**Web-Based AI Model as a Decision Support System to Enhance Precision Farming for Smart Agriculture: Special Reference to Paddy Crop in the Wet Zone of Sri Lanka**

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***ABSTRACT***

Precision farming leveraged advanced technologies to enhance agricultural productivity and sustainability by overcoming the limitations of traditional methods of nutrient assessment, which often lacked accuracy and efficiency. This study focused on the application of a web-based AI model as a decision support system to identify major nutrient deficiencies in paddy crop within the wet zone of Sri Lanka. The main objective was to apply an AI-driven tool that could accurately diagnose nitrogen (N), phosphorus (P), and potassium (K) deficiencies, thereby enabling timely and precise nutrient management. The methodology adopted in this study integrated deficiency data and machine learning algorithms to accurately detect nutrient deficiencies. Field data collection, model training, and validation were key components of the methodology. The model's efficacy was evaluated through field trials and accuracy assessments. The findings demonstrated the viability of real-time nutrient deficiency identification, leading to more precise and timely interventions. The display of results on the web map was implemented using Java and Spring Boot for the backend, JavaScript for the frontend, and MongoDB for the database. By integrating real-time web GIS capabilities, the study facilitated the immediate visualization of AI-generated insights on a web map, enhancing accessibility and usability for agricultural stakeholders who are ready to adopt precision farming for smart agriculture. The research also explored strategies to integrate this decision support system into farmers' practices especially on nutrient management, aiming to improve their decision-making processes and overall crop yield. The successful implementation of the proposed system held significant potential for advancing precision farming practices, ultimately contributing to increased agricultural productivity and sustainability in the wet zone region and it can be applied to other agroecological regions in the country.

**Keywords:** *AI model, decision support system, nutrient deficiencies, paddy crop, precision farming*