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EVALUATION OF LAND SUITABILITY FOR PLANTATION CROPS AND MEDICINAL PLANTS IN THE INTERCROPPING SYSTEM IN CIOMAS DISTRICT, SERANG REGENCY

Putra Utama[1], Hermita[2] , Diana Putri Angelina[3]
[1,2,3] Department of Agrotechnology, Faculty of Agriculture, University Sultan Ageng Tirtayasa Banten.
Corresponding Author

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Abstract

The research was aimed to determine land suitability classes, limiting factors, and efforts to improve land suitability of plantation crops and medicinal plants in the intercropping system in Ciomas subdistrict Serang District. This type of research was descriptive. This research was carried out in Cisitu Village Ciomas Subdistrict Serang District and the soil laboratory of the Faculty of Agriculture Untirta from October 2018 until September 2019. The implementation of the study consisted of 5 stages: collecting data and information, determining soil sample points and field surveys, taking soil samples and field observations, laboratory analysis, data analysis and assessing land suitability classes. The method of data analysis was carried out with a matching system between the characteristics of the land in the study area with conditions for growing of plantation crops and medicinal plants. The results showed that the actual land suitability class for melinjo, clove, and turmeric plants was quite suitable (S2) with limiting factors for erosion hazard, and nutrient retention. Potential land suitability classes for melinjo, clove and turmeric are very suitable (S1). While the actual land suitability class of ginger plants was not suitable (N) with the limiting factor of water availability, the limiting factor cannot be improved. Improvement efforts that can be done to improve the limiting factors were by making terraces, providing organic material, and liming. The cropping pattern of intercropping that can be done was intercropping melinjo plants with turmeric plants and intercropping clove plants with turmeric plants.

Keywords: *Intercropping system; Land Suitability Evaluation; Medicinal plant; Plantation crops*.

INTRODUCTION

One of the problems in the cultivation of plantation crops is inappropriate land use and inappropriate management actions. According to Wakiah (2016), the potential for the development of plantation crops is the existence of land that has not been optimally utilized and is in an area with a supportive climate and the existence of sufficient labor available. The development of plantation crops both in quality and quantity is still very possible, especially development in terms of the amount of production land.

Land use by planting several types of plants simultaneously can be an alternative to land use. According to Lahjie (2001), simultaneous planting between perennial plants and annuals is expected to give more yields than just one type of product at the same time. Setiawan (2009) stated that intercropping is an effort to plant

several types of plants on the same land and time, which are arranged in such a way in rows of plants. To support success in implementing the intercropping system, an evaluation of land suitability is very necessary.

Land is one of the important factors in the agricultural sector, because its use as one of the mediums for crop cultivation is the main and most important basic capital in farming that must be maintained and maintained its sustainability. Land is also one of the determining factors in the success of agricultural activities. Every agricultural business certainly focuses on the high production that will be achieved. This can be achieved if it is based on an understanding of land conditions with agricultural commodities to be developed (Adelia *et al*., 2016). Land suitability evaluation is a process contained in land use. The intended land use process is to compare the conditions of land use with the condition of land use capabilities contained in a location. The purpose of this land evaluation is to be able to determine the value of a land for a certain purpose. Things that need to be considered in land evaluation are economic, social, and environmental aspects that are closely related to the formation of a land itself (Hardjowigeno and Widiatmaka, 2014).

Ciomas Subdistrict, Serang Regency has a large potential for land resources, based on statistical data from the Ministry of Environment and Forestry in 2015 the area of plantation and forestry land in ciomas district reached 4,218 ha. One of the uses of land resources in Ciomas District is in Cisitu Village, this area has received attention to develop plantation crops with agroforestry development patterns. The development of land conversion in Cisitu Village, Ciomas District from forest land to community plantations is quite potential in developing several plantation crop commodities. Some of the plantation crop commodities developed in Cisitu Village include Melinjo, cloves.

Based on the above problems, the author sees the need to evaluate the suitability of land in Ciomas District, Serang Regency to find out how the level of land suitability and limiting factors and the right improvements for the cultivation of plantation crops and medicinal plants in order to produce optimally. Therefore, there is a need for research on Land Suitability Evaluation for Plantation Plants and Medicinal Plants in the Intercropping System in Ciomas District, Serang Regency. Based on the background description above, the problem can be identified as follows (1) How is the suitability of the land for plantation crops and medicinal plants in the intercropping system in Cisitu Village, Ciomas District, Serang Regency?
(2) What are the factors that are the barriers in the suitability of land for plantation crops and medicinal plants in the intercropping system in Cisitu Village, Ciomas District, Serang Regency? And (3) What efforts can be made to improve the level of land suitability of plantation crops and medicinal plants in the intercropping system in Cisitu Village, Ciomas District, Serang Regency?

