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on
Agro-tourism Development
(ISAD)

**AGRO-TOURISM:
EDUCATING, CONSERVING,
AND EMPOWERING**

Hosted by:

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Universitas Pembangunan Nasional "Veteran" Yogyakarta
Indonesia

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Proceedings

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AGRO-TOURISM: EDUCATING, CONSERVING AND EMPOWERING

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Proceedings

International Seminar on Agro-tourism Development

(ISAD 2011)

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Preface

Agro-tourism has become increasingly popular among domestic and foreign travellers. This is because Agro-tourism manages to utilize the natural beauty of agricultural landscapes and the cultural diversity of each region. The goal of Agro-tourism is not only for natural conservation, but also for empowering local communities socially and economically. Simply, by developing Agro-tourism, local economies grow. However, to further empower the local communities, it is imperative that they are involved in the planning, decision making and management of the Agro-tourism. Thus, education plays an important role in this matter. The theme of the seminar is Agro-tourism development based on local resources. Topics of interest for the seminar include: Services on Agro-tourism, Socio-culture, Economics and business, Regional development, Land management, Processing of agricultural products, Agronomy, Forestry, Livestock, and Fishery.

The objectives of the seminar are sharing research information and empirical experiences, as well as innovative ideas that will open new perspectives on agriculture related to tourism issues. It also aims to establish interaction and communication among researchers, observers and practitioners in finding solutions of the problems regarding agriculture and tourism to improve welfare of the rural areas.

On behalf of the international seminar organizers, we are pleased to present the Proceedings of the International Seminar on Agro-tourism Development (ISAD 2011). ISAD is an event held in cooperation between the Faculty of Agriculture Universitas Pembangunan Nasional "Veteran" (UPN "Veteran"), Yogyakarta, Indonesia and the Faculty of Resource Science and Technology and Faculty of Economics and Business Universiti Malaysia Sarawak, Malaysia.

Finally, we would like to express our gratitude to the Rector UPN "Veteran", Yogyakarta for the financial support, the Dean of the Faculty of Agriculture for hosting, and the Scientific and Steering Committee. We wish to thank the keynote speaker Sultan Hamengku Buwana X, and invited speakers Syukur Iwantoro, MS., MBA, the Head of Agro-tourism Commissions, Ministry of Agriculture Indonesia; Prof. Shuib Ahmad, Institute of Agricultural and Food Policy Studies, Putra Infoport, Universiti Putra Malaysia; Prof. Haruo Kuroyanagi, Jogakuen Sugiyama University; Prof. Jesusa D. Ortuoste, Sultan Kudarat State University The Philippines; Marc Vanacht, President of AG Business Consultant, USA; and Dr. M. Reza, Expert of Taman Buah Mekarsari, Indonesia; as well as participants for their contribution in making the seminar a success. We wish to thank the Regency and Local Government of Bantul Yogyakarta as the major sponsor and all other sponsors for their contribution in making this seminar possible. As a Chairperson, I highly appreciate the great efforts of the members of the organizing committee whose hard work made this seminar a great success.

Yogyakarta, December 8, 2011
Siti Syamsiar
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SOIL CHARACTERISTIC THAT IS OVERGROWN WITH MANGROVES API-API (Avicennia sp.) AND NIPAH (Nypa fruticans) IN ESTUARY AREA, CIJULANG, CIAMIS, WEST JAVA

