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Identification of soil erosion risk areas for conservation planning in different states of India

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Abstract

Assessment of soil erosion risks, especially in the developing countries, is a challenging task mainly due to non-availability or insufficiency of relevant data. In this paper, the soil erosion risks have been estimated by integrating the spatial data on potential erosion rates and soil loss tolerance limits for conservation planning at state level in India. The erosion risk classes have been prioritized based upon the difference between the prevailing erosion rates and the permissible erosion limits. The analysis revealed that about 50% of total geographical area (TGA) of India, falling in five priority erosion risk classes, requires different intensity of conservation measures though about 91% area suffers from potential erosion rates varying from < 5 to > 40 t $ha^{-1}yr^{-1}$. Statewise analysis indicated that Andhra Pradesh, Maharashtra and Rajasthan share about 75% of total area under priority Class 1 (6.4 M ha) though they account for only 19.4% of the total area (36.2 M ha) under very severe potential erosion rate category (> 40 t $ha^{-1}yr^{-1}$). It was observed that about 75% of total geographical area (TGA) in the states of Bihar, Gujarat, Haryana, Kerala and Punjab does not require any specific soil conservation measure as the potential erosion rates are well within the tolerance limits. The developed methodology can be successfully employed for prioritization of erosion risk areas at watershed, region or country level.

Key words

Erosion risk, Soil sustainability, Potential erosion rate, Soil conservation

Introduction

Among many environmental hazards, checking land degradation is of utmost importance as it has direct bearing on decline in productivity on arable and non-arable lands. It is estimated that about 80% of the current degradation on agricultural land in the world is caused by soil erosion due to water (Angima *et al.,* 2003). Hydrological disasters coupled with high erosion rates have serious social, economic and environmental implications (Pimentel, 2000). One of the major negative onsite effects of soil erosion is the loss of soil fertility status leading to decline in productivity. It is estimated that India suffers an annual loss of 13.4 million tonnes in the production of major cereal, oilseed and pulse crops due to water erosion equivalent to about $ 2.51 billion (Sharda *et al.,* 2010). India ranks very high among the developing countries plagued by high population and poverty which have close nexus with land degradation. Increasing demographic pressures on the limited and shrinking per capita land resource forces people to adopt inappropriate and unscientific land use and management practices for short-term gains with utter disregard to long-term sustainability and environmental security (Hacisalihoglu, 2007). As per harmonized data base on land degradation, 120.72 million ha area is affected by various forms of land degradation in India with water erosion being the chief contributor (68.4%) (Maji, 2007).

Assessment of soil erosion risk and its prioritization is a challenging task, especially in the developing countries due to non-availability of relevant data and analytical tools for such an assessment. As a result, it becomes difficult to adopt appropriate conservation and management practices in risk prone areas to check land degradation and sustain productivity (Upadhyay, 1991; Arhonditsis *et al.,* 2002). The data available on land degradation, prevailing soil erosion