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STUDY OF EROSION ON DIFFERENT TYPES OF LAND USE IN THE REGION UPSTREAM WATERSHED AREA (DAS) KOMERING SOUTH SUMATRA

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ABSTRACT

Research was conducted upstream catchment area of Komering. The method used in this study is to survey the level of semi-detailed, where observation and sampling conducted on the basis of soil maps with a scale of 1: 50,000 to 1: 25,000. The pattern of systematic sampling is done based on the existing base maps at four levels of steepness of the slope as well as three forms of land use. The purpose of this study was to identify and predict the potential magnitude of erosion on different types of land use with different slope in the upper watersheds (DAS) Komering.

The condition of the river area and the mainland have shown that DAS Komering has disorder or deterioration of ecosystems and environmental quality due to illegal logging to area ponds, plantations that do not pay attention to the principles of environmental sustainability and the turbidity of water in estuaries Komering. The lowest value erosion in the upstream watershed study area is in forest Komering (HT1) that is equal to 5.79 tons/ha/yr, while the highest erosion values are in the area of mixed farms (KC3) that is equal to 348.65 tons/ha/yr. Recommended control measures is necessary that the rate of soil erosion and land rehabilitation in the catchment area so that environmental degradation is widespread and severe.

Keywords : *Erosion, Komering Watersheds,Types of land use, Slope*

INTRODUCTION

Komering watersheds is one of nine Sub Musi watersheds and is located in the southern part of Sumatra island. The watersheds is located in South Sumatra Province. The results of the monitoring that has been done, the condition of the river area and the mainland is seen that watersheds Komering have experienced disruption or deterioration of ecosystems and environmental quality. Deterioration of environmental quality is particularly indicated because of illegal logging to the area of aquaculture and plantations that are not observing the principles of environmental sustainability and the turbidity of water on estuaries Komering. Particular problems of water turbidity is caused by the presence of sediments transported along the river water runoff derived from soil erosion that occurs on the mainland Komering upstream watersheds (David R. Montgomery, 2007). While the transported sediment will cause water turbidity that may affect aquatic ecosystems and sedimentation on downstream areas Komering. Therefore, to anticipate and cope with problems of erosion that occurs primarily on the upstream watersheds Komering as described above, takes concrete measures and concrete actions in an integrated effort. This study will be focused to identify the level of erosion on different types of land use and the different slopes in the watersheds area upstream Komering, so Komering watersheds conditions can saved from the threats disaster of erosion. The purpose of this study was to identify and predict the potential of

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erosion on different types of land use with a different slope in the upstream Komering Watersheds area.

MATERIALS AND METHODS

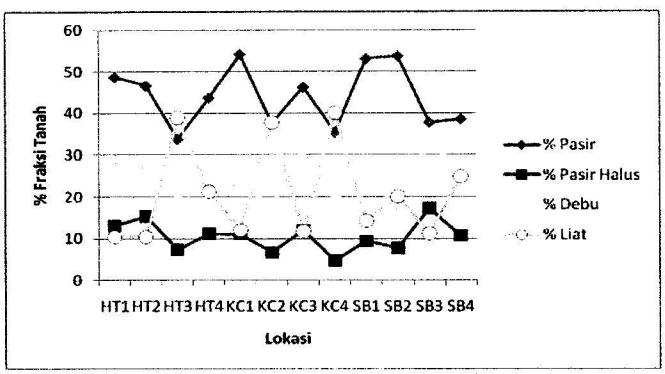
The materials used in this study are as follows: 1) Map Komering watersheds, 2) composite soil samples, 3) Undsturb soil sample, 4) Materials soil analysis in the laboratory. The tools used were: 1) Stopwatch, 2) GPS (Global Positioning System), 3) Calculator, 54) Drill Belgie, 5) Knife, 6) stakes observations, 7) rule, 8) hoe, 9) tools write, 10) tools for analysis of soil in the laboratory.

