using the Proportional Random Sampling Method on oil palm, areca nut, coffee and secondary forest soils. Samples were taken from each plant as many as 20 samples. With a depth of 0 - 20 cm. The physical characteristics of peat soil observed were a decrease in the thickness of the peat layer, a decrease in the water level of the peat soil, organic matter content, C-organic content, volume weight and soil water content of peat but

To see differences in soil physical properties on oil palm, areca nut, coffee and forest soils on the parameters of peat thickness, peat water level, organic matter content, c-organic content, volume weight, water content in the Unpaired Middle Value Test at the 5% level (Steel and Torrie, 1995).

RESULTS AND DISCUSSION

1. Peat Kadalman and Peat Ground Water Level

Based on the results of the Unpaired Middle Value Test for oil palm, areca nut, coffee and secondary forest on the parameters of peat depth and peat soil water table height can be seen in Table 1

Table 1

Peat depth and peat ground water level in Mekar Jaya Village, Batara District .

Plant	**Peat depth (cm)**	**Water level (cm)**
Palm	104.30a	46.08a
betel nut	88.44 b	44,68a
Coffee	98.40b	49.00b
Forest	150.44c	37.30c

Note: The numbers in each column followed by the same letter are not significantly different at the 5% level according to the unpaired t - test .

The results of the Unpaired Mean Test analysis for the parameter of peat depth are seen in areca palm plants the same as coffee plants but very significantly different from oil palm and forest plantations. forest .

From Table 1 the peat depth is the same in areca and coffee plants, this is due to the influence of both plant canopy and root development in peat soils which is almost the same as in areca plants the influence of fibrous roots. Meanwhile, from the coffee plant, there is a return of organic material from pruning leaves to the ground from the twigs and branches of the coffee plant. So there is a return of organic matter in the soil. This will play a role in the state of stable peat material. This is marked by a balanced process of reforming and adding peat ingredients which reflects the level of fertility of the peat soil. Even if compared to the depth of forest peat, it decreased by 36.84 percent. Where according to Wahyunto et al (2005), that the fertility of peat soil can be seen from the thickness of the peat where shallow peat is 50-100 cm and medium peat is from 100-200 cm.

An overview of the peat groundwater level indicates that the water in the peat has moved away from the topsoil. From Table I, the water level of the peat soil is the same for oil palm and areca nut plants because it is suspected that the shape of the crown and the roots are the same because they are still classified as monocotyledonous plants with fibrous roots that spread a lot in the surface layer of the soil. In addition , this plant really needs a lot of water to process photosynthesis. That's why water dries

easily on peat land planted with oil palm that has been drained. which causes the aeration zone to increase but the water zone to decrease in soil particles. This situation, according to Nugroho and Budi (2012), that the groundwater level changes over time depending on the amount of rainfall, evaporation, transpiration and irrigation water. Information about the water level can be used as a parameter in indications of degradation of peatlands. Furthermore, according to Aswandi (2017), that the groundwater level should be maintained at less than 27 cm. This is to prevent the physical properties of the soil from the dangers of drought and erosion. In addition, a decrease in the groundwater level can cause soil conditions to become aerobic so that the decomposition process will be faster and will cause the surface layer of peat soil to decrease.

2. Content of organic matter and C organic peat

The results of the unpaired mean mean value test for soil organic matter and C-organic content in oil palm, areca nut, coffee and forest plants can be seen in Table 2 below

Table 2 Organic and C - Organic Content of Peat in Oil Palm, Banana Coffee and Forest Plants in Mekar Jaya Village, Batara District .

Plant	**Organic matter (%)**	**C-Organic Content (%)**
Palm	84.88 a	49.90a
betel nut	87.75 a	50.04a
Coffee	86.19b	50.48 a
Forest	89.94c	52.33 b

Note: The numbers in each column followed by the same letter are not significantly different at the 5% level according to the unpaired t - test .

