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Effects of Land Fires on Peat Soil Characteristics in Landasan Ulin District, Banjarbaru City

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Abstract

Peat is a type of soil that has a dry condition, which causes it to burn easily. When the peat is burned, the spread of fire will occur very quickly until it reaches the ground, because peat soil does not contain solid soil, but branches, grass, and tree debris. Even though the fire on the surface has been extinguished, the fire that is in the inner layer is not necessarily extinguished. This study aims to determine the effect of land fires on the characteristics of peat soil in Landasan Ulin District, Banjarbaru City, including the physical and chemical properties of the peat soil. This research uses quantitative methods with a descriptive approach. Primary data in this study include: texture, color, bulk density (BD), soil structure, pH, and nutrients. Primary data collection was in the form of field surveys by looking at peatlands and the physical and chemical characteristics of the soil with 14 samples taken at 7 sample points. The results showed that on peatlands that had been burned, there was an increase in the value of BD, pH, and soluble Fe so that the potential for absorbing and distributing water was low, and plant roots were difficult to absorb nutrients. Organic C content also decreased, causing soil fertility to decrease.

Keywords: Peat Soil, Land Fires, Soil Characteristics

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1. Introduction

Peat is a type of soil that is formed from the incomplete decomposition process of tree vegetation because the soil is anaerobic or waterlogged. Each peatland has different characteristics, which depend on the physical, chemical, biological properties as well as natural objects and the type of sediment beneath it, which determine the carrying capacity of the peatland, related to its capacity as a growing medium, biota habitat, biodiversity, and hydrological topography (Wibowo, 2013) .

Peat soil forms in lowland, swampy areas. Some peat soils are found on tidal flats which are usually in the form of low to medium topogenic peat. Most peat soils are

found in lowland areas as far as the seashore between large rivers and are usually in the form of ombrogen peat with medium to very deep peat depth (Najiyati et al, 2005).

Peat has an important role in controlling the impacts of climate change in Indonesia. Peat stores a third of the world's carbon reserves. Peatlands store 57 gigatons or 20 times more than ordinary tropical rainforests or mineral soil. The carbon reserves contained in peat soil will be released into the air (Wibowo, 2009).

Peat that is dry will cause the peat to burn easily. According to Mubarak et al (2019), forest fires are a form of disturbance that is increasingly occurring. The negative impacts caused by forest fires are quite large, including ecological damage. Routine fires in forests and peatlands occur almost every year, especially in the Landasan Ulin District, Banjarbaru City.

Factors that influence the occurrence of land fires are the nature of peat soil which is very flammable and difficult to extinguish, in addition to land clearing activities by burning land (Deasy, 2017). When peat is burned, the fire will spread very quickly until it reaches the ground, because peat soil does not contain solid soil, but rather twigs, grass and tree remains. Even though the fire on the surface has been extinguished, the fire in the deeper layers may not necessarily be extinguished. Fires in the soil layer can last for months (Widyati, 2011). The average depth of the burned peat layer is 22.03 cm (varies between 0-42.3 cm) but at a certain point the layer can burn up to 100 cm (Limin, 2006). Extinguishing fires on peatlands is very difficult and requires a lot of water. This is what makes peat fires a major disaster and have an impact on the environment. The Ministry of Environment and Forestry (KLHK) stated that a total of 857,756 ha of forest and peatland burned in the period from January to the end of September 2019. According to KLHK data in 2019, peatland fires reached 227,304 ha. Burned land in Kalimantan occurred in several provinces, such as Central Kalimantan with an area of 134,227 ha, West Kalimantan with an area of 127,462 ha and South Kalimantan with an area of 113,454 ha (Pasai, 2020).

