

Collapse of newly built forest terrace walls and evaluation of possible mitigation treatments

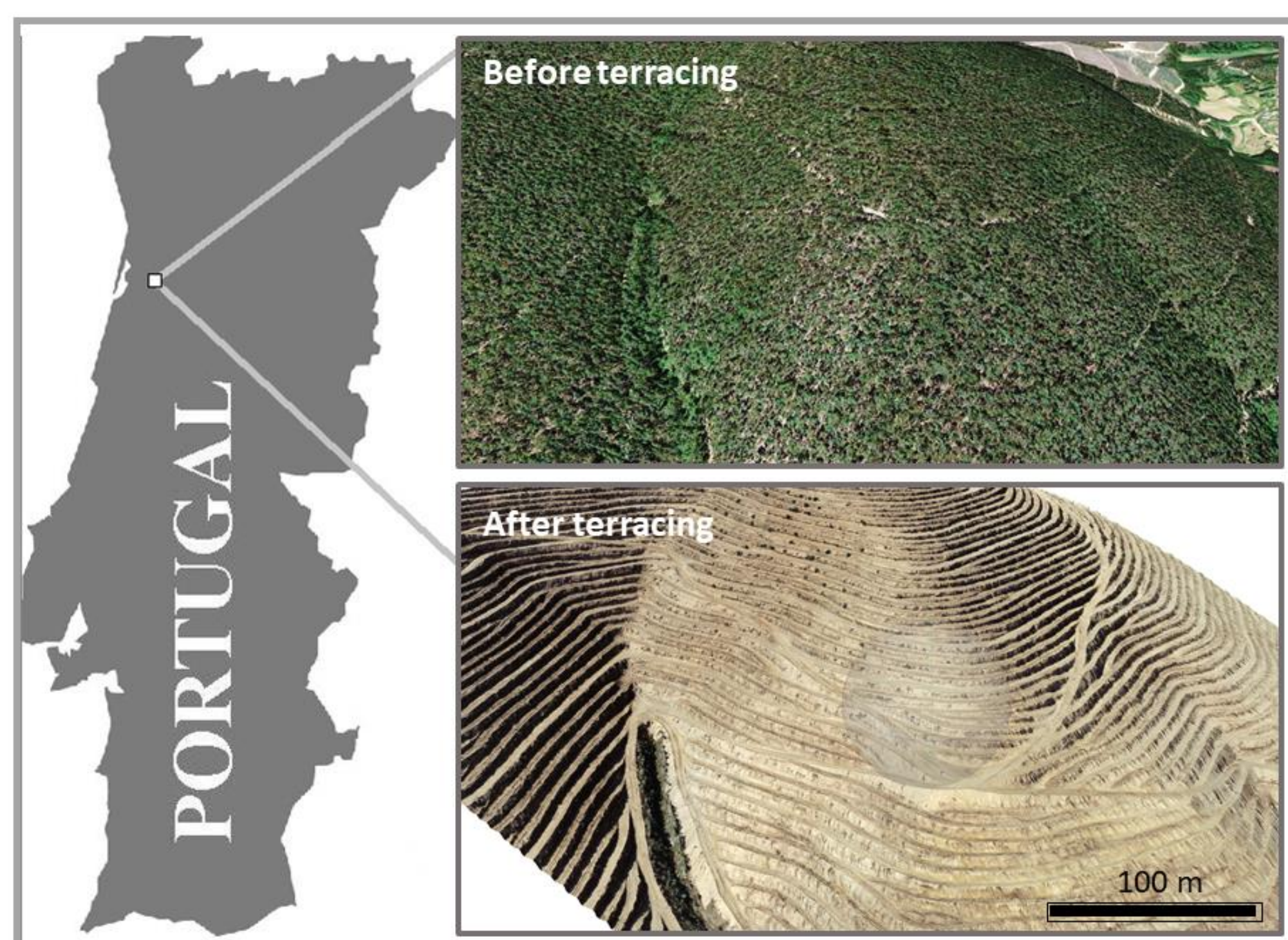
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Objectives

In recent decades, large numbers of monoculture forest plantations have been established worldwide (FAO, 2016). Land use shift to monocultures may have important implications in the soil, especially after mechanical preparation of the soils for new agroforestry plantations (Martins et al., 2013). This construction of bench terraces in mountain areas employs heavy mechanical preparation of the soils during the initial tree establishment. The bulldozers cut the terrain into consecutive flatten steps, facilitating the establishment of new plantations. Nowadays, terracing is the preferable soil management practice to plant eucalypts in the mountains of Portugal. The present study assesses the collapse of terrace walls during the first post-terraced-year and explore the mitigation potential of two different soil amelioration/conservation existing techniques feasible for application in forest plantations such as the application of hydromulch and polyacrylamide.

Study site



The study area is in a 10 ha catchment in the foothills of the Caramulo Mountains in north-central Portugal near the village of Boialvo. The catchment drains to the oriental part of the Cértima river whereas the soil occupation is predominantly forested (Corine Land Cover, 2012). Eucalypt plantations (*Eucalyptus globulus*) occupy nowadays roughly all the forested area. This area was bench terraced in the spring of 2019 to prepare the soils to receive a new eucalypt plantation.



Figure 1 – Terraces being built by a bulldozer in July 2019 near the village of Boialvo (Anadia Municipality).