The method used in this study is a survey of the semidetailed level, where the observation and sample collection was conducted based on soil maps with a scale of 1: 50,000 to 1: 25,000, slope maps, and climate maps. Systematic sampling conducted on four levels of steepness of slope (L1 = 0-8%, 8-15% = L2, L3 = 15-30%, and L4 = > 30%); three forms of land use, namely: HT = forest , KC = mixed farms, and SB = shrub; and two patterns of conservation, namely: K0 = without conservation and K1= conservation patterns. Any combination of treatments was taken in three replications, so there are 72 sample points to be observed and analyzed. Observation and analysis of aspects of the land (physical, chemical, slope, elevation, drainage) performed in the field and laboratory, while the observations on aspects of climate data obtained from the nearest climatological station within the period of 10 years.

RESULTS AND DISCUSSION

Geographically located on sub-watersheds Komering is $103^{0}34'12$ "-10 500 '36" BT and $02^{0}58'12$ "-$04^{0}59$ '24" LS, with area ± 915,375.820 ha. Sub-watersheds Komering is divided into 30 sub-sub-watersheds, but in the upstream sub-watersheds area in the district Komering South OKU only consist of 12 sub-sub-watersheds with an area of ±. 402,386.93 ha. Based on the classification of known climatic average rainfall around the region upstream watersheds Komering ranged from 124.25 mm/ year to 381.58 mm / year, with the number of rainy days ranges from 2-2751 days / year.

The study results showed that the dominant soil type Brown Yellow Podzolic Association and others, including the type Latosol and Alluvial. Types of soils are are sensitive to erosion and very high risk of of erosion, this soil is generally crumb, not stabil, and sensitive to erosion. The Physical Chracteristic of soil at on study site had a sandy loam texture class to sandy clay loam, the structure of the upper layer is generally shaped granules to angular blocky, moderate to quick permeability, and organic matter content on average is low to moderate.



Description : HT = hutan; KC = kebun campuran; SB = semak belukar

Figure 1. The percentage fraction of soil (texture) on some types of land use

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From Figure 1 above shows there are 4 texture classes obtained from analysis of a sandy loam, clay loam, sandy clay loam, and clay. In the secondary forest *(Hutan Sekunder)*, texture class are generally dominated by sandy loam to sandy clay loam. In the area of mixed farms *(Kebun Campuran)*, belongs to a class clay (clay) to sandy loam (sandy loam). While in shrubs in area *(Semak Belukar)*, soil texture classes usually dominated by sandy loam to sandy clay loam. Observations permeability at the study site can be seen in Figure 2 below :

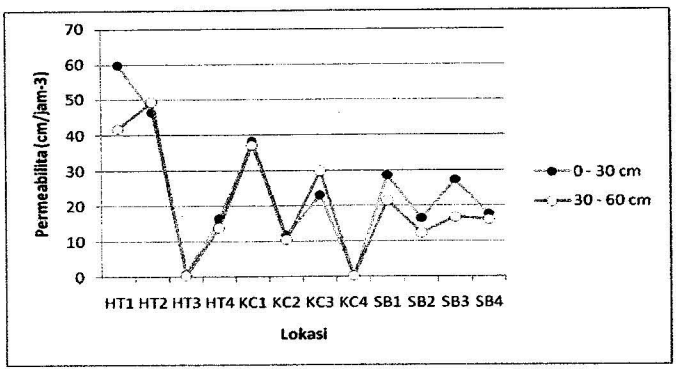
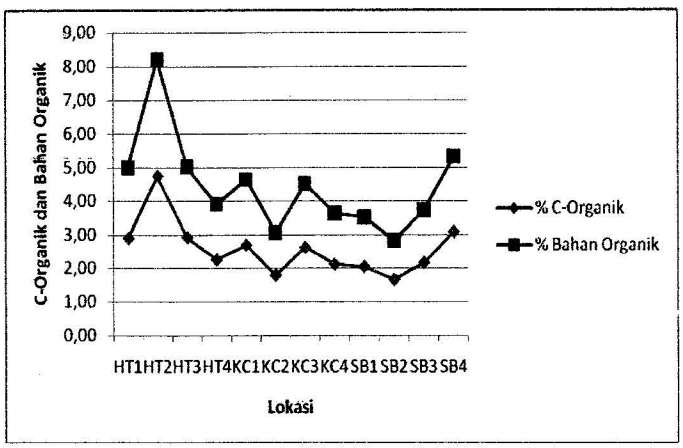


