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LAND SUITABILITY EVALUATION OF SOYBEAN AS DROUGHT ADAPTATION IN GROBOGAN REGENCY

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ABSTRACT

Grobogan regency is a regency in central java which getting a lot of drought in dry season. The drought has an impact on various sectors of life, including agriculture. This research aims to measure the land suitability for soybean in Grobogan as an adaptation to drought season. This research is in descriptive qualitative, using purposive sampling technique to get soil sample based on the type of soil. Data collection techniques were observation, interviews, laboratory analysis. Analysis of land suitability for soybean plants by matching the quality and characteristics of land in Grobogan Regency with the conditions for growing soybean plants. The result of this study is (1) the actual land suitability for soybean plants in Grobogan Regency shows a marginal appropriate class (S3) covering 85024.98 ha or 43.03%, not suitable (N1) covering 4792,925 ha or 2.43% and not permanently suitable (N2) covering 1896.49 ha or 0.96%. (2) Through improving the quality of land characteristics to the management of a high level of land suitability, potential can reach a sufficiently suitable class (S2) covering an area of 85248.10 ha or 43.14%, marginal appropriate (S3) covering an area of 3824.37 ha or 1.94% and not suitable (N1) totaling 2641.92 ha or 1.34% .

Key word: *Drought, Land Suitability, Soybean Plants.*

A. INTRODUCTION

Drought is a condition where extreme rainfall is very small or there is no rainfall for a relatively long period of time ie exceeding the dry season time (Moreland, 1993). Meanwhile, according to Wilhite & Svoboda (2000: 3), drought occurs as a result of a decrease in the amount of rain over a long period of time, usually in one season or more, despite other climatic factors (such as high temperatures, high winds, and low relative humidity) is often associated with drought in many regions of the world and can significantly worsen the situation

Hisdal (2000: 1) states that generally drought occurs in all climate zones and each region has a different character. Drought is different from dry or arid, this phenomenon is temporary can be characterized by deviations from normal conditions.

Furthermore ISDR (2005: 4) defines drought as a condition caused by lack of rainfall in a longer period of time than it should, usually occurs throughout the season or even more. This drought includes temporary changes in conditions, unlike dry climates, which are fixed climate conditions. A seasonal dry

climate (i.e a dry season) also needs to be distinguished from drought. This is also in accordance with the review of the International Glossary of Hyrology (WMO 2012), they states that a state of drought without prolonged rain or a period of dryness under normal long enough so that it causes the hydrological balance seriously disturbed. The disruption of the hydrological balance intended is the condition of the availability of water resources that are not as much as in normal weather to potentially threaten the needs of human life, one of which is the unproductive agricultural land.

Grobogan is one of the regency in central java which mostly experience the drought season. According to 2011 Grobogan Regency Flood and Drought Hazard Map, most of the area is prone to drought. supported by the latest data from the 3 Monthly Standardized Precipitation Index Map (SPI) in Central Java issued by Semarang Station BMKG, between December 2014 and February 2015, this region is classified as one of the regency which are really prone to drought with drought in the highest level compared to other regency in Central Java. This condition results in meteorological, hydrological, and agricultural drought. People in this area sometimes are getting lack of water to meet their daily needs, until the drought in agricultural land. So in this study an evaluation of land suitability for soybean plants in dry areas in Grobogan Regency was carried out as an effort to optimize land in the dry season.

Land evaluation itself is a process of estimating the potential of land for various uses (Rayes, 2006: 141). Land suitability is a description of the level of suitability of a piece of land for a particular land use (Sitorus, 1998: 42). The suitability classes of an area can differs from one another, depending on the type of land use being considered

Land suitability is of two categories, actual land suitability and potential land suitability. Actual land suitability is land suitability based on data on the biophysical nature of land or land resources before the land is given the inputs needed to overcome obstacles. The biophysical data is in the form of soil and climate characteristics that are related to the growth requirements of the plant being evaluated. Potential land suitability illustrates land suitability that will be achieved if improvement efforts are made.

Some examples of land suitability studies for soybean include research by Kamkar (2013) in Iran using GIS, the results indicate that only 11.82% of the total area is really suitable for soybeans.

Soybeans are not so affected by temperature during growth. Meanwhile, according to Aminifar (2012) irrigation affects the growth of soybeans. Further in Munene's research, Prisca (2017) regarding land suitability for soybeans in Kabwe, showed that 82% of the area is suitable for soybean crop while 12% is not suitable for the soil reaction inhibiting factors and the availability of phosphorus. Whereas the evaluation of land suitability for soybean in Grobogan Regency is carried out in a dry area so that the results of whether soybeans can be a solution to optimize land during the dry season is obtained.

