CONSERVATION SOIL PROCESSING TEST ON THE IMPROVEMENT OF SOIL PHYSICS PROPERTIES

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ABSTRACT

Conservation soil processing tests on soil physics properties is one of the efforts to increase agricultural production is intensive tillage. Soil processing aims to provide or provide a better growing environment for plant growth. There are 3 types of tillage. They are no tillage, minimum tillage, full tillage on corn and peanuts, minimum tillage can increase crop production. This research was conducted in nursery of the seed nursery of Balai Benih Dinas Tanaman Pangan dan Holtikultura, Medan. This research used Randomized non factorial design which was the Soil Processing Factor as a sub-plot consisting of 3 levels were no tillage (T0), minimum tillage (T1), full tillage (T2). The results of this research showed that soil treatment had significant affecton the improvement of soil physical properties, namely bulk density, total pore space, permeability and no significant effect on all parameters of soil physical chemical properties

Keywords*: tillage, soil physics, conservation*

A. INTRODUCTION

Although the use of agricultural mechanization such as tractors and tana processing equipment is needed in sugarcane cultivation (Hendromono et al. 2006). However, this can result in a decrease in the quality of the physical properties of the soil in the long run, if intensive tillage is carried out, one of which can reduce soil porosity. This is supported by Hakim's (2011) which states that tillage can temporarily increase soil porosity, but over a long period of time will cause a decrease in soil porosity.

The high weight value of soil contents in acid dry land causes soil compaction (Hairiah et al., 2004). Soil compaction will affect the increased resistance of soil penetration so that the roots require greater strength to penetrate the soil (Junedi et al., 2013). Overland cultivation can cause the soil to become loose and open for a long time, thereby increasing the rate of evapotranspiration and reducing the soil's holding capacity to water. Water losses that occur result in reduced availability of water in the soil. The availability of water in the soil greatly affects plant growth, where the water used by plants is available water that is present in the pores of the soil in the root layer of plants (Wahyunie et al., 2012).

The application of tillage conservation in the long term is more beneficial because it is able to improve and maintain the physical condition of the soil, prevent soil erosion, maintain moisture and suppress soil temperature fluctuations and maintain the survival of organisms (Efendi and Suwardi, 2009). In corn and peanut crops, minimum tillage can increase crop production (Sinukaban 1990). One of the efforts to increase agricultural production is intensive land management. Tillage aims to provide or provide a better growing environment for plant growth. There are 3 types of tillage; no tillage, minimum tillage, full tillage.

Therefore, a more efficient and appropriate method for farming with no tillage or as little as possible tillage (minimum tillage) is sought. In corn and peanut crops, minimum tillage can increase crop production (Sinukaban 1990). Hardjowigeno (2003) states that the denser the soil, the higher the density of the action, which means that it is more difficult to continue the water (plant roots). With the disruption of the root system, processes in the plant tissue will be disrupted, especially the process of absorption of nutrients through the roots to the top of the plant. One of the annual crops grown in dry land which is superior is peanuts because it has high enough oil and protein content. Peanuts require conditions for growing fertile, loose, light-textured and well drained soil (Susilawati, 2010).

Materechera research results (2009) showed that the production of peanut pods increased by improved soil structure, decreased value of content weight, and soil penetration resistance due to mulch on the surface. This plant needs loose soil so that it can be penetrated by gynopora so that the pod formation process is not easily hampered. There are many varieties of peanuts, so it needs to be tested

which one is better with the treatment of peanuts in peanut cultivation. According to Goenadi (2006) the physical properties of soils can increase the stability of soil aggregates, thereby creating a stable and ideal soil structure for plant growth which results in a good porosity level and reduces the level of soil density. Soil compaction will affect the increased resistance of soil penetration so that the roots require greater strength to penetrate the soil (Junedi et al., 2013). Return of residuals or crop residues combined with manure, can improve soil physical conditions such as the level of soil aggregation to be good, soil permeability to increase, reduce the level of soil density, soil porosity to be good which results in increased root development (Hati et al., 2006).

