EDITORIAL

LAND MANAGEMENT AND POLICY RESPONSES TO MITIGATE DESERTIFICATION AND LAND DEGRADATION

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Globally, recognition is growing that land sits at the centre of the food, energy and water nexus. Land plays a crucial role in providing food and water security, building resilience to climate change and contributing to its mitigation, as well as supporting biodiversity and helping to meet energy needs (Thomas *et al.*, 2012). At the same time, land degradation and its vicious form in drylands, desertification, is still widespread – jeopardising livelihoods and sustainable development. Although several biophysical processes cause land degradation both on their own and in combination, they interact with multi-faceted human-induced drivers at different levels. These range from the level of the individual land user whose management practices may be destructive, exploitative, short-sighted or negligent, to the policy level, at which land use and management across larger (administrative) areas are governed, and may be ill-conceived, inequitable, discriminatory, or simply ineffective. Despite on-going degradation, land users and policy makers have in many instances responded with innovative practices and policies that have transformed degraded landscapes and prevented further degradation. Such success stories are isolated and the global challenges are vast, so it is critical to better understand the drivers of ongoing degradation processes, in order that we can learn from past errors and local successes in achieving sustainable land management (SLM).

Moving towards being able to up-scale successful SLM becomes all the more important as we enter the post-2015 era in which the Millennium Development Goals (MDGs) look set to be succeeded by Sustainable Development Goals (SDGs). The Future We Want, the outcome document of the international Rio+20 meeting (UN, 2012) identified the need to advance towards a land degradation neutral world within the context of sustainable development. As political discussions continue as to the exact focus of the SDGs, the need for a robust evidence base to inform policy that draws on an understanding of the drivers and impacts of, and responses to, land degradation, becomes increasingly vital. This is particularly so for those people living with and affected by land degradation in their everyday lives, and as nexus approaches recognise the multiple benefits associated with mitigating the impacts of land degradation and desertification.

This special issue of Land Degradation and Development draws on approaches used in the Desertification Mitigation and Remediation of Land - a Global Approach for Local Solutions (DESIRE) project, which took a multi-scale approach to address land degradation, drawing on the perspectives of multiple stakeholders (Hessel *et al.*, in press). It brings together a number of papers that study impacts of and responses to desertification and land degradation in locations across the globe. Papers connect three realms of land degradation studies: 1) identifying and assessing the impacts of land degradation and environmental change; 2) appraising and selecting suitable mitigation measures; and 3) designing and analysing policy responses. The third realm is cyclically connected to the first: existing and historical land management and policies may drive degradation (Reed *et al.*, 2011). To study the socio-economic aspects of land degradation we might start by looking at environmental change driven by contextual human interference. The first three papers in this special issue take such an approach.

The first paper by Bisaro *et al.* (2014) sets the scene by analysing the contemporary global drivers of desertification and land degradation. They frame global drivers in four categories: rising food and energy prices, emerging carbon markets, increasing global interconnection and complexity, and climate change impacts. Using input from a stakeholder consultation process, the paper identifies for each of these categories the research priorities to support SLM. Generalizing the priorities across these global drivers, Bisaro *et al.* (2014) argue for better contextual understanding of land degradation impacts and potentials for development options (landscape and target group-specific impacts, including temporal dimensions of change), multi-level analyses to better understand the interconnections and complexities between local and global level processes (e.g. through commodity value chains and emerging markets for ecosystem services), and creation of multi-stakeholder partnerships to embed new scientific insights in policy and practice, align interdisciplinary research with development priorities, and develop and foster understanding of analytical methods that can be used by a variety of stakeholders in participatory assessments of impacts and development options. Such participatory tools can then identify and address barriers to the adoption of SLM practices and guide initiatives to improve environmental and development outcomes for dryland populations.

Stringer and Harris (2014) explore drivers of and responses to land degradation for a case study area (Dolj County) in southern Romania during the period 1984-2007, covering the transition from socialist to post-socialist eras. Taking a mixed-methods approach including remote sensing, literature review, primary empirical data (ranging from interviews and household surveys to key informant interviews and focus group discussions) and policy analysis, they demonstrate how complex interactions between human and political-economic drivers of land degradation with biophysical factors impact upon the landscape. Contrary to common belief, the steady consistency of the governance regime during the socialist era enabled a stable, productive landscape to take shape, underpinned by irrigation development and plantation of forest shelterbelts. In the post-socialist period rural areas performed a safety net function mitigating the effects from the dismantling of state-owned (agro-)industries and ensuing job losses. However, it was difficult for owners of often fragmented redistributed lands with limited agricultural experience to farm the land in an economically viable way. Increased demand for fuel wood following population influx, combined with collapse of the irrigation system in the absence of any coordinating institution, culminated in increased land degradation. The paper concludes that the (re-)creation of formal institutions based on more open and inclusive social and economic structures and processes could help reduce land degradation through shifts towards forestry and the maintenance of land cover.