B. MATERIALS AND METHODS

This research was conducted in Grobogan Regency, Central Java Province. Site selection based on the Grobogan excessively experiences drought. The study uses a qualitative descriptive approach with purposive sampling, soil sampling in accordance with the type of soil in Grobogan Regency. The data used are primary data from direct observations / measurements in the field and laboratory test results, called Laboratory analysis. Laboratory analysis data in the form of 1) Soil Texture; 2) Land Drainage; 3) Land CEC; 4) Soil pH; 5) Organic C; 6) N Total; 7) P 2O5; 8) K2O. While the data obtained from Observation and Measurement are: 1) Effective Depth; 2) Surface Rocks; 3) Rock outcrops; 4) Flood inundation; 5) Erosion Type 6) Plotting of rain recording station.

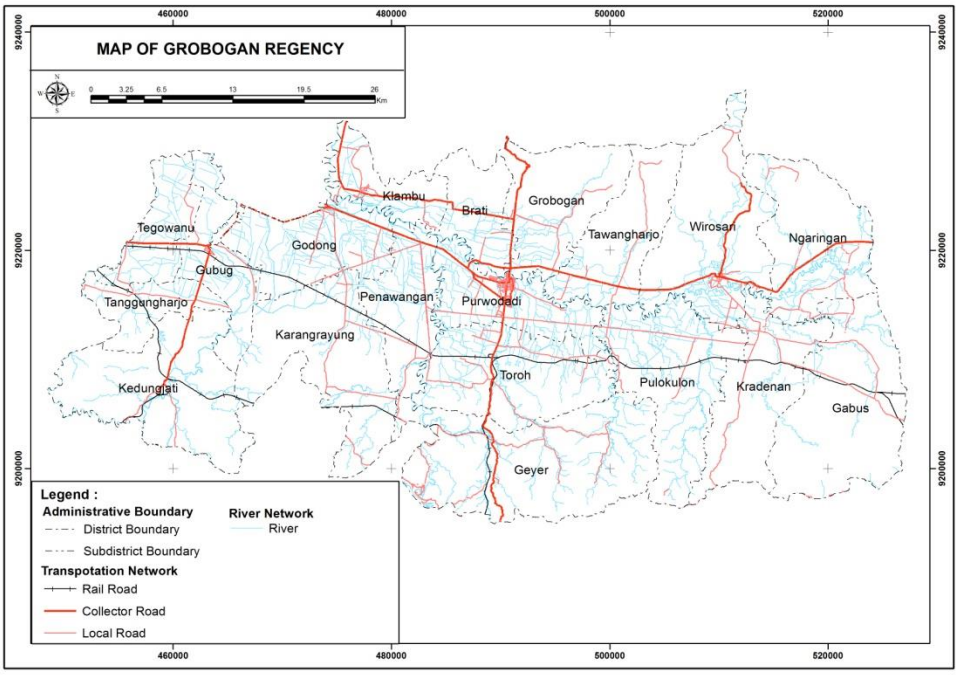

Figure 1. Grobogan Regency Administration Map

The level of land suitability is obtained by matching the quality and characteristics of the land with the parameters for soybean growth requirements. Based on the results, it can be seen that the heaviest limiting factor is the determinants, a sub-class of land suitability for soybean plants is produced in each land unit in Grobogan Regency.

C. RESULTS AND DISCUSSION

Based on the results of matching between physical properties, chemical soil samples in Grobogan Regency with soybean growth requirements, two types of land suitability are obtained, called actual land suitability and potential land suitability.

1. Actual Land Suitability

Land suitability analysis for soybean plants is carried out by the use of paddy fields, gardens and dry fields which have a total area of 91714.39 ha. Based on data analysis of land quality and land characteristics. It produced 4 land suitability classes for soybean plants in Grobogan Regency called Marginal Accordance Class (S3) with an area of 85024.98 ha, incompatible class (N1) distribution area of 4792.92 ha and Permanent Non-Matching Class (N2) area of 1896.49 Ha.

