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Diagnosing Soil and Coconut Root Existence in Lontang Plantation of Manado City

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ABSTRACT

Province of North Sulawesi has been known as wave palm area (coconut). One of the plantations (coconut) potential become the farmer's income and Locally-Generated Revenue (LGR). Therefore, it is important to maximize the soil function and root system of coconut. This research was aimed to diagnose a soil and coconut root existence in Lontang Plantation of Manado City. Soil observations were carried out on a single stretch of coconut plantations owned by community. The observation was done through the soil profile at a spacing of <1 m; 3 m and 5 m from the main tree of the coconut. The results showed that decreasing of C-Organic content in 1 m depth was not followed by enhancement of soil content weight, because C-Organic has spread equally in middle state and into the depth of >1 m on 3 and 5 m spacing profile from the main tree which categorized as low. Existence of total root length (Lrv) and dry root weight (Drv) shows that deeper soil will be more reduced of the root Lrv and Drv values along with the organic material in the bottom layer (> 1 m) lower than above it. The highest Lrv and Drv average value is located on the depth of 0 – 60 cm. Specrol existence on 1 - 3 m spacing profile have showed many soft roots which grow on these spacing. The soft root has a roles to absorb nutrient and water for the plant and direct contact with the soil.

Keywords: Coconut root, dry root weight (Drv), total root length (Lrv)

ABSTRAK

Propinsi Sulawesi Utara dikenal sebagai daerah nyiur melambai (kelapa). Salah satu potensi perkebunan (kelapa) tersebut merupakan sumber pendapatan petani dan pendapatan asli daerah. Untuk meningkatkan produksi, maka perlu upaya pengoptimalan fungsi tanah dan sistem perakaran. Tujuan penelitian ini untuk mendiagnosis tanah dan keberadaan akar kelapa dalam di perkebunan lontang Kota Manado. Hasil penelitian menunjukkan pada kedalaman 1 m penurunan kadar C-Organik belum diikuti dengan peningkatan berat isi tanah, dikarenakan C-Organik menyebar sama dalam keadaan sedang dan pada kedalaman >1 meter untuk jarak profil 3 dan 5 meter dari pohon utama yang tergolong rendah. Keberadaan akar kelapa dalam (Lrv dan Drv) menunjukkan bahwa semakin meningkat kedalaman tanah, nilai Lrv dan Drv akar semakin menurun seiring bahan organik di lapisan bawah (>1m) lebih rendah dari pada di atasnya. Nilai rata – rata Lrv dan Drv tertinggi berada pada kedalaman 0 – 60 cm. Keberadaan specrol pada profil jarak 1-3 meter menunjukkan banyak akar halus yang tumbuh pada jarak tersebut.

Keywords: Akar kelapa, berat kering akar (Drv), total panjang akar (LRV)

INTRODUCTION

Manado City of North Sulawesi Province is known as a waving palm city that is characterized by the spread of palm plants. Pandin (2009) reported that North Sulawesi has collected various types of coconut based on the nature of the speed of the first flowering, leaf number, number of bunches, levels of copra and oil content. Some types of coconut are known, among others, in Mapanget (DMT) and in Tenga (DTA), which produces more than 80 grains tree^{-1} yr^{-1}. Torar (2009) assessed through an intensive maintenance, the coconut can produce up to 2.5 Mg ha^{-1} yr^{-1} of copra which is much different with hybrid coconut copra that reach 4-5 Mg ha^{-1} yr^{-1}. However Runtunuwu *et al*. (2008) assessed the hybrid coconut that has been through the assembly of hybrid seeds with a relatively uniform growth, the productive growth is lower than the coconut that in a relatively can last up to 100 years. The coconut production can be increased by addition of nutrition in the form of chemical or organic fertilizers, the last is derived from organic matter to improve the growth of coconut through plant roots.

There is assumption that the roots spread as larger as its crown distribution, so application of fertilizer should be conducted circular rightly under the outer portion of the crown. This often reduces the efficiency level of fertilizer absorption because the contact level between the plant and fertilizer is low. Hairiah *et al.* (2000) stated that basic concept of the root connection with header is the function balance relationship, namely the root function in absorbing water and nutrient to meet the canopy needs instead of distribution size of the plant root system. The relationship between the roots and the plant canopy (Brouwer 1983) is a functional relationship. It means that the root serves to absorb water and nutrients to meet the needs of the canopy to continue photosynthesis. Instead, the header will send the result of photosynthesis of carbohydrates throughout the body of the plant including the roots.

