Estimation of grazing-induced erosion through remote-sensing technologies in the Autonomous Province of Trento, Northern Italy

Loris Torresani (1), Massimo Prosdocimi (1), Roberta Masin (2), Mauro Penasa (2), and Paolo Tarolli (1)

(1) Department of Land, Environment, Agriculture and Forestry, University of Padova, Agripolis, viale dell'Università 16, 35020 Legnaro (PD), Italy (paolo.tarolli@unipd.it), (2) Department of Agronomy, Food, Natural resources, Animals and Environment, University of Padova, Agripolis, viale dell'Università 16, 35020 Legnaro (PD), Italy

Grassland and pasturelands cover a vast portion of the Earth surface and are vital for biodiversity richness, environmental protection and feed resources for livestock. Overgrazing is considered one of the major causes of soil degradation worldwide, mainly in pasturelands grazed by domestic animals. Therefore, an in-depth investigation to better quantify the effects of overgrazing in terms of soil loss is needed.

At this regard, this work aims to estimate the volume of eroded materials caused by mismanagement of grazing areas in the whole Autonomous Province of Trento (Northern Italy).

To achieve this goal, the first step dealt with the analysis of the entire provincial area by means of freely available aerial images, which allowed the identification and accurate mapping of every eroded area caused by grazing animals. The terrestrial digital photogrammetric technique, namely Structure from Motion (SfM), was then applied to obtain high-resolution Digital Surface Models (DSMs) of two representative eroded areas. By having the pre-event surface conditions, DSMs of difference, namely DoDs, was computed to estimate the erosion volume and the average depth of erosion for both areas. The average depths obtained from the DoDs were compared and validated by measures taken in the field. A large amount of depth measures from different sites were then collected to obtain a reference value for the whole province. This value was used as reference depth for calculating the eroded volume in the whole province.

In the final stage, the Connectivity Index (CI) was adopted to analyse the existing connection between the eroded areas and the channel network.

This work highlighted that SfM can be a solid low-cost technique for the low-cost and fast quantification of eroded soil due to grazing. It can also be used as a strategic instrument for improving the grazing management system at large scales, with the goal of reducing the risk of pastureland degradation.