



Tropentag, October 6-8, 2009, Hamburg

“Biophysical and Socio-economic Frame Conditions
for the Sustainable Management
of Natural Resources”

Soil Water Availability for Agricultural Use in Small Wetlands in East Africa

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Abstract

The conversion of wetlands into sites of agricultural production is mostly inter-linked with hydrological alterations (building of raised beds, drainage, irrigation etc.) that might also have negative effects on other system components. Yet, wetland ecosystems require a certain amount of water to maintain the long-term agricultural production potential and the diverse ecosystem services. Our research aims at determining the amount of water required to sustain the wetlands production potential for different wetland types and use patterns to maintain the long-term agricultural production potential of wetlands from a hydrological perspective. Two wetland types — one low-elevation floodplain wetland in Tanzania (350–400 m amsl, wetland size 23.5 km², catchment area 3600 km²) and one high-elevation inland valley wetland in Kenya (1720–1780 m amsl, wetland size 9 ha, catchment area 2 km²) — have been selected for in-depth studies. In view of assessing the spatial and temporal availability of water for different agricultural uses, we (1) quantify the seasonal changes in water table (above-ground, within rooting zone, below rooting zone), the water storage capacity in the root zone and soil moisture variations along hydrological gradient; (2) assess the key factors controlling the hydrological regime of the wetlands; and (3) evaluate the effects of different agricultural uses on the storage and the seasonal availability of water. Hydrological parameters (*e.g.* discharge, water table depth, stratified soil moisture contents) and meteorological parameters (rainfall, temperature, relative humidity) are measured during the rainy and dry season as well as during the dry-to-wet season transition period. Soil water balance (HYDRUS 1D) and catchment models (SWAT) are applied to provide a base for the evaluation of scenarios of wetland use. Different use scenarios will be incorporated and model results will contribute for the formulation of recommendations for sustainable resource use strategies for small wetlands in East Africa.

Keywords: East Africa, small wetlands, water availability