



Changes in land use and rainfall-triggered rainfall: a case study in Oltrepo Pavese (Northern Italy)

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Rainfall-triggered shallow landslides are the most damaging among the all landslide phenomena. Land use change has been recognized as one of the most important factor influencing the occurrence of rainfall-triggered landslides. On April 27th 2009 a strong rainfall event triggered hundreds of shallow landslides in the western sector of Oltrepo Pavese area, which has an extension of about 800 km² and is located in Northern Apennines, Italy. The soils involved in the slides were sandy silt and clay derived from the weathering of marls and conglomerates. Land use consists of cultivated areas with extensive vineyards.

The events, which involved one fatality and several injured people, provided an opportunity to improve knowledge on the causes of shallow landslides in the study area and an analysis of the relationship between shallow landslide distribution and the changes in land use was carried out.

Digital aerial photographs with a spatial resolution of 15 cm were taken in May 2009 and they were used to identify the location and the typologies of the landslides.

Results obtained through an extensive field survey (determination of the slide body and runout geometries and the geological and geotechnical characteristics of the soils involved in landslides) combined with photo-interpretation revealed that the causes of the slides involved geological, geotechnical, hydrogeological and above all anthropogenic processes.

Three sets of aerial photos, taken in 1980, 2003 and 2009, were the basis for constructing the land use maps and to study the influence of land use changes in shallow landslide development.

Significant changes occurred in land use, particularly in the agricultural practices, during studied period and they had caused a significant modification of the runoff conditions. Till the 80s traditional vineyard plantations presented tillage perpendicular to the maximum slope gradient; agricultural works were undertaken in the traditional manner with weeding and digging, thus runoff and sediment transport were partially controlled. After the 80s traditional vineyards disappeared and were replaced by modern vineyards with row direction parallel to the maximum slope gradient in order to optimize the vine density and the mechanical work. The shape of the slope was also altered, whereas the steepest slopes were abandoned and recolonized by natural vegetation.

Results indicate that changes in land cover have played major role in landslide occurrence and distribution in the study area. The revegetation process in the abandoned vineyards has proven to be moderately successful in reducing landslide occurrence.