Mapping Plant Nutrient Status of Oil Palm (*Elaeis guineensis* Jacq) Based Leaf N P K Pagar Manik Silinda Serdang District of Bedagai

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Mapping Plant Nutrient Status of Oil Palm (*Elaeis guineensis* Jacq) Based Leaf N P K Pagar Manik Silinda Serdang District of Bedagai

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Abstract. This study aims to identify the fertility variables that are obstacles in Silinda District by evaluating soil fertility status and reviewing management alternatives that are in accordance with the soil fertility status at the site at an altitude of ± 242 m asl. This research is a phenomenological qualitative descriptive study with a semi-detailed survey level free grid survey method and supported by qualitative laboratory analysis. Nutrient status mapping is carried out based on N P K leaves and seen on the administrative map of the village fence bead district silinda regency serdang bedagai. The results showed that nutrient status mapping for oil palm plants (Elaeis quenensis Jacq) in the study area was optimum at N nutrient levels with a value of 2.4% and deficiencies in P and K and could be made an effort to improve by providing manure and organic fertilizer .

1. Introduction

Palm oil is one of the commodities that has become the world's favorite. In the last two decades the palm oil business has grown above 10% per year, far leaving other plantation commodities that have grown below 5%. Palm oil as a palm oil producer (CPO - crude palm oil) and palm oil core (CPO) is one of the favorite plantations that are a source of non-oil and gas foreign exchange for Indonesia. Bright prospects for investment in palm oil commodities in the world trade in vegetable oils have encouraged the Indonesian government to spur the development of oil palm plantations. There is also a growing world need for palm oil. Opportunities for oil palm business development are very promising, as seen from the increasing demand every year. There is a bright hope that in the future for the development of bio-diesel as an environmentally friendly alternative fuel that has begun to develop and will replace oil fuels originating from the earth [1].

Survey and mapping of nutrient status is a work unit that complements and benefits each other to increase its use such as the physical and environmental conditions of the survey location, land conditions, classification and interpretation of land capabilities and suggestions / recommendations. Palm oil is a plant that requires large amounts of N, P and K nutrients. N, P and K nutrient requirements are usually given in the form of inorganic and organic fertilizers. The use of inorganic fertilizers containing N, P and K elements can reach 6-8 kg / tree / year for immature plants (TBM), and 8 - 12 kg / tree / year for producing plants (TM) [2]. Palm oil leaves resemble coconut leaves, which form a compound arrangement, even finned, and reinforced parallel. The leaves form one midrib which reaches 7.59 m in length. The number of leaves in each midrib ranges from 250-400

strands. Leaf production depends on the local climate. In North Sumatra leaf production can reach 20-24 strands / year. The age of the leaves begins to form until about 6-7 years old. Healthy and fresh palm leaves are dark green [3]. The number of midribs, the length of midribs, and the number of leaflets depends on the age of the plant. Older plants have more leaves and children. Similarly, the midrib will be longer than the plants that are still young. Mature plants can produce 40-50 midribs. Plants that are around 10-13 years old, leaf surface area can reach 10-15 m^2. The leaf surface area will interact with the level of plant productivity. The more surface area or the more number of leaves, the production will increase because the photosynthesis process will run well. Photosynthesis process will be optimal if the leaf surface area reaches 11 m^2 [4].

In this problem, one of the efforts made was survey and mapping activities. The purpose of the survey and mapping is to provide or provide information for land users, form of territory, and other conditions that need to be known including nutrient availability needed to increase production and also assist in making decisions about land use and planning development of the area surveyed [5]. Based on the description above, the authors are interested in knowing and analyzing the mapping of nutrient status of oil palm plants based on NPK leaves in the village of bead fence, sub-district Silinda, Serdang, Bedagai.

