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## The short-term effects of bench terrace construction for planting eucalypt trees on soil fertility

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In recent decades, the establishment of monospecific tree plantations has increased markedly. Such changes in land use may have important implications for soil properties and functions. At present, the most common monospecific tree plantations worldwide are those of eucalypt, and they have been reported to negatively affect soil functions such as carbon sequestration and soil biodiversity (macroinvertebrates). This has been attributed, at least in part, to the practice of soil mobilization prior to tree planting. Arguably, the construction of bench terraces for installing eucalypt plantation is an extreme form of soil mobilization and has become increasingly common in Central Portugal, including to facilitate forestry operations on steep slopes such as the planting itself, the application of agrichemicals for fertilization and weed control, mechanical control of the understory fuel load, and the logging and extraction of wood. While bench terracing is a technique that aims at soil and water conservation on steep slopes that are otherwise very hard to cultivate, its effectiveness has been poorly studied. Considerable rates of splash erosion have been reported on the terraces themselves during the initial period after their construction, and so have elevates rates of water erosion on steep tracks. Slope-scale soil losses, however, are difficult to quantify, even using erosion survey methods due to the fast growth of the eucalypts. While the same is true for the associated fertility losses, the main impact of bench terracing on topsoil fertility may results from the - massive -redistribution and inversion of the soil layers up to depths of 30 cm and more. This study aimed to quantify this direct effect of bench terracing on soil nutrient status. To this end, a 10 ha forest land property was sampled before and immediately after bench terracing during summer 2019. Before bench terracing, on 4th of April 2019, soil sampling was carried out at 5 points along a transect of 100 m centred on the middle section of a South-East facing slope; after bench terracing, on 23rd July 2019, soil sampling was carried out on 5 terraces on the same slope section, separated from each other by 1 terrace. Before bench terracing, the O layer, and the 0-10 cm (A horizon) and 15-20 (B horizon) mineral soil depths were sampled at each transect point; after terracing, the 0-20 cm of mixed mineral soil depths were sampled at each terrace. The mineral soil samples were analysed with respect to PMN and HCW as well as total C, N and P. The results showed clear differences between the nutrient status of the mineral soils before and after bench terracing. The construction of bench terraces diminished all soil nutrient analysed, this not only affected the stock of soil major nutrients, but also strongly affect the labile and plant available fractions. Therefore, terracing has immediately implications in soil fertility and may impose important limitations in the kye ecological functions of forest soil

such as nutrient cycling, storage and turnover.