

Soils are essential for life in terrestrial ecosystems: for plant life, by providing physical support, water and nutrients, and for animal life, indirectly through the plant-dependent food web and directly as the habitat for soil fauna. Soils are generated through processes that take millennia to unfold. The build-up of artificial soils is feasible only on a small scale and requires high investments (quarries, for instance). Therefore, policy-makers must consider soils to be an essential and non-renewable resource.

Catalonia has been greatly affected by agriculture and other land uses for at least two millennia so human-driven impacts are widespread. Soil pollution by organic chemicals and/or metals (mainly Cu, Pb, Sn and Zn) is common in old industrial areas and close to urban areas. The pollution due to poor agricultural practices affects larger areas – the excess of fertilizers, pesticides, and particularly slurries –, owing to their leaching potential to groundwater. Nevertheless, the main threats to the soils of Catalonia are from extensive land use changes, resulting in soil sealing – conversion of agricultural lands into urban or industrial areas, and construction of roads and public infrastructures. We describe the example of the Llobregat delta, and the loss of agricultural lands in favor of other uses (urban, infrastructure, industry) which eventually represent an irreversible loss of prime farmland soils. This is a huge problem on a European scale and it should be addressed through soil protection policies.

The abandonment of agriculture leads to the loss of agricultural soils and to their conversion into other land uses (forests, grasslands, shrublands). Grasslands and forest soils are richer in soil organic matter (SOM) than agricultural soils: thus, such a conversion entails a recovery of their natural fertility and increases carbon sequestration. The opposite path, i.e. the conversion of forest or grassland soils into agricultural soils, is riskier, for it implies SOM losses and – due also to the operations of deforestation, often involving the use of heavy machinery – increased risks of soil erosion. Erosive processes can be also triggered by wildfires, even though they are today less severe than in the period of 1980-2000, owing to major efforts in prevention. The degradation of ancient man-made landscapes, particularly old agricultural terraces, strengthens these negative effects and the risk of desertification.

Good agricultural practices are needed to maintain soil productivity in the long term. SOM content in agricultural soils is low on the average, and it should be increased. Irrigation increases both plant production and SOM levels. But the setting up of irrigation systems is costly in terms of carbon footprint, and their long-term

sustainability in Catalonia – which is not particularly rich in water resources – should be carefully considered: the salinization of some areas could be an undesirable side effect. Conservation agriculture practices (less tillage or none at all, cover crops) are effective in reducing soil erosion. A good management of organic amendments is needed, too: not all of them help to increase the SOM level and some (e.g., slurries) pose a risk of groundwater pollution.

Climate change will worsen the aforementioned constraints. The projected decreases in precipitation and increases in temperature may lead to increased risks of soil erosion, soil fertility losses and, eventually, desertification. A proper management of the soil as a global resource will be crucial to reduce damages to tolerable levels. The European directives for soil protection will be an important institutional framework to maintain soils as a vital resource for feeding an increasing population and for supporting natural ecosystems.