Root growth is influenced by several factors in the soil, among others, the availability of nutrients, presence of toxic elements, water and soil physical conditions (soil content weight and porosity) (Kramer *et al.* 1995). For additional nutrients in coconut plantations, derived from plant biomass (leaves and fronds) and fertilizer application. In general, root growth will be hampered by the increasing of content weight (CW). The density of the soil in the bottom layer is high, usually measured from the high soil weight (g cm^{-3}). In general, the soil content weight increased with increasing soil depth, along with the lack of soil organic matter content, rooting activity, biota, and soil clay content. This is confirmed by Russell (1977) that the growth of plant roots is reduced with increasing soil CW and the growth had been stopped when particle density (PD) > 1.45 g cm^{-3}. The roots grow in soil that has a maximum soil CW of 1.46 g cm^{-3} on clay and 1.75 g cm^{-3} for sandy soil. But the study results of Hairiah et al. (2001), showed that an increasing of CW on Ultisol is really followed by an increasing the Lrv sengon (total length of roots) at soil depth of 40-70 cm and 70-100 cm. While the differences in inputs of organic matter in a plantation, will provide a different value of CW. It was shown by the research of Hairiah *et al.* (2011) for the zone between rows of palm trees which is a place of fertilizing for crop biomass have the lower CW than the zone around the trunk or in the zone between principals of each with CW by 1.12 g cm^{-3} and 1.20 g cm^{-3}. The decline in CW can be done through the addition of organic matter soil (OMC) content, because it helps the granulation process. Thus more and more granulation soil is formed, then the pore space is available also will multiply (Sutanto and Rachman 2002). These conditions are very favorable for growth of plant roots which was assummed to affect the density of tree roots. Any difference in the density of the roots of coconut trees will affect the number and placement of fertilizer given in order to increase the efficiency of fertilizer uptake.

This research aimed to diagnose the soil and existence of coconut root existence in Lontang Plantations of Manado.

MATERIALS AND METHODS

Study Sites

This research was conducted in June to October 2015 on land owned by farmers of Lontang Plantation in Manado. Soil observations were carried out on a single stretch of coconut plantations owned by community. The observation was done through the soil profile at a spacing of <1 m; 3 m and 5 m from the main tree of the coconut.

Observation Process

Every soil profile was observed based on the horizon, then the soil samples were taken to diagnose the physical properties of terrain. After that the observations of roots in the profile were done by taking into account the spread of the coconut roots. The coconut tree were selected based on coconut tree age > 30 years who had a less productive growth.

Observation method for root distribution is the soil trenching method. The hole of soil profile was created by size of 1 × 1 m with a path length of 1-6 meters in a perpendicular direction and then sideways out of the tree line. Roots distribution of coconut trees from every profile were sampled. Samples of soil and roots along the profile wall were cut into the size of 20 × 20 × 20 cm in order to obtain several pieces of soil samples. Samples of soil and water were removed by wet sieving, using 2 layers of sieve hole sized 2 mm and 250 ìm. Examples of root obtained is determined Lrv (cm cm^{-3}) by the interception method of line from Tenant (1975, *citation by* Smit *et al.* 2000) and Drv (g cm^{-3}). The total length of the root is determined by the method of interception line. The further samples of

Depth / Horizon	Soil Profile	Properties of Soil
0-9 cm / A		Dark brown color (7.5 YR 3/2), sandy clay loam texture, blocky structure, crumbly consistency, rooting number with diameter + 0.5 cm 3.
9 - 30 cm / AB		Dark brown color (7.5 YR 3/2), sandy clay loam texture, blocky structure, crumbly consistency until firm, rooting number with diameter ± 0.5 cm 20.
30- 51cm / Bt1		Dark brown color (7.5 YR 3/2), sandy clay textures, blocky structure, firm consistency, there is a tough membrane, rooting number with diameter ± 0.5 cm 20.
51 - 80cm / Bt2		The brown color (7.5 YR 4/2), dusty clay textures, blocky structure, firm consistency, there is a tough membrane, rooting number with diameter ± 0.5 cm 20.
80 – 100/ Bt3 cm		The brown color (7.5 YR 4/3), dusty clay textures, blocky structure, firm consistency, there is a tough membrane, rooting number with diameter ± 0.5 cm 5 - 10.
100 - 140 cm / Bt4		The brown color (7.5 YR 4/3), dusty clay textures, blocky structure, firm consistency, there is a tough membrane, rooting number with diameter ± 0.5 cm 5 - 10.

