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Soil erosion limits for Lakshadweep Archipelago

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Soil loss tolerance limits (*T* value) define the soil loss amounts that are tolerable to maintain, continuously and economically, the sustainability of soil productivity. Within these limits, soil erosion and soil formation processes are in equilibrium. The Lakshadweep Islands is prone to soil erosion and about 20 running kilometre seashore line is being subjected to severe erosion. The unique land and soils of the Lakshadweep Coral Islands require careful management to protect the fragile ecosystem. Soils of ten inhabited islands of Lakshadweep were studied in detail to assign *T* values, for suggesting a conservation plan. The *T* value for the whole Archipelago varied between 7.5 and 12.5 t ha^{-1} yr^{-1}. The spatial delineation of soils with respect to *T* value can facilitate the management of these valuable resources and prevent their degradation.

Keywords: Conservation plan, soil erosion, soil loss tolerance, soil sustainability.

SOIL is an essential natural resource, which is available in limited quantities. Soil functions are mainly in crop production and as a filtering agent indispensable for the maintenance of water quality. In tropical agro-ecosystems, soil erosion is the main land-degradation process, especially if land use is intense[1]. Soil erosion can reduce crop productivity, due either to physical degradation or nutrient depletion[2]. Soil erosion is also an environmental hazard. In this case, the impacts are called off-farm, while silting and pollution of water resources are the major consequences[3]. Erosion limits have to be defined in order to keep these impacts at acceptable levels.

Soil loss tolerance is the maximum rate of annual soil erosion that may occur and still permit a high level of crop productivity to be obtained economically and indefinitely[4]. The *T* value is also sometimes called 'permissible soil loss'. Within these limits, soil erosion and soil formation processes are in equilibrium. Soil loss tolerance depends on the soil type. In very deep and homogenous soils, the effects of erosion will be less pronounced than in shallow soils encountered on highlands of semiarid zones or highly weathered soils whose nutrient storage and availability depend largely on the organic matter of the surface layer[5]. Determination of soil tolerance is intended to compare the expected soil loss with the soil loss tolerance. If soil loss is less than or equal to the soil loss tolerance, soil loss can be still permitted. The maximum soil loss tolerance for tropical regions[5] is 25 t ha^{-1} yr^{-1}. A commonly used soil loss tolerance rate is 5–12 t ha^{-1} yr^{-1} for shallow to deep soils[6,7]. However, the current used rates for tolerable soil loss are far too high for fragile tropical soils with low levels of fertility[5,7]. It has also been indicated that tolerance values for tropical soils have not yet been formulated at the international level[5]. Established annual soil loss tolerance limits[7–9] vary between 0.2 and 11 t ha^{-1} yr^{-1}.

It is important to mention here that soil formation is a positive feedback process, i.e. the product of the process accelerates the production of the product. Therefore soils have to be kept in place to make more of them. The estimated rate of soil loss from farmland has a disastrous consequence for food production. Further, each harvesting removes the plant nutrients from the soil. In a self-

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