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Study Of The Ground Cover Species Important For Agriculture In Peat Swamp Forest Area Tengku Dacing Village

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Abstract. This study aims first to determine the ground cover species that are potentially important for agriculture in the peat swamp forest of Tengku Dacing Village, Second, knowing the benefits and potentials of the ground cover species that are potentially important for agriculture. Third, knowing the distribution of the ground cover species that are potentially important for agriculture in the peat swamp forest of Tengku Dacing Village. The research method uses descriptive quantitative and qualitative descriptive methods. The quantitative descriptive method is carried out by analyzing the data that has been obtained using the data analysis formula from Indriyanto in 2017. While the qualitative description method is carried out by conducting an analysis with plant species identifier experts and literature research to determine the types and potential of the understorey plants that have been successfully recorded. With this research, it is hoped that the community will be able to know more about the important value of each existing understorey, whether it is used as a medicinal plant, ornamental plant, or as a basic material for making handicrafts. The results of this study, concluded that: first, there are 28 species of understorey in the peat forest of Tengku Dacing Village. Second, there are 15 spesies of plants that have the potential as medicinal plants, 6 types of plants that have the potential as ornamental plants and several plants that have the potential as basic materials for handicrafts (mats). Third, the diversity of understorey species in the peat swamp forest of Tengku Dacing Village is not too high. Fourth, the understorey that dominates the peat swamp forest of Tengku Dacing Village is Carex cryptostachys. Fifth, the distribution pattern of plants in the peat swamp forest of Tengku Dacing Village is in groups.

1. Introduction

Peat swamp forest is one type of ecosystem in tropical rain forests. Peat swamp forest is generally known has a very high conservation value and other functions such as hydrological functions, carbon stocks, and biodiversity that are important for environmental comfort and animal life. In Indonesia, peat forests are concentrated on three main islands, namely Sumatra, Kalimantan and Papua . In Kalimantan, the most exposed peat swamp forest is peat swamp forest in Central Kalimantan and West Kalimantan, while the peat swamp forest in North Kalimantan has not been recorded at all. The characteristics of peat swamp forest are that it is saturated with water and the soil is formed from organic matter (peat) and is located in an area that is always flooded with fresh water with high acidity with a pH of 3.5–4.0. Peat swamp forest needs to be managed wisely and sustainably because it has high economic and ecological value [1] [2].

Peat swamp forest is important as a habitat for plants and animals and is a major global carbon store [3]. Prediction of the sustainability of peat swamp forests in Indonesia can be threatened by forest fires, excessive logging activities, construction of drainage and conversion of area functions to development of oil palm plantations and also residential areas. It is known that peat swamp forest is easily disturbed and once it is disturbed, it is very difficult to return to its original condition. This factor causes changes to the structure of the vegetation that grows in it. Vegetation structure can be used to estimate tree density in various diameter classes. The composition of peat swamp forest species is generally dominated by *Palaquium leiocarpum*, *Stemonurus scorpioides*, *Nauclea* sp., *Koompassiamalaccensis*, dan *Shorea* sp. [4]. It is common to find that the vegetation that makes up peat swamp forest will be rarer and stunted, the farther from the river or closer to the center of the peat dome, because the nutrients contained in the peat itself are getting less and less so that it can affect the composition of the tree species in it [5]. The species composition and structure of peat swamp forest of Lake Punggualas, Sebangau National Park, Central Kalimantan were studied based on the data from 40 plots from 2.10 ha forest area. Results of the study recorded 2,253 individual plant from 99 species, 77 genera and 42 families, which were scattered in various diameters. Density level of the tree reached 139.41 stems/ha and basal area of 15.53 m²/ha, pole level of 960 stems/ha and basal area of 25.39 m²/ha, sapling level of 9,090 stems/ha and basal area of 6.42 m²/ha, seedling level of 91,000 stems/ha. Family that have the highest number of species were Myrtaceae, Euphorbiaceae, Sapotaceae, Dipterocarpaceae and Lauraceae. Based on Importance value index (IVI), Diospyros borneensis Hiern. is the most dominating (39.91%) and Palaquium xanthochymum (de Vriese) Pierre (32.64%) [6].