Figure 1. Soil profile at spacing of 1 m from the Coconut tree and interpretation results.

roots were roasted at 80 °C for ± 24 hours and the dry weights were weighed.

Soil Analysis

After conducting the root observations, in every depth, soil sampling were than to measure the concentrations of total C-organics and CW. The soil samples were taken from depths of 0-20 cm to 100 cm and were conducted for each zone, per depth with intervals of 20 cm. The soil samples were dried, pulverized and weresifted through sieve with diameter of 2 mm. Total C-organics were measured by using a Walkey and Black method. Soil CW measurement was done by taking the land intact in the field, with a size of 20 cm × 20 cm × 20 cm. Sampling was done on the land which was cleaned of weeds and litter. Soil samplings were repeated at every depth of 20 cm until the depth of 100 cm. The soil wet weight ias much as 500 g was ovened at 105 °C for 24 hours and then weighed of its dry weight. The data obtained was interpreted descriptively.

RESULTS AND DISCUSSION

Based on Resource Map exploratory soil (Pusat Penelitian Tanah Agroklimat 2000), the study area (coordinate point of N 01° 26’14.7", E 124° 49’33.2") has the main material of the plains volcanic which became the main material in forming the soil Inceptisol order of Dystrudepts group. The Inceptisol order is a land with cambic horizon (such as: a horizon that has experienced alteration) with the upper limit at 100 cm and the lower limit at a depth of 25 cm or more than the surface of mineral soil, or have no material sulfide in the depth of 50 cm of the mineral soil surface, and at a depth of between 20 and 50 cm below the mineral soil surface that

Depth / Horizon	Soil Profile	Properties of Soil
0-7 cm / A		Dark brown color (7.5 YR 3/2), sandy clay loam texture, blocky structure, very crumbly consistency.
7 - 26 cm / AB		Dark brown color (7.5 YR 3/2), sandy clay loam texture, blocky structure, crumbly consistency until firm, rooting number with diameter ± 0.5 cm 1.
26 - 44cm / Bt1		Dark brown color (7.5 YR 3/3), dusty clay textures, blocky structure, firm consistency, there is a tough membrane, rooting number with diameter ± 0.5 cm 1.
44 - 64cm / Bt2		The brown color (7.5 YR 4/2), dusty clay textures, blocky structure, firm consistency, there is a tough membrane, rooting number with diameter ± 0.5 cm 4.
64 – 82/ Bt3 cm		The brown color (7.5 YR 4/3), dusty clay textures, blocky structure, firm consistency, there is a tough membrane, rooting number with diameter ± 0.5 cm 3.
82 - 100 cm / Bt4		Dark brown color until brown (7.5 YR 3/3 - 4/3), dusty clay textures, blocky structure, firm consistency, there is a tough membrane, rooting number with diameter ± 0.5 cm 2.

Figure 2. Soil profile at spacing of 3 m from the Coconut tree and its interpretation.

has a value of 0.7 or less in one or more their sub-horizon, or has a clay content of less than 8 percent in one or more their sub-horizon and has epipedon umbrik, Molik, histik (both mineral and organic). This land is still relatively young, soil properties are varied depending on the main material, including a finer texture of fine sand argillaceous, very acidic to neutral, depending on the origin and nature of the material with its environment. It is in mountainous or hilly slopes with shallow and rocky soil. In the study area it was found the sub order of Udepts on the Dystrudepts group as a land with kambik horizon by the upper limit at 100 cm and the lower limit at a depth of 25 cm or more by wet saturation as less than 60 percent at one horizon or more between a depth of 25 cm and 75 cm from mineral soil surface, and has a hick moisture regime. The results of soil profile observation for spacing of 1 m from a coconut tree is shown in Figure 1, and at a spacing of 3 m from the coconut tree is shown in Figure 2, and at a spacing of 5 m from the coconut tree is shown in Figure 3.