Table 1. Recapitulation of the Area of Forest and Land Fires in Kalimantan

No.	Province	2017	2018	2019	2020
1.	West Kalimantan	7,467.33 ha	68,422.03 ha	151,070.00 ha	2,500.00 ha
2.	**South Kalimantan**	**8,290.34 ha**	**98,637.99 ha**	**137,848.00 ha**	**128.00 ha**
3.	Central Kalimantan	1,743.82 ha	47,432.57 ha	317,749.00 ha	1,459.00 ha
4.	East Kalimantan	676.38 ha	27,893.20 ha	68,524.00 ha	3,486.00 ha
5.	North Kalimantan	82.22 ha	627.71 ha	8,559.00 ha	138.00 ha

Source: SiPongi (Karhutla Monitoring System)

The burned land on Kalimantan Island is spread across all provinces in Kalimantan. The area of burnt land varies quite widely. Every year the area of land fires always increases, as happened from 2017 to 2019 and decreased in 2020. The largest land fires occurred in Central Kalimantan Province, West Kalimantan Province was the second largest area of land fires, then South Kalimantan Province was in the third largest position, continued East Kalimantan Province and North Kalimantan Province.

Based on the 2016 BRG Peat Restoration Indicative Map, the Peat Hydrological Unitary Map and the 2017 KLHK National Peat Ecosystem Use Map, restoration priority zones in South Kalimantan include peatlands affected by forest fires, land and plantations in 2015 covering an area of 12,798 ha, energy cultivation areas covering areas plantation cultivation rights covering an area of 1,586 ha, unlicensed forest areas

covering an area of 6,728 ha, as well as other designated zone areas not only cultivation use rights covering an area of 4,484 ha. Based on data from the South Kalimantan Provincial Environmental Service (2015), the area of peatland that is considered damaged based on restoration priorities, both damage to canalized peat domes and fire scars in South Kalimantan in 2015 were 45,567 ha and 11,775.8 ha respectively.

Landasan Ulin District, which is located in Banjarbaru City, is one of the areas with a fairly wide distribution of peatlands, so the potential for peatland fires is quite large. The peatland fire factor is influenced by the dry season which then causes hot and dry weather as well as land clearing for agriculture by burning land. Specifically for peatlands in the Banjarbaru city area, those that can be used for fertile soil are only in the Landasan Ulin sub-district (Noor, 2022) . These two factors mutually influence the acceleration of the spread of fire in the peatland area of Landasan Ulin District. Landasan Ulin District is also the area most dominantly affected by fires that occur on peatlands. In this area there is also Syamsudin Noor Airport which is the main airport located among peatlands where there are several hotspots or hot spots which resulted in disruption of flight activities that occurred in 2019 (Alphama, Rianawati, & Rezekiah, 2020). Research into the effects of land fires on peat soil characteristics in Landasan Ulin District needs to be carried out. The aim of this research is to determine the effect of forest and land fires on peat soil characteristics.

2. Method

The research uses quantitative descriptive methods. This research describes, analyzes and provides information about the conditions in the field. The samples in this study were soil from previously burned peatlands taken by *purposive sampling* in Landasan Ulin District, Banjarbaru City. Primary data collection was carried out by direct observation and measurement of peatlands and the physical and chemical characteristics of the soil. Secondary data is obtained from data from other people or agencies and then used as support for primary data. Secondary data collected is in the form of books, journals, articles, previous research or documents from related agencies.

The data that has been obtained from the research is then analyzed using descriptive analysis. The data analysis carried out is the characteristics of peat soil which is divided into two properties, namely physical properties and chemical properties of the soil. The analysis used is quantitative in nature so that data is obtained in the form of numbers, then processed and interpreted. Descriptive data included in this research include mean, standard error of mean, median, standard deviation, range, maximum and minimum.

3. Results and Discussion

A. Peat Soil Characteristics Based on Physical Properties

The results of laboratory tests from 14 samples, taken from 7 points, with a total of 2 samples per area that has been burned are as follows:

Table 2. Laboratory Test Results

No.	Sample Code	Texture			B.D	C-org	Fe-Soluble	pH (H2O)
		Sand	Dust	Look				

		----------%----------			g/cm ^{3}	%	ppm	
1	A1				0.23	20,21	32.43	6.16
2	A2				0.18	17.33	53.90	4.48
3	B1	50.50	19.71	29.79	0.36	8,10	499.56	4.58
4	B2				0.80	23.28	179.64	4.10
5	C1				0.43	15.08	347.03	5.08
6	C2				0.23	14.22	252.83	5.44
7	D1	17.27	10,11	72.61	0.86	2.72	240.97	5.81
8	D2	26.41	20.24	53.36	0.83	5.37	183.28	4.69
9	E1	27.07	22.41	50.53	0.79	2.88	545.27	2.89
10	E2	27.97	16.96	55.08	0.94	5.86	769.05	2.48
11	F1	46.42	9.52	44.06	1.08	1.42	108.09	5.07
12	F2	54.50	10.37	35.13	1.36	2.34	56.54	5.03
13	G1				0.45	33.74	74.02	6.46
14	G2				0.30	21.19	542.05	3.99

Source: Analysis Results from Laboratory Tests

The coordinates for taking the sample points are presented in the following table.

Table 3. Sampling Coordinate Points

No	Sample Point		Sampling Coordinate Point
1	A	A1	S 03 º 25'41. 62”
			E 114 º 46'19. 32”
		A2	S 03 º 25'50. 33”
			E 114 º 46'18. 04”
2	B	B1	S 03 º 25'50. 42”
			E 114 º 47'08. 14”
		B2	S 03 º 25'53. 52”
			E 114 º 47'06. 42”
3	C	C1	S 03 º 25'52. 31”
			E 114 º 46'57. 52”
		C2	S 03 º 25'54. 62”
			E 114 º 46'57. 57”
4	D	D1	S 03 º 26'21. 38”
			E 114 º 47'07. 94"
		D2	S 03 º 26'22. 70”
			E 114 º 47'07. 35”
5	E	E1	S 03 º 29'19. 28”
			E 114 º 46'08. 68”
		E2	S 03 º 29'20. 36”
			E 114 º 46'09. 39”
6	F	F1	S 03 º 20'12. 26”
			E 114 º 46'47. 73”
		F2	S 03 º 46'45. 56”
			E 114 º 28'11. 83”
	G	G1	S 03 º 25'54. 27”

7		E 114 º 46'09. 66”
	G2	S 03 º 25'53. 40”
		E 114 º 46'10. 05”

Source: Landasan Ulin District Field Survey (Ellisa, 2021)

The results of the analysis show that the more severe the level of peatland fire, the *bulk density value* of the soil on that land increases. The bulk density of soil at various points in peatlands that have been burned is presented in table 4.

Table 4. Results of Physical Analysis of Soil Bulk Weight in Landasan Ulin District

No.	Sample Point		BD value g/cm ^{3}	Type of soil	Maturity Peat
1	A	A1	0.23	Organic	Hemic
		A2	0.18	Organic	Fibric
2	B	B1	0.36	Organic	Saprik
		B2	0.80	Organic	Saprik
3	C	C1	0.43	Organic	Saprik
		C2	0.23	Organic	Hemic
4	D	D1	0.86	Organic	Saprik
		D2	0.83	Organic	Saprik
5	E	E1	0.79	Organic	Saprik
		E2	0.94	Organic	Saprik
6	F	F1	1.08	Organic	Saprik
		F2	1.36	Organic	Saprik
7	G	G1	0.45	Organic	Saprik
		G2	0.30	Organic	Saprik

Source: Analysis Results from Laboratory Tests

Based on the analysis Table 4, sample point A1 has a BD value of 0.23 g/cm ^{3} and sample point A2 has a BD value of 0.18 g/cm $^{3.}$ Sample point B1 has a BD value of 0.36 g/cm ^{3} and sample point B2 has a BD value of 0, 80 g/cm ^{3}. Sample point C1 has a BD value of 0.43 g/cm ^{3} and sample point C2 has a BD value of 0.23 g/cm ^{3}. Sample point D1 has a BD value of 0.86 g/cm ^{3} and sample point D2 has a BD value of 0.83 g/cm ^{3}. Sample point E1 has a BD value of 0.79 g/cm ^{3} and sample point E2 has a BD value of 0.94 g/cm ^{3}. Sample point F1 has a BD value of 1.08 g/cm ^{3} and sample point F2 has a BD value of 1.36 g/cm ^{3}. Sample point G1 has a BD value of 0.45 g/cm ^{3} and sample point G2 has a BD value of 0.30 g/cm ^{3}. The sample points from A to G have one Fibric peat maturity, namely at sample point A2, two hemic maturity at sample points A1 and C2 and the rest are sapric peat maturity.

