FACTORS AFFECTING WATER QUALITY IN SEKAMPUNG AND SANGHARUS SUBWATERSHEDS, LAMPUNG INDONESIA

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1. Introduction

Rapid conversion of forest land use into other land uses such as plantation or agriculture land can act as non-point pollution and become the primary factor threatening of water quality in the aquatic system. In Sekampung and Sangharus subwatersheds, Lampung Indonesia, the protected forest converted into Community-Based Forest (CBF). The background of land use conversion has the impact from transmigration program to Lampung province started in 1905. The land use change can decline water quality, severed by erosion. Mostly, land use in Sekampung and Sangharus subwatersheds were converted to coffee plantations. The objective of this study is to know the factors that are affecting water quality in Sekampung and Sangharus rivers for considering adequate land management.

2. Material and Method

Study area

The research area was located in Sekampung and Sangharus subwatersheds, Lampung province, Indonesia (5°5'45"S to 5°16'5"S and 104°30'34"E to 104°42'58"E). The area of Sekampung and Sangharus subwatersheds were 141.3 km^2 and 117.2 km^2. The climatology parameters showed that the mean maximum temperature was 31.6 °C and mean minimum temperature was 22.5 °C. The mean annual precipitation for 44 years in Raden Inten station was 2151 mm.

Methodology

Water from river stream in each subwatershed was collected to determine nutrient composition. The water sampling was conducted in the rainy season in October, November (twice), and December 2016. There were 12 parameters of water quality analyzed in this study. The parameters of Ca, K, Mg, Na, Cl, NO_3, PO_4, and SO_4 were analyzed by using ion chromatography (Dionex ICS-1600, Thermo-Fisher) whether parameters of Al, Fe, Si were analyzed by inductively coupled plasma atomic emission spectroscopy (ICPE-9000, Shimadzu). The concentration of TSS (Total Suspended Soil) was examined by centrifugation (CN-1050, AS-ONE). This research also compared water quality from the previous study.

3. Result and Discussion

Sekampung and Sangharus subwatersheds have its characteristics of water quality. The concentration of TSS, Al, and Fe in Sekampung river are higher than in Sangharus river (Fig. 1). On the contrary, the water quality of Ca, K, Mg, Na, NO_3, Cl, PO_4, Si, and SO_4 in Sangharus river show higher values than in Sekampung river.

Lower adoption of soil conservation vegetation mat and misuse of conservation zone in CBF, dominantly in Sekampung subwatershed, give resulting in high sedimentation. The mobility of Al and Fe in acid soil make these cations were found in sedimentation. Sekampung subwatershed has more population of Javanese migrants whose social characteristics are more intensive doing tillage and opening forest. Miss management of converting land use forest to the coffee plantation in this subwatershed give result in declining of water quality due to sedimentation.

The parent material of basaltic tuff andesite (94.3%) in the Sangharus subwatershed influence thse higher concentration of cation and anion in Sangharus river compare to Sekampung river.Sekampung subwatershed has lower basaltic tuff andesite (89.6%) and granite (3.1%). The granite parent material tends to have acid characteristic whose lower concentration cation and anion. Higher of fertilizer application play roles in the high concentration of NO_3 and PO_4 in Sangharus subwatershed compare to Sekampung subwatershed.

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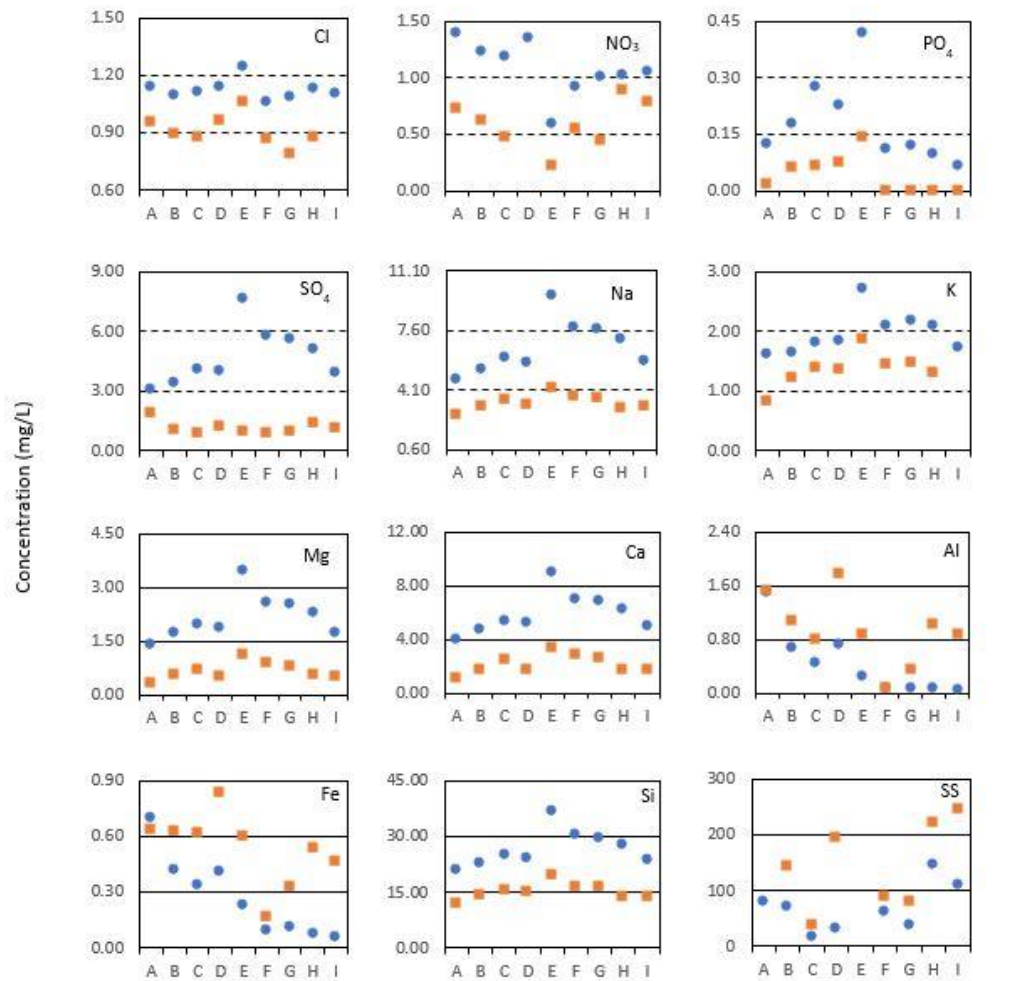
A: 03/26/2016
B: 04/10/2016
C: 04/23/2016
D: 05/08/2016
E: 07/17/2016
F: 10/23/2016
G: 11/06/2016
H: 11/20/2016
I: 12/04/2016

• Sangharus river
■ Sekampung river

➢ Data A-E: secondary data
➢ Data F-I: primary sampling

Figure 1. Water Quality

4. Conclusion

The result showed that Sekampung river had higher of Al, Fe, and sedimentation compare to Sangharus river because of improper land management in Sekampung subwatershed. The Sangharus river had higher concentration Ca, Mg, K, Si, Na, NO_3, PO_4, Cl, SO_4 due to the Sangharus subwatershed has larger basaltic tuff andesite area than Sekampung subwatershed. Besides that, the higher concentration of NO_3 and PO_4 in Sangharus river also got influenced by fertilizer application in Sangharus subwatershed.