Study On Vegetation And Its Habitat Conditions In Undisturbed Forest

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Abstract: Now the flood has become a regular thing every rainy season arrives. But the longer, apparently extensive flood-affected areas is increasing with duration longer time. Even now in certain areas, the rain which lasted 1 hour is sufficient cause inundation. There are continuous efforts to overcome the flooding problems, but it seems the problem of flooding rather than diminish even more to improve the intensity, frequency and spreading. We tried to learn about the condition of undisturbed natural forests and how to treat rain forest. The study was conducted in the undisturbed natural forests namely Simpulan Angin forest situated in Deli Serdang, North Sumatra, Indonesia. The results show the undisturbed forest has 4 stratum layer of vegetation canopy. Humus in undisturbed forests has a thickness of 9-14 cm evenly distributed on the forest floor that serves as a giant sponge to absorb and store rainwater. This means that the undisturbed forest can absorb rainwater> 3,000 tons m 3 ha-1 every time it rains.

Index Terms: undisturbed forest, vegetation, humus, thickness, rainwater.

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1 INTRODUCTION

The forest is an ecosystem unity with the landscape with natural resources and composed by many components, and each component can not be separated even interdependent and affect one another. Forests in the role of great benefit for life, both tangible benefits are felt directly, or intangible perceived indirectly. The immediate benefits such as the provision of timber, wildlife, and mining products, while indirect benefits such as recreation benefits, protection and water regulation and the prevention of erosion (Nopandry et al., 2005). Today the major urban areas often floods during the rainy season. Heavy rain in just one hour alone can soak settlements and the associated infrastructure. Maintenance draenase trench was not much help cope with the recent flooding in the rainy season. This is contrary to the condition of the city in ancient times when population growth has not been as fast as today (Kompas, 2014). Insistence increasingly rapid population growth forced us to reexamine the ways to overcome the threat of floods. In the future with the rapid population growth will drive the growth of settlements and infrastructure, which of course will be covering the floor city into concrete and asphalt which further reduces the pore space where rain water infiltration into the soil. Therefore, through this study, researchers aimed to learn about the condition of undisturbed natural forests and how to treat rain forest. The results of this study will be the beginning of knowledge for researchers to replicate the same thing in the densely populated city.

METHODS

This research was conducted in undisturbed forest namely Forest of Simpulan Angin located in Dostrict Deli Serdang, North Sumatra Province, Indonesia. This forest is part of the Bukit Barisan Forest Park which covers 51,600 hectares. This forest is located at an altitude of 700 meters above sea level and is about 60 km from Medan city as the capital of North Sumatra Province, Indonesia.

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But the difficult road conditions cause travel time to study can reach 4 hours. The study took place from June to August 2016. Ancillary equipment used in this study include: hoes, shovels, machetes, tripe, chisel, measuring tape, phiband, haga meter, GPS, handcounter, 5m handmeter, tallysheet, cameras and stationery necessary.

Research procedure

The study was designed consisting of fieldwork and laboratory research. The field research in the form of activities in the forest vegetation analysis, observing the thickness of humus, to long lateral roots few dominant tree. While laboratory studies such as the calculation of forest humus ability to absorb water.

1. Analysis of Vegetation

Vegetation analysis in this study using lines of procedures following the procedures Kusmana (1997). Paths defined by 5 lines with spacing between lines is 50 m. Long lines were made along 100 m so that there will be five pieces of plot-level tree on each track. Each piece is created nested to estimate the level of seedlings, saplings and trees measuring 2 x 2 m, 5 x 5 m and 10 x 10 m. At any level of growth, namely seedlings, saplings, poles and trees recorded the necessary data from the type, number, height and diameter of the trunk. Then the obtained data incorporated into tallysheet prepared beforehand. The data obtained were used to calculate the wealth and dominance types (important value index).