RESEARCH METHODS

Resersch Location and Time

The location determination was carried out purposively (deliberately) in Cisitu Village, Ciomas District, Serang Regency. With the reason that Cisitu Village has the potential to be developed into an agroforestry area for plantation crops. Meanwhile, soil analysis is carried out at the Soil and Agroclimate Laboratory, Department of Agroecotechnology, Faculty of Agriculture, Sultan Ageng Tirtayasa University. The study was conducted October 2018-September 2019.

Data Types and Sources

This type of research is descriptive research. Primary data were used in this study from the results obtained from soil testing of research samples. Secondary data were obtained based on the literacy studies used.

Data Analysis

Laboratory Analysis

Such analysis is carried out in order to find out the physical and chemical properties of the soil. The tests carried out include C-Organic (%) with the Walkly & Black method (wet combustion), N (%) with the Kjeldhal method, P (ppm) with the Olsen method, K (ppm) with the PUTK method, Total KTK (cmol/kg) with the Kjeldahl Distillation method**,** pH H_2O and KCl with the pH meter method, water content (%) with the Gravimetric and Texture methods with qualitative methods.

Land Alignment Class Analysis

Data analysis in this study was carried out using the *matching* method, namely by matching land characteristic data obtained in the field and analysis in the laboratory with land suitability criteria and planting requirements for plantation plants and medicinal plants in Cisitu Village, Ciomas District, Serang Regency. The collected primary and secondary data are then analyzed descriptively. Descriptive analysis is used to provide an overview, explanation, and description of the relationship between one factor and another based on facts, data and information, then made in the form of a table. The results of the land suitability evaluation are made in actual and potential forms, then the data from the actual and potential land suitability evaluation results that have been obtained are poured in the form of a land suitability evaluation map using the ArcGIS 10.5 application.

RESULTS AND DISCUSSION

Table 1. Soil Sample Analysis Results

Parameter	CiT1	CiT2
Location coordinates	614'59"S10600'31"E°°	615'13"S10600'27"E°°
The height of the premises	550 m	575 m
Slope slope	8% - 15%	3% - 8%
Soil pH	6.5	6.5
Drainage	Good	Good
Soil depth	>100 cm	>100 cm
Rocks on the surface	0%	0%
Rock outcrops	0%	0%
Vegetation	Cloves, melinjo.	Melinjo, Duren, Banana, Sengon, Palm, Pete, Coffee.
Up to Air (%)	22.93	22.30
Texture	Slanting loam	Slanting loam
C-org (%)	3.50	4.66
N-total (%)	0.13	0.08
C/N Ratio (%)	27.87	63.13
P available (ppm)	5.55	8.86
K available	Low	Low
pH H_2O	5.69	5.79

Parameter	CiT1	CiT2
KTK **(cmol(+)$^{kg-1}$)**	2.27	7.57

Keterngan :
CiT1: Cisitu Village sample point 1
CiT2: Cisitu Village sample point 2

The results of the evaluation of the suitability of the height of the place can be seen that there is no significant limiting factor, melinjo and clove plantation plants have a very suitable level of suitability (S1) at the location of the CiT1 and CiT2 points with a place height of 550 meters above sea level and 575 masl. According to Effendi (2000), melinjo can grow to a height of 1200 m above sea level, but maximum production is achieved at an altitude of no more than 400 m above sea level, it states that melinjo production in the research area is less than optimal but melinjo plants can still grow well. Based on the Meteorological Climatology and Geophysics Agency from 2007-2017, Serang Regency has an average temperature of 27 °C, it is said that there is no heavy limiting factor (S1).

After being compared with the growing requirements of melinjo, clove, ginger, and turmeric plants, the limiting factor is found in the ginger plant, which is not suitable (N) because it has a very heavy limiting factor.

Evaluation of Drainage Suitability, it can be seen that the drainage conditions in Cisitu Village, Ciomas District at two soil sample points are of good value, the drainage conditions at the study site are seen qualitatively, namely the water absorption is good and there is no yellow or gray soil. Therefore, the results of the evaluation of land suitability for melinjo, clove, ginger, and turmeric plants are very good (S1). Soil texture Evaluation of Soil Texture Suitability, the value of soil texture observations at the study site is that clay textures are slithered clay at both soil sample points. land suitability at both soil sample points is very suitable (S1) for melinjo, clove and turmeric plants. Meanwhile, in ginger plants, the results of the evaluation of land suitability are quite appropriate (S2). Soil Depth at the site of the study that has been observed and analyzed is known that the average soil depth is more than 100 cm. This is very suitable for plantation crop commodities because it also has a deep root. The soil depth conditions at the study site are also very suitable for annuals that have shallow to moderate root, so the results of the evaluation of land suitability for melinjo, clove, ginger, and turmeric plants are very appropriate (S1).

