ABSTRAK

STUDI PREDIKTIF PERTUMBUHAN TANAMAN MELON PADA SISTEM VERTIKAL *FARMING* DENGAN ALGORITMA *DEEP LEARNING*

(2025: 86 Halaman + 30 Gambar + 8 Tabel + Daftar Pustaka + Lampiran)

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Pertanian modern menuntut efisiensi tinggi dalam lahan dan pemantauan pertumbuhan tanaman secara akurat. Penelitian ini bertujuan untuk mengembangkan sistem prediksi pertumbuhan tanaman melon berbasis citra visual pada sistem *vertical farming* aquaponik menggunakan algoritma *deep learning*, khususnya *Convolutional Neural Network* (CNN) dan *transfer learning* dengan arsitektur *MobileNetV2*. Data dikumpulkan selama 14 minggu melalui kamera CCTV V380 yang merekam pertumbuhan tanaman melon dari fase awal hingga berbuah. Proses *preprocessing* meliputi *resize*, *augmentasi*, dan normalisasi gambar sebelum digunakan dalam pelatihan model. Model dievaluasi menggunakan metrik akurasi, *precision*, *recall*, dan *F1-score*. Hasil penelitian menunjukkan bahwa model CNN dan *MobileNetV2* mampu mengklasifikasikan tahap pertumbuhan tanaman melon secara akurat serta grafik training dan validation loss yang stabil. Penelitian ini membuktikan bahwa integrasi sistem pertanian vertikal dengan teknologi *deep learning* mampu mendukung pertanian presisi, efisien, dan berkelanjutan.

Kata Kunci: *Vertical Farming*, Tanaman Melon, *Deep Learning*, CNN, *MobileNetV2*, Prediksi Pertumbuhan, *Transfer Learning*, Aquaponik

ABSTRACT

PREDICTIVE STUDY OF MELON PLANT GROWTH IN A VERTICAL FARMING SYSTEM USING DEEP LEARNING ALGORITHMS

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The rapid advancement of modern agriculture calls for efficient cultivation methods and intelligent monitoring systems, particularly in limited urban spaces. This study proposes a predictive framework for monitoring the growth stages of melon (Cucumis melo) plants cultivated in a vertical farming aquaponic system using deep learning techniques. A dataset of 700 images was collected over a 14-week period using CCTV V380 cameras, capturing visual growth from seedling to fruit-bearing stages. The proposed system employs Convolutional Neural Networks (CNN) and transfer learning with the MobileNetV2 architecture. Data preprocessing techniques—including image resizing, normalization, and augmentation—were applied prior to model training and evaluation. The models were assessed using accuracy, precision, recall, and F1-score metrics. Experimental results show that both CNN and MobileNetV2 models achieved high classification accuracy, with the best model reaching 98% accuracy and demonstrating stable convergence throughout training. These findings indicate that integrating vertical farming systems with deep learning models can significantly enhance plant growth monitoring, support resource-efficient cultivation, and promote the development of sustainable precision agriculture.

Keywords: *Precision Agriculture, Vertical Farming, Melon Growth Prediction, Deep Learning, CNN, MobileNetV2, Aquaponics, Image Classification*