DEVELOPMENT AND OPTIMIZATION OF AN ARDUINO-BASED AEROPONICS SYSTEM WITH AUTOMATED PH LEVEL MONITORING FOR SUSTAINABLE CROP CULTIVATION

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Bachelor of Science in Computer Science

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ABSTRACT

The pursuit of sustainable agriculture while combating hunger represents a critical contemporary challenge. Projections for 2050 indicate a substantial increase in global food demand, compelling the need for innovative solutions within agricultural systems. Conventional farming practices, while historically effective, are now scrutinized for their inefficiency and resource-intensive nature, particularly in the face of urbanization and limited resources. This thesis explores the imperative for modern farming innovations that are tailored to urbanized landscapes, prioritize resource efficiency, and integrate technology to meet the demands of a rapidly advancing world.

The research focuses on the design and development of an Arduino-based aeroponics system with automated pH level monitoring to enhance sustainable agriculture practices. The system aims to grow plants in a soil-free environment using nutrient-rich water while optimizing resource efficiency and minimizing water usage.

Through automated pH level monitoring and nutrient delivery, the system demonstrates improved resource efficiency, decreased water usage, and enhanced nutrient utilization compared to conventional farming techniques. The research methodology includes experimental design, Agile methodology adoption, data collection processes, and data visualization techniques to analyze the system's performance and impact on sustainable crop cultivation.

The findings highlight the system's efficacy in promoting healthy plant growth, sustainability in agriculture, and its transformative potential in crop cultivation

methodologies. Recommendations for future research and practical applications in sustainable agriculture are provided based on the study's conclusions.

Keywords: sustainable agriculture, food demand, conventional farming, urbanization, resource efficiency, technology integration, Arduino, aeroponics, automated pH monitoring, nutrient delivery, water usage, experimental design, Agile methodology, data visualization, crop cultivation.