

**ESTIMATION OF CARBON STOCK ON VARIOUS LAND
COVER IN WONOSALAM VILLAGE JOMBANG DISTRICT
USING NDVI VEGETATION INDEX AND LANDSAT 9**

THESIS



By:

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APPROVAL SHEET

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Submitted On:
October 30, 2025

This thesis is accepted as one of the requirements for obtaining a Bachelor of
Agriculture degree
University of Pembangunan Nasional "Veteran" Jawa Timur

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ESTIMATION OF CARBON STOCK ON VARIOUS LAND COVER IN WONOSALAM VILLAGE JOMBANG DISTRICT USING NDVI VEGETATION INDEX AND LANDSAT 9

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ABSTRACT

Global warming is one of the major environmental issues triggered by increasing carbon emissions from human activities such as deforestation and land-use change. Vegetation plays an important role in reducing carbon emissions through the processes of carbon absorption and storage within biomass and soil. The dominance of natural vegetation and community plantations in Wonosalam Village makes this area an important carbon sink. This study aims to analyze carbon stock across various land cover types in Wonosalam Village using the Normalized Difference Vegetation Index (NDVI) derived from Landsat 9 imagery, validated with field measurements. The research was conducted from March to August 2025. Field carbon stock measurements were carried out using allometric equations based on vegetation types. Landsat 9 imagery was classified using an unsupervised method to determine land cover distribution. NDVI values from each sample point were correlated with field carbon stock data using two types of regression models, and the model with the highest coefficient of determination (R^2) was selected as the best model. The results showed that the power regression model ($Y = 760.15x^{1.3036}$) produced the highest coefficient of determination ($R^2 = 0.8997$) and was used as the basis for carbon stock estimation. The total estimated carbon stock was 102,957 tons with a total biomass of 205,914 tons. These findings indicate that the NDVI- and Landsat 9-based approach is effective for spatial estimation of carbon stock.

Keyword: Biomass, Landsat 9, NDVI, Global Warming, Carbon Stock

ABSTRAK

Pemanasan global merupakan salah satu isu lingkungan akibat meningkatnya emisi karbon dari aktivitas manusia seperti deforestasi dan alih fungsi lahan. Vegetasi berperan penting dalam mengurangi emisi karbon melalui proses penyerapan dan penyimpanan karbon dalam biomassa dan tanah. Dominasi vegetasi alami dan perkebunan rakyat di Desa Wonosalam menjadikan kawasan ini berperan penting sebagai penyerap karbon. Penelitian ini bertujuan menganalisis stok karbon pada berbagai tutupan lahan di Desa Wonosalam memanfaatkan NDVI dari citra Landsat 9 yang divalidasi melalui hasil lapangan. Penelitian dilakukan pada bulan Maret – Agustus 2025. Pengukuran stok karbon di lapangan dilakukan dengan persamaan alometrik berdasarkan jenis vegetasi. Citra Landsat 9 diklasifikasikan secara *unsupervised* untuk menentukan sebaran tutupan lahan. Nilai NDVI dari setiap titik sampel dikorelasikan dengan data stok karbon lapangan menggunakan dua jenis model regresi, dan model dengan hasil nilai koefisien determinasi (R^2) tertinggi dipilih sebagai model terbaik. Hasil penelitian menunjukkan bahwa model regresi power ($Y = 760.15x^{1.3036}$) menghasilkan koefisien determinasi terbaik ($R^2 = 0.8997$), dan digunakan sebagai dasar estimasi stok karbon. Estimasi total stok karbon sebesar 102.957 Ton dengan biomassa sebesar 205.914 Ton. Hasil menunjukkan bahwa pendekatan berbasis NDVI dan citra Landsat 9 efektif digunakan untuk mengestimasi stok karbon secara spasial.

Kata kunci: Biomassa, Landsat 9, NDVI, Pemanasan Global, Stok Karbon

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Author

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