Management Fertilizer Dosage of Peatland on Plant Conditions and Average Bunch Weight (ABW) of Palm Oil in the Sembilang Dangku Landscape

Rio Octarizza Segara¹, Hariyadi² and Sukarman³
¹Student, Department- Management of Natural Resources and the Environment, Bogor Agricultural University, INDONESIA
²Lecturer, Department of Agronomy and Horticulture, Bogor Agricultural University, INDONESIA
³Lecturer, Department Center for Land and Agriculture Resources, Ministry of Agriculture, INDONESIA
¹Corresponding Author: riooctsegara@gmail.com

ABSTRACT

Palm oil is a prospective crop in the plantation sector. Palm oil is currently contributing large foreign exchange to the country, especially in Indonesia. The problem that occurs is the increase in the area for oil palm plantation development has been limited. One alternative way that can be done is the utilization of neglected marginal land for example peatlands. This research was carried out on the dangku crossing landscape in lowland areas or 5 m above sea level. The results show FFB and ABW have no significant effect on the regression and correlation values at the level of 0.05. The effect of significant difference was shown by the results of average bunch weight (ABW) in T1 treatment, namely the dose of N <1 Kg and P <1.5 Kg which had the highest average compared to T2 and T3 treatments. In addition, fertilizer doses affect plant conditions and visual conditions of plant leaves. The average condition at the location of the planting year which observed normality of the plant was more than 75% with green leaf conditions around 80%. Based on this, it can be explained that fertilizer doses have a good effect on plants in the Sembilang dangku landscape in terms of ABW and plant conditions.

Keywords — ABW, Oil Palm, Peat Land, Plant Conditions

I. INTRODUCTION

Palm oil is a prospective crop in the world of plantations and businesses. This is evidenced by the high demand for world palm oil both at home and abroad. This is evidenced by approximately 10 million hectares of oil palm plantations in Indonesia [3]. The limited amount of land available is a limitation that has a very large influence on this industry. One alternative that can be done is the utilization of neglected marginal land such as peatlands [9].

Indonesia's peatland area is 14.85 million ha [8] while the unproductive area of peatland in Indonesia is reported to be 4.2 million ha [2]. Peatlands in South Sumatra are quite extensive, approximately 1.42 million ha, which are spread mostly in three districts, namely Ogan Komering Ilir, Musi Banyu Asin and Banyuasin [10].

Nowadays, partial management of natural and environmental resources has not been considered successful due to being too conservative. Landscape-based management is able to combine management with exploratory economic goals and the goal of maintaining conservative environmental services [6]. Sembilang Dangku area is one of the lowland forest areas with sloping topography remaining in South Sumatra. The Province of South Sumatra has a Sembilang Dangku Landscape whose management balances the needs of the community with environmental conservation and utilization of environmental services. One part of this landscape is oil palm plantations [5]. This study discusses management fertilizer dosage on plant conditions and oil palm Fresh Fruit Bunch (FFB) production especially for Average Bunch Weight (ABW) in the Sembilang Dangku Landscape in South Sumatra, Indonesia. This study aims to look at the effect of fertilizer dosage on oil palm plants on peatland to the condition of the crop and the results obtained, namely FFB (fresh fruit bunches) and ABW (average bunch weight).

II. METHODOLOGY

This research was doing in January-March 2018 which are included data collection in the field, data
RESULTS AND DISCUSSION

Fertilizer Dosage

The following will explain the type of fertilizer and fertilizer dosage used by the company / estate at the research location. The effect of fertilizer will be related to ABW (average bunch weight) and FFB (fresh fruit bunches). The type of fertilizer used in these locations are:

A: Hi kay plus 13.6.27 (Location 1) dose 3 Kg each treatment with 3x application every year,
B: NPK 15.10.23 (Location 2) dose 2-3 Kg each treatment with 2x every year,
C: NK21.32 and RP.11 (Locations 3, 4 and 5) dose 3 Kg each treatment with 3x every year,
D: NPK 15.15.15 (Location 6) dose 2 Kg each treatment with 2x every year.

Based on the results obtained, L6 location has the least dose and treatment values compared to L1 to L5. The results of the fertilizer type formula will produce different FFB and ABW production. The results obtained in the Minitab 17 application on the Pearson correlation value between FFB and ABW is -0.418 which means that the value of FFB is inversely proportional to ABW and it is also consistent with the p-value results (0.00> 0.005) which means that it is not significantly different. So, there is no correlation between FFB and ABW. Observation of regression value between FFB and ABW shows p-value: 0.00> 0.05, meaning that it is not significantly different so, there is no influence between FFB and ABW.

