

Dinamika dan Stabilisasi Karbon Organik Tanah Berdasarkan Lama Konversi Lahan Pada Sistem Pertanian Padi Organik di Kedungjati, Purbalingga

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ABSTRAK

Penerapan praktik pertanian konvensional telah terbukti mampu meningkatkan produksi pangan nasional, namun di sisi lain juga berpotensi memberikan dampak negatif terhadap lingkungan akibat penggunaan bahan kimia yang intensif. Oleh karena itu, sistem pertanian organik menjadi alternatif yang lebih ramah lingkungan dalam menjaga keberlanjutan fungsi tanah. Dalam proses konversi dari sistem konvensional ke organik, diperlukan periode transisi untuk memulihkan kondisi tanah. C-organik tanah menjadi indikator penting dalam menilai keberhasilan konversi tersebut karena perannya yang vital dalam mempengaruhi sifat kimia, fisika, dan biologi tanah. Penelitian ini bertujuan untuk menganalisis dinamika dan stabilisasi karbon organik tanah pada lahan dengan lama waktu konversi pertanian organik yang berbeda, serta mengkaji hubungannya dengan sifat tanah lainnya. Lokasi penelitian berada di lahan sawah Gapoktan Subur, Desa Kedungjati, Purbalingga. Sampel tanah diambil dari lima kategori lahan, yaitu lahan konvensional serta lahan yang telah dikonversi ke organik selama 2, 4, 6, dan 8 tahun. Setiap kategori diambil tiga ulangan sehingga diperoleh total 15 sampel tanah. Parameter penelitian meliputi C-organik, *Particulate Organic Carbon* (POC), *Mineral Associated Organic Carbon* (MAOC), gugus fungsi bahan organik, pH, N-total, C/N rasio, KTK, berat volume, *Microbial Biomass Carbon* (MBC), dan MBC/C-org rasio. Hasil penelitian menunjukkan bahwa semakin lama lahan dikelola secara organik, kandungan dan stabilitas karbon organik tanah cenderung meningkat, yang ditunjukkan oleh distribusi fraksi karbon organik serta didukung oleh analisis FTIR. Karbon organik tanah juga menunjukkan hubungan yang bervariasi dengan sifat tanah. Secara keseluruhan, peningkatan karbon organik tanah diikuti oleh perbaikan sifat kimia, fisika, dan biologi tanah yang menggambarkan peningkatan kualitas tanah.

Kata Kunci: C-organik tanah, fraksinasi, *mineral-associated organic carbon*, *particulate organic carbon*.

Dynamics And Stabilization of Soil Organic Carbon Based on Land Conversion Duration in Organic Rice Farming System in Kedungjati, Purbalingga

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ABSTRACT

The application of conventional farming practices has significantly increased national food production. However, it also has the potential to cause negative environmental impacts due to the intensive use of chemical inputs. Organic farming systems are considered a more sustainable alternative for maintaining soil functions. The transition from conventional to organic farming requires a conversion period to restore soil conditions. Soil organic carbon (SOC) is a key indicator for evaluating the success of this transition, as it plays a crucial role in influencing soil chemical, physical, and biological properties. This study aimed to analyze the dynamics and stabilization of SOC under different durations of organic farming conversion as well as to examine its relationship with various soil properties. The research was conducted in paddy fields of Gapoktan Subur, Kedungjati Village, Purbalingga. Soil samples were collected from five categories: conventional farming and organic farming for 2, 4, 6, and 8 years, with three replicates each. Research parameters included SOC, Particulate Organic Carbon (POC), Mineral Associated Organic Carbon (MAOC), functional groups of soil organic matter, pH, total nitrogen, C/N ratio, cation exchange capacity, bulk density, Microbial Biomass Carbon (MBC), and MBC/C-org ratio. The results indicated that longer conversion periods led to increased SOC content and stability, as reflected by the distribution of organic carbon fractions and supported by FTIR analysis. SOC also exhibited varying relationships with soil properties. Overall, the increase in SOC was associated with improvements in soil chemical, physical, and biological properties, indicating enhanced soil quality.

Keywords: fractionation, mineral-associated organic carbon, particulate organic carbon, soil organic carbon.