IoT-Based Smart Cultivation Platform for Geisha Coffee with Artificial Light Integration

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Abstract

The objectives of this project were to develop an intelligent platform to enhance the cultivation efficiency of Geisha coffee using IoT technology and artificial lighting, and to evaluate the performance of the developed intelligent platform in controlling environmental conditions and promoting the growth of Geisha coffee plants.The system was designed using the Design Thinking process, which included five steps: understanding the farmers' problems, defining the problem by considering context, cost, and the developer potential, generating ideas based on previous data and research, creating a prototype through analysis and design, and developing, testing, and improving the hardware and software. The results showed that the smart greenhouse system functioned effectively as designed and was powered by solar energy. The system consisted of a solar energy unit, an environmental sensing and control system for temperature, humidity and light intensity, and a real-time monitoring and control interface using Home Assistant. The system enabled convenient and timely monitoring and control of environmental conditions. In addition, it was able to maintain optimal conditions for the growth of Geisha coffee, increasing the potential for high-quality coffee production and reducing the risk of fungal infection. Therefore, the smart greenhouse system provides an effective alternative for coffee cultivation in a controlled environment.

Keywords: Smart Greenhouse, Geisha Coffee, Internet of Things (IoT), Artificial Lighting, Design Thinking