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Soil Erosion and Land Use Effects on Phosphorus Dynamics in a Brazilian Watershed

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Abstract

Brazil is the fourth largest consumer of fertilizers, with an annual consumption of nearly one million tons of P and this amount is predicted to increase due to agricultural intensification. Whereas, in developed countries the oversupply of P triggers environmental problems, in most tropical countries P deficiency is the major economic constraint to farmers. The concept of balanced P fertilisation aims at a harmonisation of natural supply by soil and environment, the nutrient demand of the crop and inevitable losses to the environment.

The agricultural production systems fulfil the criteria of sustainability only, if the losses in this balances can be minimised whilst maximising crop productivity and economic profits. This paper deals with the significance of erosion processes in P losses. The study was carried out in a 2.200 ha catchment which is located within the sugarcane growing region of São Paulo State, Southeast Brazil 22°40'S and 47°47'W.

The region is characterized by heavy rainfall and severe soil degradation caused by erosion. Current land use comprises mainly of sugarcane (70 %) and to a small degree pastures (8 %) and natural forest (22 %). 300 soil profile samples were taken and analysed for texture, exchangeable cations, CEC, SOM, pH, available P, total P and total Fe using standard methods. Soil erosion and depositions were calculated using the Water Erosion Prediction Program (WEPP) hillslope version 99.5 (Flanagan & Nearing, 1995). It was found that land-use had a significant impact on the distribution of total and available P. Soil P was transferred from areas of high P input (sugarcane) to areas of low input (pasture, forest) due to soil particle erosion. Additionally, low input areas were found to have a higher soil organic matter content and moisture regime than high input areas and therefore a better buffering capacity for P.

Keywords: Land-use, phosphorus, soil erosion

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