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Land Suitability for Smallholder's Oil Palm Plantation in Seruyan Regency, Central Kalimantan, Indonesia

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Abstractct: *Extensive development of oil palm plantations in the Seruyan Regencyvery rapidly. Their land expansion activities require assessments about the suitability of land for palm trees. So that can know the precise management to be able to generate maximum productivity. The research method that has been used is exploratory survey methods (exploratory research). The analysis used is descriptive analysis in accordance with the requirements of growing oil crops put forward by Djaenudin et al (2003). Based on the survey results revealed that the general condition of the land in the SeruyanRegency land classified as very suitable (S1) for palm oil plantations. When viewed from the chemical characteristics of the soil, the land in this region has a low fertility rate, and is on sour land.*

Keywords:*smallholder's oil palm plantation, land suitability, soil fertility*

I. Introduction

Increased harvest oil palm, requiring a variety of good agricultural efforts, including the extension of cultivation (palm garden). These activities have orientation on expansion by opening and ensuring several new areas that had been left alone. In conducting the addition of oil palm plantations, it is necessary to vote on the land suitability for palm oil plants (Gray, 1969; Paramananthan, 1987). The physical properties of the soil such as soil solum depth, texture and structure of soil, an important factor that determines the level of land suitability for oil palm planting large scale (Mutert, 1999).

Palm garden soils generally have a pH of less than 5.0, most of the land is poor N-land, P-available, and K-exchange. Half of the land is poor oil palm to very poor Mg-exchange for the growth of palm trees. With the exception of P and Mg on soil terric-Troposaprist, oil palm planted in the ground is expected to greatly response to the application of N, P, K and Mg. Meanwhile soil amendment materials such as empty fruit bunches (EFB) and palm fertilizer, can be applied to improve nutrient deficiencies, soil physical limitations such as waterproof coating, and low water retention capacity is difficult to repair. Thus, the physical properties of soil such as soil solum depth, texture and structure of the soil, is the main criteria for assessing the suitability of land for palm oil plants for large scale oil palm plantation (Mutert, 1999).

Land suitability classification is the classification of land based on suitability for a particular purpose of use. In selecting suitable land for oil palm plantations are two stages. The first stage is to assess the growing requirements of cultivated plants, or some of the traits of the soil, and the location has a negative influence on the palm trees. The second stage is to identify and restrict land that has the desired properties, but without the undesirable traits (Tinker, 1976; Sitorus, 2004; Hardjowigeno, 2010).

In general, land suitability consisting of land suitability actual (current) and land suitability of potential (future) (Sys, et al., 1993). The actual land suitability is a picture of the suitability of land at the moment which is based on direct observation. The suitability of potential land is land suitability in the future, after the land changed because it was given a treatment. Land suitability evaluation is good can be expected the land to be used for planting can provide optimal results. Formulated objectives poured from the problems that have been put forward which is to analyze the suitability of Non-Governmental oil palm plantation in the Seruyan Regency.

II. Methods

2.1 Research Location

This research was conducted in the SeruyanRegency by taking the focus area of nongovernmental oil palm plantation area. Location of the study sample was taken (sample) knowingly is 4 (four) villages of 3 (three)

districts, the Sembuluh I Village (DanauSembuluhSubdistrict), PembuangHulu I Village, and PembuangHulu II Village (HanauSub district), TabikuVillage(Seruyan RayaSub district). The location was chosen because the regions are oil palm plantation development nongovernmental and already in production. The research was conducted between the months of August 2015. Geographically research sites can be seen in the Figure below.

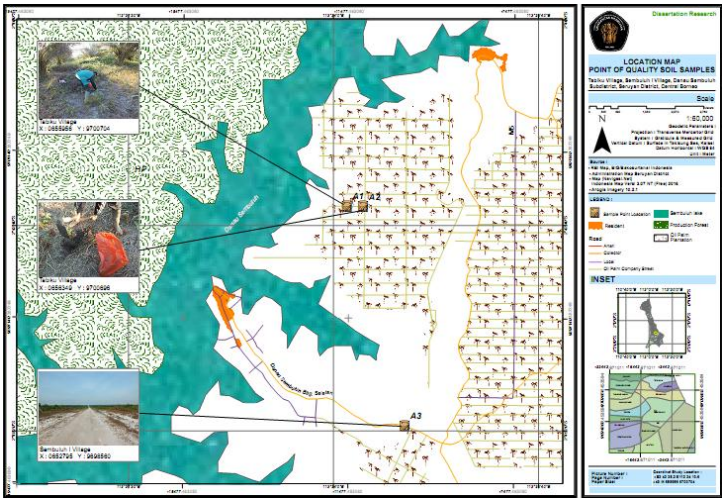

Figure1. Location of Sample Point the Soil Quality in Sembuluh I Village and Tabiku Village

