

Participative decision mechanisms for sustainable development in co-operative livestock systems in Europe

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Introduction Alpine pastures have been used for centuries and have a specific economic, ecological and cultural history that gives local identity. Alpine pastures, used only in summer, are endangered due to modern farming methods and economic conditions. The consequences include loss of biodiversity, traditionally used landscapes and socio-cultural identity in marginal regions (Riseth *et al.*, 2003). As the Entlebuch UNESCO Biosphere Reserve was established by its inhabitants in a participative process, sustainable development in alpine pastures is also implemented by stakeholder participation. The methodology of participative decision mechanisms were used in two EU-projects: LACOPE: Landscape development, Biodiversity and Co-operative Livestock Systems in Europe, developing references for sustainable development in marginal regions and VisuLANDS: Visualisations Tools for Public Participation in the Management of Landscape Change. The main objective was to improve participative decision mechanisms using visualisation tools.

Materials and methods Ten alpine pastures were selected. The farmers, NGO's, local trade organisations, local tourism providers and experts from national and local public authorities were invited to a series of workshops. The models of System Dynamics and 3-D visualisation tools were used - applied simultaneously in the workshops and adapted for the regional conditions. Local knowledge and more detailed information was gained from the workshops, interviews, questionnaires (n = 150) and context analysis and was used to develop indicators and measures for designing scenarios for the use of livestock in random regions in mountain areas.

Results Stakeholders developed scenarios starting with a SWOT analysis, defining main targets and indicators. The indicators integrated in the model of System Dynamics show interdependences and connections between indicators and gives a better understanding of the entire system (Coyle, 1998). The model shows limitations and possibilities for controlling and changing land use management for a future development.

According to the results of the model, scenarios for changes in land use were developed and consequences for the landscape were presented with the 3-D visualisation tool, showing changes and providing support for the discussion about sustainable development of landscape management, considering ecological and economical conditions. System Dynamics and 3-D visualisation tools were important instruments, improving participative processes. Considering a balance of economic development and maintenance of socio-cultural factors improving biodiversity of alpine pastures, co-operative structures and the management of alpine pastures have to be maintained and adapted to changed conditions (Kalies *et al.*, 2003). Strategies developed in participative processes have a broader acceptance in the region and accelerated changes in management and increased the sensitivity of farmers for future challenges.

Conclusion Applying Dynamic System models and 3D visualisation tools support participative decision mechanisms by allowing the present situation and possible scenarios for the future to be seen clearly. Both instruments are worth adopting for better understanding of complex systems and can be used for modelling scenarios (Vennix, 1999). Participative decisions have a broad acceptance, initiate early adaptations of structural changes and maintain sustainable development.

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