i-SPiKE 2023

INTERNATIONAL EXHIBITION & SYMPOSIUM ON PRODUCTIVITY, INNOVATION, KNOWLEDGE & EDUCATION

"Optimizing Innovation in Knowledge, Education and Design"

EXTENDED ABSTRACT

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Malaysia.

Assalamualaikum warahmatullahi wabarakatuh,

First and foremost, I would like to express my gratitude to the organizing committee of i-Spike 2023 for their tremendous efforts in bringing this online competition a reality . I must extend my congratulations to the committee for successfully delivering on their promise to make i-Spike 2023 a meaningful event for academics worldwide.

The theme for this event, 'Optimizing Innovation in Knowledge, Education, and Design,' is both timely and highly relevant in today's world, especially at the tertiary level. Innovation plays a central role in our daily lives, offering new solutions for products, processes, and services By adopting a strategic approach to 'Optimizing Innovation in Knowledge, Education, and Design,' we have the potential to enhance support for learners and educators, while also expanding opportunities for learner engagement, interactivity, and access to education.

I am awed by the magnitude and multitude of participants in this competition. I am also confident that all the innovations presented have provided valuable insights into the significance of innovative and advanced teaching materials in promoting sustainable development for the betterment of teaching and learning. Hopefully, this will mark the beginning of a long series of i-Spike events in the future.

It is also my hope that you find i-Spike 2023 to be an excellent platform for learning, sharing, and collaboration. Once again, I want to thank all the committee members of i-Spike 2023 for their hard work in making this event a reality I would also like to extend my congratulations to all the winners, and I hope that each of you will successfully achieve your intended goals through your participation in this competition.

Professor Dr. Roshima Haji Said
RECTOR
UiTM KEDAH BRANCH

WELCOME MESSAGE (i-SPiKE 2023 CHAIR)

We are looking forward to welcoming you to the 3rd International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2023 (i-SPiKE 2023). Your presence here is a clear, crystal-clear testimony to the importance you place on the research and innovation arena. The theme of this year's Innovation is "*Optimizing Innovation in Knowledge, Education, & Design*". We believe that the presentations by the distinguished innovators will contribute immensely to a deeper understanding of the current issues in relation to the theme.

i-SPiKE 2023 offers a platform for nurturing the next generation of innovators and fostering cutting-edge innovations at the crossroads of collaboration, creativity, and enthusiasm. We enthusiastically welcome junior and young inventors from schools and universities, as well as local and foreign academicians and industry professionals, to showcase their innovative products and engage in knowledge sharing. All submissions have been rigorously evaluated by expert juries comprising professionals from both industry and academia.

On behalf of the conference organisers, I would like to extend our sincere thanks for your participation, and we hope you enjoy the event. A special note of appreciation goes out to all the committee members of i-SPiKE 2023; your dedication and hard work are greatly appreciated.

Dr. Junaida Ismail
Chair
3rdInternational Exhibition & Symposium Productivity, Innovation, Knowledge, and Education 2023 (i-SPiKE 2023)

SMART AQUAPONIC GARDEN WITH AN IOT MONITORING SYSTEM

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SYSCORE Sungai Petani

ABSTRACT

The smart aquaponic garden with an IoT monitoring system combines aquaculture and hydroponics in a symbiotic ecosystem, leveraging IoT sensors to monitor water parameters and optimize plant growth. The central monitoring platform processes real-time data, ensuring optimal conditions for plants and fish while detecting abnormalities. With remote access and control, the system promotes sustainable agriculture, reduces water consumption, and provides an accessible platform for local food production, making it an efficient and convenient solution for urban farming and community gardens.

INTRODUCTION

A smart aquaponic garden with an IoT monitoring system is a groundbreaking innovation in sustainable agriculture that merges the principles of aquaponics with advanced IoT technology. By incorporating sensors, data analysis, and automation, this system enables real-time monitoring and control of crucial parameters, optimizing plant growth and fish health. It revolutionizes gardening by providing remote access to environmental data, automated adjustments, and increased efficiency, ultimately transforming the way we cultivate food in a resource-efficient and eco-friendly manner.

PROBLEM STATEMENT

The problem statement elaborates on the challenges and shortcomings of traditional gardening methods and highlights the need for a smart aquaponic garden with an IoT monitoring system.

Resource Inefficiency: Traditional gardening methods often result in inefficient resource utilization, including water, fertilizers, and energy. This leads to wastage, environmental impact, and increased costs.

Lack of Real-time Monitoring: Without real-time monitoring capabilities, gardeners struggle to promptly identify and address issues such as nutrient deficiencies, water quality problems, or temperature fluctuations that can impact plant and fish health.