Figure 1 shows that the soil color at a depth of 0-51 cm is dark brown (7.5 YR 3/2) and at a depth of 51- 140 is brown (7.5 YR 4/3). The textures are (sandy clay loam at a depth of 0-30 cm, sandy clay at a depth of 30-51cm and dusty clay at a depth of 51-140 cm). The soil structure is blocky with a crumbly consistency (0-9 cm), crumbly until firm (9-30 cm) and firm (30-140).

Figure 2, shows the color of the soil at a depth of 0-44 cm is dark chocolate, at a depth of 44-82 is brown and at a depth of 82-100 is dark brown until brown. Texture of sandy clay loam is at a depth of 0-26 cm, and the dusty clay is at a depth of 26-100 cm. Soil structure is blockly with very crumbly consistency (0-7 cm), crumbly until firm (7-26 cm), strong (26-100 cm). There is a tough membrane at a depth of 44-100 cmF.

Depth / Horizon	Soil Profile	Properties of Soil
0-6 cm / A		Dark brown color (7.5 YR 3/2), sandy clay loam texture, blocky structure, consistency is very crumbly, rooting number with diameter ± 0.5 cm 3.
6 - 24 cm / AB		Dark brown color (7.5 YR 3/2), sandy clay loam texture, blocky structure, consistency is crumbly until slightly firm, rooting number with diameter ± 0.5 cm 2.
24 - 41cm / Bt1		The brown color (7.5 YR 4/2), dusty clay textures, blocky structure, consistency is crumbly until slightly firm, there is a tough membrane, rooting number wirh diameter ± 0.5 cm 1.
41 - 55cm / Bt2		The brown color (7.5 YR 4/2), dusty clay textures, blocky structure, consistency is crumbly until firm, there is a tough membrane.
55 – 72/ Bt3 cm		The brown color (7.5 YR 4/2), dusty clay textures, blocky structure, consistency is crumbly until firm, there is a tough membrane, rooting number with diameter ± 0.5 cm 2.
82 - 100 cm / Bt4		The brown color (7.5 YR 4/2 - 4/3), dusty clay textures, blocky structure, consistency is crumbly until firm, there is a tough membrane.

Figure 3. Soil profile at spacing of 5 m from the Coconut tree and its interpretation.

Figure 3 shows soil color at a depth of 0-24 cm dark brown and at a depth of 24-100 cm is brown. Texture of sandy clay loam is at a depth of 0-24 cm, and the dusty clay is at a depth of 24-100 cm. Soil structure is blockly with very crumbly consistency (0-6 cm), crumbly until slightly firm (6-41 cm), crumbly until firm (41-100 cm). There is a clay membranes at a depth of 41-55 cm and of 82-100 cm.

C-organic level on the lower layer of soil profile spacing of 3-5 m has decreased although it is not significant at a depth of 80 cm, while at spacing of 1 m at depth until 1 m, C-organic level is still relatively moderate (decreasing is not significant). The percentage of soil C-organic is ranged from 4.10 to 2.84% (moderate until low).

Decreasing of C-organic level has not been followed by an increasing of soil content weight (Figure 4) where the value of CW in general is ranged from 0.3 to 0.7 g cm^{-3}), because the C-organic spreads equally in a state of moderate, and only at the depth of 1 meter for spacing of 3 and 5 m are relatively low. The C-organic levels is supposed to be sleady because the root will still be remained in the area during the crop needs.

Average value of C-organic at profile spacing of 1 m from the coconut tree is ranged from 2.20 to 2.38% (classified as moderate for layer 0-100 cm) with organic matter content of 3.79 to 4.10%. At profile spacing of 3 m from coconut trees, C- organic values is ranged from 1.65 – 2.26% (relatively low only in the lining of 80-100 cm and of 2.84-3.89% (moderate in the lining of 0-80 cm). At profile spacing of 5 m from coconut trees, C-organic values is ranged from 1.89 – 2.38% (relatively low only in the lining of 80-100 cm) and at 0-80 cm is classified as moderate with organic matter content of 3.26 to 4.10%. This showed that the soil where the coconut growth is classified as good in absorbing nutrients, so that the potential for leaching will be smaller.

In relation to the coconut roots (Lrv and Drv), it has been known that the deeper the soil depth, the Lrv and Drv root values will be more decreasing as the organic matter content in the bottom layer (> 1m) is lower than the surface layer.

