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PROCEEDING

Social Conservation based on Nation Character Building

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PREFACE OF THE DIRECTOR

Assalamualaikum Wr. Wb.

Indonesia encounters several environmental and moral decadence issues. Some of those environmental issues are flood, landslides, forest fires, and others. In addition, the existence of drug abuse, promiscuity, binge-drinking, and corruption also shows that Indonesia faces the crisis of moral decadence. These problems must be solved with the right approach in order to gain precise solution. One approach that can be used is a "social conservation" approach.

Social conservation is viewed as a social perspective to the existing environmental and social issues. Social studies on conservation are essential to respond the environmental problems, poor implementation of environmental ethics, and public indifference toward environmental and moral issues. Social approach in responding the environmental and moral decadence problems which are summarized in social conservation has an important role to address the existing environmental and moral decadence issues because both issues are closely related to human involvement as the actors.

Social conservation aims to develop attitudes, behavior, and habituation within a loving community in maintaining, preserving, and implementing the values and norms of life which are believed to be true and accepted as a guide for the society and nation. The implementation of social conservation as an attempt to inculcate noble values is relevant to the efforts of national character development. Both aspects become an integral part because their existence reinforces each other. Therefore, the effort to strengthen social conservation is in accordance with the nation character building.

In this occasion I would like to thank to Erica Balasz, M.A. (USA), Katie Jones, M.Ed. (UK), Prof. Kiyoko Majima (Japan), Peter F. Walton (Canada), Prof. Takeshi Tsuchiya (Japan), Prof. Tri Marhaeni Pudji Astuti (Indonesia), and Prof. Udin S. Winataputra (Indonesia) who are willing to participate to the conference.

Wassalamualaikum Wr. Wb.

Prof. Dr. Maman Rachman, M.Sc.
Board of Director of 4ᵗʰ ICESS

PREFACE OF THE DEAN

Assalamualaikum Wr. Wb.

All praise be to the Almighty that the 4th International Conference of Education and Social Sciences 2015 (ICESS 2015) has successfully convented at the Grasia Hotel Semarang, Central Java, Indonesia.

The conference's theme of Social Conservation based on Nation Character Building accomodates seven subthemes encompassing (1) Management of Environmental and Moral Decadence Issues in the Perspective of Social Sciences; (2) Best Practices in Character Building and Environmental Ethics; (3) Urgency of Social Sciences and Social Studies Education in Character Building and Environmental Ethics; (4) Role of Social Sciences and Social Studies Education in Creating Social Conservation; (5) Building Integrity for the Nation Development; (6) Socializing the Social and Political Sciences for Nation Development; (7) Woman Contribution on Character Building and Environmental Ethics.

This conference is aimed to analyzing several implementation practices (best practices) of character education in various countries as piloting models in Indonesia; Analyzing the character values that need to be internalized in response to various environmental and moral/character decadence issues; Facilitating the establishment of a forum for brainstorming and discussion on the national character building; Discussing various efforts to internalize the characters values in the context of social conservation; Discussing various efforts to address the environmental and moral decadence issues in the perspective of social sciences.

To end this preface, the ICESS 2015 committee are proud to congratulate and express warmest gratitude and thanks to the presenters, participants and to all individuals that has contributed directly as well as indirectly to the success of ICESS 2015.

May ICESS 2015 be truly beneficial and successful to all of you.

Wassalamualaikum Wr. Wb.

Dr. Subagyo, M.Pd.
Dean of Faculty of Social Sciences, Semarang State University

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STATUS OF SOIL FERTILITY'S CARRYING CAPACITY FOR GREENING PLANTS IN UNNES BIODIVERSITY TRANGKIL SEKARAN PARK, SEMARANG

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ABSTRACT

Status of soil fertility's carrying capacity in this research is limited as the ability of the various attributes of soil fertility in order to support plant life which is growing on it. The purpose of this research is to know the status of the various attributes of the soil's fertility which becomes a success determinant of greening plant development in UNNES Biodiversity Park. The population of this research was the land conservation of Semarang State University which was established as the Biodiversity Park. Biodiversity Park is located in Trangkil - Sekaran with the area is approximately 15 hectares. Data collection was done by documentation method, field measurement, and laboratory tests. Method of data analysis was done by descriptive. The results of research show that the soil fertility's carrying capacity in research location is low classified. Parameter of soil pH tends to be high, even as alkalis, thus limiting the development of plants. Some soil chemical parameters (C-organic and N-total) are in very low circumstances which cause plants experiencing scarcity conditions. Instead of Fe and Mn micro nutrients are within the limits of toxic to plants. Considering this condition, then the choice of the plants type that can be developed in the Biodiversity Unnes Park is very limited. The submitted suggestion from this research is the needed for choosing kind of plants that really have tolerant of low status of soil fertility's carrying capacity.

