

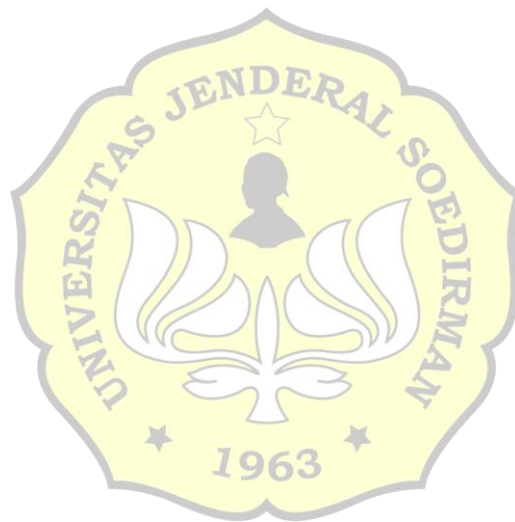
## RINGKASAN

Penggunaan traktor sudah menjadi kebutuhan penting petani untuk mengolah tanah karena dinilai lebih efektif dibandingkan dengan pengolahan tanah konvensional. Sementara itu perlintasan traktor ketika melakukan pengolahan tanah dapat mengakibatkan pemadatan tanah yang dapat berpengaruh negatif terhadap tingkat produksi tanaman. Disisi lain mulsa organik dapat menciptakan kondisi lingkungan tanah yang baik bagi aktivitas mikroorganisme tanah, meningkatkan kandungan bahan organik tanah, dan menekan pertumbuhan gulma. Meskipun ketersediaan mulsa organik melimpah, namun kajian tentang pemanfaatan mulsa untuk mengurangi dampak pemadatan tanah akibat perlintasan traktor roda empat pada tingkat kedalaman 0 – 50 cm masih terbatas. Oleh karena itu, penelitian ini ditujukan untuk (1) Mengkaji pengaruh jenis mulsa organik terhadap kepadatan tanah akibat perlintasan traktor roda empat pada kedalaman 0 – 50 cm. (2) Mempelajari hubungan antara beberapa variabel sifat fisik tanah ( $k_s$ ,  $\rho_d$ ,  $w$ ,  $f$ ) terkait dengan pemberian jenis mulsa organik dan kepadatan tanah akibat perlintasan traktor roda empat pada kedalaman 0 – 50 cm.

Penelitian dilaksanakan pada bulan Desember 2023 – Juni 2024 di lahan pertanian Unit Penyewaan Jasa Alsintan (UPJA) Sokaraja serta lab Terpadu 1 IAB, Universitas Jenderal Soedirman. Rancangan percobaan menggunakan Rancangan Acak Lengkap (RAL) dengan 4 taraf perlakuan, yaitu tanpa mulsa ( $M_0$ ), mulsa jerami ( $M_J$ ), mulsa sekam ( $M_S$ ), dan mulsa serasah daun bambu ( $M_{SD}$ ). Sampel tanah tidak terganggu diambil pada kedalaman 0 – 10, 10 – 20, 20 – 30, 30 – 40, dan 40 – 50 cm, dengan jumlah ulangan pengambilan sampel tanah 5 kali pada setiap kedalaman tanah, sehingga total sampel tanah yang diambil adalah 100 sampel. Bahan yang digunakan meliputi: mulsa jerami, serasah daun bambu, sekam dan 4 buah petakan lahan berukuran 2 m x 2 m. Sedangkan alat yang digunakan meliputi: traktor roda empat, *head core ring sampler*, *soil ring sampler* dengan ukuran standar, oven, jangka sorong, timbangan digital, cawan alumunium, alat *falling head meter*, cangkul, sekop, linggis, pisau, patok, tali, meteran, kantong plastik, kain, papan kayu, palu, isolasi, baki, pagar ploting dan *stopwatch*. Variabel yang diukur adalah *dry bulk density*, konduktivitas hidrolik jenuh, porositas, dan kadar air tanah. Analisis data menggunakan analisis regresi serta *Analysis of Variance* (ANOVA) 5 % dengan uji lanjut menggunakan uji *Duncan's Multiple Range Test* (DMRT) 5%.

