



Tropentag, October 5-7, 2011, Bonn

“Development on the margin”

## New Institutions and Technologies to Cope with Risk in Pastoral Systems — Pitfalls and Chances

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### Abstract

Pastoral systems worldwide undergo fundamental changes in the last decades. New institutions and technologies emerged to cope with variable and unpredictable climate and to adapt to changing socio-economic settings. Examples are the utilisation of supplementary feeding, long-distance mobility by use of trucks or the introduction of rain-index insurances. Besides intended effects of these new ways to reduce income risk, adverse non-intended effects may occur in these complex social-ecological systems.

Socio-geographic research on the High Plateau (Morocco) has shown that households are not a homogeneous group but rather differ in various regards. Policy instruments (such as subsidised supplementary feeding) to decrease income risk not help to reduce the polarisation of the pastoralists, if these instruments are not targeted to the marginalised group. However, for that purpose a comprehensive understanding of consequences of such instruments is in need.

Abstracting from this case study, we built a dynamic, stylized ecological-economic simulation model for a hypothetical grazing system to investigate the impact of the design of new institutions and technologies such as supplementary feeding on livelihoods and on pasture condition in long-term. Hereby we include explicitly the feedbacks between the ecological processes, human decision-making and socio-economic framework conditions.

Our results show that the timing of supplementation matters. As prior studies indicated, it is revealed that supplementation in drought years may increase long-term pressure on the grassland. Hence on short-term income risk may be reduced, but on long-term ecological degradation may occur. However, feeding strategies, which provide forage (additionally) in the years after droughts, when rainfall is not anymore limiting, are beneficial in ecological and economic terms as long as the additional forage is used to reduce pasture pressure but not to increase livestock number rapidly.

Finally we want to point out a general potential of our approach: We use modelling not to make predictions for the real world. We rather use it as a tool for communication, to make aware of intended but in particular also of non-intended consequences of different policies. Therewith we aim to support discussions on appropriate risk management strategies – for instance for marginalised natural resource users.

**Keywords:** Morocco, pastoralism