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Soil erosion and on abandoned land in Spain – Methodological aspects on monitoring of degradation processes

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Soil erosion processes on abandoned land constitute a great scientific challenge for investigating their quantification, distribution, morphogenesis and temperal development. Abandoned fields, as a result of the land use change during the past century, can frequently be found in the Mediterranean. They will increase rapidly because of the socio-economic factors as migration into cities, demographic change, and the set-aside programmes of the EU. In comparison to arable land they demonstrate heterogenic geomorphodynamic processes with high variability over small spaces. Their activity and development are difficult to record and to evaluate. Due to linear erosion between the dwarf shrubs the soil erosion patterns show big differences depending on soil crusts, vegetation structure and sheep trails. Gully erosion is a major phenomenon and the dynamic of gully growth is highly variable.

With rainfall simulations, infiltration measurement, testplot monitoring and large scale aerial photography in several test sites in Northeast and Southeast Spain erosion processes could be quantified.

In the Basins like the Ebro valley, under open matorral of *Rosmarinus officionalis* and *Lygeum spartum* on haplic Gypsisols runoff rates range between 0 to 72% , erosion rates vary from 0 to 77 g m^{-2}/ 30 min of simulated rainfall. On Mountainous landscapes like the Prepyrenees, runoff under matorral of dense *Genista scorpius* on hypercalcic Calcisols with rock fragment cover remains high (runoff coefficients up to 62%). Soil erosion rates are highly variable, too (1 g m^{-2}up to 29 g m^{-2}/ 30 min

simulated rainfall). In High Mountain areas like the Central Pyrenees (dense matorral of *Genista scorpius*, dense herbaceous cover of *Brachypodium retusum*, stagnic Regosols with stone cover of siltstone fragments), runoff coefficients are lower (up to 35%), soil erosion also, with rates not higher than 11 g m^{-2}. In the mountainous landscapes by far the highest values of runoff and erosion were found in sheep trails (up to 66%, 334 g m^{-2}).

With a large-scale testplot monitoring the development of soil erosion processes can be evaluated: those areas where soil erosions activity predominantly increased where classified as unstable, areas where the erosion activity did not change or even decreased were classified as vulnerable or stable. In all test sites the proportion of unstable areas reaches around 50 %. The amount of unstable areas, where increasing erosion activity is combined with a decreasing vegetation cover is highest within the semi arid basins reaching there 29 %.

The high runoff of abandoned fields rates results in gully growth downslope with maximum headcut retreat rates between 0,06 and 0,84 m $a^{-1}$and an area loss between 1,07 and 11,09 m^2 a^{-1}. Considering that gully erosion contributes 80-83% of total sediment produced on rangelands in South-East Spain (Poesen and Hooke 1997) and that they are the main sediment source for the rapid siltation of reservoirs, which are of vital importance for irrigation water in Spain, this rates are especially noteworthy.

References

POESEN, J. & HOOKE, J. M. (1997): Erosion, Flooding and Channel Management in Mediterranean Environments of Southern Europe. – Progress in Physical Geography, **21** (2): 157-178