It is important to know and explore every understorey that exists in the peat swamp forest of North Kalimantan, in order to find out every potential that exists and be able to take advantage of the potential of these understorey plants to support development, especially in the agricultural sector. This important understorey in agriculture can be assessed from the use value and function of each vegetation, either as a vegetable, as a medicine, as an ornamental plant, and so on.

To find out the types and potential of each existing vegetation, it is necessary to carry out analytical activities on peat swamp forests so that they can be used as data to consider the importance of preserving the potential of local nature in the Kalimantan region, especially in Tengku Dacing Village, North Kalimantan [7] . In addition, important understorey plants that have potential for agriculture can help with breeding activities that you want to do and can be used as cultivated plants, so that these understorey plants can not only be sustainable in their natural habitat but can also be preserved by being cultivated in other places. In this way, the availability of understorey plants that are potentially important for agriculture will still exist and be sustainable. Based on the background of the problem formulation of this research, what are the types of understorey that are potentially important for agriculture in the peat swamp forest of Tengku Dacing Village? What benefits and potentials do understorey plants have that are potentially important for agriculture? What is the distribution pattern of undergrowth?

Based on the above problem formulation, this study aims to determine what types of bottom plants are potentially important for agriculture in the peat swamp forest of Tengku Dacing Village. peat swamp forest of Tengku Dacing Village, To find out the distribution of bottom plants that are potentially important for agriculture in the peat swamp forest of Tengku Dacing Village.

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2. Materials and Method

The research was conducted in October 2019 to June 2020 and a field survey was conducted in the Peat Swamp Forest of Tengku Dacing Village, North Kalimantan. The tools used in this research are meters, raffia ropes, boots, stationery, large ribbons, cameras and compasses. The material used is peat swamp forest vegetation. Research methods use quantitative descriptive and qualitative descriptive methods. Quantitative descriptive method is done by analyzing the data obtained using the data analysis. While the qualitative descriptive method is done by identifying with plant type identifiers and literature research to determine the type and potential of plants successfully recorded.

The data collection technique was carried out by direct observation in the field. Observation is a systematic approach to research methods based on separate rules that require discipline. Observations carried out included observations regarding the condition of the research location and the vegetation of the peat swamp forest.

2.1. Research Implementation

After arriving at the research location, namely in Tengku Dacing Village, North Kalimantan, the location points were determined and the research identification plots were made. The method used is a combination of the path method and the plotted line method so that the plots are made in the path. Transect length made is 175 meters. In the 175 meter long transect, 6 research plots were made with a size of 25 meters x 20 meters. Data Collection on Every Vegetation. In the measuring plot that was made previously, identification of the type and number of each plant was carried out, after that it was identified the name, description, benefits of each plant that had been found and determined the distribution pattern of undergrowth in the Peat Swamp Forest of Tengku Dacing Village.

Vegetation Identification. The identification is done by finding out the benefits and potential of each existing vegetation with the literature study and interview methods. Data processing. data processing using quantitative descriptive analysis methods and qualitative descriptive. Observation Parameters. The parameters observed in the undergrowth of the peat swamp forest in Tengku Dacing Village were the types of understorey found, the distribution pattern of each understorey, a description of each understorey found, and the benefits of each understorey found. Data analysis. Quantitative Descriptive Analysis:

2.2. Bottom Plant Type Composition

The results of field observations will be analyzed to find out a description of the composition of understorey species that are the object of research using the formula according to Indriyanto (2017) [8], as follows:

a. Density

$$\text{Density} = \frac{\text{number of individuals of a species}}{\text{area of sample plot}}$$

$$\text{Relative Density (KR)} = \frac{\text{Relative of a species}}{\text{the total density of all apecies}} \times 100\%$$

b. Frequency

$$\text{Frequency} = \frac{the\ number\ of\ a\ species\ occupying\ one\ plot}{total\ number\ of\ observation\ plots}$$

$$\text{Relative frequency (FR)} = \frac{frequency\ of\ a\ species}{the\ total\ frequency\ of\ all\ species} \times 100\%$$

c. Dominancy

$$\text{dominancy} = \frac{\text{basal area of a species}}{plot\ area}$$

Relative dominancy (DR) = $\frac{\Sigma\, basal\ area\ of\ a\ species}{\Sigma\ \text{basal area of all species}}$ x 100%

d. Important value index (INP)

