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Spatio-temporal analysis of soil erosion risk and runoff using AGNPS model in an Ethiopian Catchment

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Soil erosion is one form of land degradation in Ethiopia deteriorating the fertility and productivity of the land while soil erosion and conservation research is at an infant stage in the country. Extensive soil and water conservation schemes have been implemented by the Ethiopian Government at different times in different erosion prone areas although with mixed results. This could be attributed to the inappropriate methods used for assessment of soil erosion and runoff processes and hence there is a need to improve and enhance current resource management and development activities in areas with heavy degradation and low productivity in Ethiopia.

Effective control of soil erosion requires an ability to quantitatively predict the amount of soil loss that would occur under alternate management strategies and practices. Modeling of soil erosion is important to determine the spatial and temporal distribution of the net soil loss for devising the optimal soil conservation and management practices. The Agricultural Non-Point Source Pollution Model (AGNPS) is an event based distributed model developed by the US Department of Agriculture used to simulate the amount of soil loss, runoff volume, peak flow rate and nutrient flux of a catchment using real or hypothetical storm events. It also enables to compare several land use and management practices and propose the best land use and management practices for optimum soil and water conservation. Most of the AGNPS inputs are easily generated using GIS from a remotely sensed data.

The paper illustrates the importance of using the model to estimate the amount of soil loss and runoff; and the steps and expected outputs of a proposed study in the 280 km2 Koga catchment in the highlands of Ethiopia. The Koga catchment is one of the agriculture dominated typical catchments in the North Western highlands of Ethiopia with high population density that leads to increased pressure on natural resources. The study will attempt to provide methods for evaluating potential erosion and runoff problems that can be adapted to similar agricultural watersheds in the highlands of Ethiopia.