

Preliminary analysis of relation between natural and anthropic elements in the calanco area of Podere Paiccia (Southern Tuscany – Italy): crowns of mudflow vs. erosion control practices (graticciate) during the period 1989-2015.

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The study area Podere Paiccia, which is characterized by four calanchi, extends over a surface of 155,000 square meters, on N-NNW slopes, from 435 to 513m, with an average slope of 25° and it develops on Pliocene marine bedrocks. The calanchi represent an important morphology in southern Tuscany and also in Pliocene and Plio-Pleistocene bedrock in nearby areas of piedmont zones of Apennines. During the 1989 the “Consorzio di Bonifica della Val d’Orcia” introduced erosion control practices named graticciate (fences) along three of the four calanchi. They consisted of chestnut stakes (about 1 m long), fixed in the ground, connected by smaller transverse stakes and placed perpendicularly to the slopes, at 7-10 meters intervals, extending laterally for about 10 meters. These calanchi are formed by gullies, rills, crowns and mudflows. The crowns, one of the more dynamic erosional forms, are generally arch-shaped (40-50 cm in height, vary in width, gradient $54^\circ \div 90^\circ$). The four calanchi, named 1-2-3-4, were divided into three zones of equal size: high, medium and low. The analysis conducted by photo shoots and field measurements, during the years 1989-1992-1996-2002-2005-2015, aim to discover the relation between crowns and graticciate. In 1989, 1 did not present graticciate, 2 had graticciate in all 3 zones (28), 3 and 4 had graticciate (24 and 22 respectively) but only in the medium and high zones. The crowns (57 in 1, 58 in 2, 78 in 3 and 56 in 4) rise towards the ridges. In case during the ascend crowns meet the graticciate, these last are deformed and then destroyed (periods: 1989÷1992, 1992÷1996, 1996÷2002, 2002÷2005, 2005÷2015, graticciate destroyed along the 2, 3, 4, % mean values: 51, 87, 100 - 26, 46, 72, 90 costant value from 2005 - 57, 75 costant value 1992÷2002, 78,100). Until total destruction, graticciate limit the number of crowns in the high zones. Along 2, 3 and 4 the number of crowns is greater in the medium zones (mean values of the ratios among numbers of crowns, in high, medium, low areas: 1:3:1), in 1 the number of crowns is greater in the high zones (7:3:1). When graticciate in the medium zones are destroyed, the numbers of crowns in the high zones grow, e.g. in 2, where the graticciate were totally destroyed since 2002, the ratios are before 2002, 2:3:1, after 8:4:1; in 2, since 2002 the numeric rates became similar to those of 1. In low zones in 1 and 2 the number of crowns decreases, while in 3 and 4, since 1989, generally grows during the time. These graticciate have not durable effect due to the lack of maintenance. It is advisable to carry out these erosion control practices along all slopes and not only in medium and high zones. Using of graticciate vive (living fences) requires less maintenance and cause lower environmental impact. Future study will consist of a detailed monitoring of the current movements in slopes through frontal DEM photogrammetric reconstruction and subsequent intersection by map calculator with high definition DEM from LIDAR.