Table 5. Descriptive Statistics of Bulk Density

N Statistics	Range Statistics	Min Statistics	Max Statistics	Mean		Std. Statistical Deviation	Variance Statistics
				Statistics	Std. Error		
14	1.18	0.18	1.36	0.63	0.98	0.36	0.13

The statistical Table 5 above shows that the lowest *Bulk Density value* of the 14 soil samples is 0.18 g/cm ^{3} while the highest is 1.36 g/cm ^{3}. The average value from the

sample statistical calculation results is 0.63 and the standard deviation is 0.36. The calculation results show that the standard deviation value is lower than the average value, this shows that the representation of the data obtained is good. Soil texture shows the composition of particles between sand, silt and clay fractions. Soil texture in the Landing Ulin District is seen from the results of laboratory tests and analyzed using the soil texture triangle.

Table 6. Soil Texture Analysis with Triangle Diagram

No.	Sample Point		Ward	Sand	Dust	Look	Texture Class
1	A	A1	Umbrella Gun				
		A2					
2	B	B1	Umbrella Gun	50.50	19.71	29.79	Sandy Loam
		B2					
3	C	C1	Hang an umbrella				
		C2					
4	D	D1	Hang an umbrella	17.27	10,11	72.61	Dusty Clay
		D2		26.41	20.24	53.36	Dusty Clay Loam
5	E	E1	East Ulin Foundation	27.07	22.41	50.53	Dusty Clay Loam
		E2		27.97	16.96	55.08	Dusty Clay Loam
6	F	F1	Syamsuddin Noor	46.42	9.52	44.06	Sandy Clay Loam
		F2		54.50	10.37	35.13	Sandy clay
7	G	G1	Umbrella Gun				
		G2					

Source: Analysis Results from Laboratory Tests

Table 7. Texture Descriptive Statistics

	N Statistics	**Range Statistics**	**Min Statistics**	**Max Statistics**	**Mean**		**Std. Statistical Deviation**	**Variance Statistics**
					Statistics	**Std. Error**		
Sand	7	37.23	17.27	54.5	35.7	5.45	14.4	207.9
Dust	7	12.89	9.52	22.4	15.6	2.07	5.4	30.1
Look	7	42.82	29.79	72.6	48.6	5.34	14.1	200.1

The statistical Table 7 above shows that the lowest sand texture value from 7 soil samples is 17.27 while the highest is 54.5, the lowest dust texture value from 7 soil samples is 9.52 while the highest is 22.4, the lowest clay texture value from 7 samples land is 29.79 while high is 72.6. The average value from the results of statistical calculations for samples of sand texture is 35.7, dust is 15.6 and clay is 48.6 and the standard deviation for sand texture is 14.4, dust is 5.4 and clay is 14.1 The calculation results show that the standard deviation value is lower than the average value, this shows that the representation of the data obtained is good.

The results of soil texture analysis at 14 sample points contained 7 sample points of peat soil mixed with sand, dust and clay, and 7 sample points with pure peat soil conditions. The texture of the 7 sample points containing sand, dust and clay is

dominated by dusty clay, namely at sample points D2, E1 and E2. Sandy loam texture at sample point B1, dusty clay texture at sample point D1 and sandy clay loam texture at sample points F1 and F2.