INP = KR + FR

2.3. Diversity of Bottom Plants

Field observations were analyzed using the Shanon-Wiener (H") species diversity index. Odum (1998) said that the diversity of plant species can be calculated using the Shanon-Wiener (H") diversity index, namely:

$$H'' = - \sum_{i-1}^{s} \left(\frac{}{N}\right) \text{In} \left(\frac{}{N}\right)$$

Description :
s : number of types, ni : the number of individuals of type i, N : the number of individuals of all types

The greater the value of H′ indicates the higher the species diversity. The value of the Shannon species diversity is defined as follows: . H′ > 3 indicates high species diversity in an area, 1 H ≤ 3 shows moderate species diversity in an area, H′ < 1 indicates low species diversity in an area [9].

2.4. Dominancy index

The dominancy index is a parameter that states the level of centralized dominancy (mastery) of a species in a community. Mastery or dominancy of species in a community can be concentrated in one species, several species, or on many species which can be estimated from the high and low dominance index (ID) [8].

ID = $\Sigma\, (ni/N)^2$, ID = dominance index, ni = important value index of species to-i,N = total of important value.

If the ID value is high, then the dominance (mastery) is concentrated in one species. But if the ID value is low, then dominance is concentrated in several species. If the criteria for the dominance index value range from 0 to 1, the criteria for the ID value are as follows:
ID < 0.50 = Low dominance ID 0.50 < ID < 0.7 5 = Medium dominance ID > 1.00 = High dominance (8).

2.5. Morisita spread index

The distribution pattern of undergrowth in this study was determined using the Morisita Index. This index is not affected by the size of the sampling area and is very good for comparing population dispersion patterns. The morosita spread index can be calculated using the formula :

$$I_d = n\, \frac{\sum X^2 - N}{N\,(N-1)}$$

Description = I_d : morisita spread index, n : number of smple plot, N : total number individual in (N), $\sum X^2$: the square of the number of individuals per observation point. After analysis, obtained information as described below: Id = 1, then the distribution is random, Id < 1, then the distribution is uniform, Id > 1, then the distribution is clustered (10). Qualitative descriptive analysis to find out the type and potential of each vegetation recorded in the peat swamp forest of Tengku Dacing Village, North Kalimantan.

3. Result\ and Discussion

3.1. Result

Data of of the ground cover species in the peat swamp forest of Tengku Dacing Village, North Kalimantan. There were 28 species of the ground cover found in the peat swamp forest of Tengku Dacing Village, coordinates 3.69862, 117.72168 (Table 1).

Table 1. Types of the ground cover species in the Peat Forest of Tengku Dacing Village

NO	Scientific name	Local name
1	*Acrostichum speciosum*	Blujua
2	*Adiantum latifolium*	Suplir
3	*Aeschynanthus tricolor*	Bunga Lipstik
4	*Aglaonema simplex*	Sri Rejeki
5	*Agrostistachys borneensis*	(unknown)
6	*Aidia auriculata*	(unknown)
7	*Alangium uniloculare*	(unknown)
8	*Anadendrum microstachyum*	Daun Ketam
9	*Asparagus sp*	Asparagus
10	*Asplenium cirrhatum*	Paku-pakuan
11	*Asplenium longissium*	Paku Rumput
12	*Asplenium nidus*	Paku Sarang Burung
13	*Calamus sp*	Rotan
14	*Camphylopus pyriformis*	Lumut Gambut
15	*Carex cryptostacys*	Rumput Pisau
16	*Guioa Pleuropteris*	Pulas
17	*Nepenthes ampularia*	Kantong Semar
18	*Nepenthes mirabilis*	Kantong Semar
19	*Nephrolepis auriculata*	Paku-pakuan
20	*Psychotria sarmentosa*	Lengkokoq
21	*Pteris multifida*	Paku-pakuan
22	*Pyrrosia longifolia*	Paku-pakuan
23	*Quercus laurifolia*	(unknown)
24	*Racopilum aristatum*	Lumut
25	*Scindapsus pictus*	Skindapsus Lurik

