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Sustainable Water Management for Smart Agriculture in Rice Cultivation in Mediterranean Regions

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Abstract

Water scarcity is among the most critical challenges facing Mediterranean agriculture, particularly rice production, which requires substantial amounts of water. Addressing this challenge requires the adoption of innovative and sustainable tools for water management systems. The objective of this study was to co-design a water monitoring and management system for rice cultivation under Mediterranean conditions. The approach was based on a multi-stakeholder participatory framework involving farmers, farm advisors, water management authorities, researchers, and other relevant actors to ensure that the developed solutions respond to local needs and practical constraints. The system integrated smart agriculture technologies, including field sensors for monitoring soil and water conditions, as well as advanced remote monitoring tools such as Unmanned Aerial Vehicles (UAVs). These technologies were combined with field-based measurements to support data-driven decision-making and improve irrigation efficiency. The study found that the tools used optimized water use while maintaining crop productivity and minimizing environmental impacts. By integrating digital technologies with participatory design processes, the study demonstrates how smart farming can support sustainable rice production, enhance resource efficiency, strengthen food security, and increase resilience to climate variability and future environmental changes.

Keywords: wetlands, conservation, farming, digital, Natura.

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