Figure 2. Soil Permeability Values on Various Land Use Type

Permeability values on the area secondary forest (HT) quite slow to quick, with a variation of the value of 0.34 cm / hour up to 59.85 cm / hour. In the area of mixed farms (KC), the value of permeability quite slow to quick with a variation of the value of 0.25 cm / hour up to 38.13 cm / hour. While in shrubs area (SB) permeability values quite fast with a variation of a value of 12.34 cm / hour up to 28.60 cm / hour. The results of the analysis of soil organic matter content at the study site can be seen in Figure 3.



Description : HT = hutan; KC = kebun campuran; SB = semak belukar

Figure 3. Graph of comparison of C-organic and organic materials (BO) on various types of land use

Percent organic matter on the area research is very diverse, ranging from low, moderate to high. At the second location of forest area (HT_2) has the highest organic matter of 8.2% which was

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then followed by the location of the four areas of shrubs (SB_4) of 5.33%. This is because on the second area of forest and shrubs fourth area there are many plant tissues of roots, stems, twigs, leaves, flowers and fruit are decomposed. Then the number makrofauna ground in both areas is also greatly contribute to the formation of organic material. Lowest organic matter present in the area of the second shrubs (SB_2) that is equal to 2.84% which was followed by a second area of mixed farms (KC_2) that is equal to 3.06%. This is because in both these areas is not too much vegetation which grows so that the decomposition of plant tissue as a primary source of organic matter formation is also small.

The observation result water content, density of contents, and total pore at the study site can be seen in Figure 4.

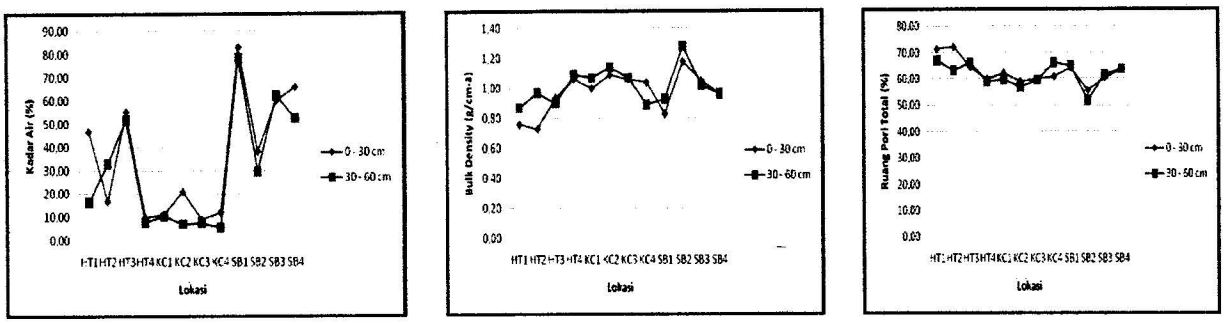

Figure 4. Graph Comparative Water Content (KA), Density Of Contents (BI), And Total Pore On Various Types Of Land Use At Two Depths Of Soil

From Figure 4 above, secondary forest (HT) in quantitative soil moisture content has value on the top layer is higher than the bottom layer with a range of 9.72% to 55.29% in the top layer, while the bottom layer around 7, 69% to 51.68%. But at some point the forest samples had values lower water content in the top layer compared to layer underneath, as in HT2 (16.74% to 32.95% and the top layer on bottom layer. The density of the content (bulk density) classified is the average has a value below 1 g/cm3. total pore space is high, with a texture that is generally dominated by sandy loam (sandy loam) to sandy clay loam (sandy clay loam). At the location of mixed farms (KC), a quantitative value of soil moisture content is low, where the upper layer of 8.77% to 20.86% and the bottom layer of 5.46% to 10.22%. Density value of the content (bulk density) is high, generally have a value> 1 g/cm3 although the KC4 layer 2 there is still a value lower than 1 g/cm3, which is 0.89 g/cm3.

