RINGKASAN

Penggunaan *power tiller* sebagai alat pengolah tanah biasanya hanya difokuskan pada kinerja produktivitasnya saja, sedangkan dampak negatif terhadap tanah masih kurang diperhatikan. Sementara itu, intensitas perlintasan traktor diyakini menjadi salah satu penyebab terjadinya pemadatan tanah yang tentunya dapat mempengaruhi sifat fisik tanah. Sedangkan sifat fisik tanah penting untuk diperhatikan karena akan mempengaruhi pertumbuhan dan produksi tanaman. Meskipun demikian, penelitian mengenai pengaruh perlintasan traktor terhadap sifat fisik tanah biasanya hanya dilakukan pada kedalaman 0 – 30 cm saja. Disisi lain, sistem perakaran tanaman mampu menembus kedalaman tanah hingga > 30 cm. Oleh karena itu, penelitian ini ditujukan untuk (1) mengkaji pengaruh perlintasan *power tiller* terhadap sifat fisik tanah pada tingkat kedalaman tanah 0 – 50 cm, serta (2) mengkaji hubungan antara beberapa variabel sifat fisik tanah terkait dengan pengaruh perlintasan *power tiller*.

Penelitian dilaksanakan pada bulan Februari – Mei 2024 di lahan UPTD BBLP Banjarnegara (pengambilan sampel tanah tidak terganggu) serta lab Terpadu 1 IAB, Universitas Jenderal Soedriman (pengukuran sifat fisik tanah). Rancangan percobaan menggunakan Rancangan Acak Lengkap (RAL), dengan 4 taraf perlakuan perlintasan *power tiller*, yaitu 0 perlintasan (L_0), 1 perlintasan (L_1), 4 perlintasan (L_4), dan 7 perlintasan (L_7). 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 adalah 5 kali untuk setiap kedalaman tanah, sehingga total sampel tanah yang diambil adalah 100 sampel. Bahan yang digunakan adalah 4 buah petakan lahan ukuran 1 m x 6 m. Sedangkan alat yang digunakan meliputi: 1 unit *power tiller* tipe TYM TR120, *head core ring sampler*, *soil ring sampler* ukuran 100 cm^3, 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, dan *stopwatch*. Variabel yang diukur adalah *dry bulk density*, konduktivitas hidrolik jenuh, porositas, kadar air, dan *wet bulk density*. 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 peningkatan intensitas perlintasan *power tiller* dan tingkat kedalaman tanah cenderung memberikan pengaruh terhadap peningkatan nilai *dry bulk density* dan *wet bulk density*, serta penurunan nilai konduktivitas hidrolik jenuh, porositas, dan kadar air tanah. Secara statistik, pengaruh tersebut cenderung saling berbeda nyata antar perlakuan dan kedalaman tanah. Pengaruh paling signifikan berada antara perlakuan L_0 dan L_7 serta pada kedalaman 0 – 10 cm. Hasil analisis regresi menunjukkan adanya hubungan antara beberapa variabel sifat fisik tanah, dimana *dry bulk density* memiliki hubungan linear negatif dengan porositas dan konduktivitas hidrolik jenuh, sedangkan porositas dan kadar air memiliki hubungan linear positif dengan konduktivitas hidrolik jenuh.

SUMMARY

The use of power tiller as a soil processing tool is usually only focused on its productivity performance, while the negative impact on the soil is still less considered. Meanwhile, the intensity of tractor crossings is believed to be one of the causes of soil compaction which can certainly affect the physical properties of the soil. Meanwhile, soil physical properties are important to consider because they will affect plant growth and production. However, research on the effect of tractor crossings on soil physical properties is usually only conducted at a depth of 0-30 cm. On the other hand, the root system of plants is able to penetrate soil depths up to > 30 cm. Therefore, this research is aimed at (1) assessing the effect of power tiller crossings on soil physical properties at the 0-50 cm soil depth level, and (2) examining the relationship between several soil physical properties variables related to the effect of power tiller crossings.

The research was conducted from February to May 2024 at the UPTD BBLP Banjarnegara (undisturbed soil sampling) and Integrated Lab 1 IAB, Jenderal Soedriman University (soil physical properties measurement). The experimental design used a completely randomized design (CRD), with 4 levels of power tiller crossings, namely 0 crossings (L_0), 1 crossing (L_1), 4 crossings (L_4), and 7 crossings (L_7). Undisturbed soil samples were taken at depths of 0 - 10, 10 - 20, 20 - 30, 30 - 40, and 40 - 50 cm, with the number of soil sampling replicates being 5 times for each soil depth, so that the total soil samples taken were 100 samples. Materials used include: water and 4 plots of land measuring 1 m x 6 m. While the tools used include: 1 unit of power tiller type TYM TR120, head core ring sampler, soil ring sampler size 100 cm^3, oven, vernier, digital scale, aluminum cup, falling head meter, hoe, shovel, crowbar, knife, stakes, rope, meter, plastic bag, cloth, wooden board, hammer, insulation, tray, and stopwatch. The variables measured were dry bulk density, saturated hydraulic conductivity, porosity, moisture content, and wet bulk density. Data analysis used regression analysis as well as 5% Analysis of Variance (ANOVA) with further tests using Duncan's Multiple Range Test (DMRT) 5%.

The results showed that increasing the intensity of power tiller crossings and the level of soil depth tended to have an effect on increasing the values of dry bulk density and wet bulk density, as well as decreasing the values of saturated hydraulic conductivity, porosity, and soil moisture content. Statistically, these effects tended to differ significantly between treatments and soil depths. The most significant effect was between treatments L_0 and L_7 and at a depth of 0 – 10 cm. The results of regression analysis showed a relationship between several variables of soil physical properties, where dry bulk density has a negative linear relationship with porosity and saturated hydraulic conductivity, while porosity and moisture content have a positive linear relationship with saturated hydraulic conductivity.