The soil pH at the CiT1 study site was 5.69 and the soil pH at the CiT2 study site was 5.79 which means that both of them belong to slightly acidic soils. Based on the technical manual for land evaluation for agricultural commodities written by Djaenuddin *et al.* (2000), the pH corresponding to the melinjo, clove, and turmeric plants ranges from 5.0-7.0. While the pH suitable for ginger plants ranges from 5.0-6.0. The C-organic content of the soil in Cisitu Village, Ciomas District is high, namely at the CiT1 soil sample point is 3.50% and at the CiT2 soil sample point it is 4.66%. Therefore, the results of the evaluation of land suitability are very appropriate (S1) which means that the availability of organic matter as nutrients in the soil is very good. This fairly good situation is caused by the large amount of vegetation growing in the research area which is a contributor to organic matter to the soil. Based on the criteria for assessing soil chemical properties, the KTK value of the CiT2 soil map unit is low, which is less than 16 cmol. Likewise, the results of land suitability at the CiT1 soil sample point are quite appropriate (S2). According to Prabowo and Subantoro (2015),

if nutrient leaching occurs, the KTK value is low because the process of nutrient absorption by soil colloids does not take place relatively, nutrients are easily washed off and lost with the movement of water in the soil (infiltration), and in turn nutrients are not available to plant plants. KTK is a non-permanent limiting factor so that improvement efforts can be made to make it more suitable for the cultivation of melinjo, clove, ginger and turmeric plants.

The slope of Cisitu Village, Ciomas District for the location of the CiT2 sample point is on a slope of 3-8% which means that the steepness level is small, the results of the land suitability evaluation are very appropriate (S1) which means it does not have a meaningful limiting factor for melinjo, clove, ginger, and turmeric plants. While the location of the CiT1 sample point is on a slope of 8-15% which means that the steepness level is moderate, the results of the land suitability evaluation are quite appropriate (S2) which means that the land has a limiting factor, and this limiting factor will affect the productivity of melinjo, clove, ginger, and turmeric plants. The slope of the slope affects in the tillage of the land and the ability of the soil to withstand erosion.

Evaluation of Rock Suitability on the Surface, the value of rocks on the surface at both the CiT1 and CiT2 soil sample points is 0%, which means that there are no rocks around the study site. So that the results of the comparison of land suitability with plant growing conditions have a very appropriate value (S1) which means that there is no rock limiting factor on the surface.

To improve the suitability of actual land to potential land suitability requires several efforts to improve the quality of the land. So that the class of potential land suitability can increase. Land fish-eating efforts that can be made to improve the factor barrier and to increase the quality of land for melinjo, clove, ginger, and turmeric plants at the research site are mean improvement in the land suitability class is quite appropriate (S2) with the slope limiting factor. It is known that at the cit1 soil sample point the slope is moderate, this can interfere with plant productivity because it can cause erosion hazards. Therefore, it is necessary to make efforts to improve with the application of isolated conservation techniques on the land. The creation of terraces also aims to facilitate land treatment, retain water so as to reduce the speed and number of surface flows, and increase the chances of water absorption by the soil. Based on its function, the shape of a terrace that is suitable as an effort to improve land at the research site is the gulu terrace and at the CiT1 soil sample point with a slope of 8-15%.

Efforts to improve the land suitability class S2 (quite appropriate) with nutrient retention limiting factors for clay KTK against melinjo, clove, ginger and turmeric plants, namely by adding organic matter to the soil. The capacity of the soil cation exchange is closely related to the level of soil fertility. System intercropping plantation plants and medicinal plants that can be applied, namely intercropping melinjo plantation plants with turmeric medicinal plants and intercropping clove plantation plants with turmeric medicinal plants. This system can be applied to cit1 and cit2 land areas. The combination of these plants also has different root lengths between plantation plants and medicinal plants, making them suitable for intercropping.

