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Soil bioengineering works made from Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) timber: a case of study in Tuscany

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In 2017, the design section of the GESAAF department took care of the project of the hydrogeological restoration of two streams in the upper part of the Arno river's catchment (Central Italy) , through soil bioengineering works made from Douglasia fir timber. Local topography is various, including both plains and densely forested mountains. Part of the valley is included in the Foreste Casentinesi, Monte Falterona, Campigna National Park. For this, the hydrogeological dynamics assessment have a considerable interest and a high investment of resources.
The used soil bioengineering structures were of two types: prefabricated and built in site. The first ones were composed by folding double cribwall modules of 2,5 meter of length and variable cros-section, mounted in a building site and transported in the site object of restoration (total volume, 120 m3). The second ones were traditional live double crib walls for 460 m3 and live slope grids for 125 m2. The works carried out by means of bioengineering techniques were 37.5% of the total amount of the works (about 300.000 €.
The works were done with local wood coming from the numerous Douglasia-fir stands located close by the area of intervention. Douglasia wood is suitable for this type of use, as it is sufficiently durable to guarantee the development of vegetation from cuttings and rooted plantations. Furthermore, it represents an innovative valorization of residual trunks not suitable for the production of beams and boards for the construction industry. The building of foldable cribwall modules allows companies to use human resources during unfavorable seasons for outdoor works, and represents the possibility of using bioengineering structures also for companies poor in expert personnel. Total assembly and positioning of prefabricated cribwalls resulted lower than traditional on-site mounting, even if some limits were found for sites hardly reachable for traditional machinery.