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THE ROLE OF LAND SURVEYING AND CADASTRE IN MODERN AGRICULTURE: A COMPARATIVE PERSPECTIVE ON ROMANIA AND EUROPE

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Introduction

Land surveying and cadastral systems play an essential role in modern agriculture by providing accurate spatial information for land administration, property registration, and sustainable agricultural planning. The integration of GNSS, GIS, UAV photogrammetry, and remote sensing technologies improves land mapping, parcel identification, and agricultural resource management. In Romania, land fragmentation and incomplete cadastral registration remain important challenges, highlighting the need for digital modernization and the adoption of advanced geospatial technologies within the broader European context.

Material and method

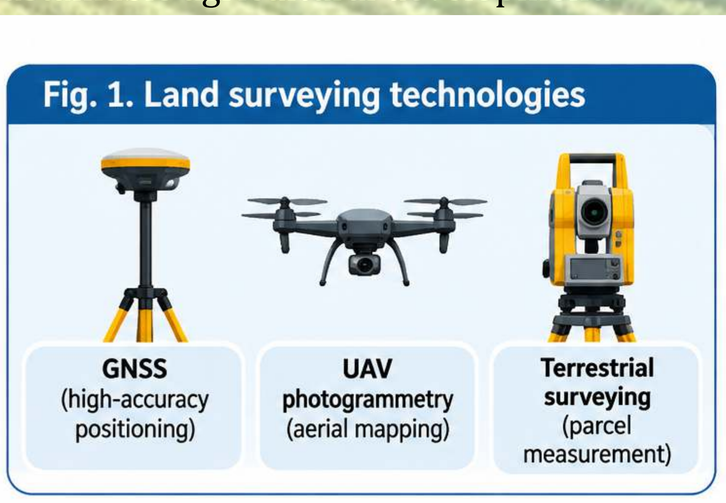
The study employs a qualitative and comparative approach based on scientific literature, cadastral policy documents, institutional reports, and European Union regulations. The analysis focuses on cadastral registration, land fragmentation, GNSS surveying, UAV photogrammetry, GIS integration, and precision agriculture. A comparative matrix was used to assess spatial data accuracy, cadastral digitalization, institutional interoperability, and opportunities for sustainable agricultural land management in Romania and Europe. The methodological framework also examines the integration of cadastral databases with agricultural and environmental spatial information to support land-use planning and resource management. Particular attention is given to the contribution of modern surveying technologies and European spatial data standards to improving cadastral accuracy, digital accessibility, and agricultural sustainability.