2. Method

The research was carried out at the people's plantation in Pagarmanik Village, Silinda Subdistrict, Serdang Bedagai Regency, North Sumatra and continued with leaf analysis conducted at PT Socfin Indonesia Laboratory and at the Central Laboratory of Soil Sciences, Faculty of Agriculture, University of North Sumatra. Research activities were held in October 2017 until December 2017. This research uses sampling of palm oil leaves. The method used in this study is a semi-detailed survey level free grid survey method (observation density of 1 sample per 100 m) Implementation of sampling of palm oil leaves as many as 9 sample trees with a distance of 100 m in the field using scattered random methods with a predetermined area with based on the basic map in the manner as presented in Figure then the data is analyzed by Variant analysis on each parameter measured and tested further for the real treatment using the Duncan Multiple Range Test at the level of 5%.

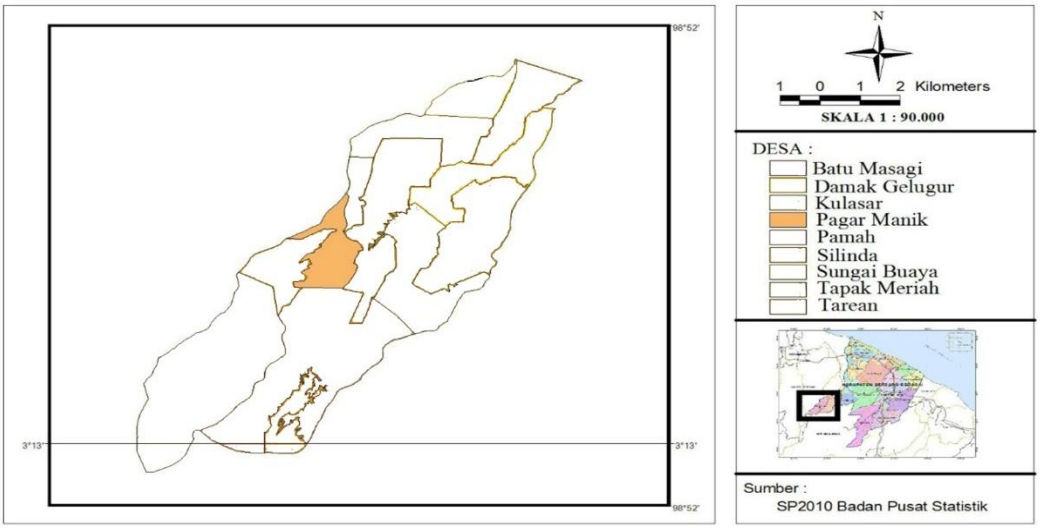

Figure 1. Administration Map of Research Sites

2.1. Leaf Sampling

Sampling of leaf samples was also done vertically with several locations in plants producing 1 with age ranging from 3-4 years old used 9th bale and in crop yield 2 with age around 20 years in 17th breeze. The tree used as the example tree should meet some of the following provisions: (a) Normal tree, (b) Healthy and not sick, (c) Not near the road, trench or building, and (d) Not adjacent to dead trees or inserts

3. Result and Discussion

3.1. Mapping of nutrient

Climate data used in this study is climate data Pt Cinta Jaya, within ± 2 km from the research location. The climate data used is rainfall data in 2018, this data is considered to be able to represent the climate in the research location, considering that there is no rainfall (climate) station in the Silinda Sub-District area. Palm Oil which has high economic value is suitable to be developed in areas that have ideal altitudes ranging from 0-400 m above sea level, rainfall of 2,000-2,500 mm / year, optimum temperature is 29-30 ° C, sunlight intensity is around 5-7 hours / day with an average irradiation of 6 hr/day, the optimum humidity is around 80-90%. Evenly distributed rainfall throughout the year resulted in a lesser fruit yield, because it can result in vegetative growth being more dominant than generative growth, so that the flowers/fruits formed become smaller [7]. Based on the land taxonomy system, the place of this study has soil types namely *Kandiudults* and *Dystrudepts* or soil inseptisol in Figure 2.

