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Soil and Carbon Loss within Watersheds Affected by Rubber Cultivation in Xishuangbanna, South-West China

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Abstract

Soil erosion is a hazard traditionally associated with agriculture in tropical and semi-arid areas. It affects long term soil fertility and sustainable land use thus decreasing agricultural food production and threatening human livelihood. It is estimated that soil carbon stock, being a main determinant of soil fertility and agricultural productivity, can be reduced due erosion by 25–50 % over several years. Among different erosion types, water erosion plays an important role with more than 10 Mha soil being lost through water erosion worldwide per year. Deforestation and other land cover/land use changes strongly accelerate erosion, as in our study case, where rapid expansion of rubber plantations modifies carbon dynamics at landscape level. In Xishuangbanna, South-West China rubber plantations increased by 175 % during last decade and the spread continues. This study aims at analysing soil loss in the watershed of a small Naban River tribute in Xishuangbanna based on sediment load of stream and surface runoff estimations. A hydrological station was built in 2013 on the outlet of the Naban River tribute to continuously monitor its water level, turbidity and local precipitation. Soil and carbon loss through the stream out of the watershed will be estimated based on the relationship between water level and discharge, water turbidity, suspended solids, and carbon content,. Surface runoff and soil erosion were estimated over 4 months for 6 bounded plots built on mid-age and young rubber plantation, so that canopy development effects on soil erosion rate can be estimated. The collected samples will be analysed for its texture and carbon content. Data on precipitation, surface soil erosion and carbon export by stream will be used for the validation of the LUCIA (Land Use Change Impact Assessment) model in order to estimate carbon losses accross the landscape depending on land use change and specifically to assess the effect of rubber expansion on carbon dynamics and soil fertility.

Keywords: Carbon loss, China, land use change, rubber plantations, soil erosion

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