



Assessing land degradation and acknowledging adaptive policy options to face with changes: an integrated approach applied to a semiarid agropastoral system

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The complexity of assessing land degradation on semiarid systems deals with challenges that have rarely been addressed. Land degradation is a human-induced and permanent reduction of key ecosystem functions and services at different temporal and spatial scale. Initial attempts to assess land degradation at a broader scale were based on expert opinion, however the empirical bases to sustain these estimations are weak and the ecological data are still scarce. In addition, such approaches are essentially subjective and they reflect the objectives and assumptions of those making the assessment, who are rarely land users themselves. Currently, the concept of "land degradation" is debated, and in the last years have emerged a growing number of efforts to develop land degradation participatory assessment methods that could capture a more complex understanding of human-environment interactions. This study proposes an interdisciplinary and hybrid methodology, combining local and scientific knowledge, to assess land degradation in mixed farming systems. Specifically, i) it describes and analyses the mixed farming system and it explores how historically political, social and institutional local factors have interacted with ecological process, ii) it identifies key ecosystem processes and services needed to support the agropastoral systems that are perceived to be under threat from land degradation; iii) it assesses the status and trends of these key ecosystem services; and iv) it identifies and evaluates potential management alternatives to prevent land degradation and cope with changes (e.g. climate change). We show how to achieve, through a co-construction of hybrid knowledge between scientific and farmers, a more accurate and reliable appraisal of land degradation, since farmer's perception is contextualized, dynamic and complex and involves simultaneously multiple temporal and spatial scales and multiple dimensions of analysis that could help the scientific exploration. The study reveals that the ecosystem services' exploration with local actors is a good method to reveal the multiple and sometimes conflictive local strategies and interests at stake. Ecosystem services assessment has also been used as an entry to discuss with local land users about adaptive management strategies to improve soil functions involved in the maintenance of the provision and regulation processes and land productivity that support local livelihoods face to changes. The integrated methodological framework adopted has a positive impact to empower local users, enlarging the access to adequate information and channels of communication between experts/local users, and improving their capacity to use the co-constructed hybrid knowledge. We argue that engaging the relevant and interested actors in the process is key to understand margin of flexibility for dialogue between local users, scientific and policy makers and it is a base for ownership of local actors in decision making processes that facilitates effective soil-land governance. Finally, we discuss how wide institutional changes at different levels are needed to support agro-environmental policies for communities, small and medium farmers and to undertake new adaptive management strategies to cope with uncertainties of future changes.