2. The thickness of humus

Data taken from the forest humus thickness across sub plots that exist in sample plots in the study of vegetation analysis. Determination of measurement points taken by purposive sampling yet located in the plots of vegetation analysis research. The data obtained in the subsequent averaged to obtain an average thickness of humus in the forest. Furthermore humus samples were taken from each plot research and brought to the laboratory for examination ability to absorb water. Humus is calculated thump densitynya and calculated its ability to absorb water for every hectare of topsoil suspect's ability to absorb rainwater.

3. Bulk density of humus

Of the 10 research plots were determined randomly drawn each 200 g sample humus for the next bulk densitynya taken and analyzed in the laboratory. Soil samples were also analyzed water absorption ability by taking each 100 g sample humus soak them in water for 24 hours, then drained until no dripping water and then weighed. Having in mind the weight and humus ovenkan dried at a temperature of 105oC for 2 x 24 hours and then weighed. Difference in weight of each sample will be considered as humus ability to absorb water. This figure is subsequently converted into the alleged amount of topsoil per hectare to determine its ability to absorb rainwater.

RESULTS AND DISCUSSION

Species Richness

Based on the analysis of vegetation in 25 research plots of 10,000 m2 spread over an area of 3.5 ha was found 95 species of plants from seedling to the tree level. The dominant species have as many as six types using the method of calculating the INP and the data presented in Table 1.

Table 1. *Density per ha and dominance types (important value [IV] index) of seedling, sapling, pole and tree in the forest undisturbed wind Conclusions*

Rate Of Growth and The Scientific Names of Plants	Density ha^{-1}	IV Index
Seedling		
Sapium sp	2000	28.45
Schima wallichi	1600	20.94
Strombosia javanica	1600	20.94
Altingia excelsa	1500	20.2
Lithocarpus elegans	1400	19.46
Dacryodes rugosa	1100	17.24
Sapling		
Sapium sp	224	27.75
Altingia excelsa	192	22.25
Dacryodes rugosa	192	22.25
Schima wallichi	240	21.57
Actinodaphe glomerata	160	20.33
Lithocarpus elegans	112	13.87
Pole		
Lithocarpus elegans	108	39.29
Sapium sp	84	30.95
Dacryodes rugosa	76	29.37
Actinodaphe glomerata	64	23.41
Altingia excelsa	48	20.24
Schima wallichi	28	12.7
Tree		
Dacryodes rugosa	25	29.46
Sapium sp	22	27.47
Lithocarpus elegans	15	22.84
Castanopsis motleyana	12	20.85
Altingia excelsa	14	18.95
Canarium litturale	11	13.74

Table 1 shows that this Simpulan Angin undisturbed forest dominated and characterized by stands of *Dacryodes rugosa, Sapium sp* and *Lithocarpus elegans*. This is shown by the dominance (IV index) at tree level. With a density of 201 trees ha^{-1}. According Utomo (2006) in the undisturbed forest national park Gunung Gede Pangrango (local name) tree density ranges from 202-220 ha^{-1}. The results show the Simpulan Angin (local name) undisturbed forest has 4 strata canopy layers, namely: a vegetation height of 30-35 m, 20-25 m, 7-10 m and 1-2 m. The canopy layer is formed due to the nature of each type of plant that is tolerant and intolerant of shade. This canopy layers apparently also serves slow the speed of the rain fall to the forest floor. According Denslow (1980) in the canopy layer of the forest has many functions that optimize the use of space in each stratum, the absorption of sunlight for photosynthesis activity of plants, increase resistance to high wind pressure, to slow the fall of rainwater into the forest floor.

Humus thickness

Samples of humus on the forest floor were taken from 25 research plots vegetation analysis. Based on the results of measurements of the thickness of humus in the forest knot winds made to the entire swath observation data obtained as shown in Table 2.

