37. Multitemporal GIS Monitoring of Agricultural Plastic Covers for Land Management in the Metapontino District

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Agricultural plastics used for crop protection and soil covering are a structural component of intensive Mediterranean cropping systems, yet they also represent a potential source of soil pollution, associated with their progressive degradation and the dispersion of fragments into the environment. Effective territorial management therefore requires operational tools capable of locating plastic-covered surfaces, quantifying the environmental pressure they exert, and tracking their evolution over time. This study develops a multitemporal GIS-based framework for monitorning greenhouse and tunnel covers detected from Sentinel-2 imagery in the Metapontino district (Basilicata, Southern Italy). Building on a methodology previously consolidated by the authors and based on spectral indices applied to Sentinel-2 imagery, the GIS implementation combines the comparison of plastic-cover distribution between two winter reference periods, the aggregation of plastic pressure indicators at the municipal scale, and the dissemination of results through a WebGIS prototype, conceived as a decision-support tool for public administrations and stakeholders involved in collection planning. The locally calibrated classification achieved an overall accuracy of 92.52%, while an independent assessment of the second reference period yielded an area-weighted overall accuracy of 94.0%. Detected greenhouse and tunnel cover increased from 1,959.8 ha in 2018 to 2,394.2 ha in 2024 (+22.2%), although only 56.4% of the 2018 detected surface persisted at the same locations in 2024, indicating substantial spatial turnover. Estimated agricultural plastic waste increased from 13,597.6 to 13,712.6 t yr^{-1} (+0.85%). The proposed framework provides a replicable approach for integrating remote sensing and GIS to support spatially explicit monitoring and management of agricultural plastics in intensive Mediterranean farming areas.