



Tropentag, September 20-22, 2017, Bonn

“Future Agriculture:  
Socio-ecological transitions and bio-cultural shifts”

## Climate Change Impacts on Erosion Control in a Watershed with an Integrative Modelling Approach

HONGXI LIU, XUEQING YANG, SERGEY BLAGODATSKIY, CARSTEN MAROHN, MARCUS GIESE,  
GEORG CADISCH

*University of Hohenheim, Inst. of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute), Germany*

### Abstract

In this study we applied a landscape based soil-crop/tree integrative model (Land Use Change Impact Assessment, LUCIA) and investigated the efficacy of erosion control measures in rubber plantations under increased precipitation and temperature based on existing climate change scenarios. The model was firstly calibrated and validated at plot level to simulate weed management (“no-weeding”, “once-weeding”, “twice-weeding” and “clear-weeding”) effects on soil loss in rubber plantations. Subsequently, the model was calibrated to simulate total sediment yield in a small watershed (.. ha, or km<sup>2</sup>) located in Xishuangbanna, South-West China, where rubber plantations occupy around 15 % land use in this watershed. Model outputs suggested that total soil loss in the watershed decreased by 15 % with reduced herbicide application in rubber plantations. Scenarios of climate change were further applied in the model to assess response of erosion control measures to increasing precipitation and temperature: 1) ‘baseline’ with rainfall and temperature measured in 2014; 2) ‘R+’ with rainfall amount increased by 2.6%; 3) ‘T+’ with temperature increased by 2.4°C; 4) ‘RCP (representative concentration pathways) 8.5’ with rainfall increased by 2.6 % as well as temperature by 2.4°C. Modelling results indicated that increasing temperature (‘T+’) decreased soil litter cover by accelerating decomposition. This affected soil loss to higher extent than increasing rainfall (‘R+’) at both plot and watershed level. Soil loss in rubber plantation increased from 2 t ha<sup>-1</sup> to 3 t ha<sup>-1</sup> under “twice-weeding” due to increasing precipitation and temperature; while reduced herbicide application (“no-weeding” and “once-weeding”) kept soil loss below 1 t ha<sup>-1</sup>. Total sediment yield in the watershed increased from 800 t a<sup>-1</sup> to 1130 t a<sup>-1</sup> by increased precipitation and temperature under current management but was reduced 960 t a<sup>-1</sup> under reduced herbicide in rubber plantations. The results of this study suggest that management has the potential to mitigate soil loss by climate variability or change.

**Keywords:** Climate change, erosion control, modelling, rubber plantation, watershed