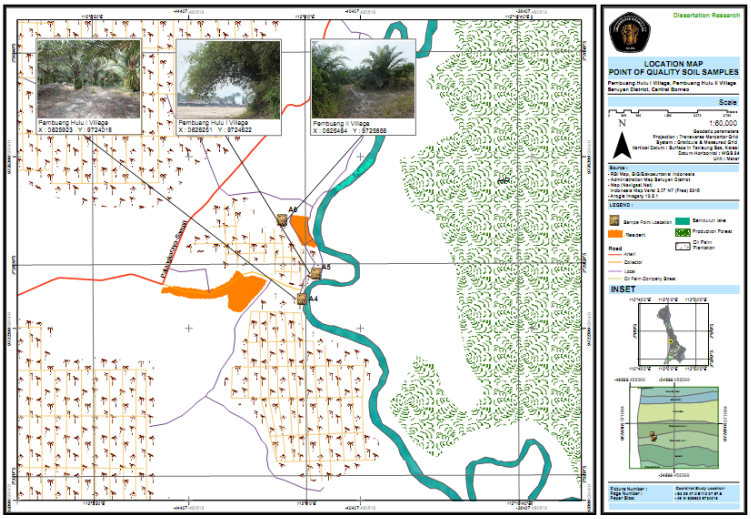

Figure1. The Sample point Locations of Soil Quality in PembuangHulu I Village and PembuangHulu II Village

2.2 Data Collection

Soil sampling aims to determine the characterization of soil fertility in the nongovernmental oil palm plantations. Soil samples were collected using a spade, at a depth of 15-20 cm. Each sample was then composited and about 500 g subsample was taken for analysis in the laboratory. Analysis of soil fertility includes several parameters, such as texture, pH, total-N, C-organic, cation exchange capacity(KTK), P_2O_5, K_2O, Ca, Mg, K, Na, Al, and H^+. The soil samples were taken coded according to their respective places. Before further analysis in the laboratory, the soil samples need to be treated specially as described in several guides (Rayes, 2007).

2.3 Data Analysis

Land capability analysis using the criteria of land capability class, which consists of: the slope surface, comprising: (A) = 0-3% flat; (B) = 3-8% of ramps / choppy; (C) = 8-15% slightly tilted / wavy; (D) = 15-30% tilt / hilly; (E) = 30-45% rather steep; and (F)> 45% steep, very steep (Arsyad, 2012). Depth of the soil, consisting of: (K0) = in (> 90cm); (K1) = medium (50 - 90cm); (K2) = shallow (25 - 50cm); (K3) = very shallow (<25cm) (Arsyad, 2012; Hardjowigeno and Widiatmaka, 2011).

Soil texture, include: (T1) = Soil texture textured cover sandy clay, clay dust and clay; (T2) = Soil texture is rather smooth, covering texture sandy clay loam, clayey loam, clay loam dusty; (T3) = Soil textured, textures include clay, clay dust and dust; (T4) = Soil texture is rather coarse, covering texture sandy loam, fine sandy loam and sandy loam very fine; and (T5) = Soil rough-textured, covering texture argillaceous sand and sand (Arsyad, 2012; Hardjowigeno and Widiatmaka, 2011). To know the actual land suitability palm oil plantations used descriptive analysis using the criteria of land suitability of agricultural commodities from Agroclimate Land Research Center and Agricultural Research and Development Agency (Djaenuddin, et al., 2003).

