

ANALYSIS OF LAND CARRYING CAPACITY FOR THE DEVELOPMENT OF LEADING COMMODITIES IN KULON PROGO REGENCY, INDONESIA

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ABSTRACT: Kulon Progo Regency is one of the regencies in the Special Province of Yogyakarta Indonesia, known for its diverse natural resources, including agricultural commodities. The Agricultural products that have become the leading commodity of Kulon Progo include pepper, coffee, cloves, durian, and cocoa. The development of leading commodities is a strategic step to improve the economy of the region, especially in increasing the Gross Regional Domestic Product (GRDP). Finding the potential for developing agricultural commodities can be done through the analysis of land carrying capacity. Analysis for land carrying capacity can be divided into land use capability and land suitability analysis. The map overlay results in the form of a slope, soil type, and rainfall are produced by several classes of land capability, where the ideal location is dominated in Kalibawang, Samigaluh, Girimulyo, Kokap, and part of Pengasih District with a slope of less than 40%. The topographic analysis shows the dominance of relatively flat land, with a dominant slope of 0-8%. Basing the analysis above on the Guidelines for Public Works No. 20 of 2007 obtained a total weight between 84-108. This value shows that the land use is dominated by the direction of perennial crops.

Keywords: Land carrying capacity, Land capability, Land suitability, Leading commodity

1. INTRODUCTION

Population increase also increases the utilization rate of natural resources, including the use of space for human needs and other living things. This has decreased the quality and quantity of the environment in a number of regions in Indonesia. Therefore, the utilization of natural resources must be carried out wisely, taking into account the environmental carrying capacity and environmental capacity. As a consequence, the environmental carrying capacity and environmental capacity is essential to be known, understood and used as a basis for natural resource utilization planning, development planning and spatial utilization planning, ensuring the changes during the development process do not reduce the potential for future use [1],[2]. Sustainable land/soil prevention must be at the core of any land use planning [3],[4].

Kulon Progo Regency is developing rapidly. Administratively, Kulon Progo Regency is in the Province of Yogyakarta Special Region. The construction of the New Yogyakarta International Airport (NYIA) is one of the supporting factors for land use change. The NYIA development will use rice fields, which of course will reduce the area of agricultural land and has caused many people in the Kulon Progo Regency to lose their livelihoods. Consequently, this reduces the agricultural land

and impacts various aspects, including environmental, social and economic. The land use change from non-urban solid to urban solid increasing surface runoff [5] and has an impact to land use for agriculture [6].

Based on the data Kulon Progo Regency in Figure 2017 [7], the number of people working in the agricultural sector reached 44.6% of the total workforce population. Nationally in Indonesia, the number of people working in agriculture reaches 31.86% of the total population of the workforce. In this condition, Kulon Progo Regency is above the national average, which means that the agricultural sector in Kulon Progo Regency significantly contributes to the regional economy. From the data of GRDP (Gross Regional Domestic Product) growth rate, the agricultural sector experienced a small increase of 1.6%.

The development of leading agricultural commodities in Kulon Progo Regency can be developed to improve the welfare of the community. Increasing added value by processing agricultural products must be done to provide employment and promote welfare. To support the processing of agricultural products, the development of potential product or leading commodities must be known to maintain the continuity of the processing industry. Analyzing the land carrying capacity by conducting the land use capability and land suitability analysis to

determine the availability of land and the potential for the development of leading commodities in the future. This analysis can provide land capability class results as an input to the policy making of the development of the leading commodities in the regions.

2. METHODE

2.1 Land Carrying Capacity Analysis

Analysis of the land carrying capacity is used to calculate the optimum environmental ability to provide a good life and fulfill the requirements of the quality of life to the residents of the neighborhood dwelling the area. Soemarwoto [8]-[9] explained that the higher the level of population density, the higher the level of demand land. If there is insufficient land availability, forest clearing and planting erosion-prone areas which shows a high land demand condition.

If the optimum ability has been fulfilled, while the population still increase then there will be competition for resources. To reduce disparity in meeting the needs of each individual for resources, a technology is needed that can help increase the capacity of resources. The existence of the carrying capacity concept is based on a notion that the environment has maximum capacity limits to support population growth that is directly proportional to the principle of benefits.

