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Stratification of Plot Scale Vegetation in Agroforestry Dusung Patterns in the Toisapu Hamlet, Ambon City, Indonesia

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A B S T R A C T

The study was carried out in the Dusung Community Forest (Agroforestry) area of Toisapu Negeri Hutumuri Hamlet, South Leitimur Subdistrict, Ambon City in August - October 2018 to determine the condition of stratification of stands based on ecological conditions in dusung agroforestry systems in Toisapu Hamlet. The study was begun with an inventory of potential at the seedling, sapling, pole and tree levels to see vegetation. The results of the study on three measurement plots have different types of vegetation specifically for stratification of pole and tree level vegetation. Based on the results of inventory types and calculation of plant density index (INP Value) for tree level and pole in Plot 1 plot, Plot 2 and Plot 3, there were five dominant types of vegetation, Nutmeg (*Myristica fragrans*), with INP = 39, 9, Durian (*Durio zibethinus*) with INP = 86.6, Langsat (*Lansium* sp) with INP = 43, Duku (*Lansium domestisum*) with INP = 103 and Clove (*Eugenia aromatica*) with INP = 27.4.

Introduction

Indonesia is one of the countries included in megadiversity, which is a country that has high diversity. MOH R.I (2007), added that Indonesia was the center of biodiversity and was ranked as the second richest in the world after Brazilia. It is estimated that around 25% of the various species in the world are in Indonesia, of which each contains thousands of non-plasma plasma in unique combinations so that there are various genes in individuals (Arief, 2001). Most of Indonesia's forests are included in tropical rainforests, which are complex communities, places that provide trees of various sizes. Tropical rainforest is the most fertile type of vegetation. Arief (1986) in Idriyanto (2008) explains that in tropical rainforests there are canopy stratification from various tree species that are of different heights. These characteristics are owned by tropical rain forests. In Indonesia, tropical rainforests are found in Sumatra, Kalimantan, Sulawesi, Maluku, and Irian Jaya. This forest has about 3,000 large tree species and is included in 450 genera.

Community forests in Indonesia that are developed with agroforestry patterns will provide results that are not only wood but also

fruits, food, medicines, bamboo, industrial plants, spices and so on.

The number of types of plants that make up community forests with agroforestry systems has an impact on the period of acceptance. By using time management, it will greatly benefit farmers because they can meet their needs.

The character of the dusung agroforestry system in the Maluku Islands is generally located in 1–10 Km of land settlements with wet lowlands (0 - 500 masl), so that fruits (Duren, Nutmeg, Mangosteen, Duku, Langsat), spice plants (Nutmeg, Clove, Pecan) and food crops (Tubers and Bananas) are very dominant according to soil conditions (Wattimena, 2007). The type of land use at the study site has developed into a dry land gardening area mixed with shrubs with various types of fruit trees, timber and lower-level plants. This area has hilly forest vegetation with woody vegetation, namely, Linggua (P*etrocarpus Indicus*), Samama (*Anthocepalus Macrophylus*), Walnuts (*Canarium Indicum*), Kenanga (*Cananga Odorata*), Coastal Bintanggor (*Callophylum Inophylum L*), Pulai (*Alstonia Schlolaris*), Kayu Besi Pantai (*Insia sp*), Ketapang (*Terminalia Catappa*), Cemara Pantai (*Kasuarina sp*). Fruit plants namely Mango (*Mangifera indica*), Durian (*Durio zibhethinus*), Duku (*Lansium domesticum*), Langsat (*Langsium sp*), Guava (*Myrtaceae*) and plantation vegetation such as Nutmeg (*Miristyca fragans*) Coconut (*Cocos nucifera*), Clove (*Eugenia aromatica*), shrub vegetation is dominated by Alang-alang (*Imperata cilindrika*) and ferns (*Nephrolepsis exaltata*).

Materials and Methods

Time and location of research

The research was carried out on dusung areas in community forest of Toisapu Negeri Hutumuri Hamlet, South Leitimur Subdistrict, Ambon City, which are astronomically located at 03º 40 '06.7 "South Latitude and 128º 17' 36.8" East Longitude with location elevations 50-100 asl (Fig. 1 and 2).

