Geophysical Research Abstracts
Vol. 18, EGU2016-6629-1, 2016
EGU General Assembly 2016

EFFECT OF POTATO (Solanum tuberosum L.) CROPPING SYSTEMS ON SOIL AND NUTRIENT LOSSES THROUGH RUNOFF IN A HUMIC NITISOL, KENYA

Shadrack Nyawade (1), Gachene Charles (1), Nancy Karanja (1), and Schulte-Geldermann Elmar (2)

(1) Department of Land Resource Management and Agricultural Technology, University of Nairobi, P. O. BOX 29053-00625, Nairobi, Kenya (larmat@uonbi.ac.ke), (2) International Potato Center, Sub-Saharan African Region, P.O BOX 25171-00603, Nairobi, Kenya (e.schulte-geldermann@cgiar.org)

Soil erosion has been identified as one of the major causes of soil productivity decline in the potato growing areas of East African Highlands. Potato establishes a protective soil cover only at about 45-60 days after planting and does not yield sufficient surface mulch upon harvest which leaves the soil bare at the critical times when rainfall intensities are usually high thus exposes soil to erosion. A field study was carried out using runoff plots during the short and long rainy seasons of 2014/15 respectively at the University of Nairobi Upper Kabete Farm, Kenya. The objectives were to assess the effect of soil surface roughness and potato cropping systems on soil loss and runoff, to determine the effect of erosion on nutrient enrichment ratio and to evaluate the soil organic matter fraction most susceptible to soil erosion. The treatments comprised of Bare Soil (T1); Potato + Garden Pea (Pisum sativa) (T2); Potato + Climbing Bean (Phaseolus vulgaris) (T3); Potato + Dolichos (Lablab purpureus) (T4) and Sole Potato (Solanum tuberosum L.) (T5). The amount of soil loss and runoff recorded in each event differed significantly between treatments ($p<0.05$) and were consistently highest in T1 and lowest in T4. Mean cumulative soil loss reduced by 6.4, 13.3 and 24.4 t ha-1from T2, T3 and T4 respectively compared to sole potato plots (T5), while mean cumulative runoff reduced by 8.5, 17.1 and 28.3 mm from T2, T3 and T4 respectively when compared with the sole potato plots (T5) indicating that T4 plots provided the most effective cover in reducing soil loss and runoff. Regression analyses revealed that both runoff and soil loss related significantly with surface roughness and percent cover ($R2=0.83$ and 0.73 respectively, $p<0.05$). Statistically significant linear dependence of runoff and soil loss on surface roughness and crop cover was found in T4 ($p<0.05$) indicating that this system was highly effective in minimizing soil loss and runoff. Enrichment ratio was on average greater than unity for all soil elements analyzed indicating that erosion process was selective. Concentrations of soil organic matter in the eroded sediment were higher in the stable fraction; mineral organic carbon (18.43-19.30 g kg-1), mineral nitrogen (1.67-1.93 g kg-1) than in the labile fraction; particulate organic carbon (7.72-9.39 g kg-1), particulate nitrogen (0.62-0.84 g kg-1) indicating that much of the eroded soil organic matter was in stable form. The study shows that there is need to incorporate suitable indeterminate legume cover crops such as Dolichos lablab in potato cropping systems so as to minimize soil and nutrient losses due to erosion.

Acknowledgement

This study was part of the CIP-Sub Saharan Africa managed project-"Improved Soil Fertility Management for Sustainable Intensification in Potato Based Systems in Ethiopia and Kenya"-funded by the BMZ/GIZ International Agricultural Research for Development Fund.