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Commentary

Rice Cultivation System with Iot-Based Smart Crop Field Monitoring

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DESCRIPTION

Agriculture, being the primary source of food grains and other basic resources, is regarded as the foundation of human life. It is critical to the country's economic development. It also offers a lot of job chances to the people. Growth in the agriculture sector is essential for the country's economic success. Unfortunately, many farmers continue to adopt conventional agricultural practices, which results in low crop and fruit yields. However, everywhere automation has been adopted and humans have been replaced by automated machines, the yield has increased. As a result, current science and technology must be implemented in the agriculture industry in order to increase production.

Due to the increase in crop demand as a result of the expanding population, it is anticipated that by 2050, global farmers would have increased production by 70% from 2009. In order to fulfill this need, agricultural water consumption is expected to skyrocket to 4.5 trillion m^3, or 45.1 percent, as compared to world irrigation water demand in 2005. Rice (*Oryza sativa L.*) is the world's second-most-produced crop, behind maize, in terms of harvested yield, feeding around 4 billion people. However, compared to other important crops, rice cultivation needs a large amount of water. Rice production uses 3419 l/kg of water on average, far more than other crops like wheat (1334 l/kg) and barley, and accounts for almost 30% of all irrigated farmland in the world.

Smart agriculture strives to assist farmers in making decisions that will increase crop output and quality, save water and other input costs, and preserve soil health. This is especially crucial for the livelihoods of marginal farmers, cattle ranchers, and other linked vocations, especially in light of the uncertainties surrounding climate change. It entails frequent data monitoring of weather, water, soil, crop development, and utilizing this information in an integrated way for decision making, in addition to a thorough grasp of the local agro-ecological zone, geomorphology, subsurface conditions, and local socio-economic conditions.The Smart Field Cultivation Server (SFCS), an NB-IoT-based paddy field environment monitoring system, consisted of three major components: water saving irrigation technique, SFCS with NB-IoT-based data storage and transmitting field server, and the APP, all of which are described in the following sections. Following the development of the SFCS and the APP, they were tested on an experimental paddy field.

Smart Field Cultivation Server (SFCS)

Rice development is influenced by air temperature and humidity, sunshine, soil temperature and moisture, water, and nutrient; these factors are represented by electronic conductivity, Crisnapati, Wardana, Aryanto, and Hermawan. As a result, this study used environment sensors to create the SFCS and implement NB-IoT technology for data transmission based on the parameters listed above.

Application for smartphones

The app was created on the iOS platform using XCode 10 and the Swift programming language. The user interface is finished in writing by using copyrighted photographs or photos acquired on location. The APP is divided into three sections: a user login system, a data display program, and a field cultivation schedule based on SPRI. The Google Firebase database was used to create the first component of the user login system. Firebase is a back-end service platform for developing mobile applications. Existing Google cloud services and newly released data analysis, message push, notification system, error report, remote configuration, and dynamic link were used to integrate the function. The Firebase Application Programming Interface (FAPI) may be used to obtain cloud data, such as user information and observed field data.

A thermistor is a thermally sensitive resistor that displays a substantial, predictable, and accurate change in resistance as temperature changes. At low temperatures, an NTC thermistor has an extremely high resistance. The resistance lowers rapidly as the temperature rises. Small variations in temperature are reflected extremely quickly and with excellent precision because an NTC thermistor encounters such a substantial change in resistance per °C (Temperature range: 0.05 to 1.5 degrees Celsius).

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