

EGU22-12400

<https://doi.org/10.5194/egusphere-egu22-12400>

EGU General Assembly 2022

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Agricultural land abandonment and regulation ecosystem services balance in the Mediterranean area of Spain

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The abandonment of traditional agricultural land is a challenge of increasing importance in recent years. In Spain, the annual abandonment rate of agricultural lands has been growing leading to several social and economic impacts. The environmental consequences of abandonment of cultivation can directly impact the benefits that human beings obtain from them. Furthermore, land abandonment affects ecosystem services, defined as the benefits that humans obtain directly or indirectly from ecosystems (Constanza et al., 1997). Besides product provision, ecosystem services help to regulate, mediate and provide a better environment, supporting human life as well as climate change adaptation or biodiversity. This research aims to evaluating the effect of the abandonment of agricultural lands on three relevant regulation ecosystem services such as global climate regulation, soil stabilization, and protection and pollination.

The study was conducted for the *Comunitat Valenciana* (East of Spain), where agricultural land change and abandonment are especially remarkable because of the importance of traditional orchards around cities and villages and their slow fading out in the last three decades.

Agricultural abandoned areas, during the 2012-2019 period, have been delineated using the Temperature - Vegetation Dryness Index (TVDI). The TDVI is a water stress index based on the relationship between land surface temperature and the normalized difference vegetation index (NDVI) from remote sensing data (i.e., MODIS). The selected area corresponds to a zone that was cultivated in 2012 but with persistent water stress (i.e., TVDI > 0.8) for the rest of the period.

The estimation of gains and losses of ecosystem services in the selected abandoned areas was computed using a set of remote sensing methodology-based indicators. More specifically, carbon sequestration computed from Gross Primary Production (GPP) and Net Primary Production (NPP) was used to evaluate the potential to mitigate climate change. Soil stabilization was evaluated by using the Universal Soil Loss Equation (USLE). Finally, pollination was evaluated by computing nesting and floral resources.

The assessment of the ecosystem services throughout the 2012-2019 period indicates that there is a loss of ecosystem services in the study area. Furthermore, the results show a balance of gains and losses of each service all along the study period. The outcomes could be implemented in a

decision-making process to improve land management.