



A model-GIS platform to globally assess the environmental impact of European agri-environmental schemes.

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Agri-environmental schemes (AES) are key European policy actions that foster environmentally friendly farming technique application. Despite AES account for about 7% of total EU CAP funding, their effectiveness is debated because of frequent mismatches between allocated funds and expected results. Indeed, the lack of information about the interaction between pedo-climatic conditions and management practices makes any local valuation challenging. Here, by developing a result-oriented multi-criteria scheme, we quantified at local level benefits and drawbacks of AES that were adopted in Veneto Region (North-Eastern Italy), over the first four years of Rural Development Program (RDP) 2014-2020. A DayCent model-GIS platform was used to compare a business-as-usual (BAU) scenario with an AES, in terms of soil and water quality impact, and GHGs emissions. The model integrated multiple types of pedo-climatic and land management information at high spatial resolution.

Results showed an improvement of water and soil quality after the AES adoption. A SOC content increment ($+0.58 \text{ t ha}^{-1} \text{ yr}^{-1}$) and nitrate leaching reduction ($19.5 \text{ kg ha}^{-1} \text{ yr}^{-1}$) were calculated after mixed application of continuous soil cover, low soil disturbance and organic matter addition. Soil loss by erosion and P loss by erosion were also lowered (up to 85%). Low fertilizer input yielded an abatement of N_2O emissions, while CO_2 emissions were strongly dependent on pedo-climatic conditions. CO_2 emissions within the same climatic zone after the application of No Tillage, both in short and in long period, showed lower reduction in the high plain soils compared to the low plain soils ($789.1 \text{ kg ha}^{-1} \text{ yr}^{-1}$ vs $1229.9 \text{ kg ha}^{-1} \text{ yr}^{-1}$).

The model-GIS platform demonstrated to be a reliable tool to optimize RDP fund allocations according to result-oriented criteria, avoiding mismatches between AES payments and environmental targets.