



Review Article

Terraced landscapes: From an old best practice to a potential hazard for soil degradation due to land abandonment

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ABSTRACT

Among the most evident landscape signatures of the human fingerprint, the terraces related to agricultural activities are of great importance. This technique is widely used in various parts of the world under various environmental conditions. In some areas, terraced landscapes can be considered a historical heritage and a cultural ecosystem service to be adequately preserved. However, terraced landscapes subject to abandonment can progressively increase gully erosion and cause terrace failure. Partly because of changes in societal perspective and migration towards metropolitan areas, some countries have been affected by serious and wide abandonment of agricultural lands in recent decades. This review aims to discuss the current state of agricultural terraced landscapes, underlining critical issues and likely solutions. The paper is structured in three main sections. The introduction provides an overview of the available literature on terraced landscapes and their critical issues. The second section presents three case studies: the first is located in the so-called Cinque Terre area (Liguria, Northern Italy), the second is placed in the Chianti Classico area (Tuscany, Central Italy), and the third refers to the renowned Amalfi Coast (Salerno, Southern Italy). The last section of the review relates to likely solutions (non-structural and structural management) and future challenges (use of high-resolution topography derived by lidar) for suitable management of such environments.

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1. Terraces: the ancient practice of soil conservation and steep hillslopes cultivation

Terraces are among the most evident human signatures on the landscape, and they cover large areas of the Earth (Fig. 1). The purpose of terracing and its effect on hydrological processes depend on geology and soil properties (Grove and Rackham, 2003), but they are generally built to retain more water and soil, to reduce both hydrological connectivity and erosion (Lasanta et al., 2001; Cammeraat, 2004; Cots-Folch et al., 2006), to allow machinery and ploughs to work in better conditions, to make human work in the slopes easy and comfortable, and to promote irrigation.

Terraces reduce the slope gradient and length, facilitating cultivation on steep slopes. They increase water infiltration in areas with moderate to low soil permeability (Van Wesemael et al., 1998; Yuan et al., 2003), controlling the overland flow (quantity

and velocity (energy), thereby leading to a reduction in soil erosion (Gachene et al., 1997; Wakindiki and Ben-Hur, 2002; Louwagie et al., 2011; Li et al., 2012), with positive effects on agricultural activities. In all Mediterranean basins, terraced landscapes are considered to be among the most important and characteristic anthropological imprints on the relief (Douglas et al., 1994, 1996; Gallart et al., 1994; Dunjó et al., 2003; Trischitta, 2005), and they symbolize an important European cultural heritage (Varotto, 2008; Arnaez et al., 2011). During the past centuries, the need for cultivable and well-exposed areas determined the extensive anthropogenic terracing of large parts of hillslopes. Several publications have reported the presence, construction, and soil relationship of ancient terraces in the Americas (e.g., Spencer and Hale, 1961; Donkin, 1979; Healy et al., 1983; Beach and Dunning, 1995; Dunning et al., 1998; Beach et al., 2002). In the arid landscape of south Peru, terrace construction and irrigation



Fig. 1. Modern terraces in Portugal (photo by Feliciano Guimarães) (a) and Germany (source Franzfoto) (b), Inca-era terraces on Pumatallis (photo by McKay Savage) (c) and Taquile (d) (Perú), and terraces in China (photo by Anna Frodesiak) (e) and Philippines (photo by Adi Simionov) (f). (The photos are licensed under the Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license).

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