2.2 Land Capability

Land capability analysis is used to determine the capability level of a landscape for specific uses, which is analyzed using data input on the physical condition of the land. The primary data needed is slope data which is given weight, and the scores are then classified according to the land capability unit classes. Classification of land capability using a reference to the Regulation of the Minister of Public Works No. 20 / PRT / M / 2007 [10], concerning Guidelines for Physical and Environmental Analysis, Economic and Socio-Cultural Techniques in the Preparation of Spatial Planning.

The physical and environmental analysis of the region is done to recognize the characteristics of these natural resources, by examining the capability and suitability of the land, so that land use in the development of the region and/or region can be done optimally while paying attention to the balance of the ecosystem.

2.3 Land Suitability

The method of obtaining land suitability is conducted with map overlay techniques carried out

using land capability data input so that it can produce a land suitability map. Land suitability is essentially a description of the level of suitability of a plot of land for a particular use [11]. The evaluation of land suitability is carried out to revise the allocation of space use at this time. The evaluation of land suitability is done by comparing the existing land use with the results of the analysis of the land capability to obtain the availability of land for the development of the expected commodity [12-15].

2.4 Land Availability

In the analysis phase of the availability of land describes the land allotment in the types of commodities, the potential and problems of land that can be developed for commodities, as well as references for agricultural development in the form of land area, soil type, and threshold. The measurement of farming area is done by taking into account the area of land not used for agriculture, namely rice fields, irrigation channels, and buildings.

3. RESULT AND DISCUSSION

Analysis of land carrying capacity consists of an analysis of land capability and suitability. The following is the elaboration of the results of the analysis of land capability and suitability:

3.1 Land Carrying Capacity Analysis

3.1.1 Analysis of Land Capability

In the existing condition, the topographic conditions in Kulon Progo Regency are dominated by land that is classified as flat and with a dominant slope of 0-8%. There are eight Land Capability Units (SKL/Satuan Kemampuan Lahan) based on PERMEN PU (Public Work Regulation) 2007:

A. SKL Morphology

Based on Guidelines for Public Works No. PU. 20 of 2007, the result obtained the largest value, namely the value of 5 as the land capability of the morphology is low because it has a dominant slope level that is classified as flat.

B. SKL Ease of Doing

The ease of working SKL is an assessment and description of the land of the level of convenience to be utilized in the development and development process of the region. From the classification, the higher the slope level, the steeper it is, the harder the work is done, which means it is more difficult to do.

C. SKL Slope Stability

SKL analysis on the Slope Stability based on Guidelines for Public Works No. 20 of 2007

obtained the greatest value, namely the value of 4 and 5, describing the Slope Stability Level as high because it has a dominant slope level that is classified as sloping or flat.

D. SKL Foundation Stability

SKL analysis on foundation stability based on Guidelines for Public Works No. PU. 20 of 2007 obtained the greatest value, namely the value of 4 and 5, describing High Foundation Support and Stability because it has a dominant slope level that is classified as sloping or flat.

E. SKL Water Availability

The analysis of SKL Water Availability based on Guidelines for Public Works No. PU. 20 of 2007 obtained the greatest value, namely the value of 4 and 5, describing High Water Availability because it has a dominant slope level that is classified as sloping or flat

F. SKL Drainage

The analysis of SKL Drainage based on the Guidelines for Public Works No. PU. 20 of 2007 obtained the largest value, namely the value of 1 and 2, describing Small Drainage because it has a

dominant slope level that is classified as sloping or flat.

G. SKL Erosion

The analysis of SKL Erosion based on the Guidelines for Public Works No. PU. 20 of 2007 obtained the largest value, namely the value of 5, with the statement of No Erosion, because it has a dominant slope level that is classified as sloping or flat.

H. SKL Waste Disposal

The analysis of SKL Waste Disposal based on the Guidelines for Public Works No. PU. 20 of 2007 obtained the greatest value, namely the value of 4 and 5 with the description of Land Capability for Enough Waste disposal because it has a dominant slope level that is classified as sloping or flat.