Hasil penelitian menunjukkan bahwa pemberian mulsa jerami, sekam padi dan serasah daun bambu cenderung memberikan pengaruh terhadap penurunan nilai *dry bulk density* dan peningkatan nilai konduktivitas hidrolik jenuh, porositas, maupun kadar air tanah dibandingkan perlakuan tanpa mulsa organik ( $M_0$ ). Dari ketiga jenis mulsa organik tersebut, mulsa jerami ( $M_J$ ) paling berpengaruh terhadap penurunan *dry bulk density* dan peningkatan konduktivitas hidrolik jenuh, porositas, maupun kadar air tanah diikuti dengan mulsa serasah daun bambu ( $M_{SD}$ ), lalu mulsa sekam padi ( $M_S$ ). Peningkatan kedalaman tanah cenderung menghasilkan penurunan *dry bulk density*, dan peningkatan nilai konduktivitas hidrolik jenuh,

porositas, maupun kadar air tanah. *Dry bulk density* memiliki hubungan linear negatif terhadap konduktivitas hidrolis jenuh dengan nilai  $R^2$  0.5253. Porositas memiliki hubungan linear positif terhadap konduktivitas hidrolis jenuh dengan nilai  $R^2$  0.5253, Kadar air memiliki hubungan linear positif dengan konduktivitas hidrolis jenuh terhadap nilai  $R^2$  0.4578.



## SUMMARY

*The use of tractors has become a crucial necessity for farmers due to its effectiveness compared to conventional soil preparation methods. However, the passage of tractors during soil preparation can lead to soil compaction, which negatively impacts crop yields. On the other hand, organic mulch can create a favorable soil environment for microbial activity, increase soil organic matter, and suppress weed growth. Despite the abundance of organic mulch, there is limited research on its utilization to mitigate the effects of soil compaction caused by four-wheel tractor passage at depths of 0–50 cm. Therefore, this study aims to (1) investigate the impact of different types of organic mulch on soil compaction caused by four-wheel tractor passage at depths of 0–50 cm. (2) explore the relationship between several physical properties of soil ( $k_s$ ,  $p_d$ ,  $w$ ,  $f$ ) related to the application of different types of organic mulch and soil compaction caused by four-wheel tractor passage at depths of 0–50 cm.*

*The research was conducted from December 2023 to June 2024 on the agricultural land of the Unit Penyewaan Jasa Alsintan (UPJA) Sokaraja and the Integrated Laboratory 1 IAB of Jenderal Soedirman University. The experimental design used a Complete Randomized Design (CRD) with 4 treatment levels: no mulch ( $M_0$ ), wheat straw mulch ( $M_1$ ), rice straw mulch ( $M_S$ ), and bamboo leaf litter mulch ( $M_{SD}$ ). Soil samples were taken without disturbance at depths of 0–10, 10–20, 20–30, 30–40, and 40–50 cm, with 5 replications for each depth, resulting in a total of 100 soil samples. The materials used included wheat straw, bamboo leaf litter, rice straw, and 4 plots of land measuring 2 m x 2 m. The equipment used included a four-wheel tractor, head core ring sampler, soil ring sampler with standard size, oven, calipers, digital balance, aluminum cup, falling head meter, shovel, rake, axe, stakes, rope, tape measure, plastic bag, cloth, wooden board, hammer, insulation, tray, plot fencing, and stopwatch. The variables measured were dry bulk density, saturated hydraulic conductivity, porosity, and soil moisture content. Data analysis used regression analysis and Analysis of Variance (ANOVA) at a 5% significance level, with further testing using Duncan's Multiple Range Test (DMRT) at a 5% significance level.*

*The research findings indicate that the application of organic mulch straw, rice husks, bamboo leaf litter tends to influence the reduction in dry bulk density and the increase in saturated hydraulic conductivity, porosity, and soil moisture content compared to the control treatment without organic mulch ( $M_0$ ). Among the three types of organic mulch, wheat straw mulch ( $M_1$ ) had the most significant impact on reducing dry bulk density and increasing saturated hydraulic conductivity, porosity, and soil moisture content, followed by bamboo leaf litter mulch ( $M_{SD}$ ), and then rice straw mulch ( $M_S$ ). The increase in soil depth tends to result in a decrease in dry bulk density and an increase in saturated hydraulic conductivity, porosity, and soil moisture content. There is a linear negative relationship between dry bulk density and saturated hydraulic conductivity with an  $R^2$  value of 0.5253. Porosity has a linear positive relationship with saturated*

*hydraulic conductivity, also with an  $R^2$  value of 0.5253. Soil moisture content has a linear positive relationship with saturated hydraulic conductivity, with an  $R^2$  value of 0.4578.*

