RINGKASAN

Penggunaan traktor roda dua sangat signifikan manfaatnya bagi pertanian, terutama dalam meningkatkan efisiensi dan produktivitas. Namun penggunaan traktor roda dua dapat mengakibatkan pemadatan tanah, sehingga pada pengolahan tanah berikutnya tanah menjadi lebih sulit dihancurkan dan pemadatan tanah terus menerus semakin meningkat. Tekanan angin roda traktor berpotensi mempengaruhi tingkat pemadatan tanah yang terjadi. Penelitian-penelitian sebelumnya dominan mempelajari pengaruh tingkat tekanan angin roda traktor roda dua sesaat setelah perlintasan traktor. Selain itu penelitian-penelitian terdahulu berfokus pada tingkat kedalaman tanah 0 – 40 cm. Oleh karena itu, penelitian ini dilakukan dengan tujuan untuk (1) mengkaji pengaruh perbedaan tekanan angin roda traktor roda dua terhadap tingkat pemadatan tanah pada kedalaman 0 – 50 cm pada saat 6 bulan setelah perlintasan traktor, (2) mengkaji hubungan antar variabel sifat fisik tanah terkait pengaruh perbedaan tekanan angin roda traktor roda dua terhadap tingkat pemadatan tanah pada kedalaman tanah 0 – 50 cm pada saat 6 bulan setelah perlintasan traktor.

Penelitian dilaksanakan pada bulan Juli 2024 hingga Juni 2025 di lahan pertanian Unit Penyewaan Jasa Alsintan (UPJA) Sokaraja, Laboratorium Balai Penerapan Standar Instrumen Pertanian (BPSIP) Yogyakarta, serta Laboratorium Terpadu 1 *Integrated Academic Building* (IAB) Universitas Jenderal Soedirman. Alat yang digunakan yaitu traktor roda dua, *pressure gauge, head core ring sampler, soil ring sampler*,cangkul, linggis, palu, meteran, sekop, pisau, patok, tali, cawan aluminium, *falling head meter*, *stopwatch*, baki, jangka sorong, oven, dan timbangan digital. Bahan yang digunakan yaitu 4 plot lahan penelitian berukuran 2 m × 1 m dengan jarak antar plot 1 m. Penelitian menggunakan Rancangan Acak Lengkap (RAL) dengan satu faktor perlakuan yaitu tingkat tekanan angin roda traktor roda dua. Terdapat 4 taraf perlakuan yang diberikan yaitu: tanpa perlintasan traktor (T_0), 7 psi (T_7), 10 psi (T_{10}), dan 12 psi (T_{12}). Pengambilan sampel tanah tidak terganggu dilakukan 6 bulan setelah perlintasan traktor pada kedalaman 0 – 10, 10 – 20, 20 – 30, 30 – 40, dan 40 – 50 cm. Pada masing-masing kedalaman tanah dilakukan 5 kali ulangan sehingga total sampel tanah yang diambil 100. Terhadap sampel tanah tersebut dilakukan pengukuran sifat fisik tanah yang terdiri dari: *dry bulk density*, porositas tanah, kadar air tanah, dan konduktivitas hidrolik jenuh. Analisis data menggunakan analisis regresi, *Analisis of Variance (*ANOVA) dilanjut uji *Duncan's Multiple Range Test* (DMRT) taraf signifikansi 5%, serta uji *paired sample T-test*.

Hasil penelitian menunjukkan bahwa peningkatan tekanan angin roda traktor roda dua menghasilkan peningkatan nilai *dry bulk density* yang diikuti penurunan nilai porositas tanah, kadar air tanah, dan konduktivitas hidrolik jenuh. Peningkatan kedalaman tanah menghasilkan penurunan nilai *dry bulk density* dan peningkatan nilai porositas tanah, kadar air tanah, dan konduktivitas hidrolik jenuh. Hasil analisis regresi menunjukkan bahwa *dry bulk density* dengan konduktivitas hidrolik jenuh memiliki hubungan linier negatif dimana nilai *dry bulk density* meningkat maka nilai konduktivitas hidrolik jenuh menurun. Porositas tanah dengan