Table 8. Peat Soil Structure Analysis

No.	Sample Point		Ward	Structure
1	A	A1	Umbrella Gun	Granular (*Granular*)
		A2		Granular (*Granular*)
2	B	B1	Umbrella Gun	Granular (*Granular*)
		B2		Granular (*Granular*)
3	C	C1	Hang an umbrella	Granular (*Granular*)
		C2		Granular (*Granular*)
4	D	D1	Hang an umbrella	Granular (*Granular*)
		D2		Granular (*Granular*)
5	E	E1	East Ulin Foundation	Granular (*Granular*)
		E2		Granular (*Granular*)
6	F	F1	Syamsuddin Noor	Granular (*Granular*)
		F2		Granular (*Granular*)
7	G	G1	Umbrella Gun	Granular (*Granular*)
		G2		Granular (*Granular*)

Source: Field Analysis

Analysis of the peat soil structure at 8 sample points shows a granular, *rounded* aggregate structure, usually no more than 2 cm in diameter, found in the A horizon which is usually called Crumbs.

Table 9. Soil Color Analysis

No.	Sample Point		Ward	Soil Color	Information
1	A	A1	Umbrella Gun	10yr= 3/3	Dark Brown
		A2		10yr= 4/6	Dark Yellowish Brown
2	B	B1	Umbrella Gun	5yr= 5/3	Reddish Brown
		B2		5yr= 4/4	Reddish Brown
3	C	C1	Hang an umbrella	5yr= 4/4	Reddish Brown
		C2		5yr= 4/3	Reddish Brown
4	D	D1	Hang an umbrella	5yr= 6/2	Pinkish Grey
		D2		5yr=6/2	Pinkish Grey
5	E	E1	East Ulin Foundation	10yr=5/4	Yellowish Brown
		E2		10yr=5/4	Yellowish Brown
6	F	F1	Syamsuddin Noor	10yr=5/6	Yellowish Brown
		F2		10yr=5/4	Yellowish Brown
7	G	G1	Umbrella Gun	10yr=3/4	Dark Yellowish Brown
		G2		10yr=2/1	Black

Source: Field Analysis Results

b. Characteristics of Peat Soil Based on Chemical Properties

Table 10. Soil pH Analysis

No.	Sample Point		Ward	Soil pH	Information
1	A	A1	Umbrella Gun	6.16	A bit sour
		A2		4.48	Very Sour
2	B	B1	Umbrella Gun	4.58	Sour
		B2		4.10	Very Sour
3	C	C1	Hang an umbrella	5.08	Sour
		C2		5.44	Sour
4	D	D1	Hang an umbrella	5.81	A bit sour
		D2		4.69	Sour
5	E	E1	East Ulin Foundation	2.89	Very Sour
		E2		2.48	Very Sour
6	F	F1	Syamsuddin Noor	5.07	Sour
		F2		5.03	Sour
7	G	G1	Umbrella Gun	6.46	A bit sour
		G2		3.99	Very Sour

Source: Analysis Results from Laboratory Tests

The results from Table 10 show that there are 3 sample points with pH levels reaching number 6 with slightly acidic information at points A1, D1 and G1, then there are 6 sample points with pH levels reaching number 5 with sour information at point B1, C1, C2, D2, F1 and F2, and there are 5 sample points with pH levels reaching 4 with very sour information at high levels at points A2, B2, E1, E2 and G2.

Table 11. Descriptive Statistics of pH

N Statistics	Range Statistics	Min Statistics	Max Statistics	Mean		Std. Statistical Deviation	Variance Statistics
				Statistics	Std. Error		
14	3.98	2.48	6.46	4.73	0.30	1.12	1.27

The statistical Table 11 above shows that the lowest pH value of the 14 soil samples was 2.48 while the highest was 6.46. The average value from the sample statistical calculation results is 4.73 and the standard deviation is 1.12. The calculation results show that the standard deviation value is lower than the average value, this shows that the representation of the data obtained is good.

