Vegetation Analysis to Assess the Impact of Land Use History and Intensity on the Resilience of Small Wetlands in East Africa

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Abstract

Agricultural practices can impact negatively on the resilience of wetlands. Such effects are reflected in the species composition of spontaneous vegetation regenerated after land abandonment. Soil nutrient condition tends to deteriorate under prolonged intensive land use. Plants unable to cope or compete due to such stressors are selectively filtered out of the community causing shifts in species composition. In an attempt to use the spontaneous vegetation as an assessment tool for wetlands' degradation status, we analysed the interactions between land use properties, soil nutrient condition and species composition of the vegetation. We selected 66 plots distributed in four locations, two of them in Kenya and two in Tanzania. Their land uses were classified into three groups: unused, fallow, and grazing. Information about land use history and intensity was collected using rapid rural appraisal. To characterise the soil nutrient condition, soil samples were collected for carbon, nitrogen, phosphorous and potassium analysis. Vegetation assessment involved aboveground and underground sampling. Above ground vegetation was sampled in 10 m × 10 m plots, estimating the cover of all species occurring on them. Soil cores were collected in each plot for underground vegetation assessment. The soil cores were placed in a greenhouse for three months to quantify the germination of seeds contained into the soil. Germinated species and individuals were registered in this period. In general, low variability in the soil conditions along the three main land uses was detected. This resulted in a low capacity of the plant species to indicate them. Nevertheless, land use and its intensity are the main factors determining the species composition of the vegetation. Since seed banks are dominated by weeds of arable lands, underground floristic offers a useful tool to assess the effects of past land uses as well as the potential regeneration of the natural vegetation. Additionally, the geographical distribution of the localities is an important factor determining the species composition of the aboveground vegetation, especially in the fallow and grazing uses. The analysis of spontaneous vegetation and the indicator species can be used to determine the resilience or vulnerability of wetland ecosystems to agricultural use.

Keywords: Agroecosystems, biodiversity, bioindicators, wetland ecology

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