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Economics of sustainable land management

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Degradation of soil and land resources is a critical global problem. It is widespread not only in drylands and cropped areas, but in most agro-ecologies and biomes around the world. Unless addressed, it may undermine global food security and negatively affect the livelihoods of billions of people, especially of the poor. Addressing land degradation requires public, community and private actions informed and supported by evidence-based research. The current paper reviews the recent economic literature on land degradation and improvement with the purpose of highlighting major new insights and continuing gaps. Drawing conclusions from the recent research under the Economics of Land Degradation (ELD) Initiative, we find that action against land degradation has considerably higher economic, environmental and social returns than inaction. The drivers of land degradation are numerous and often context-specific, so addressing them requires targeting not some individual driver in isolation, but through comprehensive and mutually consistent packages of policy actions. We suggest the following conceptual, methodological and empirical areas for future research on economics of land degradation. Firstly, more interdisciplinary conceptual frameworks are required to connect land degradation and other intricately related issues such as climate change, water scarcity, loss of biodiversity, energy and food security. In this regard, Water-Energy-Food Security (WEF) Nexus concept can be highly useful as one of such nexus platforms for future trans-disciplinary research on economics of land degradation. Secondly, more rigorous methodologies are needed on the incorporation of the value of ecosystem services into economic calculations. Finally, there is a need for empirical studies tracing the dynamic economic and social impacts of land degradation across scales: from household to global level.

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Introduction

Well-functioning land ecosystems, providing their services in undiminished manner, are essential for food security and poverty reduction [1•]. These land ecosystems services consist of provisional ones (e.g., food, fiber, feed, biomass), but also supporting, regulating and cultural services (e.g., water purification, carbon sequestration) [2,3••]. However, the values of many supporting, regulating and cultural ecosystem services are usually not considered in the decisions by landusers, policymakers and other economic agents, since most of them do not have tangible market prices [4,5]. Nevertheless, these ecosystem services are essential for human existence, omitting them from our decision making frameworks undervalues land and leads to its degradation, resulting in losses to human wellbeing [6,7••,8••]. More tangibly, land degradation reduces the provisional goods and services derived from land. It is manifested through lower crop and livestock productivity and production, with potentially negative social and economic implications, especially in the context of growing populations and increasing demands for food, feed and diversifying uses of biomass, projected climatic and other environmental changes. All this makes land degradation unacceptable [9], in fact, at the global level, land degradation is no longer affordable: a fertile land is already a scarce commodity and has become an investment asset class with growing attraction, with spillover effects on food, feed, energy, water and financial markets in this interconnected and globalized world [5].

There is a critical need for preventing and reversing land degradation, including through land rehabilitation and restoration [9]. Land degradation has occurred on about 30% of global land area since early 1980s [10••], while land improvement has occurred only on about 3% of the global land area during the same period [10••]. The drivers of land degradation are numerous and often have context-specific characteristics. The same factor could have contradicting effects on land degradation depending on its interactions with other socio-economic and institutional factors [11]. For example, in some cases, higher levels of poverty may lead to land degradation due to inability of landusers to invest into sustainable land management. However, in some other contexts, poverty was not found to lead to land degradation since poorer households have higher dependence on land for their livelihoods and thus are more incentivized to manage it sustainably [11]. Such a heterogeneity of impacts requires adapting policy actions to local conditions. In this regard, policy frameworks for action against land degradation, though already present in many countries, too often remain ineffective [3••], due to various contradictions

and inconsistencies, which makes even more important that such action frameworks against land degradation need to be evidence-driven [5,12].

