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The Impact of Ranching on a Savannah Ecosystem in Tanzania

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Abstract

The success of large-scale cattle ranching in African savannah vegetation has often been limited by problems of bush encroachment and disease (in particular trypanosomiasis spread by tsetse flies). Mkwaja Ranch, occupying an area of 462 km² on the coast of Tanzania, is a recent example of a large ranching enterprise that failed within the savannah environment. It was closed in 2000 after 48 years of operation. Thanks to detailed records kept by the ranch managers, it has been possible to reconstruct how ranching activities affected the savannah ecosystem. In this paper we describe how grazing by cattle led to the encroachment of scrub, particular of *Acacia zanzibarica*, over the most intensively used parts of the ranch. We also compare the influence of domestic and wild herbivores upon soil nutrient conditions, measuring nitrogen and phosphorus availabilities along vegetation gradients within a recently abandoned cattle ranch and at sites in a neighbouring game reserve. The results show that cattle ranching led to considerable re-distribution of nutrients, especially of nitrogen and phosphorus, with depletion in grazing areas and accumulation in areas where animals congregated at night. In the dense *Acacia* stands N₂-fixation enhanced N availability and caused a net annual N input. Fire was the major cause for nutrient losses from tallgrass savannah. N inputs from the atmosphere and symbiotic N₂-fixation were not sufficient to compensate for these losses; our results therefore call into question the common assumption that N budgets in annually burned savannah are balanced. These results help us to understand why intensive livestock ranching as practised on Mkwaja Ranch was unsustainable.

Keywords: Bush encroachment, nitrogen, phosphorus, ranching, savannah, Tanzania