Keywords: carrying capacity, soil fertility, greening plants

INTRODUCTION

Land is an area on the earth's surface that can be used for a variety of uses. Land use should be based on the ability and not exceed its carrying capacity. This is because the land also has a very important function for the environment preservation. At this time the land availability for environmental conservation (conservation land) is getting narrower and reduced.

Conservation land is a land for efforts to prevent soil erosion or the occurrence of chemical and biological changes as a consequence of the wrong land use. Land conservation can help to preserve the environment in order to keep awake and beautiful. Conservation land can be filled by herbs or plants according to the ability of the land.

Semarang State University (UNNES) is the University of Conservation which upholds the principles of the protection, preservation, utilization, and sustainable development of natural resources. Geographically UNNES is located in a mountainous area with a varied topography. Administratively UNNES is located in the Gunungpati District, Semarang City. The area is partly an area that has function as a water catchment area in order to maintain the hydrological cycle and water provider for the life of Semarang in the lower area. According to the Regional Regulation of Semarang City Number 14 in 2011 about Spatial Planning Area (RTRW) Semarang City in 2011-2031, one of the functions is as a development Gunungpati District is as the development of open green space (RTH).

UNNES is located in the hills and surrounded by diverse habitats of animals and plants. It has a potential for the natural resources preservation. In the regulation of Semarang State University Rector number 27 in 2012 about Campus Management Based Conservation in Semarang State University, on article 3 mentions 7 main pillars of conservation, namely: (1) biodiversity conservation; (2) green architecture and internal transport system; (3) waste management; (4) paperless policies; (5) clean energy; (6) conservation, ethics, art, and culture; and (7) conservation cadre recruitment. To support the first pillar (biodiversity conservation), UNNES develops Biodiversity Park that aims to make the protection, preservation, utilization, and wisely and sustainable development on the environment, flora and fauna in UNNES and surrounding areas.

The location of UNNES Biodiversity Park is ± 1 Km from campus UNNES westward, precisely it is located in the Trangkil hills. The area of UNNES's land in Trangkil is about 64 hectares, which are intended for Biodiversity Parks program is ± 15 ha. In the area of 15 hectares are currently planted with jarak kepyar (Ricinus communis L), teak (Tectona grandis), mahogany (Mahogany), albizia (Albizia falca-

taria), and so on. These plants have a growing requirement that varies according to their needs. However, at the moment the existence of entire plants cannot grow well, even at some locations the plants are dead.

Based on the description above, it is necessary to do the research to face the various inhibiting factors of the plants growth in the UNNES Biodiversity Park. So, it is needed to do research about "Status of Soil Fertility's Carrying Capacity for Greening Plants in UNNES Biodiversity Trangkil Sekaran Park, Semarang".

RESEARCH METHODS

The research was conducted on conservation land which is owned by Semarang State University designated as Biodiversity Park. Biodiversity Park is located in Trangkil, Sekaran, Semarang with the area is approximately ± 15 hectares. The samples of research were taken based on the class of slope. The number of samples was determined into 3 units, with a slope class >3 – 8%, >8 – 15%, and >15 – 30%. The samples were initially not only consider to slope classes, but also climate (precipitation) and geological conditions (metamorphic), but given the condition of precipitation and rocks on the location of Biodiversity Parks is similar, then the diversity of the sample is determined only by the class of slope (Figure 1).

Data collection methods which were used include documentation methods, Biodiversity Park area measurement, field measurements, and laboratory tests. Data analysis was done by descriptive.

Figure 1. Sample Spot Map at UNNES Biodiversity Park

The variables of research include a set of parameters that become benchmark of soil fertility. These parameters include the effective soil depth, annual precipitation, soil pH, organic carbon, total nitrogen, soil texture, P2O5, K2O, cation exchange capacity, exchangeable cations (K, Na, Ca, and Mg), as well as macro nutrients (P, K, Ca, Mg, Na, Fe, Mn, Zn, and Cu). The laboratory that was used as a reference for the analysis of soil physical and chemical properties is Testing Institute Laboratory for Agricultural Technology, Central Java.