Total pore space is also quite high, where soil texture is generally included in the class of clay (clay) to sandy loam (sandy loam). In shrub locations (SB), a quantitative value of soil moisture content in the top layer of relatively higher than the layer below it, and it ranged between 38.14% to 83.01% in the top layer and 29.55% to 78.34 % on the bottom layer. Although the SB3, the water content in the top layer is lower than the layer below it (60.12% on the top layer and 62.25% on the bottom layer). Bulk density values (density fill) average relatively moderate to high, has a value> 1 g/cm^3 although at some point the sample still contained a lower value than 1 g/cm^3. Total pore space classified as moderate to high (47.66% s / d 67.85%), where the soil texture classes are generally dominated by sandy loam to sandy clay loam.

Based on the results of the study above, the forest area (HT) has a better ground conditions than the area of mixed farms (KC) and shrubs (SB). This is because the forest area has a water

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content conditions, density of contents, and total pore space that is fair and balanced so that plant roots can easily penetrate the soil and rain water can be infiltrated with both and can reduce erosion potential

Potential of Erosion

Erosion is the process of soil erosion and terangkutnya or parts of the land by a natural medium in the form of rain (Arsyad, 2000). Rain erosivity is a natural factor that is almost impossible to manage, while erodibilitas soil can be improved by increasing or making an ideal soil aggregate stability through the addition of materials such as organic materials amelioran. The slope and slope length as well as vegetation and soil management factor is the factor most often managed to reduce the amount of surface runoff and decrease the rate and amount of erosion (Pruski, F. F.; Nearing, M. A, 2002). Determination erosion in each area of research is done by way of approach (prediction) USLE

The results of the analysis on the potential f soil erosion in the study area can be seen in Table 1

Table 1. Analysis of Soil Erosion

Location	R	K	LS	CP	A (Erosion) (ton/ha/thn)
HT_1	2097,12	0,23	1,20	0,01	5,79
HT_2	2097,12	0,14	4,25	0,01	12,48
HT_3	1305,60	0,20	9,50	0,01	24,81
HT_4	1305,60	0,22	9,50	0,01	27,29
KC_1	2097,12	0,20	1,20	0,07	35,23
KC_2	1305,60	0,17	4,25	0,07	66,03
KC_3	2097,12	0,25	9,50	0,07	348,65
KC_4	1305,60	0,23	9,50	0,07	199,70
SB_1	1305,60	0,24	1,20	0,02	7,52
SB_2	1305,60	0,19	4,25	0,02	21,09
SB_3	1305,60	0,37	9,50	0,02	91,78
SB_4	1305,60	0,19	9,50	0,02	47,13

* Limit Erotion = 15 ton/ha/thn; source : BRLKT, 2000

Description: 1,2,3,4 = slope; *HT = hutan; KC = kebun campuran; SB = semak belukar*

