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More Sustainable Range Use in Semi-Arid Eco-Systems through Adapted Management: a Case Study on Namibian Farms Based on Bio-Economic Models

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Abstract

Due to overuse of resources, especially over-grazing, and the application of non-suitable management practices such as low recognition of prevalent natural vegetation cycles in grass and thorn bush savannahs without considering long-term degradation processes, the range quality of many commercial farms has declined. A visible decreasing appearance of natural composition of grass and bush cover, bush encroachment and a decreasing biodiversity indicate lower stocking potentials for domestic livestock on large areas of farm lands. Therefore range degradation becomes a threat to the continuation of viable commercial farming in many semi-arid grass lands. As a response, on the one hand many farms seek to increase size and decrease intensity which leads to a declining number of farmers and workers who can make a living on the natural resource. On the other hand political pressure is increasing to encourage intensity of farming and to create job opportunities for a growing population. An immanent conflict arises which is portrayed by the need to assure better resource exploitation of natural savannah and the need to limit resource use to sustain future range quality.

In a case study on Namibian farms we show how improved and better adapted management practices can solve that conflict. In particular, we investigate the potential of using certain new techniques like natural combating of bush encroachment and combinations of wildlife and domestic livestock to prove the economic, ecological and social viability of these strategies. Furthermore, the impact of policy measures to sustain biodiversity and farm income is simulated. To approach our objective we have built farm models that include bio-physical aspects on the interaction of different domestic livestock and wildlife and a transition-state-model for vegetation dynamics. The models are designed around the maximization of discounted value added of different activities for sustainable range land use as to test a long-term perspective on profitability.

Keywords: Adapted range management, biodiversity, dynamic bio-economic models, policy measures, sustainability, wildlife