

# Change of soil quality due the abandonment of farmland fields during the XXth century in the Iberian Peninsula



Universitat Autònoma de Barcelona

Lluc Presmanes Justo, Biologia Ambiental, 2013

Tutor: Miquel Ninyerola

## Introduction

In the last few decades it's been seen a sharp drop in farmland land use in the Iberian Peninsula, mostly in mountainous areas.

This abandonment phenomenon occurred because :

- Changes in population density in rural areas
- Development of mechanization and new agricultural techniques
- Low productivity in some rural areas
- Regional, national, and international market forces
- Increasing effect of regional and national governmental initiatives which subsidize some crops to the detriment of others
- Effects of the Common Agricultural Policy (CAP)

### Fire

Forestation has favored the expansion of flammable vegetation types such as shrublands and conifers. Also fires have become more frequent and because the increase of connectivity. At the same time, fires have become more frequent and widespread which is related to this land use change, mainly because the increase of connectivity.

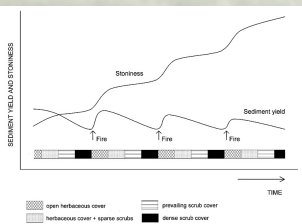


Fig 1: Hypothetical evolution of sediment yield and surface stoniness in abandoned fields affected by recurrent fires. From García-Ruiz and Lana-Renault (2011).

