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Interactions between the flooding regime and floodplain grasslands in the Tana River Delta, in Kenya

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The floodplain grasslands of the Tana River Delta, located on the East African coast in Kenya, form part of an intertwined socio-ecological deltaic system of high biodiversity value that delivers numerous goods and services. Mainly composed of Echinochloa stagnina (Retz) P. Beauv., a high-value forage species, this ecosystem is the major dry-season grazing grounds of the local pastoralist communities. The construction of hydroelectric infrastructure has led to a modification of the flooding regime. The impacts of the resulting reduction of floods in the deltaic zone on ecosystem properties and services still need to be assessed.
In such a perspective, this study characterizes the link between the flooding regime of the Tana River and the growth pattern of its floodplain grassland. Aboveground dry phytomass was sampled for 15 months under a wide variety of naturally flooded and non-flooded conditions and controlled irrigation and cutting frequency treatments. Annual aboveground dry phytomass attained high values between 11 T.ha-1 and 32 T.ha-1 and annual net primary production of the grasslands reached 35 T.ha-1.year-1. Growth rates clearly depended on the flooding regime, management and climate conditions and were on average more than twice as fast during, and 50% faster after the floods, relative to pre-flood conditions. A plant growth model allowed testing the effect of different flooding regimes on plant productivity, confirming very low productivity in the absence of floods.
These results suggest that rangeland and water management for the Tana River deltaic wetlands are tightly linked. The projected construction of another dam could lead to a reduction of flood extent and period and a decrease of grassland productivity and growth duration. Mitigation of this type of negative impacts, which will have direct and adverse consequences for the pastoralist communities as well as on the delivery of other goods and services, needs to be undertaken.