Table 12. Soluble Fe in Soil

No.	Sample Point		Ward	Fe-Soluble (ppm)
1	A	A1	Umbrella Gun	32.43
		A2		53.90
2	B	B1	Umbrella Gun	499.56
		B2		179.64
3	C	C1	Hang an umbrella	347.03
		C2		252.83
4	D	D1	Hang an umbrella	240.97
		D2		183.28
5	E	E1	East Ulin Foundation	545.27

		E2		769.05
6	F	F1	Syamsuddin Noor	108.09
		F2		56.54
7	G	G1	Umbrella Gun	74.02
		G2		542.05

Source: Laboratory Test Results

Table 13. Statistical Description of Fe-soluble

N Statistics	Range Statistics	Min Statistics	Max Statistics	Mean		Std. Statistical Deviation	Variance Statistics
				Statistics	Std. Error		
14	736.62	32.43	769.05	277.47	61.43	229,855	52833.42

The statistical Table 12 above shows that the lowest soluble Fe value from the 14 soil samples was 32.43 ppm and the highest sample value was 769.05 ppm. The average value from the sample statistical calculation results is 277.47 and the standard deviation is 229.855. The calculation results show that the standard deviation value is lower than the average value, this shows that the representation of the data obtained is good.

Table 14. Organic C in Soil

No.	Sample Point		Ward	C Organic
1	A	A1	Umbrella Gun	20,21
		A2		17.33
2	B	B1	Umbrella Gun	8,10
		B2		23.28
3	C	C1	Pay attention	15.08
		C2		14.22
4	D	D1	Pay attention	2.72
		D2		5.37
5	E	E1	East Ulin Foundation	2.88
		E2		5.86
6	F	F1	Syamsuddin Noor	1.42
		F2		2.34
7	G	G1	Umbrella Gun	33.74
		G2		21.19

Source: Laboratory Test Results

Table 15. Statistical Description of Organic C

N Statistics	Range Statistics	Min Statistics	Max Statistics	Mean		Std. Statistical Deviation	Variance Statistics
				Statistics	Std. Error		
14	32.32	1.42	33.74	12.41	2.63	9,859	97.20

Fertility is very dependent on the organic content in the soil, so a decrease in organic C content in peat soil that has been burned causes soil fertility to decrease (Deasy, 2017). The statistical Table 15 above shows that the lowest organic C value from the 14 soil samples was 1.42% while the highest was 33.74%. The average value from the sample statistical calculation results is 12.41 and the standard deviation is

9.859. The calculation results show that the standard deviation value is lower than the average value, this shows that the representation of the data obtained is good.

A. Sample Point A

The results of laboratory analysis at location A show different BD values at the two sample points. The weight of peat soil in the top layer or its BD value depends on the level of composition, ranging from 0.1 to 0.2 gr/cm3. So it can be seen from the laboratory results that the BD value in peatlands that have been burned has increased. The sample at location A is pure peat soil without a mixture of sand, dust or clay. The acidity level at location A, the first sample point, was 6.16, categorized as slightly acidic, the second sample point was 4.48, categorized as very acidic, while the pH value of unburned peat soil reached 3-4. So these results can be analyzed to show that there is an increase in pH in peat soil that has been burned. Location point A in the first sample shows a soluble Fe value of 32.43 ppm and in the second sample it is 53.90 ppm. Analysis of laboratory results shows that the soluble Fe value in the peat soil in collation A is quite low. The relatively low soluble Fe value is caused by rainwater inundating peatlands. The organic C content of peat soil that has been burned at location point A, the first sample point is 20.21% and the second sample point is 17.33%, while the organic C value in unburned peat soil reaches 40-50% (Utomo, 2010) . So these results can be analyzed to show that organic C on burned land is lower than on unburned land. This means that the fire process can reduce the organic C value of the soil.

B. Sample Point B

The results of laboratory analysis at location B show different BD values but both are at the sapric category maturity level, meaning the peat soil is mature. In the sample at location B, the first sample point contains 50.50% sand, 19.71% dust and 29.79% clay, which is in the sandy clay category, while the second sample point is pure peat soil which does not contain sand. , dust, and clay. The acidity level at location B, the first sample point, is 4.58, which is categorized as acid, the second sample point is 4.10, which is categorized as very acid, while the pH value of unburned peat soil reaches 3-4. So these results can be analyzed to show that there is an increase in pH in peat soil that has been burned. Location point B in the first sample shows a soluble Fe value of 499.56 ppm and in the second sample it is 179.64 ppm. Analysis of laboratory results shows that the soluble Fe value in the peat soil at location B is quite high so that the nutrient content is also high (Rosmarkam & Yuwono, 2002). The organic C content of peat soil that has been burned at location B, the first sample point is 8.10% and the second sample point is 23.28%, while the organic C value in unburned peat soil reaches 40-50% (Utomo, 2010) . So these results can be analyzed to show that organic C on burned land is lower than on unburned land. This means that the fire process can reduce the organic C value of the soil.

