UNIVERSITI TEKNOLOGI MARA

AUTOMATIC NUTRIENT MIXER AND PH LEVEL FOR HYDROPONIC APPLICATION

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ABSTRACT

This project presents the design and development of Automatic Nutrient Mixer and pH Level for Hydroponic Application using an Arduino microcontroller. The system aims to address the limitations of current hydroponic systems by providing efficient monitoring and control. The main objectives of the project are to incorporate IoT technology into a hydroponic system and automate nutrient dosing. The methodology involves utilizing an Arduino microcontroller as the central control unit, along with various sensors to monitor parameters such as nutrient levels, pH, and temperature in real-time. The collected data is processed and transmitted to a user interface or cloud platform, enabling remote monitoring and control. A simulation and hardware were conducted to demonstrate the successful operation of the system, including pH and TDS -controlled nutrient dosing, LDR control LED and DHT11-monitoring temperature. Future work could involve integrating advanced machine learning algorithms to optimize nutrient dosing and implement self-harvesting mechanisms, thereby enhancing plant production and contributing to the development of more efficient and sustainable hydroponic systems for agricultural practices.

Keywords—LCD, pH Sensor, TDS Sensor, Dosing Pump, DHT 11 Sensor, Agricultural

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INTRODUCTION

1.0 Research Background

The world population in 2023 was estimated to be over 8 billion people, according to the United Nations (UN)[1]. This population growth poses challenges in terms of food production, leading to deforestation. To address this, the hydroponic method offers a cost-effective and eco-friendly solution. However, efficiency of hydroponic systems remains a challenge.

The limitations in user monitoring can lead to minimal crop yields, resource wastage, and increased operational costs. It also hinders the ability to promptly detect and address issues such as nutrient deficiencies and imbalances, which can negatively impact plant health and productivity. To fully harness the potential of hydroponic farming, it is vital to develop improved monitoring solutions that enable precise and efficient cultivation practices. Also, not every individual possesses the capability to read pH levels and the essential nutrients that each plant needs. This problem makes hydroponics difficult to cultivate.

The goals of this project are to design, construct, and integrate an autonomous hydroponic system with automatic nutrient dosing using IoT technology. By attaining these goals, the initiative hopes to overcome the complexity and manual monitoring issues with current hydroponic systems. The automated system will allow for exact fertilizer dosing control and optimization, enhancing the plant growth. IoT technology integration will enable remote monitoring and control, giving users ease and accessibility. The importance of this initiative rests in its potential to transform hydroponic horticulture and make it more effective, sustainable, and available to both individuals and communities. It might support government programmes to support regional food production and supply fresh, wholesome food without the need of huge cost