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ABSTRACT

Mangrove vegetation can affect the physical and chemical characteristics of the soil underneath. Its roots are capable of binding sediment from the river and reduce erosion or abrasion. Decomposition of organic matter derived from plant litter can contribute to the plant nutrient. The objective of the research is to examine some physical and chemical characteristics of the soil that is overgrown with mangrove vegetation:Api-Api (Avicennia sp.), Nipah (Nypa fruticans), and the combination of Avicennia sp. and Nypa fruticans. The research is conducted in estuary area, Cijulang, Ciamis, West Java. The method of sampling is by using random sampling and composed in each location, which are: land that is overgrown with vegetation Api-Api, Nipah, and combination of vegetation Api-Api and Nipah. Soil sample is taken at the depth of 30 cm with the analysis of the maturity of the soil, soil pH, water salinity, organic matter, soil texture, bulk density, porosity, aggregate stability, and permeability and pore size distribution. The result shows that the soil that is overgrown with Api-Api, Nipah and the combination of Api-Api and Nipah has soil maturity index from raw to half mature, very low organic matter, and neutral pH. The soil that is overgrown with Api-Api vegetation contains higher sand fraction than Nipah vegetation or combination of Api-Api and Nipah. The soil that is overgrown with Api-Api vegetation has quick permeability, unstable aggregate stability, and also higher in bulk density, transmission pore, and salinity than Nipah or combination of Api-Api and Nipah. The soil that is overgrown with Nipah vegetation and combination of Api-Api and Nipah has permeability of slow to quite slow, quite stable aggregate stability and higher storage pore than the soil that is overgrown with Api-Api vegetation.

KEYWORDS: mangroves, soil characteristics

INTRODUCTION

Mangrove forest is a type of forest typically found along the coasts or estuaries that are influenced by the rise and fall of the tides. Mangrove grows on the sheltered beaches or flat beaches, usually along the side of the island sheltered from the wind or behind offshore coral reefs that are protected (Nontji, 1993, Nybakken, 1993). Mangrove forest ecosystems are complex and dynamic, but unstable (Anwar, 2008). Mangrove ecosystem is filled with

vegetation and is a habitat for various animals and aquatic biota. Type of soil that is developed belongs to youth development which has high clay content. Mangrove forests can continue to grow and develop and run succession in accordance with changes in their natural growth place. It is unstable because it is easily damaged and difficult to recover.

According to BPLH West Java (2008), total area mangrove forests in West Java is 40,129.89 ha (spread on the north and south coast) which consists of inside the forest area of 32,313.50 ha and outside the forest area of 7,816.30 ha. Condition of mangrove forests in West Java is entirely in damaged condition. Medium damaged mangrove forests are 24854.38 ha (62%) in width and heavy damaged are 15275.52 ha (38%) in width.

There are two types of mangrove vegetation in Cijulang, West Java which are Avicennia sp and N. fruticans which has different morphology. N. fruticans belongs to the Palmae family, has large stem and roots in the soil, while Avicennia sp has small leaves, large stem, and protruding roots and belongs to Avicenniaceae family. The mangrove morphological differences mentioned above cause differences in binding sediments dissolved from the river and reducing the erosion or abrasion from its root. Besides that, different litter production causes differences in the contribution of organic matter, nutrients, and physical characteristics of the soil if decomposition has been occurred on the litter.

The objective of the research is to examine some physical and chemical characteristics of the soil that is overgrown with mangrove vegetation Avicennia sp., Nypa fruticans, and the combination of Avicennia sp. and Nypa fruticans.

MATERIALS AND METHODS

The research location is mangrove forest which is located at sub district Cijulang, Ciamis, West Java and it has relatively flat declivity. Soil materials are taken from three different locations which are soil that is overgrown with Avicennia sp., N. fruticans and combination of Avicennia sp. and N. fruticans at the depth of 30 cm.

The method of soil sampling is by using random sampling composed on each research location with three replications. Analysis of soil include: soil pH, salinity, organic matter, soil maturity, soil texture, bulk density, porosity, permeability, aggregate stability, and pore size distribution.

RESULTS AND DISCUSSION

Physical Characteristics of the Soil

Physical characteristics of the soil that is overgrown with Avicennia sp., N. fruticans and combination of Avicennia sp. and N. fruticans are listed in Table 1, 2 and 3.

