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Application of SWAT Model to assess the climate change impact on water balance over the cereal crops in the West Seti River Basin

Pabitra Gurung (1), Luna Bharati (1), and Saroj Karki (2)

(1) International Water Management Institute (IWMI), Kathmandu, Nepal (p.gurung@cgiar.org), (2) Institute of Engineering, Pulchowk Campus, Tribhuvan University, Kathmandu, Nepal

The West Seti River basin located in the far western region of Nepal has catchment area of 7,438 km^2 and annual rainfall is about 1921 mm. According to report on climate change and vulnerability mapping in watersheds in middle and high mountain regions (Siddiqui et al., 2012), this basin is one of the most vulnerable river basin of Nepal. The average elevation of the basin is 2505 m but it varies from 314 m at basin outlet to 7043 m of Api and Nampa high mountain ranges. Agricultural land in the basin is categorized in three types; cultivation in level terraces, cultivation in slope terraces and cultivation in valley. Based on the landuse classes basin has approximately 377 km^2 area of level terraces, 227 km^2 area of slope terraces and 67 km^2 area of valley cultivation. In the basin, major summer cereal crops are rice, maize and millet; and major winter cereal crops are wheat and barley.

The Soil and Water Assessment Tool (SWAT) is used to simulate the water balances in the different cropping pattern under current and future climatic condition. The result shows that total precipitation over the rice, maize, millet, wheat and barley field are 1002 mm, 818 mm, 788mm, 186 mm and 169 mm respectively whereas total simulated actual evapotranspiration (ET) are 534 mm, 452 mm, 322 mm, 138 mm and 177 mm respectively under current climate. In similar cropping pattern, actual ET will change by +0.7% in rice, +3.4% in maize, -3.4% in millet, +41.2% in wheat and +36.2% in barley under future climate projection. Result of cropping yield shows that rice, maize and millet yield will decrease by 10%, 7.9% and 26.1% whereas yield of wheat and barley will increase by 7.8% and 5.8% accordingly. Therefore, climate change result shows that yield of summer crops are in decreasing trend and winter crops are in increasing trend.

Key Words: Water Balance, Hydrological Modeling, Climate Change, Crop Yield, SWAT