Tools and materials

The equipment used was, Phiband, Roll meter, camera, raffia, machete, Hagameter and Garmin GPS. Materials included scale stands of plots with a measuring plot gradient of 20 x 20m²; 10 x 10 m² for measuring the height and diameter of various tree stands; 5 x 5 m² and 2 x 2 m² plot gradients, for understorey measurements.

Research methods

Primary data collection was done through direct observation and measurement of the object of research in the field by inventorying the potential of vegetation at seedlings, saplings, poles and trees.

The vegetation sampling technique was carried out by 100% vegetation survey of sapling, pole and tree levels (calculation using allometric equations with diameter variables at chest height). The samples were taken from all observation lines with the width and length size of the plot 20 x 20 m² and 10 x 10 m² for measuring the height and diameter of tree stands while 5 x 5 m² and 2 x 2 m² measuring plots, for understorey measurements.

Data analysis

Data analysis using several calculation methods INP value was calculated based on the sum of the value of Relative Density (KR), Relative Frequency (FR) and Relative Dominance (DR). The amount of INP in a vegetation was calculated by the following equation (Soerianegara and Indrawan, 1983). Based on these equations, to calculate the species INP size:

Sapling, pole and tree phases used the following formula

INP = RD + RF + RD

$$\text{Density (D)} = \frac{\text{number of individuals of a type}}{\text{the whole area of the sample plot}}$$

$$\text{Relative Density (RD)} = \frac{\text{density of a type}}{\text{density of all types}} \times 100\%$$

$$\text{Frequency (F)} = \frac{\text{number of plots found in a species}}{\text{the total number of plots}}$$

$$\text{Relative Frequency (RF)} = \frac{\text{frequency of a type}}{\text{frequency of all types}} \times 100\%$$

$$\text{Domination (D)} = \frac{\text{broad basal area of a species}}{\text{the whole area of the sample plot}}$$

$$\text{Relative Dominance (RD)} = \frac{\text{Domination of a type}}{\text{Domination of all types}} \times 100\%$$

Results and Discussion

Vegetation analysis in measurement plots

The diversity of plant species found in each community forest with a dusung system on Ambon Island has a different structure and stratification of vegetation. The highest number and species were found in agroforest because local people through generations with diversification perennial cultivation plants (fruits, cloves and nutmeg) have managed forestland.

To determine the density of vegetation species, the composition (type composition) and shape (structure) of vegetation were studied at a stretch of forest area. Vegetation analysis answered the dominant plant species and gave the main characteristics of the plant community at the plot level. The size of vegetation dominance was expressed in the form of canopy closure, basal area, important value index and comparison of important values (Indriyanto, 2006).

The results of the three measurement plots had different types of vegetation that differed. The stratification of vegetation at the pole and tree level was based on the results of inventory types and calculation of plant density index (INP value). Meanwhile, tree and pole levels in Plot 1 plots 2 and plot 3 used area size of Plot. For instance, 0.12 ha showed the distribution of vegetation species as in the following table 1.

The dominant distribution of plant species in the three plots for tree growth was dominated by 5 types of plants, namely Nutmeg (*Myristica fragrans*), with INP = 39.9, Durian (*Durio zibethinus*) with INP = 86.6, Langsat (*Lansium* sp) with INP = 43, Duku (*Lansium domestisum*) with INP = 103 and Clove (*Eugenia aromatica*) with INP = 27.4.

Based on the results of the calculation of vegetation density, the plants that have the highest INP value are Duku plants followed by Durian plants and finally clove plants. Based on the results of vegetation analysis in Table 1, it was concluded that for tree level stands the Duku and Langsat plants spread more evenly than the other types. This was indicated by the frequency value category of these two types of plants, which are larger than other types of plants. Whereas, Durian and Duku trees have more species per unit area than other types of plants, so the value of the plant density is also greater. In addition, the Duku and Durian plants also have a greater dominance value so that these two types control the growing space in the vegetation community for each measurement plot.

Distribution of plant species for the three sample plots at the level of the pole level growth is 6 types, namely Nutmeg, Durian, Langsat, Duku, Mangosteen and Clove. Based on the calculation of INP value, the plants that have the largest INP value are Langsat plants with INP values = 92.5, followed by each type of Nutmeg plant with INP value = 60.9, Durian with INP value = 51.4, Duku with INP

= 41.6, Cloves with INP = 32.5; and the smallest is Mangosteen with INP = 21.1. Distribution of plant species in the three carbon measurement plots of the research location can be seen in the table 2.

