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Key Determinants of Soil Water Availability for Agricultural Production in two Wetland Types in East Africa

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Abstract

Predicted future changes of temporal and spatial precipitation patterns will affect agricultural production in East Africa, especially in rainfed upland systems. Wetlands are characterised by prolonged periods of water availability and are thus attractive land areas, which alleviate the negative effects of increasingly variable weather and changing climate conditions on agricultural production. Yet, their diverse hydrological regimes do not allow for a generalisation of their agricultural potential. This study aimed at understanding patterns of seasonal and spatial water availabilities in two distinctive wetlands under agricultural use in East Africa, comprising a floodplain in Tanzania (350–400 m amsl) and an inland valley wetland in Kenya (1720–1800 m amsl). The floodplain was cultivated with rice and maize with portions left used for grazing or as fallow. The inland valley was cultivated with arrowroot, maize and horticultural crops. We developed a digital elevation model and monitored soil moisture in the rooting zones by TDR probes, groundwater levels, stream discharges and meteorological parameters at both sites. Soil moisture surveys show that wetland morphology is a key determinant for soil water availability in the wetland systems. Both, the time of occurrence and the duration of soil flooding, triggered by rainfall events together with reservoir management in upstream areas, are key determinants driving the type and the intensity of agricultural landuse in the flood plain system. In the inland valley, soil moisture remained at constant high levels throughout the year due to the presence of springs and a high ground water table and variations occurred along the cross section between the fringe and the centre of the valley. The effect of other factors on water availability for crop production such as soil texture and organic carbon in the wetland and landuse of the adjacent slopes are currently examined and will be discussed. The research is seen to contribute to the development of guidelines for the agricultural use and management of wetland systems under variable weather and changing climate conditions.

Keywords: Kenya, soil moisture, Tanzania, TDR, wetland