konduktivitas hidrolik jenuh memiliki hubungan linier positif dimana nilai porositas tanah meningkat maka nilai konduktivitas hidrolik jenuh meningkat. Kadar air tanah dengan konduktivitas hidrolik jenuh memiliki hubungan linier positif dimana nilai kadar air meningkat maka nilai konduktivitas hidrolik jenuh meningkat. Pengamatan 6 bulan menjelaskan peningkatan nilai *dry bulk density* namun penurunan nilai porositas tanah, kadar air tanah, dan konduktivitas hidrolik jenuh dibandingkan pengamatan 0 bulan setelah perlintasan traktor.

SUMMARY

The use of two-wheeled tractors has significant benefits for agriculture, especially in increasing efficiency and productivity. However, the use of two-wheeled tractors can result in soil compaction. So that in subsequent soil processing the soil becomes more difficult to destroy and soil compaction continues to increase. Tractor tire pressure has the potential to affect the level of soil compaction that occurs. Previous studies have predominantly studied the effect of the level of tire pressure of two-wheeled tractors immediately after a tractor crossing. In addition, previous studies have focused on soil depths of 0 - 40 cm. Therefore, this study was conducted with the aim of (1) examining the effect of differences in tire pressure of two-wheeled tractors on the level of soil compaction at a depth of 0 - 50 cm at 6 months after a tractor crossing, (2) examining the relationship between variables of soil physical properties related to the effect of differences in tire pressure of two-wheeled tractors on the level of soil compaction at a depth of 0 - 50 cm at 6 months after a tractor crossing.

The research was conducted from July 2024 to June 2025 on agricultural land of the Sokaraja Agricultural Machinery Rental Service Unit (UPJA), the Yogyakarta Agricultural Instrument Standards Application Center (BPSIP) Laboratory, and the Integrated Laboratory 1 Integrated Academic Building (IAB) of Jenderal Soedirman University. The tools used were a two-wheeled tractor, pressure gauge, head core ring sampler, soil ring sampler, hoe, crowbar, hammer, meter, shovel, knife, stake, rope, aluminum cup, falling head meter, stopwatch, tray, vernier caliper, oven, and digital scales. The materials used were 4 plots of land measuring 2 m × 1 m with a distance between plots of 1 m. The study used a Completely Randomized Design (CRD) with one treatment factor, namely the level of tire pressure of the two-wheeled tractor. There were 4 levels of treatment given, namely: without tractor crossing (T_0), 7 psi (T_7), 10 psi (T_{10}), and 12 psi (T_{12}). Undisturbed soil sampling was carried out 6 months after the tractor crossing at depths of 0 – 10, 10 – 20, 20 – 30, 30 – 40, and 40 – 50 cm. At each soil depth, 5 repetitions were carried out so that a total of 100 soil samples were taken. The soil samples were measured for physical properties consisting of: dry bulk density, soil porosity, soil water content, and hydraulic conductivity. Data analysis used regression analysis, Analysis of Variance (ANOVA) followed by Duncan's Multiple Range Test (DMRT) with a significance level of 5%, and paired sample T-test.

The results showed that increasing the tire pressure of a two-wheeled tractor resulted in an increase in the dry bulk density value followed by a decrease in the soil porosity, soil water content, and hydraulic conductivity. Increasing soil depth tended to result in a decrease in the dry bulk density value and an increase in the soil porosity, soil water content, and hydraulic conductivity. The results of the regression analysis show that dry bulk density and saturated hydraulic conductivity have a negative linear relationship where the value of dry bulk density increases, the value of saturated hydraulic conductivity decreases. Soil porosity and saturated hydraulic conductivity have a positive linear relationship where the value of soil porosity increases, the value of saturated hydraulic conductivity increases. Soil

water content and saturated hydraulic conductivity have a positive linear relationship where the value of water content increases, the value of saturated hydraulic conductivity increases. Observations over 6 months explain an increase in dry bulk density but a decrease in soil porosity, soil water content, and saturated hydraulic conductivity compared to observations 0 months after the tractor crossing.