Executive Summary - SOILSERVICE

Soils and their biodiversity form the basis of agricultural production systems and generate a range of fundamental ecosystem services, such as providing food, feed, clean water and carbon storage, and control of pests and diseases. Yet soil degradation is widespread in the EU: erosion, loss of soil organic matter and compaction are some of the degradation processes that are threatening soil fertility. The SOILSERVICE project has quantified the negative impacts of intensive arable cropping systems on soil ecosystem services due to loss of soil organic matter and soil biodiversity. SOILSERVICE has also analysed how soils can be better managed to mitigate climate change and reduce nutrient and chemical inputs, and, ultimately, improve the long-term incomes of European farmers. This goes hand in hand with conserving soil biodiversity, the natural capital that generates ecosystem services. SOILSERVICE has linked ecosystem services to farmers' economic decision making by combining production, land use, soil biodiversity and sustainability in socio-economic models that can be used to analyse the consequences of current and planned policies. The findings of SOILSERVICE provide a basis for a broad range of policy decisions related to reform of the Common Agricultural Policy and environmental policy.

Intensive farming causes loss of soil biodiversity : Bacteria and fungi, nematodes, microarthropods and protozoa, and their complex interactions with each other and with plants, perform many important functions that underpin the delivery of ecosystem services. Short rotations of annual crops, high rates of fertiliser and chemical application, and absence of organic amendments (manure, grass break crops, straw, etc.) result in degradation of soil biodiversity and declining soil organic carbon content. Although impacts of land use changes may vary with regional differences in climate and soil characteristics, SOILSERVICE shows that the decrease in the abundance and biomass of most groups of soil organisms as a consequence of intensification of agriculture is general across Europe.

Restoring soils to produce more food, reduce artificial inputs and secure farm incomes: Current arable farming practices in the EU imply that soil biodiversity will continue to decline and consequently maximum yields will be lower than if biodiversity was well-maintained. Currently, inorganic fertilisers cannot substitute fully for soil services and a shift towards management that builds up soil carbon will both improve the sustainability of food production and farmers' incomes. In the four arable regions of Europe studied in the project, farmers' maximum income will increase in the future if soil carbon content—which is a good proxy for soil natural capital—is optimised. Not only do farmers benefit from higher yields but also from lower costs of inputs that are replaced by soil ecosystem services (i.e. improved fertility).

Policies based on ecosystem services: SOILSERVICE shows that most soil ecosystem services are positively correlated with soil carbon content. A single policy instrument for multiple soil ecosystem services could be based on a long term commitment to maintaining and, where desirable, increasing soil carbon content. Rewarding farmers for increasing soil carbon content would ensure cost-effective conservation of soil biodiversity but also increase farmers' profits in the future. Enhancing soil carbon content is a long-term process but it will also prevent soil erosion, loss of nutrients to surface waters, as well as promoting soil as a carbon sink to mitigate climate change. Carbon payments, if considered, could be differentiated to reflect potential spatial variation in the value of particular soil services (e.g. nitrogen retention in regions suffering from water pollution). These payments should be considered investment support and decrease over time, since increasing soil carbon is an investment in natural capital.