From Table 2 the soil organic matter content in oil palm plants is the same as areca nut but significantly different from coffee and forest plants. For soil C - organic content in oil palm, areca nut and coffee plants, they were the same and significantly different from forest soil

The levels of organic matter and C- organic are the same in oil palm and areca nut plants because in these two plants there is no return of organic matter to the soil because these plants cannot abort leaves unless the leaf midribs are cut. Due to the drainage of the peat soil for these two plants, the result is that the decomposition of organic matter in the peat will quickly decrease with marked sapric peat. As in research by Sasongko (2010), that due to planting oil palm the maturity level becomes sapric, the volume weight is 0.21 gr/cm3, and the C-organic content becomes 51.6%. Meanwhile, in land cover, shrubs matured to sapric with a C-organic content of 47.70%.

Soil organic C content is no different in oil palm, areca nut, coffee and forest plants because drainage on peat soil will accelerate the decomposition of soil organic matter, this is marked from an aerobic atmosphere to an aerobic environment with sufficient oxygen for micro-organisms to decompose organic matter where the end result is linbnim and humus This is in accordance with the research of Magasti et al (2015), that peatland which has been exposed to open drainage causes an increase in temperature, which will speed up the decomposition process. High volume weight

values will cause a decrease in the peat soil surface and release of CO2 into air and C-organic soil

6.2.2 . Volume Weight and Water content (%)

The results of the analysis of the unpaired Middle i Value Test on land planted with oil palm, areca nut, coffee and forest in the village can be seen in the table. 3 below .

Table 3. Soil Volume Weight and water Content in Mekar Jaya Village, Batara District

Plant	**Volume weight (grams / cm 3)**	**Water content (%)**
Palm	0.23a	333.26 a
betel nut	0.27b	280.10b
Coffee	0.19c	314.18c
Forest	0.10 d	307.16 cds

Note: The numbers in each column followed by the same letter are not significantly different at the 5% level according to the unpaired t-test.

Based on the analysis of the soil in Table 3, it can be seen that the peat volume weight and soil water content are significantly different in oil palm, areca nut, coffee and forest plants, except that the water content of forest soil is the same as the water content in coffee plants.

The difference in soil volume weight in oil palm plantations with areca nut and coffee plants is because this condition is very dependent on the level of decomposition of the peat material, where the volume of raw material which is still raw fiber has a lower volume. Where the contents are still clearly visible . this is in line with the opinion of Agus and Subiksa. The volume weight of the peat in the top layer varies greatly, having a value between 0.1-0.2 g/cm 3 depending on the degree of decomposition.

From Table 3 . The volume weight of soil on coffee plants is lower than that of oil palm and areca nut plants, the volume weight of which is lower than that of oil palm and areca nut plants, the volume weight of soil on coffee plants is 30% lower, this is because in coffee plants the role of fine roots can penetrate the pores of the soil. so that the peat soil is looser so that the volume weight of the soil on coffee plants is low. This is in line with the opinion of Harjowigeno (2015), that the unit weight indicates the density of the soil, the higher the value of the unit weight of the soil, the more difficult it is for the roots to penetrate the pores of the soil and allow water to pass into the soil.

Based on Table 3, there is no difference between coffee plants and forests on peat soil water content in forest vegetation with various types of plants and crown patterns and root distribution systems. Likewise with coffee plants, which every dry season will drop leaves and also when pruning is done on branches that do not become flower and fruit buds, there will be a lot of organic matter on the peat soil floor in the form of litter. where the function of litter is to store water when it rains or there are ebb and flow of water from the sea … This is in line with the research of Suratman et al., (2016), soil water content is greatly influenced by rainwater, flood overflow and the ability of the soil to hold water, evaporation and high evaporation. groundwater level While Napitupulu and Mudiantoro, (2015) that the capacity of peat soil to retain water is for

peat with a fibroic type of 580 – 3000%, for hemic peat 450 – 850% and for small sapric peat from 450%.

CONCLUSIONS

The conclusion from the research results is that the depth, ground water level, organic matter, volume weight, water content are different in oil palm, areca palm and forest plantations and the C-organic content is the same between oil palm, areca nut, coffee and forest plantations.

Suggestions from research results that to be able to replace secondary peat forests are coffee plants because some of the physical characteristics are the same as coffee plants

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