Terraced Lands in Developed Countries: A Future Potential Hazard?

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doi: https://doi.org/10.21467/abstracts.93.33

ABSTRACT

Economic and social changes have been gradually affecting landscape and physical environment over a period of more than 6000 years but one of the first signs of awareness was the report on *Man and Nature* written by G.P. Marsh in 1864 and only in 1922 the title was explicit: *Man as a Geological Agent* in the work of the British geologist Robert Lionel Sherlock as well as in the 1956 massive volume edited by W.L. Thomas: *Man's Role in Changing the Face of the Earth*.

As a consequence of the increase of population, cultivation on steep lands became a need thus becoming responsible of increased surface runoff, soil loss and ultimately land degradation. A widely recommended practice to prevent soil losses and encouraging infiltration is terracing, a practice that alters the topography and increases instability if not duly managed. Terracing dates back to antiquity when Nabataean peoples migrated between 6th and 4th century BCE and increased infiltration in an extremely dry area. Terracing can be seen as a complex iterweaving between agriculture and hydraulics as it facilitates infiltration, but not retains water which is correctly led to the final outlet downstream with appropriate channelling good for raising concentration time of the catchment.

In recent years, terraced landscapes drew attention at a world wide scale and their peculiar characters in several countries have been considered and described. Agricultural lands abandonment is presently widely spread in Mediterranean countries but terraced lands are expected to remain stable only through continuous maintenance. In Italy, where terraces are a character of the landscape in many areas, the progressive abandonment of rural areas started in the '60 and is leading not only to the deterioration of a cultural heritage but also is becoming a source of unconveniences. Even if official policies have encouraged the gradual abandonment of traditional farming systems, it is worth while outlining that even if traditional farming is far less important from economic and productive points of view, it is crucial as far as the landscape and the stability of slopes are concerned. The question is whether a traditional old best practice in agriculture is becoming a potential hazard unless huge amount of resources are devoted to conservation.

Uncontrolled runoff, seepage through the walls and wall deformation are at the origin of a number of minor collapses. Occasionally, heavy precipitation can trigger larger collapses evolving in fast debris flows. In the last decade, following intense precipitation outbursts over the terraced areas in Liguria (North Western Italy), four events can be recorded as symbolic ones. On October 25, 2011, the precipitation of 472 mm in 6 hours at Brugnato (with a total amount of 511 mm in 12 and 552 mm in 30 hours) triggered an order of 25 landslides/km^2 with impressive consequences on the built environment downstream; on November 25, 2016 the collapse of a terraced area evolved in debris flow in a minor creek at Rezzo (Imperia); on November 24, 2019 in an abandoned terraced area close to Savona a mudflow crushed the piers of a roadway bridge; again in the area of Rezzo, on November 25 and December 3, 2019 small landslides triggered by uncontrolled water conveyance evolved in mudflow and hit a village destroying a XVI century religious building. In conclusion, from the point of view of stability, the unfavourable physiographical characters of the terraced areas (steep slopes, exposure to intense rainfall outbursts, thick accumulation of colluvium) are enhanced by the remnants of no longer active agricultural practices.

DOI: 10.21467/abstracts.93