RESULTS AND DISCUSSION

The Conditions of Biodiversity UNNES Park

Based on the survey results and field measurements, the area of UNNES Biodiversity Park is 15.27 hectares. Geographically UNNES Biodiversity Park is an area which is located in the hilly area and the region is in the east of UNNES campus. This area has the characteristics of a diverse land of plains, hills, and landslides. Based on the geological map reference, UNNES Biodiversity Park has bedrock layer which is classified as marine sedimentary rocks which have undergone deposition or erosion. Marin layer prove that the area was once entered into area waters. It is evident that at some spots in the research area was found limestone.

Topography that is formed in the UNNES Biodiversity Park diverse form of plains and hills, with average height range 50-120 meters above sea level (GPS). In valley there is a tributary. The land in UNNES Biodiversity Park has three classes of slope, there are >3 – 8%, >8 – 15%, and >15 – 30%. In Table 1 is shown the extent of each slope class.

Tabel 1. The Area of Slope in UNNES Biodiversity Park

No	Class of Slope (%)	Slope	Area (Ha)
1	>3 – 8	Slight	0.38458
2	>8 – 15	Aslant	8.75531
3	>15 – 30	Sheer	6.64026

Source: Survey Result, 2014

The effective depth measurement is done in each class of slopes, the calculation of precipitation, and soil sampling. The soil samples were analyzed physical and chemical properties. In soil sampling, initially for each slope class taken at two points, then performed a composite process, so that for each slope class represented by only one soil sample.

When the research was done, greening plant growth conditions are very worrying. Most of the plants are in a state greening dead or stunted. The dominant plants types were found in the location of UNNES Biodiversity Park are mahogany, teak, albizia, and ricinnus. In addition, other plants are also found such as bananas, herbaceous, and shrubs.

Laboratory analysis

To determine the carrying capacity of soil fertility's status in the survey location, conducted field measurements and laboratory analyzes of the attributes (parameters) are the main determinants of fertility. In the following table shows the result of measurement of effective soil depth, the results of the calculation of precipitation, and the results of laboratory analysis (Table 2).

As it know that the top soil layer (depth of 0-120 cm) is part of the soil to support plant growth. Part is usually the most fertile soil than the body part deeper soil. Said to be fertile because the top layer of the available plant nutrients (macro and micro) and a variety of conditions that plants need to grow well. On the ground that have physical, chemical and biological ideal to support the growth and development of plants. When the top layer is present in low fertility status, the growth and crop production will be disrupted.

To determine the Carrying capacity of soil fertility's status in the UNNES Biodiversity Park location, it was needed to be made of benchmarking between soil properties attribute analysis results that have been conducted (table 2) with basic assessment criteria levels of soil fertility. The default level of soil fertility criteria referenced from various libraries. The standard criteria is generally accepted, however there are several types of plants that are able to survive on very bad support condition, a pioneer plant as shown. The result of benchmarking is the power state supported soil fertility, shown in table 3.

Tabel 2. Status of Soil Fertility's Carrying Capacity

No	Parameter	Attribute Status on Slope Class		
		1	2	3
1	Depth Effectiveness	Deep	Deep	Deep
2	Precipitation	Very High	Very High	Very High
3	pH (H_2O at temperature 27°C)	Rather alkalis	Rather alkalis	Alkalis
4	Organic Carbon	Very low	Very low	Very low

No	Parameter			
5	Total Nitrogen	Very low	Very low	Very low
6	Tekstur	Clay Tekstur Class	Clay Tekstur Class	Clay Tekstur Class
	- Sand			
	- Dust			
	- Clay	-	-	-
7	P₂O₅ (Olsen)	High	High	High
8	P₂O₅ (HCl 25%)	Very High	Very High	Very High
9	K₂O (HCl 25%)	High	High	High
10	Cation Exchange Capacity (KTK)			
11	Exchangeable Cation		High	
	- K	Low	Very High	Medium
	- Na	Very High	Very High	Very High
	- Ca	Very High	Medium	Very High
	- Mg	Medium		Medium
12	Micro and macro elements		High	
	- P	High	Medium	High
	- K	High	Very High	High
	- Ca	Very High	Very High	Very High
	- Mg	Very High	Very High	Very High
	- Na	Very High	Toxic	Very High
	- Fe	Toxic	Toxic	Toxic
	- Mn	Toxic	Medium	Toxic
	- Zn	Medium	Medium	Medium
	- Cu	Medium		Medium

Source: Analysis Data, 2014

Based on the information from Table 3, the effective depth on the third class belongs to the slopes, so it does not become a barrier for any plant growth. Effective depth indicates the ability of plant roots to penetrate the soil. With the effective depth of the soil in the area, then cruising rooting (root zone) be knowledgeable and able to supply the needs of the plant.