Based on the results of analysis of pole level vegetation according to the information in the table 2, that the types of Duku plants, Durian and Langsat spread very evenly compared to other types of plants.

This is indicated by the amount of the frequency value that is seen based on the results of measurements and calculations.

However, if viewed from the average value of the overall distribution of vegetation types, the pole level is uniform because the results of the assessment of the frequency values for all types of plants do not show a significant difference.

The types of nutmeg and Langsat plants have more plants per unit area of the base compared with the other three types of plants, because the density value of these plants is greater. Besides that, the stands of Langsat and Durian plants also have a greater dominance value because of the nature and character of the trees that control almost the majority of vegetarian communities in the study area. According to Martono (2012), species diversity index is important information about a community.

The wider the sample area and the more species encountered, the index value of species diversity tends to be higher. A relatively low diversity index value is common in communities that have reached a climax. The data in the table 2 is very relevant to the opinion that for both the type of tree level growth and the level of the pile, the value of the diversity index is relatively the same, as in table 3.

The number of randomly formed plant communities usually determines the high diversity of vegetation. Communities that are very stable, extensively regional, and homogeneous, usually have a lower diversity index than forest areas with no diverse vegetation or forests with a wider scale will experience periodic disturbances due to natural factors that occur for example by fire, wind, flood, pests, and human intervention.

The three carbon measurement plots where tree level stands with diversity index values ranged from 0.21 to 0.37, while in pole level stands, diversity index values ranged from 0.11 - 0.37.

Table.1 Tree level stand density value in three measurement plots

No	Jenis Pohon	∑	D	RD	F	RF	D	RD	INP
1	Nutmeg (*Myristica fragrans*)	9	7,5	12,33	0,67	18,18	0,22	9,39	39,9
2	Durian (*Durio zibethinus*)	27	22,5	36,99	0,67	18,18	0,73	31,47	86,6
3	Langsat (*Lansium sp*)	6	5	8,22	1	27,27	0,17	7,53	43
4	Duku (*Lansium domestisum)*	25	20,83	34,25	1	27,27	0,96	41,52	103
5	Clove (*Eugenia aromatica*)	6	5	8,22	0,33	9,09	0,23	10,09	27,4
	TOTAL	**73**	**60,83**	**100**	**3,67**	**100**	**2,32**	**100**	**299**

Research Data (Processed, 2018)

Table.2 Pole level stand density value in 3 carbon measurement plots

No	Pole type	∑	D	RD	F	RF	D	RD	INP
1	Nutmeg (*Myristica fragrans*)	22	73,33	36,07	0,67	13,33	0,28	11,51	60,9
2	Durian (*Durio zibethinus*)	8	26,67	13,11	1	20	0,45	18,29	51,4
3	Langsat(*Lansium sp*)	19	63,33	31,15	1	20	1,01	41,37	92,5
4	Duku (*Lansium domesticum*)	5	16,67	8,2	1	20	0,33	13,4	41,6
5	Manggis (*Garcinia manggostana*)	2	6,67	3,28	0,67	13,33	0,11	4,46	21,1
6	Clove (*Eugenia aromatica*)	5	16,67	8,2	0,67	13,33	0,27	10,98	32,5
	TOTAL	**61**	**203,33**	**100**	**5**	**100**	**2,45**	**100**	**321**

Source: Research Data (Processed, 2018)

Table.3 Vegetation diversity index in 3 measurement plots

No	Tree Type	Shannon-Winner Index(H)	Pole Type	Shannon-Winner Index(H)
1	Nutmeg (*Myristica fragrans*)	0,26	Nutmeg (*Myristica fragrans*)	0,37
2	Durian (*Durio zibethinus*)	0,37	Durian (*Durio zibethinus*)	0,27
3	Langsat (*Lansium sp*)	0,21	Langsat (*Lansium sp*)	0,36
4	Duku (*Lansium domesticum*)	0,37	Duku (*Lansium domesticum*)	0,21
5	Clove (*Eugenia aromatica*)	0,21	Manggis (*Garcinia manggostana*)	0,11
6			Clove (*Eugenia aromatica*)	0,21

