Geographisches Institut der
Rheinischen Friedrich Wilhelms Universität Bonn

Diplomarbeit

Assessment of hydro-physical properties and development of a "false chronosequence" of anthropogenic influenced soils in wetland regions of Namulonge, Uganda

vorgelegt von
Piotr Przysucha

betreut durch
Prof. Dr. Bernd Diekkrüger

Bonn, September 2014

Abstract

Fresh water and fertile soils are scarce and valuable resources. Water losses through runoff, degradation of soils and decreasing yields constitute major problems, particularly in sub-Saharan Africa. Wetlands show relatively fertile soils and year-round availability of water, while providing a wide range of ecosystem services. The present research is part of a joint project of German universities and African partners aiming to reconcile food production with environmental protection. The study constitutes a preliminary investigation of soil hydro-physical properties within an inland valley wetland in south-central Uganda. Parameters determined included particle size distribution, bulk density and volumetric soil moisture content. Measures of four or six depth increments were taken at three transects along the stream. Transects were divided into four toposequence positions along the gradient from uplands to lower slopes at the valley bottom. In a first step, soil properties were examined for spatial variability. Soils were predominantly sandy or loamy; texture, as analyzed for fringe areas, showed no variation among transects. Bulk density and moisture content distinctly differed with depth and toposequence position. Overall, uplands showed the lowest moisture content and highest bulk density. Transect positions were less influential, but traced to side-specific soil characteristics possibly reflecting different fluvial processes. Correlation analysis indicated a negative association of bulk density and moisture content; higher bulk density tended to go along with higher proportions of sand and lower proportions of clay and silt, while correlations of moisture content and texture showed reversed patterns. Comparisons between different land use categories revealed that crop-inherent factors other than the frequency of tillage were influential. To estimate impacts of the duration of cultivation, a "space for time" approach was used. As spatial variation was high, possibilities to develop such a "false chronosequence" were limited. Results generally support the view that longer periods of cultivation are associated with an increase in bulk density and a decrease in moisture content. Overall, soils under semi-natural vegetation showed relatively high moisture contents in upper layers, indicating a quick recovery of soil quality. Further research is required to better understand hydrological processes affecting the health of wetlands and to develop sustainable agronomic options.