Elevation, Slope Aspect and Integrated Nutrient Management effects on Crop Productivity and Soil Quality in North-West Himalayas, India

Birendra Nath GHOSH¹, Narinder Kumar SHARMA¹, Nurnabi Meherul ALAM¹, Raman Jeet SINGH¹ and Gopal Prasad JUYAL¹

¹Central Soil and Water Conservation Research and Training Institute, 218, Kaulagarh Road, Dehradun-248 195, Uttarakhand, India.

*Corresponding author, e-mail: bngosh62@rediffmail.com; Tel: +91-135-2758564; Fax: +91-135-2754213

Abstract: On farm bio-resource recycling has been given greater emphasis with the introduction of conservation agriculture specifically with climate change scenarios in the mid-hills of the north-west Himalaya region (NWHR). Under this changing scenario, elevation, slope aspect and integrated nutrient management (INM) may affect significantly soil quality and crop productivity. A study was conducted during 2009-10 to 2010-11 at the Ashti watershed of NWHR in a rainfed condition to examine the influence of elevation, slope aspect and integrated nutrient management (INM) on soil resource and crop productivity. Two years of farm demonstration trials indicated that crop productivity and soil quality is significantly affected by elevation, slope aspect and INM. Results showed that wheat equivalent yield (WEY) of improved technology increased crop productivity by ~20-37% compared to the conventional system. Intercropping of maize with cowpea and soybean enhanced yield by another 8-17%. North aspect and higher elevation increased crop productivity by 15-25% compared to south aspect and low elevation (except paddy). Intercropping of maize with cowpea and soybean enhanced yield by another 8-15%. Irrespective of slope, elevation and cropping system, the WEY increased by ~30% in this region due to INM technology. The influence of elevation, slope aspect and INM significantly affected soil resources (SQI) and soil carbon change (SCC). SCC is significantly correlated with SQI for conventional ($R^2 = 0.65^*$), INM technology ($R^2 = 0.81^*$) and for both technologies ($R^2 = 0.73^*$). It is recommended that at higher elevation (except for paddy soils) with a north facing slope, INM is recommended for higher crop productivity; conservation of soil resources is...