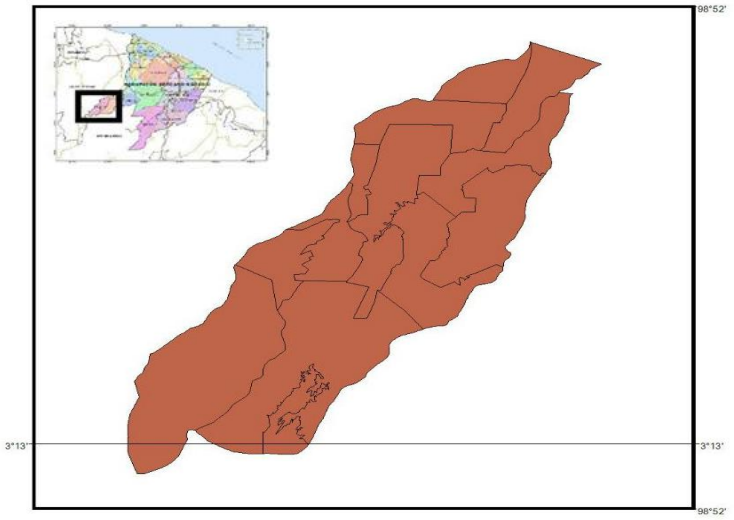

Figure 2. Map of Soil Sub-district (Scale 1 : 90,000)

From the results of sampling leaves of oil palm plants in Pagar Manik Village, Silinda District, 24 leaf samples were obtained. The results of the N-Kjehldahl, P-Total, K-Total analysis of the leaf samples were evaluated based on Von Uexkull and Fairhust soil nutrient criteria. From Table 1, it can be seen that nutrient content of palm oil leaves in Pagar Manik Village, Silinda District was in optimum condition and was supported by previous study that organic material not only adds nutrients to plants, but also can create conditions that are suitable for plants and improve aeration, facilitate root penetration, improve water holding capacity, increase soil pH, CEC, and nutrient uptake [8]. The most influential N elements in leaf development with high doses, may cause leaves becomes longer to a certain extent that plants can tolerate [9].

Table 1. Leaf nutrient content criteria on midrib

Nutrient Elements	Conservation Method			Optimal Conditions	Improvement Efforts
	PK	PC	RI		
N (%)	2.4 O	2.4 O	2.5 O	2.6–2.9 %	Fertilizing N Fertilizing cages
P (%)	0.14 D	0.14 D	0.10 D	0.16–0.19 %	Organic fertilizer
K (%)	0.75 D	1.27 O	0.50 D	1.1–1.3 %	Fertilizing K Fertilizing cages

Note: O: Optimum, D: Deficient

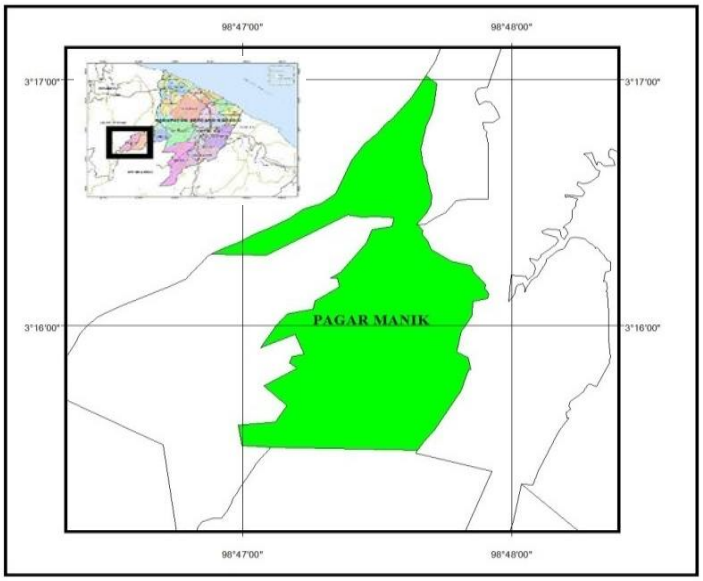

Figure 3. Criteria Map of Oil Palm Nutrient Levels in Pagar Manik Village, Silinda District, Serdang Bedagai Regency (Optimum range: 2.4–2.8%, Scale 1 : 25,000)