26	*Smilax rotundifolia*	Daun Bungkus
27	*Stenochlaena palustris*	Kelakai
28	*Teratophyllum aculeatum*	(unknown)

Table 2. Data on the number of understorey plants

PLOT	No	Scientific name	Amount
I	1	*Asplenium longissium*	26
	2	*Scindapsus pictus*	3
	3	*Guioa Pleuropteris*	13
II	1	*Asplenium nidus*	21
	2	*Carex cryptostachys*	61
	3	*Quercus laurifolia*	4
	4	*Stenochlaena palustris*	18
	5	*Anadendrum microstachyum*	10
	6	*Aeschynanthus tricolor*	15
	7	*Aidia auriculata*	18
	8	*Alangium uniloculare*	11
III	*1*	*Carex cryptostachys*	56
	2	*Asplenium nidus*	30
	3	*Quercus laurifolia*	8
	4	*Aeschynanthus tricolor*	19
IV	*1*	*Asplenium nidus*	22
	2	*Nephrolepis auriculata*	14
	3	*Carex cryptostachys*	67
	4	*Racopilum aristatum*	6
	5	*Quercus laurifolia*	13
	6	*Guioa Pleuropteris*	18
V	*1*	*Carex cryptostachys*	73
	2	*Asplenium nidus*	22
	3	*Nephrolepis auriculata*	14
VI	*1*	*Nephrolepis auriculata*	21
	2	*Calamus sp*	3
	3	*Quercus laurifolia*	17
	4	*Asplenium nidus*	20
	5	*Smilax rotundifolia*	13
	6	*Guioa Pleuropteris*	16
	7	*Camphylopus pyriformis*	8
	8	*Carex cryptostachys*	78

Based on the research that has been carried out, obtained data on Density, Relative Density, Frequency, Relative Frequency, Dominance, Relative Dominance, Important Value Index, Species Diversity, The dominance index, as well as the understorey mortality index found in the peat swamp forest of Tengku Dacing Village, can be seen in the table below with coordinates 3.69862, 117.72168.

Table 3. Data on Density, Reactive Density, Frequency, Relative Frequency, Dominance, Relative Dominance, Important Value Index, Species Diversity, Dominance Index,and Morisita Index

NO	Scientific name	K	KR	F	FR	D	DR	INP
1	*Aeschynanthus tricalor*	**0,01**	**4,17**	**0,3**	**5,88**	**0,3**	**5,88**	**10,05**
2	*Aidia auriculata*	**0,01**	**4,17**	**0,2**	**3,92**	**0,2**	**3,92**	**8,09**
3	*Alangium uniloculare*	**0,00**	**0,00**	**0,2**	**3,92**	**0,2**	**3,92**	**3,92**
4	*Anadendrum Microstachyum*	**0,00**	**0,00**	**0,2**	**3,92**	**0,2**	**3,92**	**3,92**
5	*Asplenium longissium*	**0,01**	**4,17**	**0,2**	**3,92**	**0,2**	**3,92**	**8,09**
6	*Asplenium nidus*	**0,04**	**16,67**	**0,7**	**13,73**	**0,7**	**13,73**	**30,39**
7	*Calamus sp*	**0,00**	**0,00**	**0,2**	**3,92**	**0,2**	**3,92**	**3,92**
8	*Carex cryptostachys*	**0,11**	**45,83**	**0,8**	**15,69**	**0,8**	**15,69**	**61,52**
9	*Guioa Pleuropteris*	**0,02**	**8,33**	**0,5**	**9,80**	**0,5**	**9,80**	**18,14**
10	*Nephrolepis auriculata*	**0,02**	**8,33**	**0,5**	**9,80**	**0,5**	**9,80**	**18,14**
11	*Quercus laurifolia*	**0,01**	**4,17**	**0,7**	**13,73**	**0,7**	**13,73**	**17,89**
12	*Saindapsus pictus*	**0,00**	**0,00**	**0,2**	**3,92**	**0,2**	**3,92**	**3,92**
13	*Smilax rotundifolia*	**0,00**	**0,00**	**0,2**	**3,92**	**0,2**	**3,92**	**3,92**
14	*Stenochlaena palustris*	**0,01**	**4,17**	**0,2**	**3,92**	**0,2**	**3,92**	**8,09**
	Species Diversity (H')			=		**1,86**		
	Dominancy Index (ID)			=		**1**		
	Indeks Morisita inedx (I_d)			=		**1,54**		

