Modelling the impact and viability of sustainable land management technologies: what are the bottlenecks?

L. Fleskens [1]

[1] *School of Earth & Environment, University of Leeds, Leeds LS2 9JT, UK, l.fleskens@leeds.ac.uk*

ABSTRACT

Models are increasingly used for land use planning and impact assessment of sustainable land management interventions. This requires biophysical (e.g. soil erosion) models to be coupled to models that represent the socio-economic complexities of the area of interest. The interface between such coupled models is a range of possible decision-making options, i.e. the portfolio of sustainable land management technologies to be considered. One side of the coupled model should adequately assess the likely biophysical impacts from adoption of the technologies; the other should predict which option is likely to be the most viable in a given situation. This paper builds on experiences with the PESERA-DESMICE integrated model developed in the EU FP6 DESIRE project. PESERA-DESMICE combines a process-based erosion prediction model extended with process descriptions to evaluate the effects of measures to mitigate land degradation, and a spatially-explicit economic evaluation model to evaluate the financial viability of these measures. The biophysical (PESERA) model is capable of addressing degradation problems due to wind and water erosion, grazing and fire. It can evaluate the effects of improved management strategies such as maintaining soil cover, retention of crop residues, irrigation, water harvesting, terracing and strip cropping. These management strategies introduce controls to various parameters slowing down degradation processes. Lessons from application of the model to several degradation hotspot areas around the globe will be presented, including an analysis of aspects the model addresses well and less well. The socio-economic (DESMICE) model evaluates the applicability limitations and inventories the spatial variation in the investment and maintenance costs involved for a pre-selected portfolio of technologies. The physical effects of the implementation of the management strategies relative to the without situation are subsequently valuated in monetary terms. The model pays particular attention to the spatial variation in the costs and benefits involved as a function of environmental conditions and distance to markets. While it can be assumed that land users will only potentially implement technologies if they are financially viable, there are many more factors which come into play. Work underway to include risk perception and cooperation between land users will be presented. Again, lessons from application across DESIRE project sites will be presented. The main areas for future model development will be highlighted.

Keywords: land degradation, soil conservation, integrated environmental modelling, cost-benefit analysis, policy evaluation