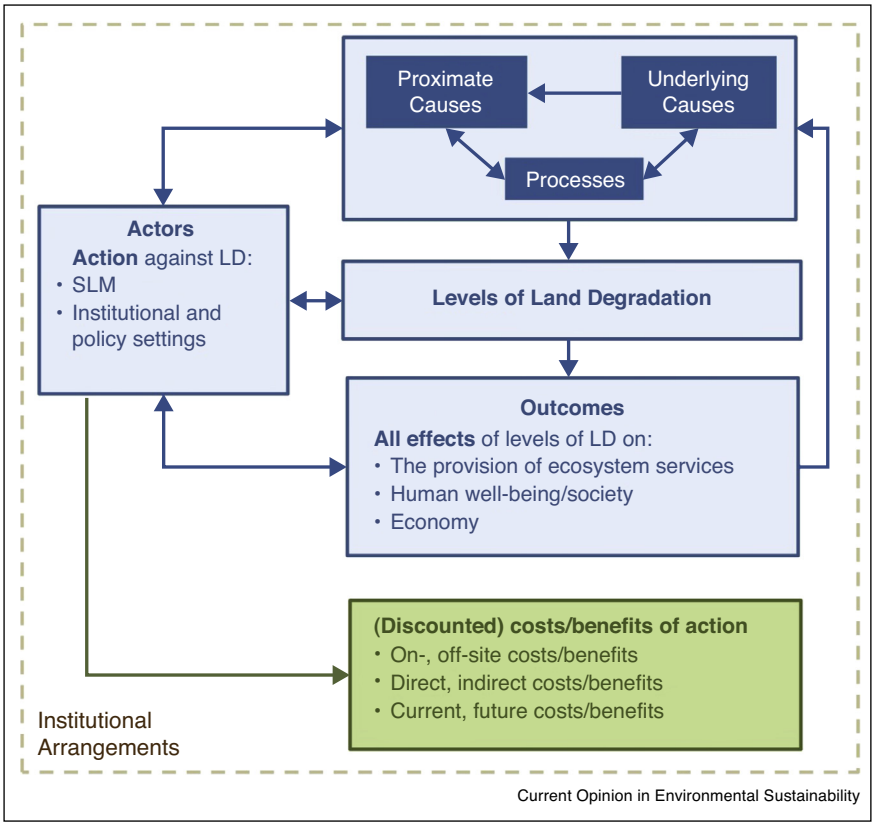
The objective of the current paper is to review the recent advances in economic literature on land degradation. In doing so, the paper seeks to answer three research questions: (1) what are the costs of land degradation at the global and regional levels, and how do the costs of action against land degradation compare with the costs of inaction?, (2) what are the new insights on the drivers of land degradation and on its socio-economic impacts?, and (3) what are the major continuing gaps in economic studies of land degradation?

Conceptual framings

Land is a terrestrial ecosystem consisting of flora, fauna, hydrological processes, providing numerous ecological goods and services to human beings [13]. Land degradation is a long-term loss of these terrestrial ecosystem goods and services [2]. These definitions call for a comprehensive approach in evaluating the costs of land degradation, including both short-term and long-term, direct and indirect, on-site and off-site benefits of sustainable land management, and comparing them with the corresponding costs of land degradation[11]. Another key element of these definitions is that they put the loss of utility to humans resulting from land degradation as their central feature.

Being comprehensive, thus, means adopting the Total Economic Value (TEV) approach [14,3••]. The TEV approach seeks to capture the value of both direct and indirect ecosystem goods and services, hence, going beyond the common monetary values of direct provisioning services only [15]. The TEV approach is based on the neoclassical welfare economics, with its roots in utilitarianism, whereby the values of ecosystem services are determined based on the degree that they satisfy individual preferences [16]. Adopting such an approach is also conceptually consistent with the definitions of land degradation by The United Nations Convention to Combat Desertification (UNCCD) and Millennium Ecosystem Assessment (MEA) cited earlier. The Economics of Land Degradation (ELD) conceptual framework (Figure 1; [11]) provides an example of the application of TEV thinking in economic evaluations of the costs of land degradation.

Figure 1



Conceptual framework for economics of land degradation.*Source*: Adapted from Ref. [11].