

## **On-site nutrient depletion as a cause and an effect of soil erosion**

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### **Abstrak (Abstract)**

On-site nutrient depletion is an ongoing process in many parts of the world, especially tropical areas; in the words of E. Smaling, it is a 'quiet crisis' which is threatening sustainable agriculture and food security.

Soil erosion is one of several processes contributing to on-site nutrient depletion. Others include leaching, harvest of agricultural products and removal of crop residues. Although these processes are measurable, they are rarely all considered in the same experimental system, making assessment of their relative significance difficult.

Nutrient depletion can also be a contributing cause of soil erosion because, when nutrients are limiting, there is lower production of above- and below-ground biomass which protects the soil against erosion. This is less frequently recognised than the fact that nutrient depletion is an effect of soil erosion.

Nutrient loss by soil erosion is the product of soil loss and the nutrient content of sediment, but many also be predicted from soil loss and topsoil nutrient content. However, soil erosion is a selective process which preferentially removes the fertile top layers of the soil profile. This nutrient-rich sediment is further enriched during transport by the selective settling of relatively heavier particles. Thus, prediction of nutrient depletion must take these enrichment processes into account.

The concept of enrichment ratio (ER) is central to predicting nutrient loss from soil loss data, particularly with increasing scale. Unfortunately, ER is not constant, varying with soil type, erosion event and scale of measurement. Separating sediment into bed load and suspended load components is particularly useful in studying nutrient enrichment process.

The problem of scaling from experimental plot to catchment level remains a major difficulty. As scale increases, erosion mechanisms change, producing sediment with ER values approaching 1.

Nutrient balance studies, where the effect of added nutrients on soil loss can be quantified, help to identify those situations where nutrient depletion is a cause of soil erosion. In nutrient balances for low-input systems, nutrient loss by soil erosion can be large. Such balances highlight which interventions should receive priority.