



NATURALISTIC ENGINEERING FOR EROSION MITIGATION



1. Massive landslide caused by a wrong soil management 2. Complete soil loss alongside a badland formation 3. Naturalistic engineering to preserve a massive landslide body 4. Floristic richness revealing the pastoral and beekeeping attitude of a recovered landslide

WHAT AND WHY

Abandonment and agricultural mechanization of the Mediterranean internal areas have caused profound hydrogeomorphological instability with phenomena of severe soil erosion and landslides. In fact, the ecological fragility of the hilly and mountainous Mediterranean landscapes has been heavily affected in recent decades by the reduced human presence. The depopulation of the internal areas has been accompanied by the degradation of a rural system oriented towards good agroforestry practices and the maintenance of large areas of meadows and pastures. The incipient agricultural mechanization of lands with sloping positions has increased the arable surface area. This, together with the reduced attention to cover crops and hydraulic, agricultural and forestry systems, has caused widespread hydrological instability. Italy is strongly affected by these problems due to the high percentage of territory represented by internal areas. A radical and shared conversion of these rural systems in disarray is now urgent.

Keywords: soil degradation, Badlands, beekeeping, pastoralism, keyline, micro-terraces

HOW THE CHALLENGE IS ADDRESSED

The recovery of beekeeping can support this conversion towards systems with high biodiversity, rich in permanent crops with arboreal, shrubby and herbaceous components capable of expressing a high melliferous potential. In particular, the numerous areas that have been subject to erosion or landslides, once settled, should be managed exclusively with good agroforestry practices capable of ensuring drainage and stability of the slopes. Here, beekeeping can take advantage of the floristic biodiversity ensured by appropriate protection and greening plantations. For example, a Keyline hydrogeological plan can be accompanied by tree and shrub plantations of melliferous plants while multi-plant meadows with staggered flowering can permanently occupy the watershed areas most exposed to erosion.

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ADVANTAGES

In Italy, as many as 5,581 municipalities, 69% of the total, are at high hydrogeological risk. There are 21,551 square kilometers considered areas at hydrogeological risk: 13,760 square kilometers of land at risk of landslides; 7,791 square kilometers of land at risk of floods. In recent decades, catastrophic events of hydrogeological instability have multiplied due to climate change combined with reduced management of the territory: abandonment of mountainous and hilly inland areas by populations engaged in traditional agro-silvo-pastoral activities; little attention to the maintenance of the territory and to hydraulic-agricultural and forestry arrangements. It is always preferable, above all, to promote the safeguarding and preventive maintenance of the territory and structures, rather than reconstruction under emergency conditions following exceptional or catastrophic events. Maintenance and protection of the territory are, today, a mandatory choice. In this regard, natural engineering can provide appropriate techniques to solve or reduce soil degradation problems, promoting environmental rehabilitation through the restoration of vegetation cover and increased stability of slopes. However, maximum effectiveness in safeguarding and protecting the territory can only be achieved through the direct and widespread involvement of the farming system in good land use practices. Agroforestry, in this context, represents the best management approach for intrinsically fragile territories such as the Mediterranean ones, due to seasonality and the extremization of meteorological events. In particular, once the territory is secured through appropriate hydraulic works, it will be the farmers themselves who are the guardians of local resilience, by choosing the most sustainable agroforestry practices. For example, areas at risk of erosion will be protected through terracing and keyline arrangements. Their productive use will be permanent pasture in a network of hedges and orchards with a strong beekeeping component. Ultimately, natural engineering allows for the restoration of environments in severe hydrogeological degradation, towards the restoration of the multiple ecosystem services inherent in agroforestry.

HIGHLIGHTS:

- **The Mediterranean area is prone to a high hydrogeological risk, due to the climate extremization.**
- **Restoring the human presidium and adopting naturalistic engineering are prerequisites to the risk reduction.**
- **Definitely, agroforestry represents the best farming system in fragile Mediterranean territories.**



Farmer's desolation in front of a severe erosion effect in the middle of an abandoned agroforestry patch

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