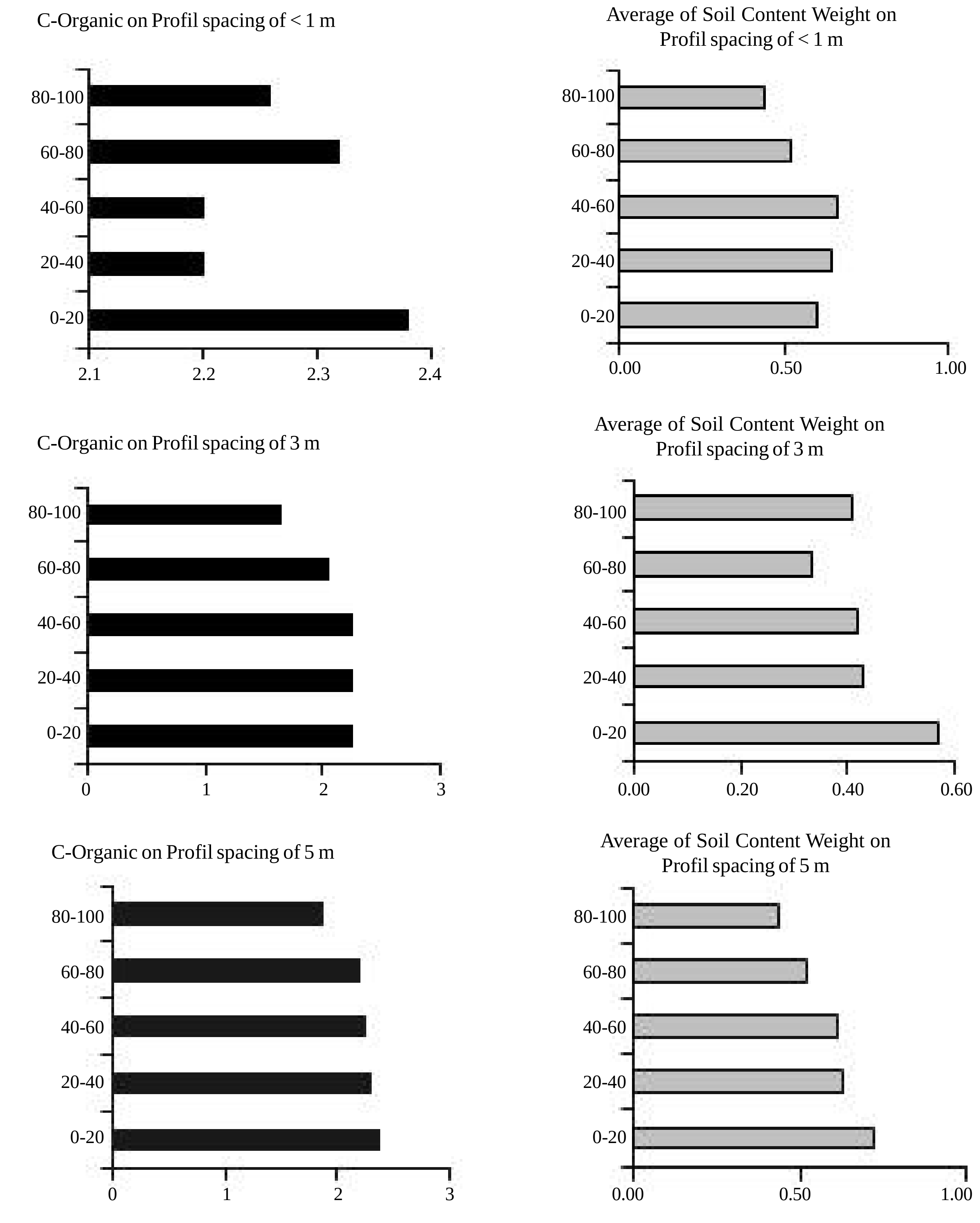

Figure 4. The average of C-organic and content weight in each soil profile under different depths.

So that the roots are difficult to spread on the bottom layer and prefer to grow more concentrated on the soil surface. Because in the soil surface there have a lot of nutrients and water to meet the plants need.