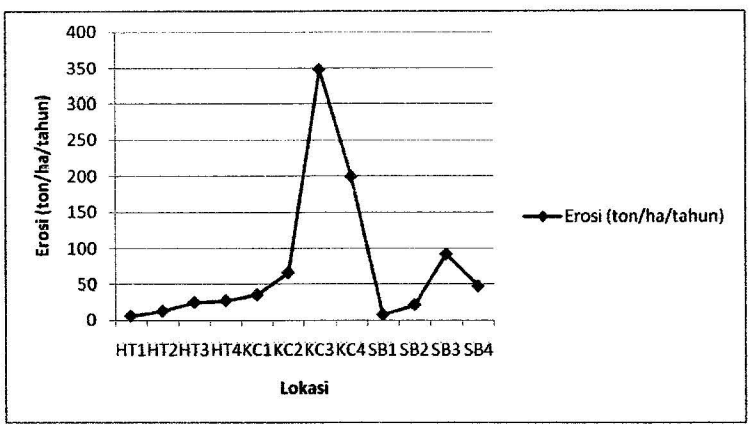

Figure 5. Graph erosion in forest areas (HT), garden blend (KC), and shrubs (SB)

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The potential erosion in the upstream of watersheds Komering from normal to heavy (Figure 5). The lowest value erosion in the upstream catchment area of research is in the area Komering shrubs (SB_2) that is equal to 5.79 tons /ha/year, whereas the highest is in the area of mixed farms (KC_3) that is equal to 348.65 tons /ha/year. In forest areas (HT), the danger of erosion normal to light. This indicates that the forest area is still in good condition that can be seen from the permeability is likely to fast, organic material that moderate to high, and the vegetation is still very tight.

In the area of mixed farms (KC), erosion danger of is very different, erosion of light, moderate, to heavy. Moderate erosion in the area of mixed farms are the first (KC_1). This is because the area has KC1 have topogafi gently sloping and a little wavy, organic matter is, quick permeability, and has a sandy loam texture. Vegetation planted in the form of coffee plants and vegetables. Erosion is happening in the area of mixed farms, both (KC_2) that has a somewhat hilly and sloping topography. KC_2 area has a low organic matter and permeability rather quickly, and vegetation in the form of lemon, coffee, and jackfruit. Heavy heavy erosion found in mixed farms (KC_3) and (KC_4). This is because in both these areas has a steep topography, organic matter was, and permeability is slow (on the KC_4). Vegetation in both these areas of coffee plants, banana plants, and some other plantation crops.

In the area of scrubland (SB), the danger of erosion is also very varied ranging from normal erosion, mild, to moderate. Normal erosion found in the area of the first bush (SB_1), due to the area SB_1 has a sloping topography and slightly undulating, organic medium, rapid permeability, and vegetation of reeds that are still very tight. Mild erosion found in the area of the second bush (SB_2) and fourth (SB_4). SB_2 area has a slope that sloping and slightly hilly, low organic material, quick permeability, and vegetation of grass and some trees. SB_4 area has the steep slopes, high organic material, rapid permeability, and vegetation in the form of coarse grass and some trees are still very tight. Erosion was found in the area of the three shrubs (SB_3) with a somewhat the steep topography, have organic material being, quick permeability, and the vegetation that grows weeds are not too tight. Land that has a moderate to severe erosion should be given alternative land conservation measures, that is with terracing gulud are able to shorten the length of the slope and the slope of the land so that erosion can also be minimized (Priatna, 2008).

CONCLUSIONS

Conclusion The research results are as follows: 1) Physical characteristics soil conditions of forest plantation better than mixed Farming and shrubs, 2) The lowest erosion potential of 5.79 tons/ha/yr occurs in forests (HT_1) while the highest value erosion that is equal to 348.65 tons/ha/ yr. There is in the area of mixed farms (KC_3). In the forest area is the highest value on HT_4 erosion that is equal to 27.29 tons / ha / yr, while the lowest was in HT_1 erosion that is equal to 5.79 tons/ha/year. In the area of mixed farms, the highest erosion values are at KC_3 that is equal to 348.65 tons/ ha/ year, while the lowest was in KC1 erosion that is equal to 35.23 tons/ha/ year. In the area of scrubland are the highest value on the SB3 erosion that is equal to 91.78 tons/ha /year, while the lowest was in SB1 erosion that is equal to 7.52 ton/ha /year, and 3) Slope factors in giving the effect to amount of potential erosion

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