

# Effects of soil erosion on nutrient status and soil productivity in the Central Highlands of Kenya

Mira Ovuka,

Physical Geography, Department of Earth Sciences, Göteborg University

## ABSTRACT

This study examines the effects of soil erosion on nutrient status and soil productivity in tropical environments using data obtained from detailed on-farm studies of two rural areas in Murang'a District, Kenya. In addition, this study deals with the impact other factors have on soil productivity, for example, land slope, climatological factors and farm resource levels. Research methods used in the study include: analyses of soil samples, aerial photographs and rainfall data; classification of soil erosion and land management; and interviews with farmers to record yields, agricultural inputs and their perception of rainfall, land use and livelihood changes. It is confirmed that soil erosion has negative effects on soil productivity. Soil nutrients and yields decrease significantly with increasing soil erosion and increase with better land management. Slope position also influences nutrient status. Highest nutrient values were found on the lower slope positions. Moreover, results show substantial land use changes with introduction of new crops and declining importance of traditional crops. Increasing land fragmentation, less fallow land and changes in land management are further examples of land use change. Farmers, today, need to use chemical fertilisers to sustain and increase agricultural production. Analysis of aerial photographs show less terraced land in the 1990s compared to the 1960s despite soil and water conservation efforts from the Ministry of Agriculture. The results also show changes in rainfall patterns during periods when the main food crop requires water. This corresponds with farmers' perceptions of rainfall changes. Increasing pressure on land has made both growing seasons equally important to secure food production. Further, farmers' resource levels influence nutrient status, maize yield, erosion and land management. Lowest nutrient status and maize yield, most erosion and poorest land management are found among low resource farmers. Land use changes were also examined in the neighbouring Nyeri District. These results confirmed findings from Murang'a and make it possible to generalise land use changes in the coffee and tea zone of Central Kenyan Highlands. The negative trends, including depleted soils, land fragmentation, intensive land use and soil erosion, are a threat to food production. In order to sustain and increase soil productivity and, in the long term, food production, it is important to adapt strategies and programs to the local situations. It is also essential that policies to achieve sustainable development in Kenya are biophysically possible, socio-politically acceptable as well as economically and technically feasible.

**Keywords:** agriculture, environmental change, generalisation, farmers' perceptions, farmers' resource level, Kenya, land management, land use, livelihood, Murang'a, Nyeri, on-farm approach, rainfall, slope, soil and water conservation, soil erosion, soil nutrient status, soil productivity, sustainable development.