3.2. Discussion

Plant data taken in 6 plots, each measuring 25x20 meters are understorey species, there are 28 plant species described in table 1. However, not all of the existing plant species can be identified quantitatively in table 2 due to several reasons, including terrain that is not possible and the type of plant. Plot one consists of three types of plants, namely Asplenium longissium, Scindapsus pictus and Guioa pleuropteris. The plant species that dominated plot one was Asplenium longissium with a total of 26 plants. Plot two consists of eight plant species, namely Asplenium nidus, Carex cryptostachys, Quercus laurifolia, Stenochlaena palustris, Anadendrum microstachyum, Aeschynanthus tricalor, Aidia auriculata and Alangium uniloculare. The plant species that dominated plot two were Carex cryptostachys with a total of 61 plants. Plot three consists of four plant species, namely Carex cryptostachys, Asplenium nidus, Quercus laurifolia and Aeschynanthus tricalor. The plant species that dominated plot three were Carex cryptostachys with a total of 56 plants. Plot four consisted of six plant species, namely Asplenium nidus, Nephrolepis auriculata, Carex cryptostachis, Racopulim aristatum, Quercus laurifolia, Guioa pleuroptheris. The plant species that dominated plot four were Carex cryptostachys with a total of 67 plants. Plot five consisted of three plant species, namely Carex cryptostachys, Asplenium nidus and Nephrolepis auriculata. The plant species that dominated plot five were Carex cryptostachys with a total of 73 plants. Plot six consisted of eight plant species, namely Nephrolepis auriculata, Calamus sp, Quercus laurifolia, Asplenium nidus, Smilax rotundifolia, Guioa pleuroptheris, Leskea iucens and Carex cryptostachys. The plant species that dominated plot six were Carex cryptostachys with a total of 78 plants. Based on the data obtained, calculations were made regarding the amount of relative density (KR), relative frequency (FR), dominance (D), important value index (INP), diversity (H‟), dominance index (ID) and distribution/morisita index (id). Based on the results of calculations that have been carried out, it is known that the highest relative density (KR) is Carex cryptostachys with a KR value of 45.83%. This shows that Carex cryptostachys grows and develops well in the peat swamp forest where the research was carried out so that this plant has a relative density level of up to 45.83%. In the calculations that have been carried out, it is known that the plant that has the highest relative frequency (FR) value is Carex cryptostachys with an FR value of 15.69%. This shows that Carex cryptostachys grows in various places with the highest frequency. Carex cryptostachys from the Cyperaceae family that likes moist and watery habitats [11] such as peat swamp forests. The plant that has the highest dominance value (D) is Carex cryptostachys with a D value of 0.8%. These data indicate that Carex cryptostachys was able to dominate the peat swamp forest area where the research was carried out. The fact that Carex cryptostachys from the family Cyperaceae has small seed seeds and a starchy endosperm [11] makes this plant can multiply rapidly in large numbers, so it is natural that Carex cryptostachys is able to dominate the peat swamp forest where the research was carried out[9]. The calculation of the important value index (INP) aims to determine the importance of a plant species. The important value index for the level of seedlings and understorey was obtained from the sum of the values of relative density (KR) and relative frequency (KR). In the calculations that have been carried out, it is known that the plant that has the highest important value index (INP) value is Carex cryptostachys, which is 61.52.

