QUANTIFYING SOIL MOISTURE LEVELS THROUGH SATELLITE AND DRONE-BASED REMOTE SENSING FOR ENHANCED CROP WATER USE EFFICIENCY

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Abstract: Precision agriculture is a technology-driven approach, integrating advanced methods such as Variable-Rate Irrigation (VRI) systems and remote sensing technologies, to optimize farming practices. This study explores the impact of precision agriculture on water use efficiency (WUE) and crop productivity. Our objective was to investigate VRI enhance WUE and crop yields. Sensors were deployed across various fields to monitor soil moisture and crop health, enabling tailored irrigation. The VRI systems adjusted the water distribution in order to minimize water wastage, using this data. Crop health was monitored using remote sensing technology, which involved the use of satellites and drones. This allowed for the identification of specific locations that had different water requirements. The data was analyzed using Artificial Intelligence (AI) to create accurate watering schedules. The results of our study demonstrate a significant improvement in WUE, with VRI systems increasing WUE by up to 30% and remote sensing technology lowering water use by 20%. In addition, these technologies significantly enhanced agricultural productivity, with VRI resulting in a 10% rise and remote sensing leading to a 5% rise. The results validate that precision agriculture is a successful approach for enhancing WUE and enhancing crop output, emphasizing its potential as a sustainable agricultural solution.

Keywords: Artificial intelligence; Crop productivity; Precision agriculture; Variable-rate irrigation; Water use efficiency