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Changes in soil carbon stocks after a conversion from secondary forest to rubber - a case study for Xishuangbanna prefecture, Southwest China

M. de Blecourt, R. Brumme, and E. Veldkamp

University of Göttingen, Büsgen Institute, Soil Science of Tropical and Subtropical Ecosystems, Büsgenweg 2, 37077 Göttingen, Germany (mblecou@gwdg.de)

Since the 1950's rapid deforestation is taking place in Xishuangbanna prefecture, a border region in Southwest China. Deforestation is mainly related to the increase of rubber plantations, the forest area was decreased by 28% (370,494 ha) while the area in rubber plantations increased by 194,151 ha (increase of 90%) between 1976 and 2003. Besides rubber plantations forest areas have mainly been replaced by shrublands, and shifting cultivation.
The aim of this study is to quantify changes in soil carbon stocks after a conversion from secondary forest to rubber. The study site has a size of 3600 ha and was located in Xishuangbanna prefecture, Southwest China. We selected 11 rubber plantation sites with ages ranging from 5 to 46 years old and paired each rubber plantation site with a secondary forest site. The sites have a size of 20 x 20m and were carefully selected to ensure that the paired sites have similar topographic and soil characteristics and only differ in the recent land use history. At each site we measured soil carbon concentration and stocks up to 120 cm's depth, furthermore we measured soil characteristics (soil pH, bulk density, exchangeable cations), biophysical parameters (slope, aspect, altitude, estimates of aboveground biomass and forest floor) and recorded management related parameters (land use age, harvesting, burning history). The specific questions addressed in this study are: i) What is the amount of change in soil carbon concentration and stocks after a conversion from forest to rubber for respectively the cumulative soil pedon and the individual soil depth intervals? ii) Which predictor variables considering soil characteristics, biophysical factors and management related parameters can be used to predict the changes in soil carbon stocks following this land use conversion?
Preliminary results show that soil carbon stocks up to 120 cm depth were signi[U+FB01]cantly lower in rubber plantations compared to their reference site (P = 0.009), with a mean difference in soil carbon stock of -39.56 Mg C ha-1 (± 4.24 SE).