Manual Labor and Maintenance: Traditional gardening methods require significant manual intervention, such as feeding fish, managing water circulation, and adjusting environmental factors.

Insufficient Data Insights: Traditional gardening methods lack detailed data collection and analysis, making it difficult to make informed decisions and optimize productivity and efficiency.

OBJECTIVES

Resource Efficiency: Optimize the use of water, fertilizers, and energy, reducing waste and minimizing environmental impact.

Real-time Monitoring and Control: Enable continuous monitoring of crucial parameters and implement automated control mechanisms to maintain optimal environmental conditions for plants and fish.

Labor Reduction: Automate routine tasks, reducing manual labor requirements and allowing gardeners to focus on strategic planning and system management.

Remote Accessibility: Provide remote access and control capabilities, enabling gardeners to monitor and manage the garden from anywhere, at any time, enhancing convenience and flexibility.

Sustainability: Create a sustainable gardening system that minimizes water consumption, eliminates the use of chemical fertilizers, and promotes a healthy ecosystem for both plants and fish.

METHODOLOGY

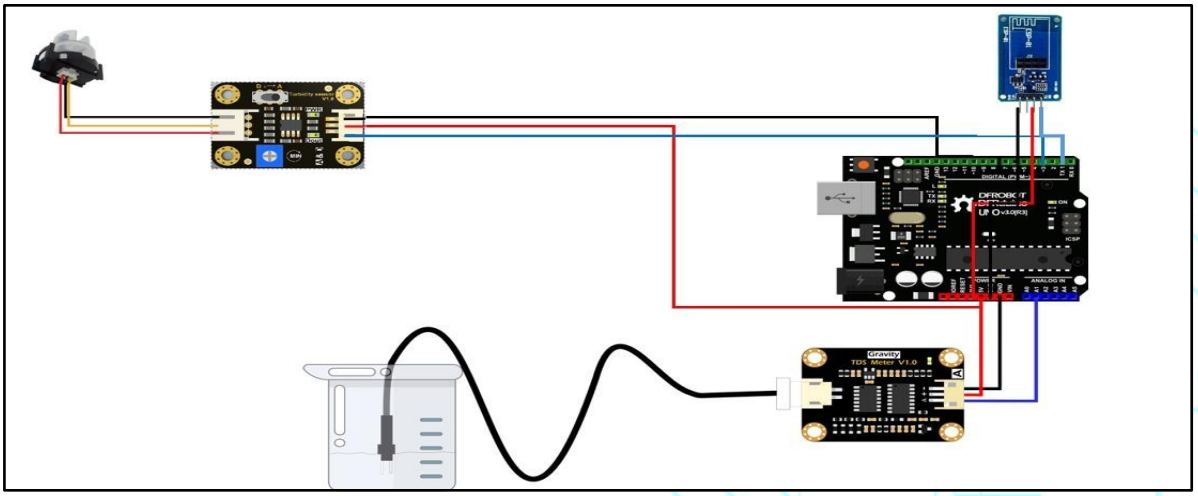

Figure 1. Component and Schematic of this project

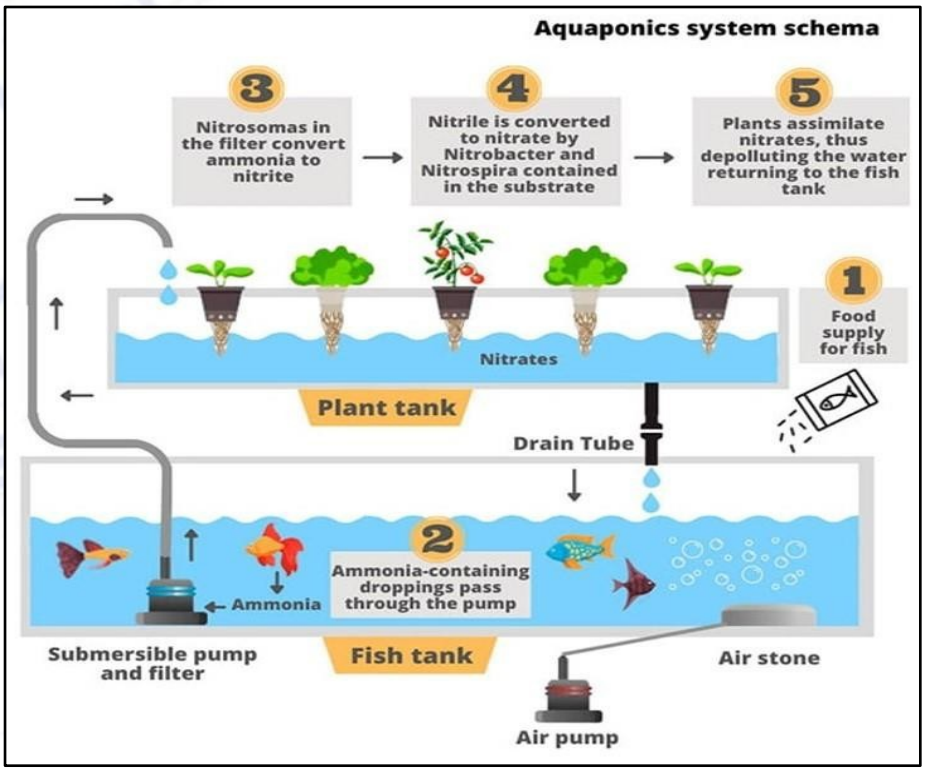

Figure 1.0 System Flow Chart of this project

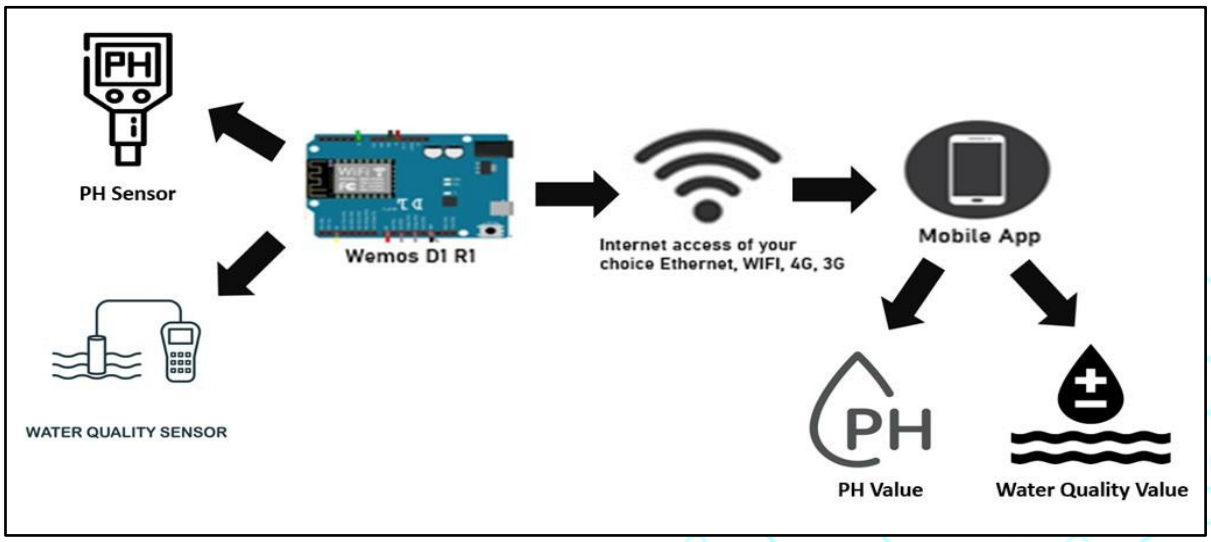

Figure 1.1 IOT Diagram of this project

COMPONENTS

In the aquaponic system with IoT monitoring, the fish tank serves as the habitat for the fish, while the plant beds above it provides a growing space for plants. A water quality sensor is used to monitor essential parameters like temperature, dissolved oxygen, and ammonia levels in the fish tank, ensuring a healthy environment for the fish. Additionally, a pH sensor measuresthe acidity or alkalinity of the water, which is crucial for plant growth. The NodeMCU board acts as the central control unit, collecting data from the sensors and enabling IoT integration. This

integration allows for remote monitoring, data analysis, and control of the system parameters, creating an efficient and sustainable ecosystem where fish and plants thrive harmoniously.

CONCLUSION

In conclusion, the Aquaponic system with IoT monitoring offers both commercial value and environmental benefits while aligning with Sustainable Development Goals (SDGs). It presents profitable opportunities in sustainable food production, optimizes resource utilization, and reduces operational costs. The system minimizes water usage, eliminates the need for chemical fertilizers, and promotes a healthier aquatic environment. By aligning with targeted SDGs, it contributes to food security, responsible consumption, clean water, and climate action.Overall, the Aquaponic system with IoT monitoring represents a promising solution that combines profitability, environmental sustainability, and progress towards global development goals.

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