I. SKL Prone to Disasters

The weighting results from the entire Land Capability Unit (SKL) based on the Guidelines for Public Works No. PU. 20 of 2007 are shown in the table of assessment or weighting of Land Capabilities (Table 1).

Table 1. Weighting the Land Capability of Kulon Progo Regency

SKL	Morphology	Easy of Doing	Slope Stability	Foundation Stability	Water Availability	Drainage	Erosion	Waste Disposal	Prone to Disaster	Total
Weight	5	1	5	3	5	5	3	0	5	
	5	1	5	3	5	25	3	0	25	72
	10	2	10	6	10	20	6	0	20	84
Value	15	3	15	9	15	15	9	0	15	96
	20	4	20	12	20	10	12	0	10	108
	25	5	25	15	25	5	15	0	5	120

Source: Analysis Result by using ArcGIS 10.5

The following is the Land Capability Map of Kulon Progo Regency which is dominated by medium pink, showing a moderate level of development capability. Its location is in Kalibawang, Samigaluh, Girimulyo, Kokap, and part of Pengasih District.

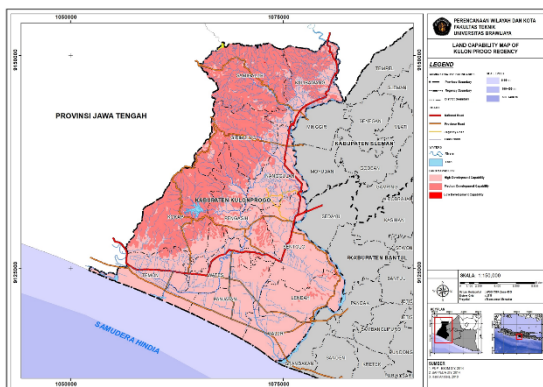


Fig.1 Land Capability Map of Kulonprogo Reg.

Based on the results of the analysis of the capability of the land, the level of land capability is

obtained in all classes of land capability. That is low development capabilities, moderate development capabilities, and rather high development capabilities.

Table 2. Land Capability Classification in Kulon Progo Regency

Total	Class	Land Capability
72	B	Low Development Capability
84	C	Medium Development Capability
96	C	Medium Development Capability
108	C	Medium Development Capability
120	D	High Development Capability

3.1.2 Land Suitability Analysis

Suitability analysis of agricultural land can be carried out with various types of guidelines, Guidelines for Public Works No. PU. 20 of 2007, Environmental Government Regulation No. 17 of 2009, and can also be analyzed by Minister of

Agriculture Regulation No. 41 of 2009. The following is the result of land suitability by using the guideline of Guidelines for Public Works No. PU. 20 of 2007, analyzing and overlaying land capability maps with existing land use maps, resulting in an agricultural spatial layout map.

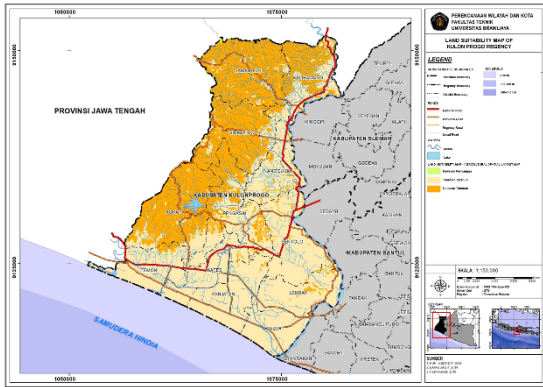


Fig 2 Land Suitability Map of Kulon Progo Regency - Agricultural spatial layout map.

In Fig. 2, the Land Suitability Map of Kulon Progo Regency – agricultural spatial layout map

Table 3. Land Suitability based on agricultural spatial layout map in Kulon Progo Regency

Weight	Class	Information	Agricultural Spatial Layout	
			Classification	Value
72	B	Low Development Capability	Buffer Zone	2
84	C	Medium Development Capability	Perennials crops	3
96	C	Medium Development Capability	Perennials crops	3
108	C	Medium Development Capability	Perennials crops	3
120	D	High Development Capability	Annual crops	4

A. Chili commodity, onions, and durians

Chili and durian commodities have different characteristics. Durian is a perennial plant that needs soil for good rooting. Durian is suitable to be developed in areas with hilly topography such as Kalibawang, Samigalu, Kokap and in some parts of Pengasih (Fig. 3).