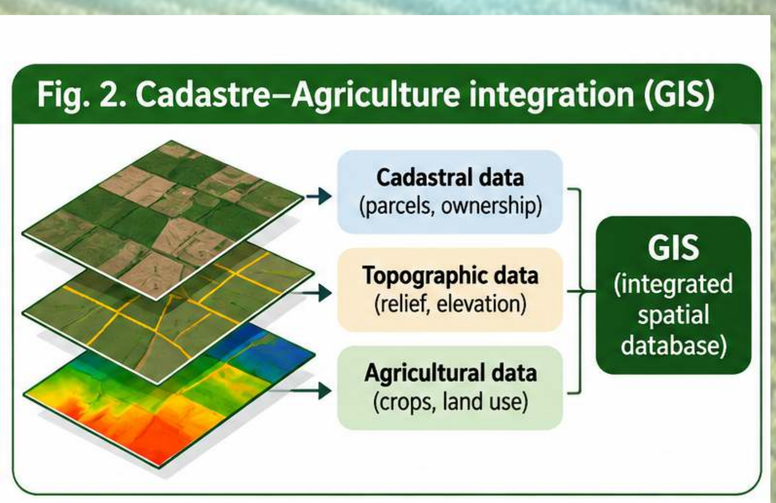
Result and discussions

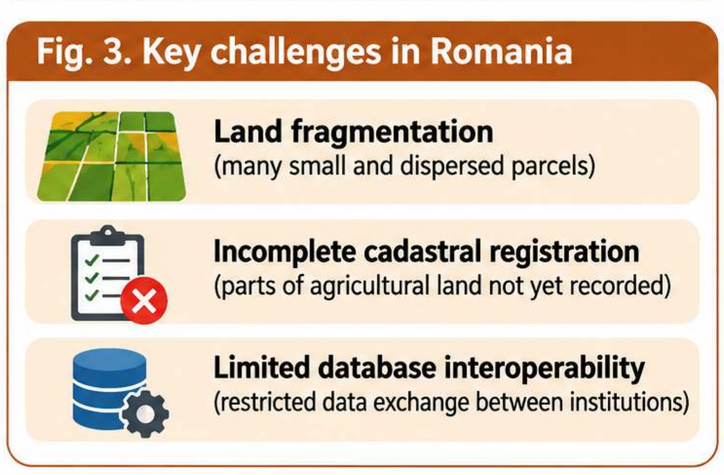
The comparative analysis highlights the essential role of accurate cadastral information and modern surveying technologies in improving agricultural land management in Romania and Europe. GNSS positioning, UAV photogrammetry, and remote sensing support precise land mapping, parcel identification, and agricultural monitoring. GIS platforms facilitate the integration of cadastral, topographic, and environmental data, improving spatial planning and decision-making. In Romania, land fragmentation, incomplete cadastral registration, and limited database interoperability remain important challenges. The modernization of cadastral systems and the adoption of European geospatial standards can improve land administration, support precision agriculture, and promote sustainable agricultural development.

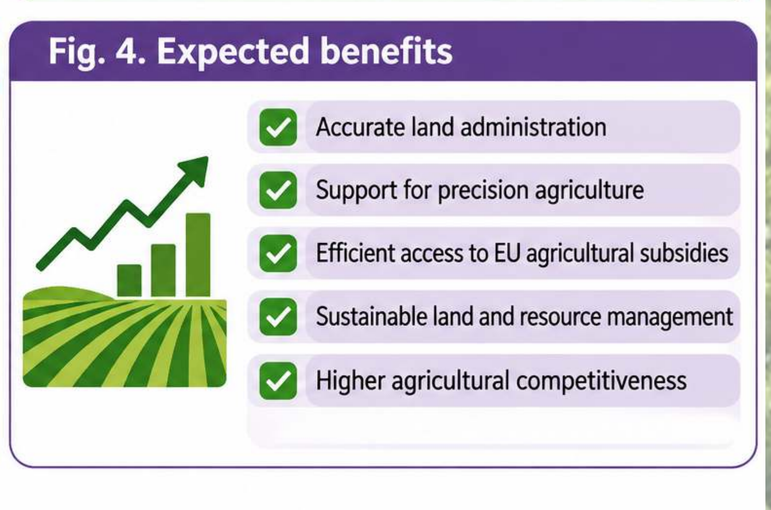
Modern surveying technologies, including GNSS, UAV photogrammetry, and total stations, support accurate agricultural land mapping and parcel identification (Fig. 1). The integration of cadastral, topographic, and agricultural data into GIS platforms improves spatial analysis and land management decisions (Fig. 2). Land fragmentation, incomplete cadastral registration, and limited database interoperability remain important challenges for agricultural modernization in Romania (Fig. 3). The modernization of cadastral systems can improve land administration, support precision agriculture, and contribute to sustainable resource management and agricultural competitiveness (Fig. 4).

Reliable cadastral information supports agricultural planning, land consolidation, and property management. The integration of GNSS, UAV, and GIS technologies improves spatial data acquisition and agricultural efficiency. European digitalization initiatives can further support cadastral modernization and sustainable land management in Romania.









Conclusions

The study highlights the essential role of land surveying and cadastral systems in modern agriculture and sustainable land management. GNSS, UAV photogrammetry, and GIS technologies improve spatial data accuracy, parcel identification, and agricultural planning. Romania continues to face challenges related to land fragmentation and incomplete cadastral registration. The integration of modern geospatial technologies, digital cadastral databases, and European standards can strengthen land administration, support precision agriculture, and promote sustainable agricultural development.

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