

ABSTRACT

Conventional farming methods face challenges in terms of land use efficiency and high dependency on weather conditions. With the increasing urban population, the available land for agriculture becomes limited, making it difficult to meet the rising food demand. Limited land and distance from farming areas hinder the supply of fresh vegetables, which are an essential source of nutrition for the human body.

The vertical hydroponic method based on IoT and machine learning offers an innovative solution with efficient land use and can be applied in limited areas. This system saves space and allows better control over the nutrients received by the plants, thus increasing the productivity and quality of the crop yield. The implementation of IoT in the vertical hydroponic system enables real-time and remote monitoring and control of the plant's environmental conditions. Sensors measure parameters such as temperature, humidity, pH, and nutrient levels. The data from these sensors is processed using machine learning algorithms, allowing the system to analyze the data and provide predictions about plant conditions.

The Random Forest Classifier machine learning algorithm shows excellent performance in predicting the conditions of hydroponic plants, particularly Pakcoy, with an accuracy rate of 98,55%, compared to the SVM algorithm at 92,49% and the Logistic Regression algorithm at 52,89%. The accuracy of tools and sensors plays a crucial role in achieving these results. This research shows that the vertical hydroponic system based on IoT and machine learning can address agricultural challenges in urban environments and contribute significantly to the sustainability of urban agriculture by leveraging IoT technology, machine learning, and reliable and efficient remote control systems. Further implementation and enhancement of this technology are expected to provide greater positive impacts globally.

Keywords: Vertical hydroponics, Internet of Things, machine learning, urban agriculture.