Nutrient content in palm oil leaves of Pagar Manik Village, Silinda Sub-district, were in deficiency conditions as for improvement efforts given, namely fertilizing organic matter. Organic materials can provide enormous benefits. Organic matter can be a source of N, P, K, and other nutrients, increasing soil CEC, reducing P absorption through the formation of complex compounds with amorphous oxide, increasing and improving soil aggregation and soil moisture, forming chelate with micro-nutrients, Al toxification and increasing soil biodiversity. This is in accordance with previous study which stated that the application of OPEFB can increase nutrient content and also reduce al-soil in the soil which is able to improve nutrient uptake of P and reduce Al-dd [10].

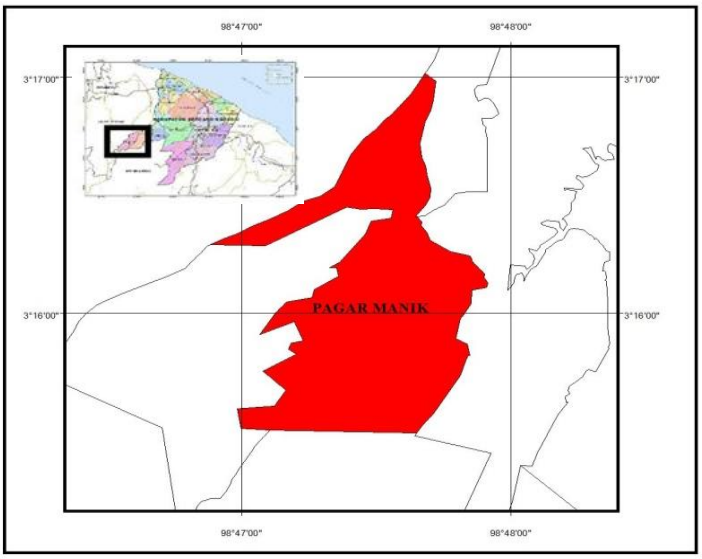

Figure 4. Criteria Map of Oil Palm Leaf Nutrient Level in Pagar Manik Village, Silinda District, Serdang Bedagai Regency (Deficiency range: 0.15–0.18%, Scale 1 : 25,000)

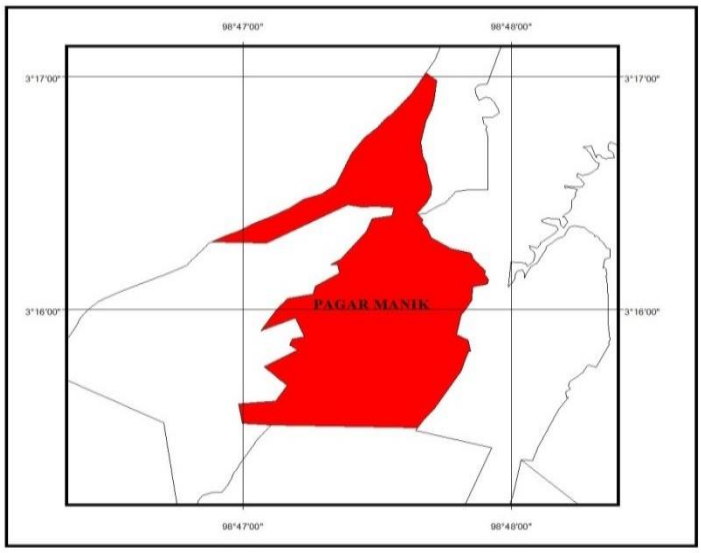

Figure 5. Criteria Map of Palm K Leaf Nutrient Level in Pagar Manik Village, Silinda District, Serdang Bedagai Regency (Deficiency range: 0.9–1.2%, Scale 1 : 25,000)

4. Conclusions

Mapping the nutrient status in N, P, K leaves from the results of the study determined that Optimum at nutrient content N was 2.5% and in nutrient content P deficiency with the lowest value of 0.10% and in nutrient content K deficiency with the lowest value of 0.50 % and improvement efforts are given manure and organic fertilizer.

Acknowledgments

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