SUBSURFACE IRRIGATION SYSTEM FOR SAUR FARM USING THRESHOLD ALGORITHM

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ABSTRACT

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The study focuses on the development of an innovative and cost-effective "Subsurface Irrigation System for Saur Farm using Threshold algorithm" to address financial constraints encountered by small-scale farmers. This system incorporates modules such as the Selection Module, enabling users to customize plant schedules, and the Soil Moisture Sensor Module, optimizing irrigation and detecting potential issues. The Temperature Sensor Module adjusts watering cycles based on real-time temperature, minimizing water waste and alleviating heat stress on plants. With the Energy Source Module comprising solar power and a backup battery, uninterrupted and sustainable power supply is ensured. The Reporting Module offers valuable insights by recording water release frequency and presenting data in a user-friendly format for analysis.

The findings of the study demonstrate the remarkable performance of the developed subsurface irrigation system with a threshold algorithm. Scoring high in functionality, usability, reliability, efficiency, and portability, the system proves its effectiveness, user-friendliness, dependability, resource-efficiency, and adaptability. These results underscore the system's significance in addressing challenges faced by small-scale farmers. Furthermore, they provide valuable insights for potential improvements and future development, establishing a strong foundation for the adoption and advancement of the system in agricultural contexts. With the potential to enhance irrigation practices, optimize resource utilization, and improve crop productivity, this developed system serves as a valuable tool for sustainable and efficient agricultural practices.

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INTRODUCTION

Irrigation is an important aspect of agriculture as it contributes to increased productivity and profitability. According to Roldán-Cañas and Moreno-Pérez (2021), modern irrigation technologies are efficient in reducing water usage and enhancing crop yields in arid and semi-arid regions where water is scarce. However, traditional irrigation approaches such as surface and overhead irrigation have limitations such as inefficiency and excessive water use (Sharaf, 2023).

As a solution to these issues, this thesis proposes the development of a subsurface irrigation system with a threshold algorithm that optimizes water consumption and enhances irrigation management approaches at Saur Farm. The subsurface irrigation system uses low-pressure, high-efficiency techniques that deliver water directly to plant roots. This technology uses less water and increases agricultural yields compared to traditional irrigation methods, making it more efficient due to reduced surface runoff and evaporation while enhancing crop quality by minimizing the incidence of weeds and diseases (Reich et al., 2022).

The system utilizes a Threshold Algorithm, which establishes a certain threshold value to determine whether a given condition is true or false (IBM, 2021).

This algorithm is very useful in a subsurface irrigation system since it helps determine the best time to water plants based on a predefined threshold value for soil moisture levels. By analyzing real-time data on soil moisture levels that determines if the soil is overly dry or saturated, the algorithm can make intelligent decisions on whether to start or stop the irrigation process and determines the exact quantity of water needed by crops, leading to optimized water usage and preservation of water resources.

This study aims to evaluate the performance of the subsurface irrigation system with a threshold algorithm at Saur Farm, focusing on its ability to enhance irrigation management tactics, reduce water use, and increase crop yields. The effectiveness of this technique in solving irrigation issues in various agricultural settings will also be evaluated.

Statement of the Problem

This study aims to develop a "Subsurface Irrigation System for Saur Farm Using a Threshold algorithm" to optimize irrigation scheduling and automation, conserve water resources, improve crop yield, and reduce the potential negative effects of over-irrigation and under-irrigation on soil.

Specifically, this study aimed to solve the following:

Farmers using manual irrigation techniques spend extended periods of time in the hot sun, increasing their risk of heat exhaustion and other illnesses. Farmers on a smaller scale may not have access to modern irrigation systems, so they use traditional techniques like flood or furrow irrigation, which require physical labor. Farmers using these methods often toil in the hot, dry environment for extended periods of time. Dehydration, fatigue, and heat stroke are all potentially fatal effects of being out in the sun for too long. As a result, farmers may be unable to work, and a labor shortage may occur. *"How can an irrigation system be designed and developed to assist farmers in their daily activities on farmland?"*