Regression equation obtained by ABW = 16.72 – 1.109 FFB, meaning that each increase in ABW is one Kg, then the value of FFB decreases by 1.109 units. In addition, the coefficient of determination (R²) shows a value of 17.5% meaning that the influence given is only 17.5%, remaining influenced by other factors not addressed in the model. this explanation is illustrated in Figure 1 and figure 2.
Regression Analysis elements N and K

Wet areas generally have N availability in low soils and organic matter that can decompose is very quickly mineralized. In addition, the availability of element K is also low so that the need for fertilizer for nutrients is important (Pahan 2013). This is because the nature of the two elements is quickly washed out and quickly decomposes. Based on this, an effect of N and K levels on ABW have to analyze to see the influence of the elements. Regression analysis of N and K elements to see the significance of data from factors N and K whether related to FFB and ABW values.

Another basis is the observation of correlation values aiming to measure the strength (strength) or degree (linear) of a linear relationship correlation coefficient is needed. Whereas, regression does not make such measurements. Regression aims to make estimates or predict the average value of one variable based on the fixed values of other variables [4], so that in this study both of them do to see whether there is a response effect of the strength of the correlation on the estimated average variable value of regression results. The following will show the results of the correlation analysis and regression data.

Table 1. Regression Analysis : FFB versus N, K

| Term | Coef | SE Coef | T-value | p-value |
|------|------|---------|---------|---------|
| Constant | 5.731 | 0.798 | 7.18 | 0.00 |
| N | 2.44 | 1.66 | 1.47 | 0.16 |
| K | -1.42 | 1.1 | -1.29 | 0.22 |

Based on the results in Table 1, the equation obtained is FFB = 5.731 + 2.44 N - 1.42 K meaning that each increase in FFB value of one unit then the value of N increases by 2.44 and the value of K decreases by 1.42 besides that, the p-value value has no value <0.05 means that it is not significantly different, so that the N and K values have no effect on the number of FFB.

The Pearson correlation of N and FFB values is 0.190 with a p-value of 0.422 so that N and FFB elements are small or weak. In addition, the Pearson correlation of K and FFB = 0.101 with p-value = 0.673 This also means that the element K is weakly correlated to FFB production.

Table 2. Regression Analysis : ABW versus N, K

| Term | Coef | SE Coef | T-value | p-value |
|------|------|---------|---------|---------|
| Constant | 15.07 | 1.77 | 8.52 | 0.00 |
| N | -3.77 | 3.68 | -1.02 | 0.32 |
| K | 0.27 | 2.44 | 0.11 | 0.91 |

Based on the results in Table 2, the equation obtained is ABW = 15.07 - 3.77 N + 0.27 K means that each increase in ABW value of one unit then the value of N decreases by 3.77 and the value of K decreases by 0.27 besides, the p-value value does not have a value <0.05 means that it is not significantly different, so the N and K values do not affect the number of ABW.

The results of different analyzes are shown by the Pearson correlation of N and ABW with a value of -0.621. although it is negative the p-value shows a value of 0.003 This indicates that the correlation is strong but the opposite means that if the value of N is small then the ABW value will be large. This is supported also by the Pearson correlation of K and ABW of -0.590 with p-value = 0.006. This indicates that the element K is strongly correlated with ABW but its opposite nature. The overall results regarding the correlation of N and K to ABW are significantly different because the results of p-value <0.05 but have opposing properties. So, that it can be explained that if the N and K values increase, the ABW value will decrease.

Subsequent testing of plant conditions. This is certainly related to fertilizer dosage, because if fertilization is done properly, the plant will grow fresh and normal. This can also be seen visually and explained in table 3. Table 3 describes the condition of plants and the condition of plant nutrition through the visual color of the leaves. The results obtained were planted normality, leaf color, number of midribs, FFB and ABW. The results obtained are the results of the average planting year in the observed block.

