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Metaheuristics Optimization in Smart Agriculture for Potato Yield and Water Conservation Solutions

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Abstract:

Smart agriculture systems are pivotal in addressing global food security and environmental sustainability, especially in resource-intensive crops like potatoes. This study presents a metaheuristics-based optimization framework for enhancing potato yield and improving water conservation in smart farming environments. The approach integrates IoT-enabled sensing technologies with advanced metaheuristic algorithms such as Genetic Algorithms (GA) and Particle Swarm Optimization (PSO) to optimize irrigation scheduling, nutrient distribution, and crop management strategies. Real-time environmental data collected from soil and climate sensors inform decision-making processes that dynamically adapt to changing field conditions. Experimental evaluations demonstrate significant improvements in yield outcomes and water-use efficiency compared to conventional practices. The proposed model provides an intelligent, adaptive solution for sustainable potato cultivation, promoting both agricultural productivity and environmental stewardship.

Keywords:

Smart agriculture, potato yield, water conservation, metaheuristics, IoT, optimization.

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