Artificial rainfall simulation tests for soil erosion modelling in Punjab, India

Jonas Lenz (1), Abrar Yousuf (2), Marcus Schindewolf (3), Michael von Werner (4), Kerstin Hartsch (5), Manmohanjit Singh (2), and Jürgen Schmidt (1)

(1) TU Bergakademie Freiberg, Soil- and Water Conservation Unit, Freiberg, Germany, (2) Punjab Agricultural University, Regional Research Station, Ballowal Saunkhri, India, (3) KU Eichstätt-Ingolstadt, Department of Physical Geography, Eichstätt, Germany, (4) GeoGnostics, Berlin, Germany, (5) IPROconsult GmbH, Department of Ecology and Environment, Dresden, Germany

The Shivalik hills stretch about 2400 km in southern part of Himalaya. The northwestern Indian state Punjab encloses a small part of these hills. Land use in the Punjabi part is dominated by shrubland and agriculture. Soil erosion is a severe problem in this region due to highly erodible soils and heavy rainstorm events during monsoon season from July to September. Predictions assume an increase of the mean annual precipitation in the Punjabi Shivaliks for the period from 2021 to 2050. Rainfall will thereby occur in fewer events with higher intensity. Days with rainfall between 100 and 150 mm/day will be 1.2 to 1.8 times more likely. Soil erosion is predicted to increase in accordance to this intensification and concentration of precipitation (Jerath et al., 2014).

Eight artificial rainfall experiments were conducted on agricultural used fields with four different management / crop conditions, which are typical for the region during monsoon time. Soil texture, content of organic carbon, bulk density, initial water content and sediment concentration from runoff samples were analyzed in laboratory. Modelling parameters for the physically based soil erosion modelling tool EROSION 3D were determined from the rainfall experiments and compared with an existing parameter catalogue.

In a further step soil erosion will be calculated with EROSION 3D for an example watershed. Soil physical parameters, a digital elevation model and precipitation data are essential input parameters. Runoff data and sediment load at the watershed outlet during monsoon season 2018 will be used for further validation of the model.

References
Jerath, N., Ladhar, S.S., Kaur, S., Sharma, V., Saile, P., Tripathi, P., Bhattacharya, S., Bhattacharya, P., 2014. Punjab State Action Plan on Climate Change. Punjab State Council for Science and Technology and GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH - German International Cooperation, India), Chandigarh