Table 3 Plant conditions in the Sembilang Dangku Landscape

| LS | Year | Plant Conditions (%) | Leaves condition(%) | NM |
|----|------|----------------------|---------------------|----|
|    |      | N  A  D  G  G-Y  Y   |                     |    |
| L1 | 2007 | 100 0 0 100 0 0     | 56                  |    |
|    | 2008 | 98  3 0 96  4  0    | 47                  |    |
The results showed that the normal condition of the plant was good enough, that is an average of 75-85%, although there are locations with normal plant values below 75%, namely L6 locations with an average value of 66.7%. This can be seen from the various points of the observed planting year. Although the age of the planting year is different, the average crop condition is quite good. In visual leaf color observations, the condition is good that is 80% green, although some are yellowish green and yellow, but only found in a few years of planting, such as locations L3 and L5 which have a yellowish green color>50% while the leaves are yellow found in some L2 planting block years but not significant because around 10% of the population. Color provides valuable information in estimating the maturity and examining plantation moreover it is good indicator for healthy plantation and ripeness [1]. This shows the effect of fertilizer doses (N and K elements) is quite important to the condition of the plant. Because the effect is directly related to the plant either quickly or slowly in fulfilling the growth and development of the principal of the plant. The number of midribs generally looks normal or is often pruned and cleaned so that the plants look neat in various planting years.

IV. CONCLUSION

The results between FFB and ABW do not have a real effect in regression and have a contrasting correlation value of -0.418. The results of regression value analysis of elements N and K to the FFB and ABW values show the same value that is not significant or p-value>0.05 so that the observed sample of N and K elements cannot estimate the number of FFB (units) and weight of FFB (Kg). In observing the correlation values between elements N and K to FFB, the result is a weak relationship. While the correlation of elements N and K to ABW shows a significant value (p-value <0.05) both elements N and element K but the value is opposite. Based on this, it can be explained if a high dose of N and K is given, the ABW (average bunch weight) value will be low. Plant conditions indicate that various plants that have different ages at the plantation site. Landscape Sembilang Dangku generally have a fairly high plant normality and the leaves are relatively green although there are several abnormal planting locations and yellow leaf color, this number is quite small when compared to normal plants and green plant leaves. Based on this, the dosage of fertilizer given to plants generally affects the plant staple/year and has an effect on plant growth either sooner or later.

REFERENCES

[1] Afatni MSM, Shariff ARM, Helmi ZMS, Saaed OMB, & Eshanta OM. (2008). Oil palm fruit bunch grading system using red, green and blue digital number. *Journal of Applied Sciences, 8*(8), 1444-1452.

[2] BBSDL. Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian. (2013). *Peta dan Rekomendasi Pengelolaan Lahan Gambut Terdegradasi di Sumatera*. Bogor (ID): Kementerian Pertanian.

[3] Dijenbun. Direktorat Jenderal Perkebunan. (2013). *Statistik Perkebunan Indonesia 2012-2014: Kelapa sawit*. Jakarta (ID): Kementerian Pertanian.

[4] Gujarati and Porter. (2009). *Dasar-dasar Ekonometrika*. Jakarta (ID): Salemba Empat.

[5] Kelola Sendang. (2017). *Kemitraan Pengelolaan Lanskap Sembilang Dangku*. Palembang (ID): Zoological Society of London (ZSL).

[6] Prasetyo LB. (2017). *Pendekatan Ekologi Lanskap untuk Konservasi Biodiversitas*. Bogor (ID): Fakultas Kehutanan Institut Pertanian Bogor.

[7] Pratisto A. (2014). *Cara Mudah Mengatasi Masalah Statistik dan Rancangan Peercobaan dengan SPSS 12*. Jakarta (ID): PT Elex Media Komputindo.

[8] Wahyunto W, Nugroho K, Ritung S, & Sulaeman Y. (2014). *Peta lahan gambut Indonesia: Metode pembuatan, tingkat keyakinan dan penggunaan*. In A. Wihardjuka, E. Majtu ah, Salvati, Husnain, & F. Agus (Eds.), *Prosiding Seminar Nasional dan Network Meeting Pengelolaan Berkelanjutan Lahan Gambut Terdegradasi untuk Mitigasi Emisi Karbon dan Peningkatan Nilai Ekonomi*, 81–96.

[9] Winarna, Santoso H, Yusuf MA, Sumaryanto, & Sutarta ES. (2014). Pertumbuhan Tanaman Kelapa Sawit di Lahan Pasang Surut (Oil palm growth on tidal land).
[10] Zulfikar. (2006). Kebijakan Pengelolaan Kawasan Hutan Rawa Gambut dengan Pola KPH di Provinsi Sumatera Selatan. Dalam: Rimbawanto et al. (ed). Prosiding Seminar Pengelolaan Hutan dan Lahan Rawa Secara Bijaksana dan Terpadu. Pusat Penelitian dan Pengembangan Hutan Tanaman, Badan Litbang Kehutanan, 7-13.