Table 2. *Data Forest Humus thickness (cm) of 25 research plots*

Line \ Plot		The thickness of humus in the plot to plot					Mean
		1	2	3	4	5	
Line no	1	12	13	12	14	10	12.2
	2	12	12	10	9	10	10.6
	3	11	12	10	10	14	11.4
	4	10	9	11	12	12	10.8
	5	10	12	11	11	11	11

Table 2 shows that of the 25 plots observations obtained soil humus thickness ranges from 10 - 12.2 cm. This means humus succession plays an important role in the ecological and hydrological systems in natural forests. Leaf drop to the forest floor will be congested before it decomposes into nutrients the plant root is readily absorbed. In this condition, in addition to functioning as a contributor of nutrients, humus turns which function also important in the hydrological cycle in the forest. Humus role in the absorption of large amounts of water and release it back into the forest soil slowly. As a result, rain water will be more in to fill the pores of the soil and into groundwater reserves for forest and surrounding areas (Arief, 1994). Further studies were conducted in 100 g of topsoil taken from 10 forest plots at random observations. The results showed that humus is able to absorb and retain water 648.5-676.6% of the dry weight (Table 3).

Table 3. *Weight per 100 g humus undisturbed forest plots were taken from 10 plots randomly*

No Sample	Field capacity weight (g)	Oven Dry weight (g)	Difference (g)	Difference (%)
1	123.5	16.5	107.0	648.5
2	123.3	16.3	107.0	656.4
3	122.8	16.0	106.8	667.5
4	123.2	15.9	107.3	674.8
5	123.3	16.1	107.2	665.8
6	122.7	15.8	106.9	676.6
7	123.6	16.2	107.4	663.0
8	123.5	16.4	107.1	653.0
9	123.2	16.3	106.9	655.8
10	123.0	16.2	106.8	659.3

Description: *Field capacity weight humus is determined by soaking for 3 hours until no further drained of water dripping.*

The calculations show that the bulk density of this forest humus is in the range 0.5-0.6 g cm^{-3}. Furthermore, based on the calculated weight of bulk density of topsoil per hectare assuming a uniform thickness of humus is 10 cm (Table 4).

Table 4. *Bulk density of topsoil and its ability to absorb rain water per hectare assuming a uniform thickness of 10 cm humus*

No Sample	Bulk Density (g cm^{-3})	Weight of Humus ha^{-1} (ton m^{-3})	Water Absorption (%)	Water Absorption (ton m^{-3})
1	0.5	500	648.5	3,243
2	0.5	500	656.4	3,282
3	0.6	600	667.5	4,005
4	0.5	500	674.8	3,374
5	0.5	500	665.8	3,329
6	0.6	600	676.6	4,060
7	0.5	500	663.0	3,315
8	0.5	500	653.0	3,265
9	0.5	500	655.8	3,279
10	0.6	600	659.3	3,956

Weight humus per hectare to 10 cm is 500-600 tons m^{-3}. This amount was able to absorb water as much as 3.243 - 4.060 tons m^{-3}. Thus in case of heavy rain, the rain water will be absorbed by the humus and are released into the soil slowly. Excess water will form surface runoff into creeks. This proves the humus is capable of functioning as a giant sponge that can absorb and store water> 3,000 tons m^{-3} ha^{-1} every time it rains. In urban areas, the government's attention is limited to the provision of green open space and urban forest alone. That was the extent of less than 30% by the uneven distribution across the city. Thus the rainwater that fell apart flowed through the trenches drainage, green open spaces and the urban forest is expected to absorb rainwater. Heading vegetation consists of 4 humus soil stratum and their role is to slow the rate of fall of rain water into the ground floor, giving opportunities for the soil to absorb rainwater more. However, it seems necessary to consider how to create an artificial sponge that can absorb and retain rainwater longer for the next release it slowly into the soil to reduce excess water that could potentially be flooded (Zagt and Werger, 1996).

CONCLUSIONS AND RECOMMENDATIONS

Conclusions
Wind undisturbed forest Conclusions consists of four stratum which serves to hold the rate of speed of rainwater into the forest floor. Undisturbed forests have a thick humus of 9-14 cm with a bulk density of 0.5-0.6 g cm-3. In undisturbed forest humus that has an average thickness of 10 cm is able to absorb rain water as much as 3.243 to 4.060 m-3 tons ha-1 every time it rains.

Suggestions
Need to do research on inorganic material that serves as an artificial sponge to mimic the concept of treating rainwater undisturbed forest in the development of open space and urban forest to reduce the risk of flooding.

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