Table 1. Texture, bulk density and porosity of the soil that is overgrown with different mangrove vegetation

Type of vegetation	Soil Fraction (%)			Texture class	Bulk Density (g/cm^3)	Porosity (%)
	Clay	Silt	Sand			
Avicennia sp.	29.48	32.31	38.62	Clay loam	1.05	56.06
N. fruticans	35.61	32.05	32.34	Clay	0.86	58.04
Combination	29.19	32.44	38.37	Clay loam	0.91	55.82

Texture class based on USDA texture triangle includes clay texture till clay loam texture. Soil fraction derives from transportation from coast that is carried at the rise of the tide. The soil that is overgrown with Nipah has clay texture class derived from river flow at the fall of the tide and be precipitated around Nipah vegetation. Nipah vegetation lies on the offshore so that at the fall of the tide, sediment derived from the river is precipitated because Nipah vegetation has stem which is stuck to the soil and roots inside the soil and Nipah vegetation grows densely. The soil that is overgrown with Api-Api vegetation and combination of Nipah and Api-Api has clay loam texture class and sand fraction percentage is higher than the soil that is overgrown with Nipah vegetation. Its location is in onshore that is influenced by the rise and fall of the tides so that sand fraction that is carried away at the rise of the tide is precipitated at the fall of the tide in the area of mangrove Api-Api vegetation. This shows that abrasion has happened in the Cijulang mangrove area because the sand fraction percentage is high. According to Sediadi (1991), Api-Api vegetation can precipitate and hold the sand particle up to 39.83% because it has pneumatophore.

Bulk Density of the soil is influenced by the content of soil organic matter. The bulk density on the soil that is overgrown with Api-Api vegetation is higher than the soil that is overgrown with N. fruticans and combination of Nipah and Api-Api (Table 1). High bulk density on the surface layer is overgrown with Api-Api vegetation due to high content of sand fraction and low organic matter content. Low bulk density on the ground is overgrown N. fruticans is a reflection of the clay content was (35.61%) and high organic matter contents (Tables 1 and 4). Soil porosity on Nipah vegetation is higher than on Api-Api vegetation and combination of Nipah and Api-Api, because the texture of the soil that is overgrown with Nipah vegetation has higher clay content so that its total pore percentage is higher than total pore percentage of Api-Api vegetation and combination of Nipah and Api-Api.

Table 2. Aggregate stability and pore size distribution of the soil that is overgrown with different mangrove vegetation

Type of vegetation	Aggregate stability (%)	Pore size distribution (% volume)		
		Transmission pores	Residual pores	Storage pores
Avicennia sp.	24.99	32.2	10.9	8.5
N. fruticans	40.84	29.0	9.7	9.2
Combination	28.66	26.6	14.2	8.3

The analysis result of aggregate stability shows that the aggregate stability value on the soil that is overgrown with Api-Api vegetation and combination is unstable, while on the soil that is overgrown with Nipah vegetation is quite stable. The soil that is overgrown with Api-Api vegetation and combination has less clay content than the soil that is overgrown with Nipah vegetation. Three groups of colloidal materials which are necessary as an cementation agent on the aggregate formation are clay minerals, iron oxides and mangan, organic colloid, and also microorganism mucus (Foth, 1994). Soil aggregate which has the value of unstable and quite stable can be easily dispersed by water. The soil that is overgrown with mangrove vegetation has an undeveloped structure because the aggregation process is impeded by the imperfect decomposition process of organic matters and always influenced by the rise and fall of the tides.

Transmission pore on the soil that is overgrown with Api-Api vegetation is higher than the soil that is overgrown with Nipah vegetation or combination, because it is dominated by sand fraction and the aggregation process has not perfected so that the soil becomes more porous and the connection between soil particles becomes loose. The highest residual pore is on the soil that is overgrown with the combination of Api-Api and Nipah, because it has more organic material content than others. Storage pore on the soil that is overgrown with Nipah vegetation is higher than the soil that is overgrown with Api-Api vegetation and combination, because it has the highest clay fraction content and the highest aggregate stability value so that its aggregation process runs well.