Table 1. Area and Percentage of Sub-Class Areas Land Suitability

No	Sub Class	Area	
		Ha	%
1	N1s/m	4792.92	4.41
2	N2s/m	1896.49	2.88
3	S3n	25570.41	27.88
4	S3n, s/m	23962.64	26.13
5	S3r,n	34833.98	37.98
6	S3r,n, s/m	657.95	0.72
Jumlah		91714,39	100

Source: Results of Primary Data Analysis and Laboratory Data 2016

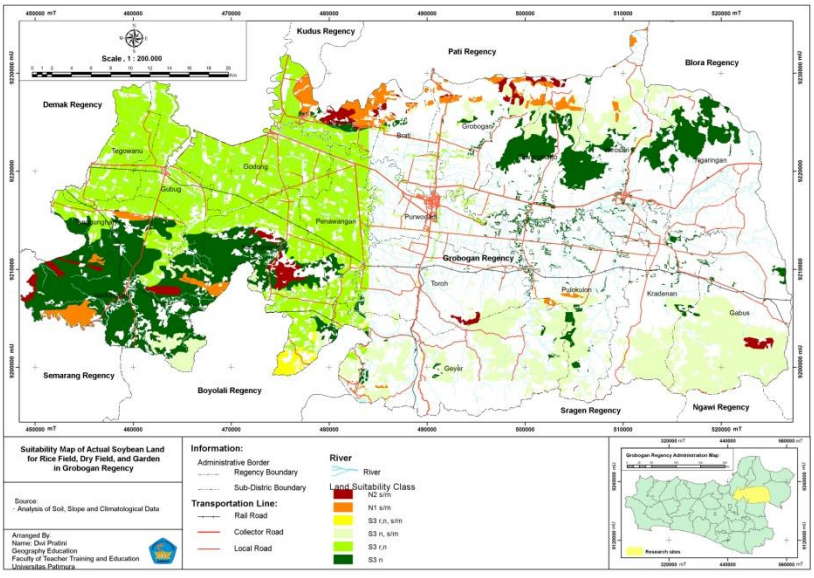

Figure 2. Actual Land Suitability Map for Soybean Plants in Grobogan Regency

Most of the Grobogan areas are in the marginal suit class with the dominant nutrient limiting factor available (n), called P2O5 and K2O. This land suitability sub-class is due to the low to very low levels of phosphorus and potassium in the study area. The P2O5 content is 9.82 ppm up to 11.98ppm and the K2O content is 0.14 me% to 0.26 me%.

In this land suitability sub-class, efforts can be made to improve the quality of land to a moderate category. Inhibiting factors P2O5 and K2O can be improved land quality by fertilizing. This subclass covers 25570.4 ha or 27.88% and is distributed in the areas of Kedungjati, Tanggungharjo, Karangrayung, Klambu, Tawangharjo, Wirosari, and Ngaringan, Pulokulon and Kradenan Sub-district.

Nutrient limiting factors are available and rooting media can be improved by fertilizing, but it requires a considerable cost. While the limiting factor in the form of a slope cannot be improved.

2. Potential Land Suitability

Making efforts to improve the actual quality of the potential for soybean plants with a high level of management produced 3 land suitability classes, called class S2 (quite appropriate), S3 (marginal appropriate) and N1 (Not suitable). This land suitability class consists of 3 subclasses, as follows.

Table 2. Grobogan Regency Potential Land Suitability Classes

No	Sub Class	Area	
		Ha	%
1	S2r	60404.39	65.8614
2	S2r, s/m	24620.59	26.8448
3	S3 s/m	4047.50	4.41316
4	N1 s/m	2641.92	2.88059
Jumlah		91714.39	100

