

Evolving concepts and opportunities in soil conservation[☆]

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Abstract

The terrestrial landscape has changed considerably compared to that of the early 20th century when soil conservation was first institutionalized. Large portions of the land are already intensively managed, and the remainder is increasingly receiving human interventions. Previous work on soil conservation focused attention on technological innovations, particularly control and mitigation of soil erosion. However, land degradation has continued and actually accelerated in many parts of the world, due mainly to demands for continued economic development, using technologies that are highly exploitive. In many cases, this has been facilitated by highly inadequate and unsympathetic institutional, legislative, and policy environments.

The paper discusses some of the new driving forces, new international programs, and new potential partners in soil conservation. Increasingly, international efforts to mitigate land degradation are shifting from studies of the biophysical processes to improving the global, national and local enabling policy environment, as well as mainstreaming of soil conservation into national and regional policies and programs. Also, increased emphasis is placed on economic instruments and international markets, such as carbon trading, and incorporation of non-market values in ecosystem investment, such as payment for ecosystem services, certification schemes, etc. The paper discusses some of the opportunities for soil conservation that accrue from these new driving forces.

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Keywords: Land degradation; Environmental goods and services; Driving forces

1. Introduction

Soil conservation has its roots in historical antiquity, but the institutionalization of the movement began with the major droughts and environmental devastations which occurred in the early part of the 20th century. The approaches to soil conservation that emerged from these experiences focused on prescriptive technological and engineering approaches to prevent or mitigate the impacts of soil erosion on crop yields, farmer income, and food security. However, after almost a century of soil conservation, the world has changed. Agriculture is now less natural resource based, and more strongly affected by globalization, production subsidies and other safety nets. Over the past decades,

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new land management technologies have progressively improved crop yields, and until very recently, the accepted evidence was that food security was no longer a concern.¹ However, events of the recent past bring this into question

Although the importance of soil conservation to national agricultural GDP varies from country to country, the global importance of soil conservation and the control and mitigation of land degradation² are more highly recognized now than at any time in the past. This is because rising populations and rising incomes in the middle classes, as well as increased capacity of human interventions to cause ecosystem degradation, are now of such magnitude that for the first time in history how we manage the land can impact directly on global environmental goods and services. This concern on environmental values is the major driving force on the geopolitical agenda for soil conservation, and this is expected to increase in the future as society better understands the important linkages between soil quality and the environment.

1.1. Linking land degradation and global environmental goods and services

Land degradation is an integral part of the environment cycles³ that support all types and quality of terrestrial life on the planet. Thus, in thinking about the processes and impacts of land degradation on society, we must increasingly focus not only on agricultural yields, farmer income, and food security, but increasingly on the impacts of land degradation on provision of environmental goods and services. The driving forces of rural land use change are shifting from agriculture, forestry and other extractive services, to provision of environmental goods and services and global life support systems, and the major decisions in this are being made by people in urban fora, with often little understanding of agriculture.

Most ecosystem changes are the result of rapid growth in demand for food, water, timber, fiber, and fuel. In the recent past, food production increased by two and a half times, water use doubled, timber harvesting increased by more than half but tripled for pulp and paper production, and installed hydropower doubled. These changes have contributed to substantial net gains in human well-being and economic development, but at growing costs of ecosystem degradation, increased risks of extreme events, and exacerbation of poverty for some groups of people. The degradation of ecosystem services represent losses of natural capital, and while this can sometimes be justified to produce greater gains in other services, often more degradation of ecosystem services takes place than is in the best interest of society.

There are direct and indirect linkages between ecosystem services and components of human well-being, and land degradation affects these linkages in different ways. Knowledge of these impacts provides evidence of the extent to which these can be mitigated with socioeconomic and technological interventions. For example, if it is possible to purchase a substitute for a degraded ecosystem service, then there is a high potential for mitigation, but if there is no substitute, or if the substitute is very expensive, or if degradation of the ecosystem service is beyond rehabilitation, then that service may be lost forever. The strength of the linkages and the potential for mitigation are shown in Fig. 1.

Changes in drivers that indirectly affect ecosystem goods and services can lead to changes in drivers that directly affect ecosystems, such as changes in local land use and cover, the application of fertilizers, etc. (Fig. 2). These result in changes to ecosystems and the services they provide, thereby affecting human well-being. These interactions can take place at several scales and can cross geographic and time scales. For example, an international demand for meat products may lead to regional deforestation, which may increase flood magnitude, loss of soil organic matter, and soil erosion.

A discussion of the current state of the global environment is given in the Appendix to this paper.

2. Global trends influencing the geopolitical agenda for soil conservation

The human footprint on global terrestrial ecosystems is very large and growing exponentially. Currently, fully 83% of the world's land area is directly influenced by human interventions⁴; 50% of the terrestrial earth's surface has

¹Although food security is reasonably assured, about 2 M people go hungry every day, due more to problems of internal security and distribution.

²Land degradation involves the processes of degrading the quality of land, whereas soil conservation normally refers to remedial or mitigation measures. Although the terms are sometimes used interchangeably in this paper, they are not the same.

³Discussions on global environmental degradation include dimensions of land degradation. Although the terms have different meaning, in most cases, environmental degradation cannot occur without considerable degradation of land resources.

⁴Cited in Karieva et al. (2007).

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