In general, the patterns of the coconut Lrv decreased with increasing the soil depth. The average of Lrv values ranged between 1330 cm cm^{-3} up to 503 cm cm^{-3} for profile spacing of 1 m from the main tree and ranged from 68 cm cm^{-3} to 259 cm cm-3 for profile spacing of 3 m from the main tree and ranged from 2.5 cm cm^{-3} to 28.5 cm cm^{-3} for profile spacing of 5 m from the main tree.

Based on the soil depth, the highest average value of Lrv is at a depth of 0-20 cm and that value

Figure 5. Snapshot of roots and porous space existences in profile of the main Coconut tree soil.

will be smaller with the increasing of the depth. It is similar to Morris and Tai (2004) who studied on the root of sugarcane (Saccharum spp.) that about 73% of the total root length was located in the upper soil layer regardless of water-table. From the distribution of average value of Lev per spacing is known that the profiles spacing of 1m has average value of LRV> 100 cm cm^{-3} and at a spacing of 3 m has a LRV> 50 - 260 cm cm^{-3}, while at a spacing of 5 m has Lrv > 2.5 - < 30 cm cm^{-3}.

The average value of Drv on profile spacing of <1 m from the main tree for soft roots (tertiary and quaternary) ranged between 1.8 g cm^{-3} until 17.6 g cm^{-3} and for coarse roots (primary and secondary) ranged from 37 g cm^{-3} until 188.5 g cm^{-3}. The average value of Drv at profile spacing of 3 m from the main tree for soft roots (tertiary and quaternary) ranged from 0.6 g cm^{-3} to 2.5 g cm^{-3} and for coarse roots (primary and secondary) ranged from 5 g cm^{-3} to 26.4 g cm^{-3}. The average value of Drv at profiles spacing of 5 m from the main tree for soft roots (tertiary and quaternary) ranged between 0.2 g cm^{-3} to 2.6 g cm^{-3} and for coarse roots (primary and secondary) ranged between 0.2 g cm^{-3} until 6.31 g cm^{-3}.

Based on soil depth, average value of Drv for the highest soft roots was at a depth of 0-20 cm and that values got smaller with the increasing depth. The highest average of drv was obtained at a profil spacing of 1m from the main tree, which reached 17.6 g cm^{-3}, while at the profile spacing of 3 m and 5 m from the main tree tended to have almost the same values under 3 g cm^{-3}.

In this study, the size of the root is calculated from soft roots (tertiary and quaternary roots). The size of the roots can indirectly indicated by the ratio value of the Lrv and Drv which is usually referred to as the specific root length Specrol (cm g^{-1}). The higher value indicates the smaller root diameter or more soft root.

Average value of coconut roots spectrol ranged from 28.5 cm g^{-1} to 72.7 cm g^{-1} for profile spacing of 1 m from the main tree and ranged from 37 cm g^{-1} to 121 cm g^{-1} for the spacing profile of 3 m from the main tree and ranged from 7.5 cm g^{-1} to 18.1

cm g^{-1} for profiles spacing within 5 m of the main tree. The highest average values of Lrv and Drv were located at a depth of 0-60 cm. This means that the rooting is more concentrated on the depth where the roots grow to absorb nutrients and water for plants. However, the research of Lakshmi and Anita (2015) in a study conducted in coconut gardens indicated that coconut roots exploited only 20 to 25 percent of land area and depending upon the canopy coverage.

Lrv and Drv values are one indicator of the root density. So the higher value of the Lrv and Drv indicates the higher density of roots. On the other hand, the existence of spectrol at a profile spacing of 1-3 m showed a lot of soft roots growing in the spacing at some depth, where these soft roots have the most effective role in the absorption of nutrients and water for plants due to conduct the direct contact with the soil. Pahan (2007) assessed the tertiary and quarter roots are the nearest part of rooting with to the soil. Both root types have a lot of grown by soft hairs which is most effective in absorbing water, air and soil nutrients.

Figure 5 shows how the roots grow in the soil due to the water source and it also shows there is a hole that forms a membrane filled with air and water at rainy season. The growth of root has grown well in the soil with low density. According to Russell (1977), growth of plant roots were reduced with increasing the soil CW, the growth had been stoped when Pd > 1.45 g cm^{-3} and a maximum of roots grown on soil with soil CW of 1.46 g cm^{-3} on clay soil and in the study location the new soil content weight reached 0.3 to 0.7 g cm^{-3}.