Thus Mursito and Kawiji (2007) said the purpose of tillage is to provide an optimum growing environment for seed germination and plant root development, control weeds and allow water infiltration, so that water is available to plants. Provision of mulch at the surface of the soil can improve physical properties soils such as reducing soil surface density, decreasing penetration resistance, and increasing water retention (Materechera, 2009), and increasing infiltration (Sharmaa et al., 2011).

B. MATERIALS AND METHODS

Materials used include: soil samples, while the fertilizers used are Urea, TSP, and KCl. Prevention of disease pests is used Decis 2.5 EC and Dithane M-45. Soil Type Inseptisol.

Other tools used: lawn mowers, hoes, Hand Tractors, rakes, tripe, tugal, buckets, knapsack sprayers, scissors, scissors, knives, gauges, scales, Leaf Area Meters, GPS, labels, Permanent Markers, sample rings, permeabilimeters, and other tools.

The research design used was a Non Factorial Randomized Block Design (RAK Non Factorial) Conservation Land Management consists of 3 levels: T0 = No-Tillage, T1 = Minimum Tillage, T2 = Full Tillage.

Parameters observed:

- Bulk Density (g / cm3) using Ring Samples
- Total Pore Space (%) using the Sample Ring
- Land permeability (cm / hour) Eijkelkamp method
- Available Moisture Methods: Field Capacities and Permanent Withered Points

C. RESULTS AND DISCUSSION

Table 1. Bulk Density Average, Total Pore Space, Permeability, Moisture Content Available as a Result of Soil Treatment.

Treatment	Bulk Density (gr/cm^3)	Total Pore Space (%)	Land permeability (cm / hour)	Available Moisture (%)
Land Management				
T0 (No-Tillage)	1.40c	46.65a	14.3 a	5.78
T1 (Minimum Tillage)	1.46b	44.07b	12.8 ab	5.70
T2 (Full Tillage)	1.50a	42.37c	10.5 b	5.43

Means values in a column and row followed by unlike letter (s) are significantly different at 5% level.

The results of conservation tillage testing on the physical properties of soil Inseptisol were carried out on the parameters of bulk density, total pore space, soil permeability, and available water content. Data and results of analysis of variance on the physical properties of the Soil are presented in Table 1. It can be seen that tillage conservation has a significant effect on bulk density, total pore space, soil permeability, and water content available, but does not significantly affect water content available. Whereas mycorrhizal inoculation treatment with peanut varieties and interactions did not significantly affect all observed parameters.

The results of the average difference test of the physical properties of the soil are presented in Table 1. From Table 1 it can be seen that the minimum tillage and without tillage significantly decreases the soil bulk density while the total pore space and soil permeability are significantly higher in the no tillage treatment, to the water content available not significantly different but there is a tendency to increase in the treatment without tillage and minimum tillage compared to Full Tillage.

The treatment without tillage and minimum tillage causes the soil bulk density to be smaller and significantly different than in the treatment of complete tillage (Full Tillage) can occur because of the action without tillage and plant roots before, especially the residual decomposed plant roots due to spraying treatment herbicides and no littering of plant residues from the roots of plants inside, while in full tillage all crop residues are previously removed and cleaned. Plant residues and residual roots are left in the soil causing more soil micro space after the residual plants / roots of these plants rot. That way the soil becomes loose or the BD becomes smaller. This is in line with the higher total Pore Space without tillage and minimum

tillage compared to no tillage (Table 1). Due to the greater Total Pore Space and smaller Bulk Density that represents more loose soil, it causes greater permeability at minimum tillage treatment. While in full tillage (Full Tillage) although in normal tillage it is more loose, but because over time it can become dense due to the blow of rainfall grains (rain kinitek energy) so that the soil pores are filled by clay clay fractions that are dispersed by the force of the rainfall blow. This is in accordance with Opinion Rauf (2005) that by cultivating soil causes the soil to loose and more quickly absorb rainwater, thus reducing surface runoff, but this effect is temporary because continuous rain will compact the soil and the treated land is easily eroded when surface flow is present. This is supported by Hakim (2011) who stated that tillage can temporarily increase soil porosity, but over a long period of time will cause a decrease in soil porosity.

D. CONCLUSION

Soil treatment significantly influences the improvement of soil physical properties, namely Bulk Density, Total Pore Space, Permeability and no significant effect on all parameters of soil physical and chemical properties

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