C. Sample Point C

The results of laboratory analysis at location C show different BD values.

The sample at location C is pure peat soil without a mixture of sand, dust or clay. The acidity level at location C, the first sample point, is 5.08, which is categorized as acid, the second sample point is 5.44, which is categorized as sour, while the pH value of unburned peat soil reaches 3-4. So these results can be analyzed to show that there is

an increase in pH in peat soil that has been burned. Location point C in the first sample shows a soluble Fe value of 347.03 ppm and in the second sample it is 252.83 ppm. Analysis of laboratory results shows that the soluble Fe value in the peat soil at location C is quite high so that the nutrient content is also high (Rosmarkam & Yuwono, 2002). The organic C content of peat soil that has been burned at location point C, the first sample point is 15.08% and the second sample point is 14.22%, while the organic C value in unburned peat soil reaches 40-50% (Utomo, 2010) . So these results can be analyzed to show that organic C on burned land is lower than on unburned land. This means that the fire process can reduce the organic C value of the soil.

D. Sample Point D

The results of laboratory analysis at location D show slightly different BD values but the same in the peat soil with a sapric maturity level or what is called mature. In the sample at location D, the first sample point contains 17.27% sand, 10.11% dust and 72.61% clay in the dusty clay category, and the second sample point contains 26.41% sand. , dust of 20.24% and clay of 53.36% fall into the dusty clay clay category. The acidity level at location D, the first sample point, was 5.81, categorized as slightly acidic, the second sample point was 4.69, categorized as acidic, while the pH value of unburned peat soil reached 3-4. So these results can be analyzed to show that there is an increase in pH in peat soil that has been burned. The effect of fire on peat soil can introduce minerals into the soil so that the pH in the soil increases (Hermanto, 2017). Location point D in the first sample shows a soluble Fe value of 240.97 ppm and in the second sample it is 183.28 ppm. Analysis of laboratory results shows that the soluble Fe value in the peat soil at location D is quite high so that the nutrient content is also high (Rosmarkam & Yuwono, 2002). The organic C content of peat soil that has been burned at location D, the first sample point is 2.72% and the second sample point is 5.37%, while the organic C value in unburned peat soil reaches 40-50% (Utomo, 2010) . So these results can be analyzed to show that organic C on burned land is lower than on unburned land. This means that the fire process can reduce the organic C value of the soil.

E. Sample Point E

The results of laboratory analysis at location E show slightly different BD values but both belong to peat soil with sapric maturity or what is called mature. In the sample at location E, the first sample point contains 27.07% sand, 22.41% dust and 50.53% clay in the dusty clay clay category, and the second sample point contains 27.97% sand. %, dust was 16.96% and clay was 55.08% in the dusty clay clay category. The acidity level at location E, the first sample point, is 2.89, categorized as very acid, the second sample point is 2.48, which is categorized as very acid, while the pH value of unburned peat soil reaches 3-4. So these results can be analyzed that there is a decrease in pH at sample point location E. Location point E in the first sample shows a soluble Fe value of 545.27 ppm and in the second sample it is 769.05 ppm. Analysis of laboratory results shows that the soluble Fe value in peat soil in collation E is quite high.

The organic C content of peat soil that has been burned at location point E, the first sample point is 2.88% and the second sample point is 5.86%, while the organic C value in unburned peat soil reaches 40-50% (Utomo, 2010) . So these results can be analyzed to show that organic C on burned land is lower than on unburned land. This means that the fire process can reduce the organic C value of the soil.