Materials and methods

Immediately after the construction of bench terraces, 12 sediment traps were installed on the study site. The traps were divided in groups of four within three different blocks (bottom, middle, top). Each sediment trap was built with one meter wide and was placed in the bottom of the terrace wall to capture all the material that could possibly fall from above riser. In each of the tree blocks, the wall behind one of the traps was selected to be treated with the application of hydromulch and another to be treated with the application of synthetic polyacrylamide. The fallen material into the 12 sediment traps were collected every month during the first post-terracing-year.



Figure 2 – Sediment traps installed in the bottom of the terrace wall (1) control (2) application of polyacrylamide (3) application of hydromulch.



Figure 3 – Application of synthetic polyacrylamide by spraying the mixture using a hydroseeder.

Results

Preliminary results on bench terrace wall collapse show that the material fallen can amount on average 200 kg by each meter of the terrace line. In addition, hydromulch and polyacrylamide applications immediately after the construction of the terrace might reduce the fallen of material by 20% and 40% respectively. Yet during the first year, 4 of the 12 plots completely collapsed.

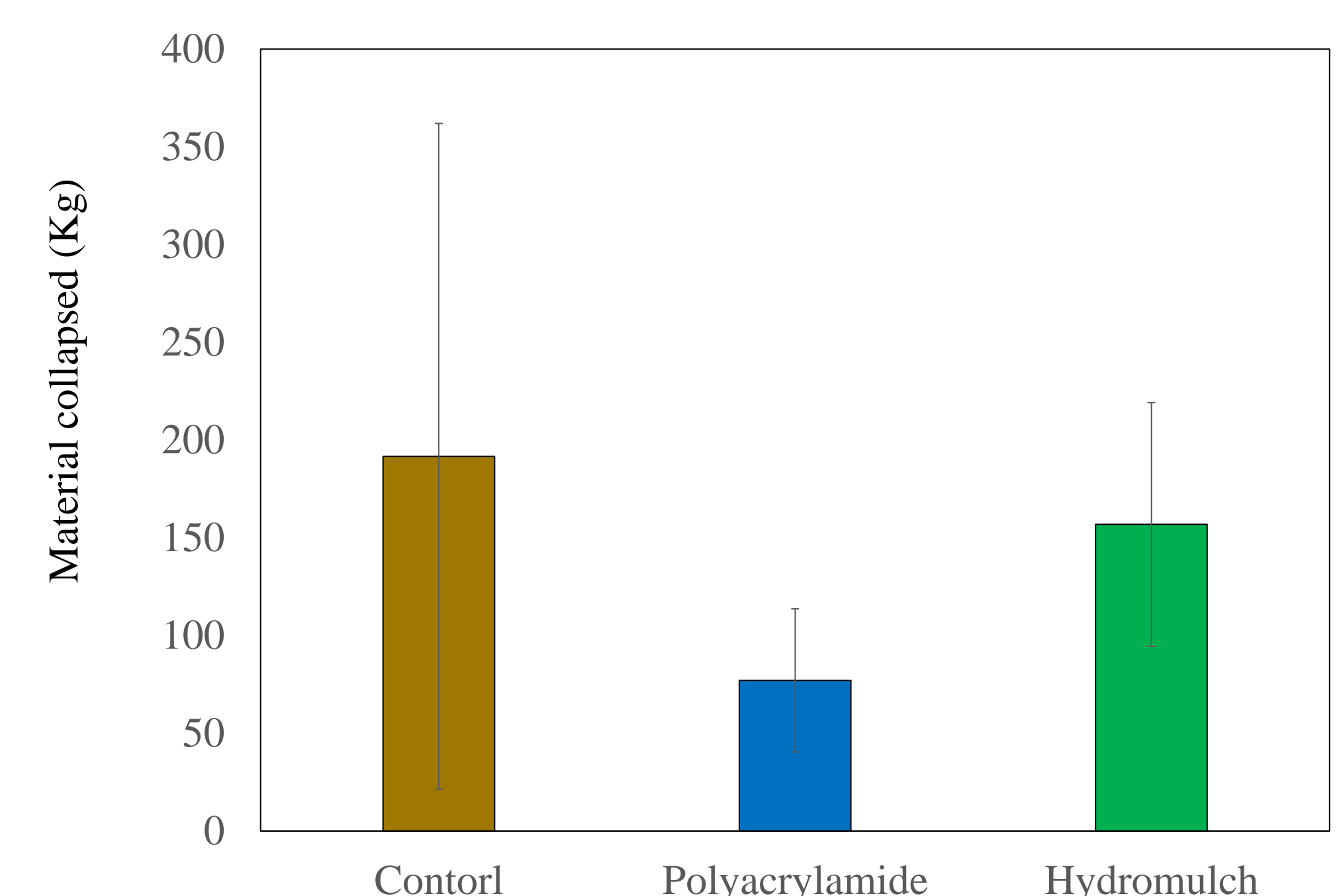


Figure 4 – Average of the total of material collapsed (kg) during the first 12 months after the construction of the bench terraces for the three individual treatments (control, polyacrylamide and hydromulch).

Conclusions

During the first 12 months the bench terraces wall show a high rate of material fallen. This not only constitute a high movement of soils and stones sliding from the riser but also comprise a substantial frequency of complete wall collapse. The treatment with hydromulch and polyacrylamide seemed to reduce the fallen of material but did not prevent the collapse of some parts of the terrace wall.

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