

KARAKTERISTIK FISIK DAN PEMADATAN TANAH AKIBAT AKTIVITAS ALAT MESIN PERTANIAN DI LAHAN SAWAH

INTISARI

Oleh:

NATHAN NAGHATA FRIZZY
21/474474/TP/13103

Penggunaan alat mesin pertanian merupakan salah satu upaya untuk meningkatkan efisiensi dan produktivitas usaha tani. Namun, aktivitas mekanisasi ini juga dapat menimbulkan dampak negatif berupa peningkatan kepadatan tanah. Pematatan akibat beban dari alsintan berpengaruh langsung terhadap sifat fisik tanah, terutama *bulk density*, porositas, dan kadar air. Penelitian ini dilakukan pada tiga kondisi lahan, yaitu tanah kontrol, tanah tanam (setelah penggunaan traktor roda dua), dan tanah panen (setelah penggunaan mesin panen padi), dengan pengambilan sampel pada kedalaman 0–30 cm dan 30–60 cm. Analisis laboratorium meliputi pengukuran *bulk density*, porositas, dan kadar air untuk mengetahui pengaruh aktivitas alsintan terhadap perubahan sifat fisik tanah.

Hasil penelitian menunjukkan bahwa penggunaan alat mesin pertanian meningkatkan kepadatan tanah secara nyata. Nilai *bulk density* pada perlakuan tanah tanam sebesar 1,01 g/cm³, kemudian 1,39 g/cm³ pada tanah panen, dan tanah rehat sebesar 1,30 g/cm³. Peningkatan kepadatan tanah ini diikuti oleh penurunan porositas, yaitu pada tanah tanam sebesar 44,6%, lalu 32,7% pada tanah panen, dan 30,2% pada tanah rest. Demikian pula, kadar air tanah menurun seiring peningkatan *bulk density*, dengan nilai 52,7% pada tanah tanam, kemudian 31% pada tanah panen, dan 36,5% pada tanah rehat. Analisis hubungan antar parameter menunjukkan pola konsisten, di mana *bulk density* berhubungan negatif dengan porositas dan kadar air, sementara porositas berhubungan positif dengan kadar air. Dari hasil analisis, aktivitas mekanisasi pertanian terbukti meningkatkan kepadatan tanah dan menurunkan kualitas sifat fisik tanah, sehingga diperlukan strategi pengelolaan lahan yang tepat untuk menjaga keberlanjutan produktivitas pertanian.

Kata kunci: kepadatan, alat mesin pertanian, sifat fisik tanah, porositas, kadar air.



***PHYSICAL CHARACTERISTICS AND SOIL COMPACTION CAUSED BY
AGRICULTURAL MACHINERY ACTIVITIES IN PADDY FIELDS***

ABSTRACT

By:

**NATHAN NAGHATA FRIZZY
21/474474/TP/13103**

The use of agricultural machinery is one of the efforts to improve the efficiency and productivity of farming activities. However, mechanization can also generate negative impacts, particularly the increase in soil compaction. Compaction caused by the load of agricultural machinery directly affects soil physical properties, especially bulk density, porosity, and water content. This study was conducted under three field conditions: control soil, cultivated soil (after the use of a two-wheel tractor), and harvested soil (after the use of a rice harvester), with soil samples taken at depths of 0–30 cm and 30–60 cm. Laboratory analysis included measurements of bulk density, porosity, and water content to determine the effect of agricultural machinery on changes in soil physical properties.

The results showed that the use of agricultural machinery significantly increased soil compaction. Bulk density values were 1.01 g/cm³ in cultivated soil, 1.39 g/cm³ in harvested soil, and 1.30 g/cm³ in resting soil. This increase in soil compaction was followed by a decrease in porosity, namely 44.6% in cultivated soil, 32.7% in harvested soil, and 30.2% in resting soil. Similarly, soil water content decreased with increasing bulk density, with values of 52.7% in cultivated soil, 31% in harvested soil, and 36.5% in resting soil. The analysis of inter-parameter relationships showed a consistent pattern, where bulk density was negatively correlated with porosity and water content, while porosity was positively correlated with water content. From these findings, it can be concluded that agricultural mechanization increases soil compaction and reduces the quality of soil physical properties, thereby requiring appropriate land management strategies to maintain sustainable agricultural productivity.

Keywords: compaction, agricultural machinery, soil physical properties, porosity, water content.