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Sustainable Rangeland Management under Conditions of the Namibian Land Reform — Simulation Based Identification of Sustainable Strategic Patterns

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Abstract

The ongoing degradation of savannah ecosystems due to maladapted rangeland management has significant long term ecological and economic consequences. In many parts of Africa, like in Namibia land tenure has been and will be reorganised as a consequence of political changes. This in turn may significantly influence land use strategies. In our study we aim at identifying sustainable land use strategies for savannah rangelands. Specifically, we are searching for general sets of adaptive rules describing the reaction of land reform beneficiaries to rainfall, vegetation dynamics and animal condition, so that the outcome of land use meets economic and ecological requirements.

For our analyses we used a model framework that is built upon an eco-hydrological vegetation model which simulates the dynamics of the natural resources (namely water and vegetation) as a function of climatic conditions and land use impacts. By dynamically linking a vegetation model, which features the up-scaled dynamics of the eco-hydrological model, to an economic model we are able to include and test decisions of land users and land use strategies. Key triggers for decision making and management patterns were identified in a survey, where our ecological-economic model was used to conduct role-plays with Namibian land reform beneficiaries. This data in combination with information from interviews is used to parameterise our model to properly reflect the situation of resettled farmers. We ran simulations, in order to compare current management strategies resulting from two different land reform measures with possible alternatives and classical commercial strategies. We analyse whether, when and to what extent the land users should react to main factors such as precipitation, vegetation dynamics, animal condition and financial situation.

Keywords: Ecological-economic model, land-reform, rangeland management, savannah, sustainable land use