The proportion of dry root weight of tertiary-quarter with the primary-secondary roots are still higher on primary and secondary roots for every depth in the ratio of 1: 10-20 (for the spacing profile <1 m), 1: 6-20 (for the spacing profile 3 m) and 1: 1-6 (for the spacing profile 5 m). Tertiary-quarter roots are classified as soft according to Bohm (1979) the size of the root diameter includes into the group of very soft roots. In addition to the small size of its diameter, the tertiary roots are short sized and very sensitive toward interference (perishable). On the other hand, the structure of dense soil will inhibit the rate of deeper penetration roots. Due to the dense soil is difficult to penetrate by the roots, then the root elongation area is getting shorter. Soil that has a high density will have a low total root length. Russel (1977) argues that if the soil density increases, then the macro pore space decreases and root penetration is inhibited. Root growth inhibited at a high level of soil density can be seen on the dry weight of roots. On the soil with more condensed roots will build self-defenses by enlarging the size of its diameter. According Wiersum (1975) in Russel (1977) that the roots can not penetrate the soil pore with size smaller than the diameter and usually the diameter will raise if the extension is limited by external constraints.

Knowledge of the distribution of plant roots is needed to increase the synchronization between nutrients available and the root zone of plants. The results showed that the highest spread of the roots was at a spacing of 1-3 m. Thus the application of fertilizer should be conducted at the zone with full roots which is at a spacing of 1-3 m on the depht of 20-60 cm.

As an effort to absorb the fertilizer efficiently, in fertilizing with planting method (pocket) on tree rings are by punching holes in the area at a spacing of 1-3 m. It may be able to avoid the losing of fertilizer both because leaching and evaporation. According to Goh *et al*. (2003) some N in the fertilizers which are applied between the lines will be taken by the bottom plant and disappear during the process of decomposition and loss of N when volatilization will be greater when the urea applied above pieces of organic material in which the activity of urea is very large. Increasing the efficiency of nutrient uptake is influenced by synchronization between when the nutrients available and when the plants need (Myers *et al.* 1994) and synchronization between the availability of the right nutrients in the area of the roots existence. One of the strategies that the availability of nutrients under coconut trees remain available can be applied by livestock breeding. Zundel and Kilcher (2007) assessed the reduce nutrient loss through improving livestock systems with various forms of corralling and controlled grazing in favourable conditions that allow direct recycling of manure. Rufino *et al.* (2006) assessed, farmyard manure can contain large amounts of easily available nutrients and thus trigger immediate crop growth. In addition, Zundel and Kilcher (2007) stated a well balanced mixture of compost raw materials, especially materials rich in phosphorus such as chicken manure and sugarcane by-products, is excellent for overcoming problems with the phosphorus balance and at the same time a good source of organic carbon.

Prediction for efficiency of fertilizer can be done with some scenarios of fertilization strategies using simulation models with input data from this and other research could be done in the future, in order to reduce the loss of fertilizer through leaching and evaporation. According to Goh *et al*. (2003), assumed that the most suitable frequency for the application of fertilizers depends on (1) susceptibility to leaching of nutrients, (2) the capacity of the soil for nutrient retention, and (3) the pattern of rainfall distribution and intensity. Because NO_3 resulted from the mineralization of N-fertilizer is prone to leaching, more frequent applications may be required for N fertilizer than manure P, which is relatively immobile in the soil. The frequency of application K and Mg should be related to the clay content and mineralogy, and the soil cation exchange capacity.

CONCLUSIONS

Diagnosis of soil at a depth of 1 m indicated that decreased levels of C-Organic has not been followed by an increase of soil content weight, because the C-Organic spread equally in a state of middle and at a depth of > 1 meter for spacing profiles 3 and 5 meters from the main tree which is classified as low. Furthermore diagnosis the rooting showed that the roots of coconut (Lrv and Drv) will be more increasing in the soil depth, the value of Lrv and Drv roots declines as the organic material in the bottom layer (> 1 m) to be lower than the surface layer with the highest average value of Lrv and Drv is located at a depth of 0-60 cm. Spectrol existence at a profiles spacing of 1-3 m showed a lot of soft roots growing in the spacing, where this soft roots which has the most effective role in the absorption of nutrients and water for plants and do the direct contact with the soil.

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