Source: Research Data (Processed 2018)

Fig.1 Research location, Toisapu Negeri Hutumuri Hamlet & shape and size of the sampling plot

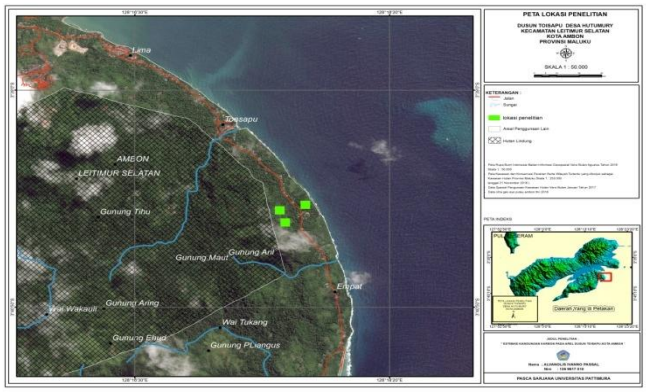
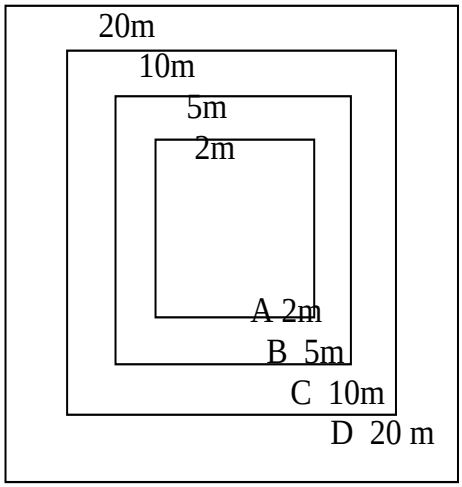


Fig.2 Shape and size of the sampling plot



Based on the Shannon-Winer diversity index criteria, for the two levels of growth this stand had a low diversity. This showed that habitat conditions in the three measuring plots are relatively homogeneous, when viewed from the aspect of disturbance to the ecosystem, because there were no any periodic crop destruction activities in the Toisapu Negeri Hutumuri Hamlet as the research location.

This is understandable because the area is a community plantation forest area or dusung agrofotrestry system, which has become a community plantation area which is preserved and the needs of the community around the community forest area.

In conclusion, plant types in plot 1 were dominated by nutmeg (*Miristica fragrans*) plants, plots of Durian (*Durio zibethinus*) plants and plots of Duku plants (*Lancium* sp) with an average density of plant species for INP tree level stands of 299 and for pole stand INP values of 321. The Shannon-Winer diversity index value or 'H' value in the three carbon measurement plots for tree level stands ranged from 0.21 - 0.37, while for pole level stands, the diversity index value ranged from 0.11 - 0.37.

References

Indriyanto. 2006. *Ekologi Hutan [Forest Ecology]*. Buku. PT Bumi Aksara. Jakarta. 210 p.

Martono, D. S. (2012). Analisis vegetasi dan asosiasi antara jenis-jenis pohon utama penyusun hutan tropis dataran rendah di Taman Nasional Gunung Rinjani Nusa Tenggara Barat [Analysis of vegetation and associations between major tree species composing lowland tropical forests in Gunung Rinjani National Park, West Nusa Tenggara]. Jurnal Agri-Tek, 13(2).

Soerianegara I dan IndrawanA, 1983. Ekologi Hutan Indonesia [Indonesian Forest Ecology]. Institut Pertanian Bogor.

Wattimena, G.A. 2007. Agroforestri di Maluku [Agroforestry in Maluku]. Makalah Diskusi Panel Alumni SMU Negeri 2 Ambon. TMII Jakarta.

Wattimena C.M.A, 2008, Evaluasi Pola Tanam Dusung Sebagai Sebuah Sisitim Agriforestry Tradisional di Kota Ambon [Evaluation of Dusung Planting Patterns as a Traditional Agroforestry System in Ambon City]. Tesis Program Studi Ilmu Kehutanan, Universitas Gadjah Mada (tidak dipublikasikan).

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