

Economic impacts of soil erosion at the regional scale: a CGE approach

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Soil degradation represents one of the main challenges for agricultural systems nowadays, with implications for territorial sustainability and food security (Lal, 2015; Panagos et al., 2018). While a large body of biophysical literature has analysed the intensity and spatial distribution of erosion processes across different geographical areas, their economic implications are still less explored, especially at the regional level. However, this scale is particularly relevant where production structures

are specialised and strongly dependent on local natural resources, as is often the case for Mediterranean agri-food systems (Scherr, 2003).

This paper addresses the following research question: to what extent can soil erosion affect the economic performance and structural configuration of a regional agri-food system? In particular, we investigate how a reduction in land productivity due to erosion processes may influence production levels, value added, prices and the allocation of productive resources within the regional economy. Apulia, a region in Southern Italy, represents an interesting case study. It is characterised by a strong

agri-food specialisation and a relevant exposure to water erosion on arable land. According to RUSLE2015 estimates provided at European level, erosion processes in the region are persistent, although not extreme. Over time, these processes may generate cumulative effects on land productivity and therefore on the stability of the regional economic system (Panagos et al., 2018). To analyse these mechanisms, we apply a regional computable general equilibrium (CGE) model based

on the DEMETRA framework. The model is calibrated on a RHOMOLO-type regional Social Accounting Matrix (SAM) for Apulia, which captures inter-sectoral linkages between agriculture, food industries and the rest of the regional economy. The use of a SAM-based framework is consistent with recent applications of environmentally extended SAM models for integrated socio-economic and environmental analysis (El Meligi et al., 2025).

Biophysical erosion indicators derived from

RUSLE2015 are translated into an exogenous negative shock to land productivity. This shock is introduced into the production structure of the model in order to simulate the macroeconomic and sectoral adjustments generated by soil loss (Sartori et al., 2019).

The data used include the regional SAM (providing information on production, income distribution and trade flows) and erosion intensity indicators at territorial level. The integration of these two dimensions allows linking environmental pressures to economy-wide responses within a coherent analytical framework. Compared to partial equilibrium or sector-specific assessments, the CGE approach allows for the analysis of indirect and feedback effects transmitted through price adjustments, factor markets and inter-sectoral linkages within the SAM structure (Berrittella et al., 2006; Sartori et al., 2019).

The novelty of the research lies in the explicit integration of spatially based erosion indicators into a regional CGE model focused on a Mediterranean agri-food system. While previous studies have analysed soil erosion either from a biophysical perspective or at more aggregated economic scales, fewer contributions have examined its economy-wide implications at the regional level using a SAM-based framework. By combining environmental data with a regional CGE structure, the paper provides a quantitative assessment of the vulnerability of Apulia's food system to soil

degradation.

The results show how a productivity shock in agriculture can propagate to other sectors, affecting output, value added and relative prices, and inducing a reallocation of labour and capital across activities. These findings contribute to the debate on the economic evaluation of environmental degradation and provide evidence that can inform regional strategies aimed at strengthening the resilience and sustainability of agri-food systems.