Jones *et al.* (2014) present a second case study of the evolution of land management over time, this time driven by policy change. They compare the performance of farming systems in two Less Favoured Areas (defined as mountain areas, areas in danger of abandonment and areas affected by specific natural handicaps – EC, 1999) in Portugal over the period 1989-2009. They pay specific attention to the past and present combinations and main features of crop and livestock enterprises. This paper also uses multiple methods: remote sensing, agricultural census and farm accountancy network data, as well as field data collected from farm interviews. In both areas, over time, farms specialised in livestock activities gained in dominance over mixed farms. As a consequence, not only the share of pastures in the landscape increased, but those with a permanent character also increased, leading to decreased stocking and reduced soil erosion rates. However, movement towards large ruminants (cattle) with high feed requirements in the Alentejo area enabled by livestock subsidy payments have induced high expenditure on external inputs and could cause over-intensification of other plots on the farm, while doing little to increase farm income. In Centro, the second research area, rural development policies have stimulated yields of mixed farming systems, resulting in more balanced environmental and economically viable outcomes. The authors conclude that policy reform should take livestock grazing regimes into account for enhanced sustainability.

These first three papers therefore demonstrate the intricate links between human factors (including policy) and biophysical drivers of environmental change. Interdisciplinary research approaches are required to discern such relations, typically covering a historical period but also capable of characterising recent land users’ responses. Such a perspective can further be taken as a starting point for predicting future trends in scenario analyses (Fleskens *et al.*, in press), but can also inform new initiatives so that they are based on an understanding of dynamics that led to the current state of land degradation. Such greater understanding should help to achieve higher success rates. This leads on to the next three papers populating the second realm of land degradation studies, either using participatory approaches to appraise and select SLM practices, or relating adopted practices back to land users’ characteristics to better understand the diffusion of responses to land degradation.

Tavares *et al.* (2014) report on a hybrid approach combining experiences and skills of local people with scientific knowledge of external stakeholders to combat desertification problems in the Cape Verde archipelago. Like in the previous papers, a mix of drivers (here classified as endogenous and exogenous) interacts to cause extensive land degradation problems. The authors review past mitigation actions taken on the islands and conclude that failure to include all stakeholders from the problem definition stage has limited the success of past responses. They then outline a series of participatory processes designed and applied within the DESIRE project case study area of Ribeira Seca, the largest watershed on Santiago Island. The approach applied consisted of five steps, including three workshops, desertification risk mapping based on field observations of indicators, and implementation of two promising SLM practices in farmers’ fields: live barriers of pigeon pea (*Cajanus cajan*) or other species, and afforestation with a variety of fruit trees. The workshops involved local and national stakeholders and focused respectively on identification of the main causes and consequences of desertification, selection of SLM options for testing in farmers’ fields, and evaluation of preliminary test results. Stakeholders regarded this approach as an opportunity to voice their opinion and feel part of the project, while they also reported noticeable improvements in conflict resolution, crop diversification and soil erosion control.

 McDonagh *et al.* (2014) studied the adoption and adaptation of SLM practices (which they term improved soil management practices) in a number of rural settlements in the eastern Ugandan hills. These villages had participated in a DFID-funded three-year research project to develop and test practical tools to support local professionals to work effectively with land users on soil management. The study involved community discussions to elicit preferences for SLM; household surveys at the beginning and at the end of the second year of the project, respectively to investigate livelihood status and ranking of production constraints and SLM options, and to evaluate why and how land users had adopted and adapted specific SLM practices; expert interviews and workshop; and support with soil management. The authors explore SLM options with regard to recommendation domain (the biophysical and socio-economic context for which an option is deemed appropriate), size of solution space (a measure to characterise the flexibility of fit of an option beyond which its performance is affected), and multi-functionality (defined as the number of uses distinguished by local land users). They conclude that multi-functionality is the most practical characteristic to focus on when identifying SLM practices likely to be adopted, and also stress that support to land users at community and household level to trial and adapt technologies is crucial for up-scaling SLM.