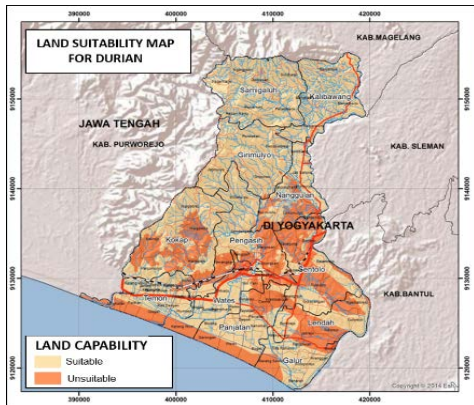


Fig 3 Land Suitability Map for Durian

illustrates of Kulon Progo Regency shows that it is dominated by the allotment of annual vegetation and perennial vegetation. While the following (Table 3) is the result of weighting the land use capability resulting in land capability class that can be used as a reference in determining the appropriate agricultural spatial layout map and weight values based on the land capability class.

The soil is the main factor in determining land suitability because land is a soil medium. Each type of soil has its own characteristics such as differences in soil texture. The growth or absence of plants is strongly influenced by soil. Each type of plant has its individual features, especially in soil texture. Soil texture is divided into 3 classes in land suitability, namely smooth, medium and rough.

The following is the land suitability for each type of commodity, especially those which are the leading commodities in Kulon Progo Regency, based on the results of overlaying the map of land height, slope, and soil texture.

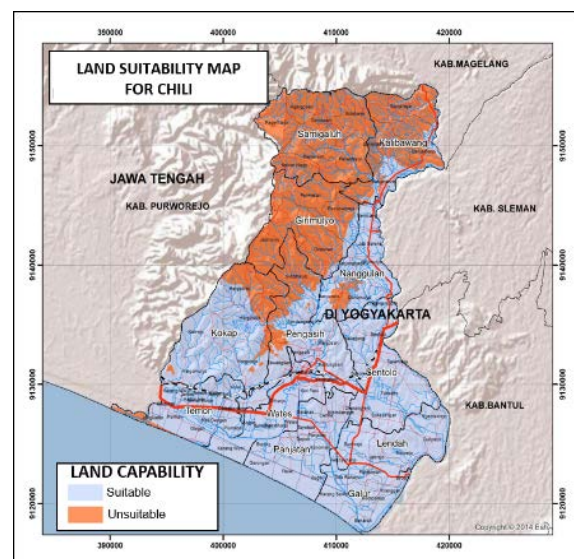


Fig 4 Land Suitability Map Onion and Chili Commodities

Commodities onions and chilies are cultivated in areas with flat topography and fast water removal (Fig. 4). The map above shows the distribution of suitable land for the cultivation of these two commodities includes the southern part of Kulon Progo Regency which are the Panjatan District, Lendah, Strains, Sentolo, Wates and Temon. While the area with extreme topography is not suitable for the cultivation of both plants.

B. Plantation Commodities (Cloves, Cocoa, Coffee, and Tea)

The whole plantation commodity is perennial plants with similar requirements. Only coconut can be developed in almost all physical characteristics of the land.