CONCLUSIONS AND SUGGESTIONS

Based on the results of research anddiscussion and discussion, it was concluded that theclass of land suitability and limiting factors for the cultivation of Melinjo, Clove, Ginger, and Turmeric Plants in Cisitu Village, Ciomas District is the actual land suitability class for the cultivation of Melinjo, Clove, and Turmeric Plants at the CiT1 and CiT2 soil sample points is quite appropriate (S2), while the actual land suitability class for ginger plant cultivation at the sample point the lands of CiT1 and CiT2 are non-compliant (N). The limiting factors of the land suitability class for Melinjo, Clove, and Turmeric plants are nutrient retention (clay KTK), and erosion hazard (slope slope). While the limiting factor of the land suitability class for ginger plants is water availability (rainfall). Land improvement efforts to improve the limiting properties of land suitability in Cisitu Village, Ciomas District, Serang Regency can be done by making guludan terraces to overcome the level of slope, and providing organic matter and liming to increase the value of soil KTK. After improvements are made, the potential land suitability class for Melinjo, Clove, and Turmeric plants can be very suitable (S1). The intercropping planting pattern that can be done by farmers in Cisitu Village, Ciomas District, Serang Regency is the intercropping of melinjo plantation plants with turmeric medicinal plants and intercropping clove plantation plants with turmeric medicinal plants.

Based on the results of this study, the advice that can be given is that the cultivation of plantation plants and medicinal plants can be carried out in Cisitu Village, Ciomas District with an intercropping system, namely intercropping the Melinjo plant with Turmeric, and intercropping clove plants with turmeric. based on the results of the land suitability evaluation, land improvements that can be suggested are the manufacture of terraces, the addition of organic matter, and liming.

BIBLIOGRAPHY

Ade, Setiawan. 2010. Land Survey and Evaluation Article. http://www.ilmutanah.unpad.ac.id/resources/artikel/survey-dan-evaluasilahan/. [August 31, 2018].

Adelia, Reza., Dibia , I Nyoman, and Mega, I Made., 2016. Evaluation of Land Suitability of Several Horticultural Crop Commodities and Plantations in the Agrotourism Area of Kerta Village, Payangan District, Gianyar Regency. E-Journal of Agroecotechnology. Vol. 5. (4).

Agus, R. 2004. Producing Cloves 3rd Edition, Print 3. Jakarta: Penebar Swadaya.

Almahdi. 2018. Save Melinjo Pidie, Indonesia. https://steemit.com/indonesia/@yayan/selamatkan-melinjo-pidie-indonesia-96744470ed6b2est. [October 8, 2019].

Alol. 2012. The Beauty of Bunga and the Benefits of K Leaves unyit. https://steemit.com/indonesia/@alol/keindahan-bunga-dan-manfaat-daun-kunyit-2017814t195451173z. [November 29, 2019].

Environment and Forestry Agency of Serang Regency. 2014. Cidanau Watershed Ecosystem Profile. https://dlhk.bantenprov.go.id/read/profil/86/Profil-Ekosistem-DAS-Cidanau.html. No. 2 October 2019].

Beets, W.C. 1982. *Multiple Cropping and Tropical Farming Systems. Westview Press*, Inc. USA. *dalam* Setiawan, Eko. 2009. Kearifan Lokal Pola Tanam Tumpangsari di Jawa Timur (*The Local Wisdom Of Pattern Intercropping Systems In East Java*). Jurnal Agrovigor. Vol. 2. (2): 79-89.

BPS [Central Statistics Agency] Serang Regency. 2018. Regional Statistics of Serang Regency 2018. Serang: Serang Regency BPS Catalog.

National BPS [Central Statistics Agency]. 2014. Indonesian Statistics. Jakarta : Jakarta Central Statistics Agency.

Dariah, Ai., Haryati, Umi., Budhyastoro, Torry. 2004. Mechanical Soil Conservation Technology. Bogor : Soil Research Center.

Djaenudin, D., H, Marwan., H, Subagjo., Hidayat, A. 2003. Technical Guidelines for Land Evaluation for Agricultural Commodities. Bogor : Soil Research Center, Puslitbangtanak.

Djaenudin, D; M. Herdriman, H. Subagyo, A. Mulyani and N. Suharta. 2000. Criteria for Land Suitability for Agricultural Commodities. Bogor : Soil Research Center. Center for Soil Research and Soil Development and Agroclimate.

Effendi, S. Dedi. 2000. Identification for the Development of Ginger Plants (*Zingiber offlcinale* Rose.) and Melinjo (*Gnetum gnemon* L.). Journal of Biology News. Vol.5(2).

Fao. 1976. A Framework for Land Evaluation. Soil Resources Management and Conservation Service Land and Water Development Division. FAO Soil Billetin No. 32. FAO-UNO, Rome. *In* Ritung, Sofyan., Wahyunto., Agus, Fahmuddin., and Hidayat, Hapid. 2007. Evaluation of Land Suitability with Sample Land Use Directive Map of West Aceh Regency. Bogor : Soil Research Center and *World Agroforestry Centre*.

Febrianti, Nur. 2008. Climate Zone Change in Indonesia using the Köppen Classification System. Proceedings of the "Atmospheric Science Applications Workshop". Center for the Utilization of Atmospheric and Climate Science, LAPAN. Vol 1: 252-259.