 Tesfaye *et al.* (2014) investigate the factors influencing adoption of SLM practices (specifically, soil bunds, stone bunds, and fanya juu terraces) in a watershed area in the Blue Nile catchment, Ethiopia. To this end, they conducted a household survey among 250 adopters and 248 non-adopters of the technologies and applied binary logit models to discern significant factors. The authors postulate that past soil conservation programmes have been ineffective in either triggering voluntary adoption of SLM practices outside the project area or maintenance of structures after project ending. They signal a need to understand factors influencing adoption, especially linked to off-site benefits, such as for downstream reservoirs and irrigation schemes. Among the factors found to be significant, access to credit, perception of erosion and acknowledgement of the importance of soil conservation are all important to consider in policy design by building in credit facilities and awareness raising of the negative impacts of soil erosion and the advantages of SLM practices. Furthermore, effects of land holding (positive relation to adoption) and livestock ownership (negative relation) point to the need to consider availability of fodder resources, and the potential to plant grass, fodder and trees on bunds as a source of income.

As the papers summarised above show, the success of responses to land degradation can be greatly enhanced by building multi-stakeholder partnerships. The key dynamics of such collaborative endeavours can be as subtle as land users feeling heard and valued, but can potentially also be extended to the development of innovative investment mechanisms that help land users adopt SLM practices with valuable downstream (or global) impacts (..). Furthermore, SLM practices preferred by land users exhibit certain characteristics, among which the potential to contribute to multiple functions is vital. Policies may be required to enable land users to adopt SLM practices, such as credit facilities. The next two papers look in more depth at policy responses to land degradation.

Mulale *et al.* (2014) assess the performance of formal institutions and their policies in promoting SLM in the Boteti area, Botswana. The significantly degraded, semi-arid Boteti area was one of the study sites of the DESIRE project and mainly consists of vast, dry sandy soils. Through several policies, the Botswana government has attempted to develop this vast area, which is traditionally used for agro-pastoralism. Building on literature review and policy document analysis complemented with field observations (transect walks) and stakeholder workshops, the authors establish that ineffective implementation of SLM-promoting provisions in key legislation such as the Tribal Lands Act and Agricultural Resources Conservation Act have respectively resulted in de facto open access rangelands with overgrazing as a result, and increased wind erosion on failed dryland farming areas. Moreover, intended modernization of the livestock sector through establishment of fenced cattle ranches has been maladapted to the local environment, and allowed ranchers to exercise dual grazing rights leading to further exacerbation of overgrazing in communal rangelands. An integrated approach to landscape management that encompasses both rangeland grazing and wildlife conservation needs, and which engages communities, should be preferentially pursued in order to address land degradation while also delivering other benefits.

 In the final paper of this special issue, Carreiras *et al.* (2014) trace the similarities and differences in policies to deal with wildfire risk in Portugal and the autonomous region of Valencia in Spain. In both areas, wildfires constitute the most detrimental driver of land degradation, having disastrous consequences; however, wildfires only became relevant from the 1970s as complete fire suppression strategies that came into force after widespread afforestation led to accumulation of very high fuel loads, further exacerbated by rural exodus and increased frequency of ignitions in the wildland/urban interface following population influx. Whereas wildfire control policies can entail a combination of wildfire prevention, mitigating fire impacts, and recovering burned ecosystems, legal and administrative limitations have governed the deployment of actions. Growing problems have demanded a reconsideration of strategies in a joint learning process between different stakeholders, taking into account local traditions, knowledge and mindsets as well as local environmental conditions. In the Portuguese case, traditional techniques such as prescribed fire (banned for over 50 years) and integrated management of mountain and rangeland areas, have been reinstated and improved by incorporation of scientific and technical knowledge to increase safety and effectiveness. In Spain (the Communidad Valenciana), fragmentation of forest zones may require implementation of a joint management unit as in Portugal, as the current promotion of collective action may hinder recovery of burned areas.

The papers in this special issue thus provide a collection of insights that address both impacts of and responses to land degradation. If progress is to be made towards an SDG that embraces the concept of a land degradation neutral world, the role of such targets and policy measures need careful consideration – particularly because if constructed carefully and underpinned by holistic thinking, measures supporting SLM practices could deliver benefits beyond reducing land degradation. In any international approach that emerges, inclusion and partnerships between multiple stakeholders spanning levels from the local to global will be required, as demonstrated by the papers in this issue. This issue also demonstrates the importance of such multi-stakeholder approaches, alongside the need to integrate different disciplinary approaches to advance our understanding of degradation drivers and consequences.

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