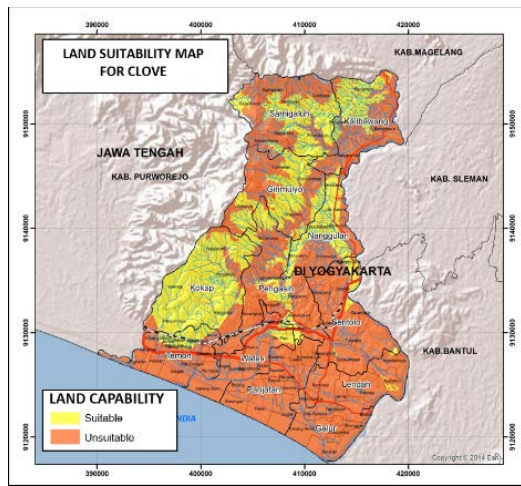


Fig 5. Land Suitability Map of Clove Commodities

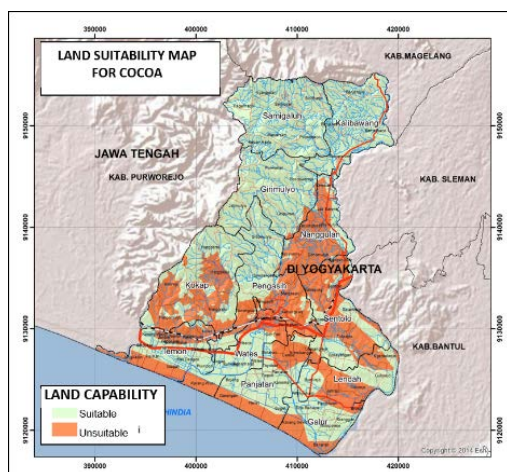


Fig 6 Land Suitability Map of Cocoa Commodities

The following is the results of overlay data analysis of basic physical conditions adjusted to

the criteria for coffee and tea commodities in Kulon Progo Regency.

Fig. 7 and Fig. 8, shows the land suitability for coffee and tea commodities which are in the western part of Kulon Progo Regency, including Kokap, Girmulyo, Samigaluh, Nanggulan, and Kalibawang Districts.

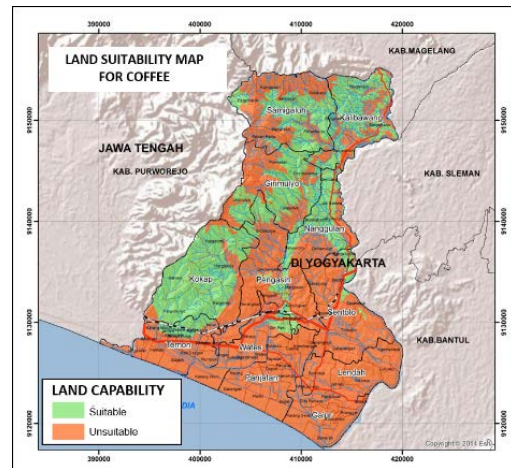


Fig 7 Land Suitability Map of Coffee Commodities

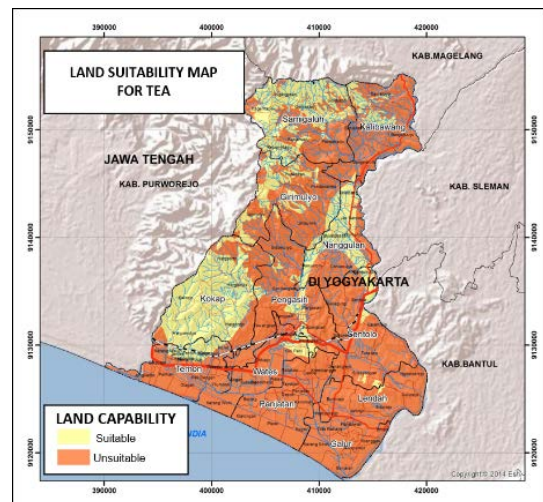


Fig 8 Land Suitability Map of Tea Commodities

4. CONCLUSION

The efforts to develop leading commodities in Kulon Progo Regency are carried out with several forms of studies and analysis, including analysis of land carrying capacity in the form of analysis of land capability and suitability of agricultural land. Several classes of land capability obtain the results of overlay map in the form of a slope, soil type, and rainfall. The ideal location to develop is in the Districts of Kalibawang, Samigaluh, Girmulyo,

Kokap, and part of Pengasih which has a slope of less than 40%. (<40%).

In the existing condition, the topographic conditions in Kulon Progo Regency are dominated by land that is classified as flat and with a dominant slope of 0-8%. Thus the results of the analysis of land capability based on the Guidelines for Public Works No. 20 of 2007 obtained the largest value, namely with the total weight between 84-108, showing the dominance of perennial plants in the agricultural spatial layout map.

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