

Can Farm Digitalization be a Key to Reaching the EU Sustainable Challenges? - Abstract

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Summary

Agriculture is the E.U.'s most prevalent land use, and therefore it is crucial to make sure that agricultural systems comply with sustainable practices. The E.U.'s new growth strategy ("European Green Deal" C.O.M./2019/640") for the implementation of the 2030 Agenda aims to address climate and environmental challenges to efficient and sustainable growth. In agriculture, climate change has resulted in high and low heat stress, changed rainfall patterns, raised carbon dioxide, increasing the frequency of extreme weather events such as droughts, floods, cyclonic disturbances and enriched salty soils. These consequences increase production costs, pest, and disease outbreaks, putting additional strain on global agricultural land. As highlighted in the Green Deal ("European Green Deal" C.O.M./2019/640), digital technologies can help the agriculture sector promote sustainable management.

Since the beginning of the twenty-first century, collecting and making historical and real-time biodiversity data digital has become more popular worldwide. Integrating digital mapping and modelling-based knowledge of a specific area, soil types, and climatic conditions can provide rapid and easy access to a large quantity of data and valuable information for better crops and land-use suitability assessment. The use of smartphones-based apps by all agriculture stakeholders plays a crucial role in the digitalization of the agriculture sector (Mondejar et al., 2021). Sustainability is not only a central topic in the agriculture system but also in the vine and oenological world. The International Organization of Vine and Wine (O.I.V.) adopted the definition and general principles of sustainable development applied to wine-growing as follows: "A global approach commensurate with the production and processing systems of grapes, combining at the same time the economic longevity of structures and territories, the production of quality products, the taking into account of the needs of viticulture of precision, the risks related to the environment, product safety, health and consumers and the enhancement of heritage, historical, cultural, ecological and aesthetic aspects." Within these sustainability challenges, the study aims to create a multi-layered spatial platform that incorporates environmental data, cultural, technical and biodiversity typical of the needs of sustainable precision viticulture to enhance one of the leading high-quality wines production areas of Center Italy called Val D'Orcia. To reach the general objective, three key actions have been implemented: (1) monitoring and traceability of production processes; (2) digitization of georeferenced information; finally, (3) the creation of a digital hub for the collection of big data. The study involved ten wineries where a desktop and smartphone application was introduced to track and collect farm, land and biodiversity data. The geographical data concerning the area of Val D'Orcia is acquired through the WebGIS tool of the Tuscany Region, GEOscopio. The "app" has also included agro-environmental parameters, and the cadastral data (surface, national references, parcel type) referred to each cultivation. Moreover, vineyard monitoring has been carried out in some sample farms to acquire biodiversity data, according to the protocols drawn up by the Italian Institute for Environmental Protection and Research (ISPRA) and Observatoire Agricole de la Biodiversité (OaB).

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Collected data was organized into layers on the platform, interpolated to make thematic and prescription maps shapefiles to create decision support systems (D.S.S.).

The digital Hub and, in particular, the development of the mobile "app" constitutes a case on a large area of sustainable precision farming for the winery of a Val D'Orcia area focusing on the biodiversity goals.

Further, the implemented system provides profitable big data management suggestions that represent a mandatory medium-term target for the smart management of the agriculture sector required by the E.U. community policies.

Keywords

Precision agriculture, geographic information system (GIS), app-based agriculture, biodiversity, resilience, rural