F. Sample Point F

The results of laboratory analysis at location F show slightly different BD values but both belong to peat soil with sapric maturity or what is called mature. In the sample at location F, the first sample point contains 46.42% sand, 9.52% dust and 44.06% clay in the sandy clay loam category, and the second sample point contains 54.50% sand. %, dust was 10.37% and clay was 35.13% in the sandy clay loam category. The acidity level at location F, the first sample point, is 5.07, which is categorized as acid, the second sample point is 5.03, which is categorized as sour, while the pH value of unburned peat soil reaches 3-4. So these results can be analyzed that there was an increase in pH at sample point location F. Location point F in the first sample showed a soluble Fe value of 108.09 ppm and in the second sample it was 56.54 ppm. Analysis of laboratory results shows that the soluble Fe value in peat soil in collation F is quite low. The relatively low soluble Fe value is caused by rainwater inundating peatlands. The organic C content of peat soil that has been burned at location point F, the first sample point is 1.42% and the second sample point is 2.34%, while the organic C value in unburned peat soil reaches 40-50% (Utomo, 2010) . So these results can be analyzed to show that organic C on burned land is lower than on unburned land. This means that the fire process can reduce the organic C value of the soil.

G. Sample Point G

The results of laboratory analysis at location G show different BD values at the two sample points but both are included in the peat soil with a sapric maturity level or called mature. The weight of peat soil in the top layer or its BD value depends on the level of composition, ranging from 0.1 to 0.2 gr/cm3. So it can be seen from the laboratory results that the BD value in peatlands that have been burned has increased. The sample at location G is pure peat soil without a mixture of sand, dust or clay. The acidity level at location G, the first sample point, is 6.46, which is categorized as slightly acidic, the second sample point is 3.99, which is categorized as very acidic, while the pH value of unburned peat soil reaches 3-4. So these results can be analyzed to show that in the first sample there was an increase in pH in peat soil that had been burned and the second sample contained a pH value that did not increase. Location point G in the first sample shows a soluble Fe value of 74.02 ppm and in the second sample it is 542.05 ppm. Analysis of laboratory results shows that the soluble Fe value in peat soil in collation G in the first sample is quite low and the second sample is high. The relatively low soluble Fe value is caused by rainwater inundating peatlands. The organic C content of peat soil that has been burned at location point G, the first sample point is 33.74% and the second sample point is 21.19%, while the organic C value in unburned peat soil reaches 40-50% (Utomo, 2010) . So these results can be analyzed to show that organic C on burned land is lower than on unburned land. This means that the fire process can reduce the organic C value of the soil.

4. Conclusion

The characteristics of the physical properties of each land when taking 14 sample points at 7 locations of peatlands that had been burned showed that the results of laboratory test analysis on *Bulk Density values* showed that the type of peat soil at the research site, namely Landasan Ulin District, had an average soil type that was organic, including saprik peat soil or mature peat soil and the results of laboratory tests also

show an increase in the BD value in peat soil that has been burned, generally peat soils that have a high BD value have low porosity, which causes the potential to absorb and channel water to be low too, p. This has an impact on plants and will greatly inhibit plant growth. The results of soil texture analysis at 14 sample points contained 7 sample points of peat soil mixed with sand, dust and clay, and 7 sample points with pure peat soil conditions.

Characteristics of the chemical properties of each land when taking 14 sample points at 7 locations of peatlands that had been burned showed that the results of laboratory test analysis on soil pH values showed that there were 3 sample points with pH levels reaching 6 with slightly acidic information, then there were 6 sample points with The pH level reached 5 with the description sour, and there were 5 sample points with pH levels reaching 4 with the description very sour. The average pH analysis of peatlands that have been burned has increased soil pH, making it difficult for plant roots to absorb nutrients from the soil. The average soluble Fe value also increased from 14 samples, there were 9 samples with quite high soluble Fe levels. The organic C content all decreased due to the land fire. Soil fertility is very dependent on the organic content in the soil, so a decrease in organic C content in peat soil that has been burned causes soil fertility to decrease.

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