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BIODIVERSITY IMPORTANT FACTORS ASSESSMENT ON LOWLAND TROPICAL FOREST BY ECOLOGICAL QUANTITATIVE PARAMETERS

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ABSTRACT

Biodiversity assessment, even in natural forest production has become one important view to consider the balanced ecology in order to maintain productivity function. Most recent studies indicated the partial approach to biodiversity valuation then would provide occurmultiple or difference view. This study aims at identifying the biodiversity important factors as assessment tools on lowland tropical forest by ecological quantitative parameters approach. The study was conducted on Labanan forest research station as lowland tropical forest that is located in Berau district East Kalimantan Province. Data collecting from permanent research plots that consist of 3 variations of logged over forest with different logging techniques and primary condition as control with total area of 48 ha, which measurement conducted periodically every two years along 24 years. Arrangement of ecological important variables based on fluctuation values of the quantitateive dimension which included: density (number of stems), basal area, number of species, shannon diversity index, species abundance, richness index andevenness index. To identify important variables of performance characteristics of biodiversity assessment using by factor analysis basedon Bartlett's Test of Sphericity with value of KMO (Kaiser Meyer Olkin) then the principal component dispersion using Biplot analysis. Determination of important variables based on minimum coefficient variance with total proportion cumulative percentage >80% and eigenvalue >1. The tendency towards of important ecological parameters as biodiversity assessment approach of lowland tropical forest stands after logging could be concluded by 2 important factors are evenness index and species abundancy value.

Key words: biodiversity, ecological, lowland tropical forest, quantitative parameters

INTRODUCTION

In forest management, quantitative parameters needed to improve the accuracy and validity of the value in achieving a sustainable management (Phillips *et al*. 2002). According Chertov *et al.* (2005), a new paradigm in achieving sustainable forest management requires forest stand growth predictions by involving the dynamics of ecological characteristics aspects. Quantitative assessment based on sampling floristic generally intended in the context of the planning and interpretation of ecological research is very important in the conservation and management of tropical forests (Mani and Parthasarathy 2006).

This paper purposed to effort the build an assessment based on factors important biodiversity of tropical forest stands, especially after logging, as well as simplify and identify the range of quantitative ecological parameters. Thus providing the knowledge characteristics of tropical lowland forest stands for reviewing stands recovery based on variations in the condition of forest stands.

METHODOLOGY

Study site

The research was conducted on permanent sample plots which were built in 1989/1990. The plots were located in the Forest Area with Special Purpose (KHDTK) Labanan research forest station where as in the village Labanan, Berau district of East Kalimantan. Geographically located between 117° 10'22 "-117° 15'35" east longitude and 1° 52'43 "-1° 57'34" north latitude. Labanan forest area has slopes of ramps (0-8%) to steep (> 45%), with hilly topography tends to altitude areas up to 500 m above sea level. The type of soil includes red-yellow podzolic, latosol and litosol. Based on Schmidt and Fergusson climate classification (1951) of climate monitoring stations Kalimarau KHDTK Labanan belong to the climate type B (very wet) with value Q = 14.3% (B2PD 2012).

Data collection

Data collection included such as: species, diameter (1.3 m or 20 cm above buttresses), and also the tree position in the plot which measurements every 2 years periodically. Plots size 200 x 200 m (4 ha) is divided into sub-plots of 100 x 100 m (1 ha) and 25 sub subplot size 20 mx 20 m. Plots consisted of 4 variations with summary condition of forest stands as explained in Table 1 (with a total of 12 plots was 48 ha).

Table 1. Research plot summary

No. plots	Treatment
2, 3, 12	Reduced impact logging with diameter > 50 cm
5, 6, 7	Reduced impact logging with diameter > 60 cm
8, 9, 11	Conventional logging with diameter > 60 cm)
1, 4, 10	Primary forest

Table 2. Assessment of biodiversity important factor on lowland tropical forests

PC Analysis	Variables	Consistency	Analysis factor
2 PC			
PC1	Basal area, Density, Individual Periodic Increment, Species abundance, Mortality, Ingrowth	FAL5, FAL7	Basal area, Stand Periodic, Evenness index, Species abundance
PC2	Heterogeneity index, Richness index, Number of species, Evenness index, Species abundance	FAL5, FAL7	
3 PC			
PC1	Richness index, Heterogeneity index, Species abundance, Number of species, Density	FAL9, FAL11, FAL15, FAL17, FAL 24	Basal area, Stand Periodic, Evenness index, Species abundance
PC2	Density, Basal area, Stand Periodic Increment, Evenness index, Mortality, Ingrowth	FAL9, FAL11, FAL15, FAL17, FAL 24	
PC3	Density, Stand Periodic Increment, Evenness index, Mortality	FAL11, FAL15, FAL17, FAL 24	

Remarks : PC = principal component; FAL = forest after logging

Data Analysis

Analysis of biodiversity important factor assesment using Principal Component Analysis approach (Principal Component Analysis /PCA) (Soemartini 2008; Mattjik and Sumertajaya 2011). To identify the main important factors that most influence the characteristics performed by factor analysis. Factor analysis is done to reduce the performance characteristics of the variable constituent based on correlation coefficient. The analysis was performed using the test Bartlett's Test of Sphericity the value of KMO (Kaiser Meyer Olkin)> 0.5 and calculation results Measures of Sampling Adequacy (MSA)> 0.6 (Timm 2002; Mattjik and Sumertajaya 2011).

RESULT AND DISCUSSION

Quantitative assessment of individual trees and forest stands with a variation of the conditions of forest stands after logging showed different responses to species group. Formulation selected parameters ecologies that performance the important factor of biodiversity presented in Table 2.

Results of factor analysis has an important constituent of variable that consistency in all periods after logging include: basic areas, basal area increment, evenness index and the abundance of species. The importance on biodiversity aspect is strongly influenced by awareness factor and knowledge perception. To conclude the important factor biodiversity for environment assessment could not be generalized, but being a specificity corresponding to characteristic of forest condition.

CONCLUSIONS

Performance assessment approach could be done as ecological index that includes variables: diversity index, index of species richness, abundance levels, the number of species, evenness index, basal area and increment. The assessment approach towards the development of forest stands can use (1) ecological index that includes variables: diversity index, index of species richness, abundance levels, the number of species, evenness index, mortality and ingrowth; (2) Stands recovery index includes variables: density and evenness index and (3) dynamic index with a variable increment of basic fields.

It is suggested that more effective planning need preparation to review the biodiveristy characteristics of forest stands with the evaluation of a variety of responses from the different groups of species. Consequences of the selection or input required silvicultural measures in achieving management objectives, especially in order to boost the productivity of stands should be based evaluation of species characteristics of forest stands taking into account the characteristics of variables keys in the stands.

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