Table 3.Permeability and maturity index of the soil that is overgrown with different mangrove vegetation

Type of vegetation	Permeability (cm/hour)	Soil maturity index
Avicennia sp.	15.16	Raw till half mature
N. fruticans	0.46	Raw till half mature
Combination	9.86	Raw till half mature

The highest soil permeability value is on the soil that is overgrown with Api-Api vegetation which has quick value, then the combination of Api-Api and Nipah which has quite slow value and Nipah which has slow value respectively. This happens because the sand fraction percentage on the soil that is overgrown with Api-Api vegetation is the highest of all.

The measure of soil maturity is used to predict the soil capability for holding the physical weight or land holding ability. The soil that is overgrown with Api-Api, Nipah, and combination of Api-Api and Nipah has soil maturity index of raw till half mature because the soil is always stagnated as the cause of the rise and fall of the tides which cause a new deposit in the form of sediment which is carried by water flow. The soil that is influenced by the rise and fall of the tides is a specific ecosystem which can only be overgrown by mangrove vegetation.

Chemical Characteristics of The Soil

Chemical characteristics of the soil that is overgrown with Api-Api, Nipah, and combination of Api-Api and Nipah are listed on table 4.

Table 4. Chemical characteristics of the soil that is overgrown with different mangrove vegetation

Type of vegetation	Organic matter (%)	Salinity ($^0/_{00}$)	pH
Avicennia sp.	0.44	4.0	6.78
N. fruticans	2.1	3.5	6.85
Combination	3.55	3.5	6.88

Organic matter source in estuary area derives from the mangrove litter production. Organic matter content on the soil that is overgrown with Api-Api vegetation is the lowest and it has very low value compared to the soil that is overgrown with Nipah vegetation or combination of Api-Api and Nipah which has low value. The soil that is overgrown with Api-Api vegetation is always influenced by the rise and fall of the tides, so that the decomposition process runs slow. Cijulang mangrove area has organic matter content from low to very low, because the litter production which is the source of organic matter becomes rare as the cause of damaged mangrove ecosystem.

Water salinity on Nipah vegetation is around 0-10 $^0/_{00}$, while on the Api-Api vegetation can hold on up to 90 $^0/_{00}$ of water salinity (Supriharyono, 2000). The soil that is overgrown with Api-Api vegetation has higher salinity because it is located onshore so that it is influenced by the sea water. The soil that is overgrown with Nipah has lower salinity because it is located offshore so that it is influenced more by the river water. Soil pH is one of the important chemical characteristics because pH affects the availability of nutrients in the soil. Soil pH in the three research location has neutral value so that the availability of nutrients is good as the cause of the continuation of organic matter decomposition process. Mangrove litter production becomes rare because the destruction has happened, so that the accumulation of litter production cannot be done and the decomposition process runs well which initiates the mineralization and the produced organic acids is low.

CONCLUSIONS

The soil that is overgrown with mangrove vegetations: Api-Api, Nipah, and combination of Api-Api and Nipah has soil maturity index from raw to half mature, very low organic materials, and neutral pH. The soil that is overgrown with Api-Api vegetation contains higher sand fraction than Nipah vegetation or combination of Api-Api and Nipah, while the highest clay fraction is the soil that is overgrown with Nipah, then Api-Api, and combination of Api-Api and Nipah respectively. The soil that is overgrown with Api-Api vegetation has quick permeability, unstable aggregate stability, and also higher in bulk density, transmission pore, and salinity than Nipah or combination of Api-Api and Nipah. The soil that is overgrown with Nipah vegetation and combination of Api-Api and Nipah has permeability of slow to quite slow, quite stable aggregate stability and higher storage pore than the soil that is overgrown with Api-Api vegetation.

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