Chapter 6
EcoAgriBot Harnessing Solar Energy and ESP8266 Connectivity for Sustainable Rice Cultivation:
EcoAgriBot A Solar-Powered, Wi-Fi-Enabled Rice Seeder for Smarter Agriculture

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ABSTRACT

The EcoAgriBot project aims to address the inefficiencies and labor-intensive aspects of conventional rice farming through the use of a solar-powered, remote-controlled Rice Direct Seeder. The device, which is meant to improve accuracy and sustainability in rice cultivation, employs solar energy and an ESP8266 Wi-Fi module for intelligent functioning. The development approach included meticulous strategizing,

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conceptualization, and experimentation to guarantee optimal performance in arid terrain. Moreover, field testing of the EcoAgriBot revealed that it can be controlled over great distances, that its efficiency in seed planting is high, and that its manpower requirements are significantly reduced. The user comments emphasized the operating speed, cost-effectiveness, and convenience of use of the product, highlighting its potential to revolutionize rice production. The study's findings indicate that the EcoAgriBot represents a notable technical progression, providing a sustainable resolution to contemporary agricultural obstacles and laying the groundwork for forthcoming advancements in farming methodologies.

1. INTRODUCTION

The Philippines is mostly an agrarian nation shaped by its geographical characteristics. In 2002, the Cagayan Valley region had a total of 321.8 thousand agricultural farms, covering an area of 540.8 thousand hectares. These farms accounted for 20.2% of the territory's total land area. Although there has been 12.6 percent growth in the number of farms and 2.0 percent expansion in the overall area used for farming since 1991, the average size of each farm has declined from 1.86 hectares to 1.68 hectares. The increase in agricultural activity in the area may be attributed mostly to its heavy dependence on farming, although the decrease in farm size is likely a result of the government's implementation of the Comprehensive Agrarian Reform Program (CARP), as reported by Nationsencyclopedia (2018).

The agricultural sector has undergone substantial transformation in recent decades, mostly driven by notable developments in technology, including sensors, gadgets, equipment, and information technology, which have played a crucial role in facilitating these changes. Advancements in technology have significantly enhanced the efficiency of rice harvesting and planting procedures. The use of mechanized planting instruments, such as rice transplanters and hand-operated rice drum seeders, has greatly facilitated the process of rice planting in both wet and dry land environments.

This study aimed to investigate the design, construction, and effectiveness of a rice direct-seeder machine. Specifically, we will focus on the architectural and fabrication aspects, the required construction materials, the use of an ESP8266 Wi-Fi module for operational functionality, and the machine's performance under real field conditions. The EcoAgriBot is a cutting-edge innovation in rice farming, as it is a solar-powered and remote-controlled device used for seeding rice. The primary objective of this project is to design and construct the device, program it using the ESP8266 Wi-Fi module, and assess its operational effectiveness under real-world conditions. This study has great importance not only for streamlining rice planting procedures for farmers but also for minimizing manual work, enhancing agricultural