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SBEE68 – Use of LAPSUS_LS model to investigate vegetation influence on catchment slope stability – A case of study in Llano Bonito, Costa Rica

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Root-soil interactions provide several ecosystem services in terms of natural geo-engineering; among them, slope stability enhancement by additional root cohesion is one of the most important and recognized. Upscaling the processes of root-soil interactions in terms of additional root cohesion presents several issues due to the heterogeneity of the root development and of the soil properties. This study aims to explore the potential of the LAPSUS_LS model to up-scale and model the effects of the vegetation on soil stability at catchment level. The model allows modification of catchment properties in a GIS environment (with particular attention to the additional root cohesion) and delivers (as an output) an erosion and sedimentation map of shallow landslides, other than the total m^3 of soil moved. We simulated two different scenarios in a catchment in Llano Bonito, Costa Rica, to understand how the model reacts to different vegetation patterns. Since agroforestry has been proposed as a method to increase the stability of sloping agricultural lands we aimed to compare an agroforestry system of coffee (*Coffee Arabica*) and the tree *Erythrina* (*poppigeana*), with a coffee monoculture. Sensitivity analyses were performed on all the input data to understand the importance of additional root cohesion for the model compared with soil characteristics, and its suitability to investigate vegetation influence. Moreover, the model was further modified to include the biomass surcharge of vegetation in the simulation. The figure below provides an overview of the steps taken in the present research in order to assess the validity of the model. Results show that additional root cohesion is a key factor for the model. However, shear plane depth has to be carefully selected to have valid outputs. At a shear plane depth of 100 cm the catchment was overall stable. At 150 cm depth, agroforestry slopes showed higher stability compared with monoculture (highly unstable). Biomass surcharge had no significant effect on slope stability. LAPSUS_LS seems suitable to understand the influence of vegetation on landslide risk, however further calibration and validation is required. More research could allow stakeholders to use the model as a decision-making tool (e.g. planning a re-vegetation approach to increase slope stability).

SBEE58 – Quantifying the stabilizing effect of forests on shallow landslide-prone slopes using SlideforNET

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Shallow landslides can pose significant risks to human livelihoods and infrastructure by directly impacting buildings and traffic ways. In addition, shallow landslides and soil loss in the upper part of stream catchments can lead to high sediment yields downstream increasing the damage intensity of floods and debris flows. The presence of forests has a stabilizing effects of hillslope. Although hydrological effects of vegetation still be difficult to quantify, some studies