III. Results And Discussion

3.1 Rainfall Conditions

Precipitation is somewhere among others influenced by the climate, topography and turnover orwind current meeting. Therefore, the amount of rainfall varies by month and location of observation stations. Based on the results of over one year, rainfall in the SeruyanRegencyranged from 1.686,6 mm up to 1.831 mm. Based on the criteria for growing oil plantsstated by Djaenudin, et al., (2003) that the area of oil palm plantationin the SeruyanRegency classified beginfrom highly suitable (S1) till sufficientlysuitable (S2).For rainfall in this region show not as an obstacle, due to the range of 1750-3000 mm year $^{-1}$. This is in line with research that has been done by Firmansyah (2014) that for the Central Kalimantan region has a fairly good rainfall in supporting the availability of water for palm trees.

3.2 Topography conditions

Based on the results of research conducted at the plantation in Seruyan Regency,slope tiltis <3, so that it can be said that the area is low-lying areas. Based on the criteria for growing palm trees stated by Djaenudin, et al., (2003) that the area of oil palm plantation in the Seruyan Regency classified as very suitable (S1).According Arsyad (2012) states that when examined from the use of land for farming, then on land with a slope conditionsranges from 0-30% to reach 8.688,2 hectare area it is possible to continuously developed as a plantation production business.

3.3 Land Quality

Chemical properties that are used to assess the condition of soil fertility in the area of research is the CationExchange Capacity (CEC), soil reaction (pH), total-N, P2O5 available, K2O available and C-organic. In general, the nutrient content is low in this region. This is in line with that expressed by Mutert, (1999) which states that more than 95 percent of oil palm plantations in Southeast Asia are on sour land, soil fertility is low. It is apparent from the characteristics of the topsoil at the site of oil palm plantations in Southeast Asia. Complete can be seen in the following table:

Table 1. Soil Chemical properties at Study Sites

SampleCode	A1	A2	A3	A4	A5	A6	Average
N-Total	0,06	0,65	0,13	0,1	0,12	0,13	0,20
P_2O_5	3,85	11,52	48,14	43,32	185,51	88,16	63,42
K_2O	8,86	14,68	10,65	45,31	14,3	13,73	17,92
P_2O_5-tsd	7,21	3,91	44,63	9,58	341,65	319,89	121,15
Ca-dd	0,52	0,58	3,59	2,02	2,67	2,83	2,04
Mg-dd	0,1	0,15	0,21	0,1	0,11	0,2	0,15
Na-dd	0,03	0,07	0,03	0,09	0,06	0,08	0,06
K-dd	0,12	0,2	0,18	0,23	0,22	0,22	0,20
Al-dd	1,42	3,46	0	0	0	0	0,81
H-dd	0,12	0,23	0,47	0,58	0,49	0,58	0,41
Source: Primary Data Analysis, 2016.							
Description							
A1 =	Tabiku Village (Coordinate X: 0655956; Y: 9700704)						
A2 =	Tabiku Village (Coordinate X: 0656349; Y: 9700696)						
A3 =	Sembuluh I Village (Coordinate X: 0652795; Y:9698560)						
A4 =	Pembuang Hulu I Village (Coordinate X:0625923; Y: 9724018)						
A5 =	Pembuang Hulu I Village (Coordinate X:0626251; Y: 9724622)						
A6 =	Pembuang Hulu II Village (Coordinate X:0625464; Y: 9725856)						

As a measure to improve soil fertility management should be conducted fertilizer for oil palm plantations covering applications 100-150-Borate fertilizer, two or three times a year starting from the second year after planting (Ng, et al., 1974).Elsewhere in normal soil, the result of sustained high plant produces large amounts of waste, waste disposal has become a problem the industry and the environment. Application of this

nutrient-rich waste into the soilpalm oil has been tested on a large scale (Wood, 1977; Wood et al., 1979), and considered to be an efficient way to recycle essential nutrients.

IV. Conclusion

Based on the research we concluded that oil palm plantations nongovernmental results in the Seruyan Regency of Central Kalimantan, generally classified as highly suitable land (S1) for oil palm plantations have metall aspects relating to the requirements grow palm trees. There are several characteristics of the land not included in the category excellent (S1), but still classified in categorypretty good (S2).While the soil depth of oil palm plantations in the regencyof Seruyan category is still relatively shallow and less suitable (S3). In general, the nutrient content in these regions is low. The study recommends thatshould make improvements on the business aspects of nutrient availability by increasing the levels of organic matter and soil depth was added again in accordance with the requirements of oil crops growingso that the palm trees get more nutrients.

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