ABSTRACT

Soil fertility measurement is a critical challenge in precision agriculture, particularly due to the complexity of sensor data such as pH, temperature, moisture, and nutrient levels including Nitrogen (N), Phosphorus (P), and Potassium (K), which are difficult to analyze manually. Although soil sensors are widely used, the data often does not directly reflect overall fertility levels, making decision-making difficult for farmers.

Most existing studies focus on only one or two soil parameters and lack integrated analysis using machine learning. This study proposes an IoT-based system combined with a Support Vector Machine (SVM) to automatically and accurately classify soil fertility based on multiple sensor parameters.

The system collects real-time data from soil sensors measuring K, P, N, pH, temperature, and moisture, and transmits it to an online storage platform. The data is manually labeled based on Potassium values into three categories: low, medium, and high, referring to relevant literature. The classification is performed using an SVM algorithm optimized via GridSearch.

The experimental results show that the system successfully collects soil data, and the SVM classification model achieves an accuracy of 97.52% in classifying soil fertility. This study contributes a practical and sensor-based classification approach with simple yet applicable field validation.

Keywords: *soil fertility, classification, soil sensor, SVM, microcontroller.*