

ESTABLISHING PERMISSIBLE EROSION RATES FOR VARIOUS LANDFORMS IN DELHI STATE, INDIA

P. JHA^{1*}, H. C. NITANT¹ AND D. MANDAL²

¹Central Soil and Water Conservation Research and Training Institute, Research Centre-Chhalesar, Agra-282006, India

²Central Soil and Water Conservation Research and Training Institute, Kaulagarh Road, Dehradun-248195, India

Received 31 May 2008; Revised 4 October 2008; Accepted 9 October 2008

ABSTRACT

Permissible erosion rate also known as soil loss tolerance (T value) is defined as maximum erosion that can take place on a given soil without degrading its long-term productivity. In India, default T value of $11.2 \text{ Mg ha}^{-1} \text{ y}^{-1}$ is used for devising land restoration strategies for different types of soils. However, ability of soil to resist degradation varies with soil type, depth and physico-chemical characteristics. Therefore, the present investigation was undertaken to determine T value of different landforms of Delhi State by taking into account the soil saturated hydraulic conductivity (SHC), bulk density (BD), organic carbon, erodibility and soil pH. Soil state was defined by a quantitative model and scaling functions were used to convert soil parameters to a 0–1 scale. The normalised values were multiplied by appropriate weighting factors based on relative importance and sensitivity analysis of each indicator. Categorical rankings of I, II or III were assigned to soil groups based on overall aggregate score. T value of different landforms of Delhi State was computed using the guideline of USDA-Natural Resource Conservation Services. Majority of landforms of Delhi had T value of $12.5 \text{ Mg ha}^{-1} \text{ y}^{-1}$, except for the soils of hill terrain, dissected hill, pediment and piedmont plain, where T value ranged from 5 to $10 \text{ Mg ha}^{-1} \text{ y}^{-1}$. These T values could be used for conservation planning and will help the planners in devising suitable land restoration strategies. Copyright © 2008 John Wiley & Sons, Ltd.

KEY WORDS: erosion; soil loss tolerance; soil groups; Delhi State; India; conservation planning

INTRODUCTION

Pressure on land has been intensified due to rapidly increasing population; consequently soil degradation has increased to a great extent (Blum, 1998). Problems of land degradation coupled with loss of soil productivity and declining soil quality continue to be the subject of concern for environmentalist and gaining widespread attention of scientific community. Though the loss of any amount of soil by erosion is generally not considered beneficial but years of field experience as well as scientific research indicate that some loss can be tolerated without affecting the crop production significantly (Schertz, 1983). This acceptable rate of erosion is known as T value (Wischmeier and Smith, 1978; McCormack *et al.*, 1982) or permissible soil loss (Kok *et al.*, 1995.). Quantifying T value without affecting crop productivity becomes a major challenge for researchers and conservation planners. If erosion rate is more than T value, they are considered unacceptable and must be reduced for sustainable agriculture. The aim of any conservation planning is to keep soil erosion to a rate either equal to or less than T value to prevent further degradation of soil.

Land restoration strategies in India aimed at the conservation of depleting natural resources on a sustainable basis; however they are mostly based on a single T value of $11.2 \text{ Mg ha}^{-1} \text{ y}^{-1}$ (Mannering, 1981; McCormack *et al.*, 1982). This could be highly misleading as it implies that soil loss less than $11.2 \text{ Mg ha}^{-1} \text{ y}^{-1}$ does not require

* Correspondence to: P. Jha, Central Soil and Water Conservation Research and Training Institute, Research Centre-Chhalesar, Agra-282006, India.
E-mail: jha_iari@yahoo.com