



Improving soil bioengineering techniques to control erosion and sedimentation within the context of torrential Mediterranean climate: a French-Canadian experience

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On marly eroded terrains of the French Southern Alps, many researches are undertaken in order to better understand the role of vegetation and bioengineering works on erosion and sedimentation control. To this view, the eroded marly gullies of the French Southern Alps are an experimental design where an original French strategy of rehabilitation, developed by scientists from Irstea (ex-Cemagref), has been tested since 2002. It is comprised of the construction of bioengineering works, namely of "brush layers and brush mats of cuttings on deadwood microdams", and implements the use of willow cuttings (*Salix purpurea* and *S. incana*). The main objective of these works is to sustainably trap and retain marly sediment, by checking their performance (growth and survival of the cuttings, sediment trapping) in a mountainous and Mediterranean climate. In Canada, several private companies have developed their own knowledge and expertise in the conception and building of bioengineering works for erosion control, especially in the context of hilly and mountainous landscapes and climates. Therefore, it was decided to use the competence and expertise of Terra Erosion Control Ltd., a Canadian company, in the French torrential Mediterranean climate. Ten modalities were tested, the aims being to develop and/or to modify existing designs of current techniques, to experiment with other live cuttings (*Populus nigra*) and rooted species (*Alnus* spp. and *Hippophae* spp.), to evaluate and compare the potential use of different organic soil amendments in order to increase beneficial soil microorganisms and finally, to evaluate the potential use of specialized tools and equipment in order to increase the efficiency of the installation for vegetation establishment and sediment trapping, while decreasing the implementation costs. The experimental design was installed in March 2011 and the early observations in Spring 2012 showed that: 1/ most of the cuttings and the plants resisted to burial and to drought conditions; in particular, the structures using wooden boards instead of locally harvested logs appeared to be holding up well; 2/ designs of current techniques with vertical cuttings were better for resprouting and sediment trapping; 3/ 0.8m live cuttings of *Populus nigra* may represent an alternative to *Salix* spp., but resprout appeared lower; 4/ it was not possible to evaluate the performance of rooted species (*Alnus* spp. and *Hippophae* spp.); therefore more experiment is needed, especially with longer plants; 5/ organic soil amendments may increase vegetation development (BRF > fertilizer > compost > mixes). By comparing the results with similar sites used as benchmarks, installed since 2002, further observations in the spring of 2013 will allow us to evaluate the efficiency of the different modalities to improve vegetation establishment and sediment trapping.