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Life-size experimentation of bioengineering for sedimentation control in eroded marly gullies (Francon catchment, Draix, France)

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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. These researches in particular made it possible to develop tools of ecological engineering bound for the practitioners in order to conceive operations for mitigation of damage related to soil erosion. In particular they are methods of diagnosis and strategies for action with bioengineering techniques. These tools must make it possible to guide the choice of the gullies to be rehabilitated and that of the types of works of vegetalisation to be used, in particular via the establishment and the use of a gully typology. Before passing to phases of real use of these tools through expertise, as this is today considered on the scale of the large catchment area of the Durance in France (4000 km^2), it appeared convenient to carry out a life-size test of application of these tools. This test was carried out on the marly catchment of Francon (73 ha), which belongs to the experimental complex of Draix (04), labellized Observatoire of Research in Environment (ORE) and of which the objectives are to improve knowledge on the formation of floods and bedload transport in small mountainous marly catchments. On this basin, 30 gullies, representing a total surface area of approximately 20 ha, were thus identified like "ecologically suitable for rehabilitation", i.e. on which it appeared possible and convenient to install bioengineering works. This test thus made it possible to check the relevance of the tools proposed to apply an action with bioengineering. An ecological operation of rehabilitation of this basin, carried out jointly with the French 'Office National des Forêts (ONF)', was then carried out in April 2008 in accordance with the test results. It consisted of the construction of 672 bioengineering works, namely of "brush layers and brush mats of cuttings on deadwood microdams", implementing in particular the use of 25.000 cuttings of willows (Salix purpurea and S. incana). Beyond its role of validation of former results, this device is used as experimental site in order to improve the effectiveness of the bioengineering works for the sustainable retention of sediment, in particular by checking their resistance (damage on the works) and their performance (resprout and survival of the cuttings, sediment trapping) during extreme climatic disturbances. In particular, it must make it possible to study the effects of changing of spatial scales, still badly perceived, by observing if the effectiveness of local actions with bioengineering (inside small gullies of 1 ha) indeed reflects the reduction of sediment yield at the exit of larger catchments (about the km^2). For this, measurements are made on 363 works in 26 gullies. The first results (2008) especially reveal: i/ a very good resistance of the works: 19 % of the works are partially damaged on less than 1/3 of their surface area, the highest rainfall intensity being 28 mm/h during 1 h; ii/ a total rate of cutting resprout of 97% (99% for S. purpurea and 94% for S. incana), the total precipitation of 2008 being 803 mm; iii/ an average trapping of 0,1 m3 of sediment per work, the latter yet still little filled. Lastly, this catchment area will also serve as "demonstration site" with the attention of the practitioners, managers and decision makers of the actions of erosion and sedimentation control.