



Historical evolution of the drainage network at the basin scale using aerial orthophotography in Southern Spain

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Soil management has major implications on the drainage systems in agricultural catchments. Management practices, such as ploughing the gully perimeter and gully filling, remove the vegetation and natural features associated with natural streams contributing to the landscape simplification and accelerating erosion processes. This study evaluated the temporal evolution of several key parameters of the drainage network at the Arroyo Galapagares basin over a period of six decades, from a set of existing orthophotographies, since the first available (1956) to the present (2011). The area of the catchment is 80 km², being representative of the Campiña, a rolling landscape covered by field crops on mostly Vertisol soils, in Southern Spain.

The complete drainage network of the basin was digitized, defining the thalweg and the perimeter of the channels. Since the distinction between the actual channel surface and surrounding weed-covered surface is not reliable by means of merely orthophotography inspection, the limits between the field crops and the drainage network surface provided a measure of the magnitude of non-cultivated areas. Using the digitization results, the temporal variation of three parameters were assessed: network length, channel sinuosity and non-cultivated surface.

The results of this analysis showed that a significant reduction of sinuosity occurred during the study period, as well as temporary decreases in the network length as a consequence of land levelling and gully filling. Moreover, a sustained growth of non-cultivated areas was observed at the upstream gullies (low-level order streams) due to the intensification of gully erosion, especially during the last decade.