Source: Results of Primary Data Analysis and Laboratory Data 2016

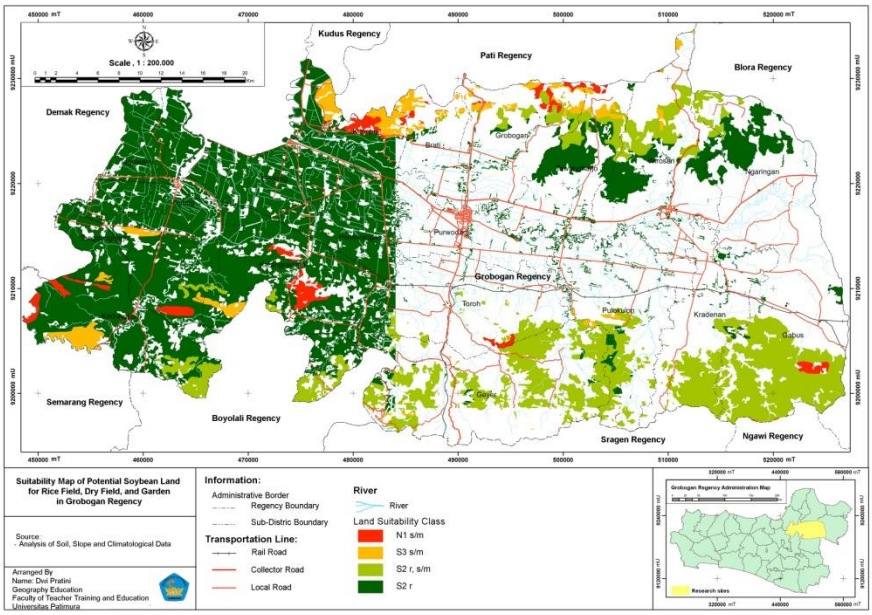

Figure 3. Potential Land Suitability Map for Soybean Plants in Grobogan Regency

Most of the regions in Grobogan Regency are in a fairly suitable class (S2) with a root media inhibiting factor with an area of 65% of the total land area. This subclass is scattered in the areas of Kedungjati, Tanggungharjo, Gubug, Tegowanu, Godong, Penawangan, Karangrayung, part of the Kelambu, Tawangharjo, Ngaringan Pulokulon sub-district.

3. Directions for Soybean Planting Recommendations in the Drought Sub-District of Grobogan Regency based on Land Suitability Evaluation Results

Based on the results of the evaluation of land suitability on various types of soil in the study area, it can be seen that the actual suitability of land as a whole is mostly included in the marginal suit class with inhibiting factors for nutrient availability in the form of K2O and P2O5. Marginally appropriate land class (S3) means that land in Grobogan Regency can be planted with soybeans but productivity is not optimal. To optimize soybean productivity can be done by improving land quality in accordance with the conditions or characteristics of the worst available land or in other words changing the suitability of actual land to suitability of potential land.

At a high management level, maximum improvement efforts can be made so that soybean plants can grow well, but also require even greater costs. A high level of management can be improved on rooting media

factors, nutrient availability, terrain and potential mechanization. Rooting media factors such as soil drainage at high management levels can be improved by improving drainage systems, such as the construction of drainage channels. Nutrient availability factors such as total N, P205 are available and K2O can be improved by fertilizing. Terain factors and potential mechanization can be improved by making terraces, contour planting parallel. The final results of this high-level management cannot indeed make all land suitability classes very suitable because Grobogan Regency has a severe inhibiting factor, called in rooting and terrain media.

Table 3. Areas that can be planted with soybeans on Actual and Potential Land Suitability

No	Actual Land		Potential Land	
	Sub Class	Large (Ha)	Sub Class	Large (Ha)
Can Be Soybean Planted				
1	S3n	25570.41	S2r	60404.39
2	S3n, s/m	23962.64	S2r, s/m	24620.59
3	S3r,n	34833.98	S3 s/m	4047.50
4	S3r,n, s/m	657.95		
	Total	85024.98		89072.48
Cannot be planted with soybeans				
1	N1s/m	4792.92	N1s/m	2641.92
2	N2s/m	1896.49		
	Total	6689.41		2641.92

Source: 2016 Research Results Data Process

The area that can be planted with soybeans in Grobogan Regency is an area of 85024.98 ha or 92.71% of the total area of existing agricultural land. Through the improvement of land characteristics by processing a high level of area the area that can be planted with soybeans increased by 4047.50 ha (4.41%) or changed to 89072.48 ha or 97.12% of existing agricultural land.

In a small part of Grobogan Regency there are some that cannot be planted with soybeans. Although efforts have been made to improve the quality of land characteristics at a high management level, it is still in the inappropriate grade (N1) because it has a very severe limiting factor, called the slope. The area that cannot be planted with soybeans covers 2641.92 ha or 1.34% of the total area of Grobogan Regency, which is spread across Kedungjati, Karangrayung, Klambu, Toroh, Groohogan, Grobogan, Tawangharjo, and Gabus Districts. For more details, it can be seen on the map of potential land suitability. Areas that are classified as inappropriate should not be planted with soybeans.

D. CONCLUSION

The actual land suitability for soybean plants in Grobogan Regency consists of 6 sub classes, called S3n, S3n, s / m, S3r, n, S3r, n, s / m, N1s / m, N2s / m. The size of the class is marginal (S3) 85024.98 ha or 43.03%, not suitable (N1) covering an area of 4792,925 ha or 2.43% and not permanently suitable (N2) covering an area of 1896.49 ha or 0.96%. Through improving the quality of land characteristics to a high level of management, there is potential suitability for 4 sub-classes, called S2r, S2r, s / m, S3 s / m, N1s / m. The size of the class is quite appropriate (S2) 85248.10 ha or 43.14%, according to the marginal (S3) area of 3824.37 ha or 1.94% and not suitable (N1) of 2641.92 ha or 1.34%. Grobogan Regency can be planted with soybeans, but for optimal results it requires more costs because it has a weight limiting factor in the root media (r), nutrients (n) and the potential for mechanization or terrain (s / m). Therefore the dry area of Grobogan Regency is not directed to be planted with soybeans.

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