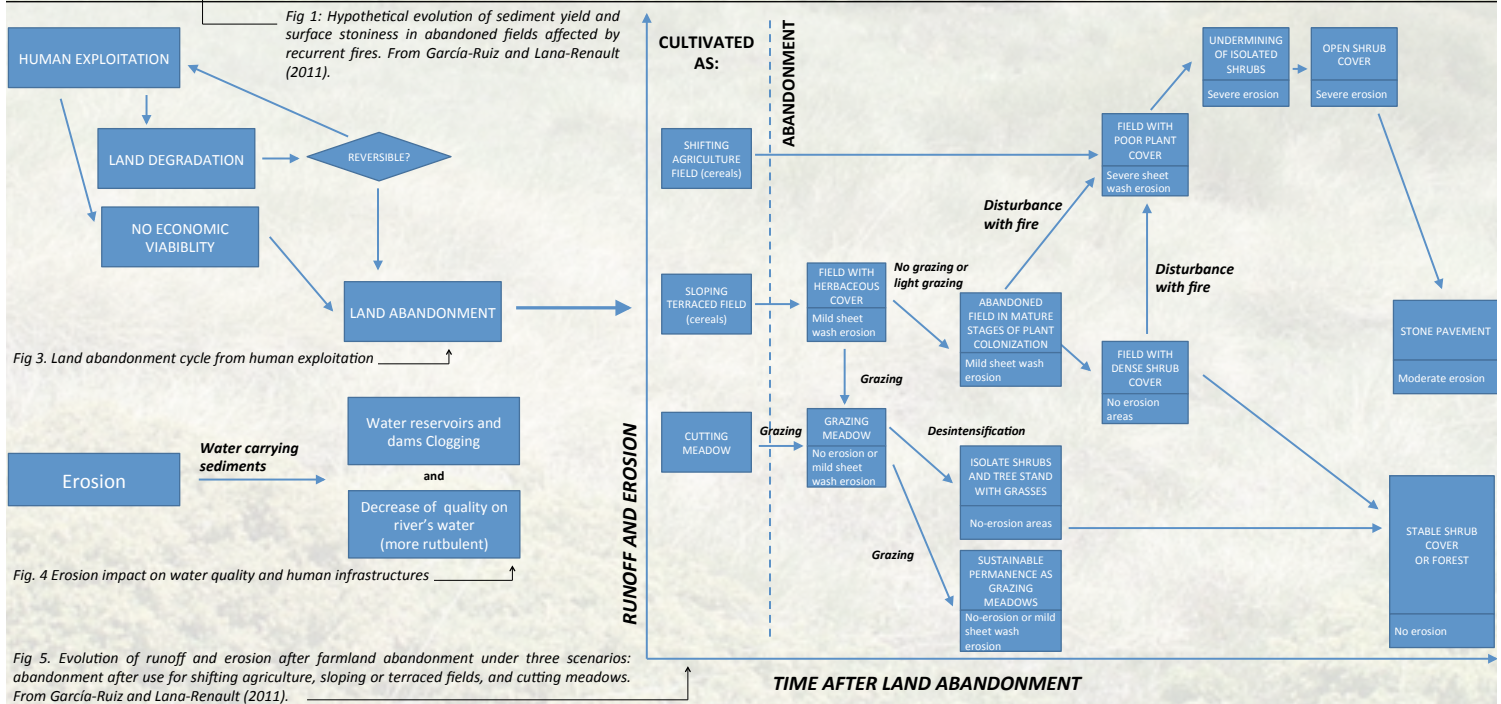


Fig 5: Evolution of runoff and erosion after farmland abandonment under three scenarios: abandonment after use for shifting agriculture, sloping or terraced fields, and cutting meadows. From García-Ruiz and Lana-Renault (2011).

## Erosion

Occurs mainly in the first years after abandonment after which soil has lower vegetation covering. Usually it can be found high runoff coefficients (sometimes because of crust), rilling, and the development of a stone pavement following soil removal.

After abandonment, soil organic matter levels recover in revegetated fields, and the aggregate stability is also greatly affected, with a remarkable increase in aggregate size. It has also been seen an improvement in infiltration capacity and a decrease in erosion potential.



Fig 6: Abandoned terraces that used to have almond crop. In Cieza, Murcia. Photograph by: F. López Bermúdez.

## Forestation

Most of the abandoned fields have undergone a process of plant recolonization. This forestation depends on:

- Depth and fertility of the soil
- Hillslope aspect
- Climate
- Distance from bordering vegetation
- Floristic composition of vegetation at the borders
- External interventions after the land has reverted

Plant colonization occurs quite rapidly on deep soils rich in organic matter. Vegetation grown after abandonment provides an excellent protection against hillslope soil erosion and increases:

- Soil organic matter content
- Aggregate stability
- Hydraulic conductivity
- Water holding

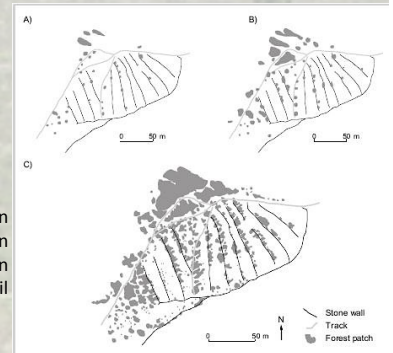


Fig 2: Development of forested area on a terraced site (Cal Roda). (A) 1957, (B) 1977, and (C) 1990. Graphic from Poyatos et al. (2003).

## Nutrient loss

Very correlated to soil organic matter, which tend to increase after cessation of farming. Field's age and the plant cover have a positive influence on the total soil carbon and nitrogen. Farmland abandonment has also effects on other nutrients such as  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$  or  $\text{N}^+$ , it will also depend on the type of lands, climate, hydrological regime and also the season of the year.

Depending on the type of plants, we will have different influences from the vegetation to the soil.

## Conclusions

There good information about the subject, but, while the Mediterranean region is very well studied, other regions of the peninsula remain quite unstudied.

A change on European Union policies about farmland abandonment should be considered, taking care on how to manage this lands.

Also, a review of the methodologies that are used to study soil erosion should be done; most of them use different temporal and spatial scales making it very difficult to compare results.

## Bibliography

Bunce, R.G.H., 1991. Ecological implications of land abandonment in Britain: some comparison with Europe. *Options Méditerranéennes* 15:53–59. // Duarte, F., Jones, N. and Fleskens, L., 2008. Traditional olive orchards on sloping land: sustainability or abandonment? *Journal of Environmental Management* 89:86–98. // Dunjó, G.P. and Gispert, M., 2003. Land use change effects on abandoned terraced soils in a Mediterranean catchment, NE Spain. *Gemma. Catena* 52:23–37. García-Ruiz, J.M., Lasanta, T., Ruiz-Flano, P., Ortigosa, L., White, S., González, C. and Martí, C., 1996. Land-use changes and sustainable development in mountain areas: A case study in the Spanish Pyrenees. *Landscape Ecology* 11:267–277. // García-Ruiz, J.M. and Lana-Renault, N., 2011. Hydrological and erosion consequences of farmland abandonment in