The high precipitation parameters are indeed very good for most of plants, but some are annual plants like teak and ricinnus, tend to be less suitable planted on land with a high precipitation. Outrageously high precipitation can lead to rooting plants are always flooded and experience the process of decay.

In terms of soil reaction, the pH of the soil in Biodiversity UNNES Park is high, even on land with a slope class >15 – 30% already is alkaline. The high pH value will limit the choice of the type of plant. Slightly alkaline soil conditions and alkalis even become a major limiting factor for the growth of vegetation types that are not resistant to alkaline conditions. The high soil pH values presumably related to the bedrock in the form of a layer (sediment) yesterday. Marine sedimentation will undergo the process of pedogenetic with alkaline soil formation. To repair the condition of the soil alkalinity needed sulfur application, either in the form of a single fertilizer and compound fertilizer (example ZA).

The amount of organic carbon (C-organic) and total nitrogen (N-total) in the location of Biodiversity Park is low. The low of both parameters are thought to have a real contribution to the cause not the growth of some plants in the garden care UNNES greening. Both parameters are needed for all kinds of plants in large quantities, so when soil level is very low, then the required intake, either in the form of organic matter (to increase organic C) and fertilizer N (to increase the N-total). If the fertilizing will be N, then it is recommended to use compound fertilizers which are able to lower the pH of the soil.

Furthermore, with regard to the condition of texture, land in Biodiversity UNNES Park is dominated by the clay fraction, so it belongs to a class of clay texture. Conditions that predominantly clay soil texture (often called heavy ground) causes plant roots can not develop properly. In dry soil conditions it tends to harden resembles a hardened soil, making it difficult for plant roots to penetrate. In contrast to the rainy conditions the soil becomes fluffy, so that at each turn of the season (dry to wet or otherwise) of land will expand and contract. As a further consequence, the soil will be easy to move, let alone be on sloping topography. The phenomenon also occurs in the land stretcher Biodiversity UNNES Park, where the position of the plant often changed after the changes of season.

The availability of land alkaline elements (K, Na, Ca, Mg) in Biodiversity UNNES Park is quite good. It is supported by bedrock of marine sediments that pedogeneticaly brings nature elements of a high base. The scarcity only occurs on the K element, so that the land should be planted when the fertilized potassium. The problem actually occurs in micro-nutrients (especially Fe and Mn) in view of its availability is exaggerated. Micro nutrients are needed by plants only in small amounts, so if too much availability will actually be toxic to growth of plant.

Based on the information that is already described, the general status of the carrying capacity of the soil fertility in Biodiversity UNNES Park is actually less than ideal for greening plant growth. The main

causes of the low carrying capacity of the soil fertility are high precipitation, low organic C, high soil pH, and high levels of most micronutrients. The high precipitation can be still overcome by making the drainage so that rainwater is not stagnant. The stagnant water will cause decomposing root plants. The low of C organic can be treated with organic fertilizer or humus. By increasing C organic will spur the binding of nutrients to be more available to plants. The high pH of the soil can be treated with sulphur fertilizer, either in the form of a single element or in the form of a compound, such as ZA (Zwavelfuur Ammonia). Applications sulfur or ZA will be able to improve soil pH toward neutral (6.5 to 7.0), so that the chemical properties of the soil so forth were improved. The high alkaline elements, gradually also will decrease if the soil pH decreases. Similarly, the high micro elements will go down with decreasing soil pH to neutral.

CONCLUSION

The research has been able to identify some parameters of the soil fertility which is suspected to be the cause of greening plants can't grow well in Biodiversity UNNES Park. The existence of these parameters is needed to be the benchmark for improving soil fertility's carrying capacity. The results of the research about status of soil fertility's carrying capacity which has been done should be used as a reference at the time of Biodiversity Park redesign, especially in zones designated for green open space by choosing plants in accordance with its carrying capacity.

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