After calculating the important value index (INP), a calculation of the species diversity (H'') of the existing plants is carried out. The calculation of species diversity (H'') aims to see the level of diversity of a species in the research area. This diversity calculation is based on the Shanon-Wiener diversity calculation. Shanon defines diversity based on three criteria, namely if $H' > 3$ indicates high species diversity in an area, if 1 $H \leq 3$ indicates moderate species diversity in an area and if $H' < 1$ indicates low species diversity in an area. area. From the calculations that have been carried out, it was found that the H'' value in the plants studied was 1.86, based on Shannon's definition that 1 H 3 indicates moderate species diversity in the peat forest where the study was conducted. The general characteristics of peatlands are characterized by high organic matter content, low pH, high CEC (Cation Exchange Capacity) value and low KB (Base Saturation) value, this results in providing an elemental condition. low nutrient [12]. With such conditions, only certain types of plants can survive, so it is natural that the data shows that the diversity in the peat swamp forest where the research was conducted is moderate.

After obtaining the results of diversity (H''), then the calculation of the dominance index (ID) is carried out. The dominance index (ID) is a calculation to determine the level of centralized dominance (mastery) of species in a community. Mastery or dominance of species in a community can be concentrated on one species, several species, or on many species which can be estimated from the high and low dominance index (ID) [8]. The criteria for the dominance index value (ID) ranging from 0 to 1 are if $ID < 0.50$ then dominance is low, if ID $0.50 < ID < 0.7\ 5$ then dominance is moderate, if $ID > 1.00$ then dominance is high [8]. In the calculations that have been carried out, the dominance index value is 1 which is based on the criteria for entering into high dominance. The available data proves that the peat forest in Tengku Dacing village at the understorey level does not have a high level of diversity and the high dominance index indicates that the dominant plant species in the area is concentrated in one species, namely the Carex cryptostachys plant.

To calculate the dominance index (ID), data processing was carried out to determine the distribution of plant species using the morisita distribution index (Id). This morisita distribution index aims to determine the distribution pattern of the vegetation in the research area. The Morisita distribution index is not affected by the area of the sampling area and is very good for comparing population dispersion patterns, based on the criteria if $Id = 1$ then the distribution is random, if $Id < 1$ then the distribution is uniform and if $Id > 1$, then the distribution is grouped. From the calculations carried out, the result of the Id value is 1.54. This value indicates that the distribution pattern of vegetation in the peat swamp forest of Tengku Dacing village is in groups. This is in accordance with field conditions, namely the distribution conditions of most plant species are grouped at a certain point.

After data collection, identification of each plant is carried out. Identification includes the search for scientific names, local names, benefits as well as a description of each plant. However, it is very unfortunate that of the 28 existing plant species, there are 6 types of plants that have not been identified with local names, benefits, and descriptions, namely plants. In addition, there are several plants whose local names and descriptions are unknown but whose benefits are not yet known. Many factors underlie this, apart from the lack of research and public interest in inventorying peat plants in the area and also the lack of interest of researchers in testing the chemical content in each plant, because if the test has been carried out, the benefits of each plant will be realized. exposed to the wider community and the public will be able to take full advantage of every plant that exists. Of the 22 plant species that have been identified with local names and their benefits, there are 16 plants that have been proven or have the potential to have benefits as herbal medicines, namely Acrostichum speciosum, Adiantum latifolium, Asplenium nidus, Asplenium longissium, Asparagus sp, Anadendrum microstachyum, Calamus sp, Guioa pleuropteris, Nephrolepis auriculata, Nepenthes mirabilis, Nepenthes ampularia, Pyrrosia longifolia, Pteris multifida, Smilax rotundifolia, Stenochlaena palustris, Asplenium cirrhatum, besides that there are 5 types of plants that are useful as ornamental plants, namely Aeschyglacinthus tricolor, Aabicinthus tricolor, Nepenthes ampularia, and there are plants that are used by the community as vegetables (Smilax rotundifolia) and as basic materials for making mats (Carex cryptostachys). With these known benefits, it is clear how important it is to preserve the existing peat swamp forest. If the ecosystem of the peat swamp forest is damaged, many potentially important plants will be lost or even extinct. On the other hand, if we can preserve the existing peat forest, we will be able to make better and more optimal use of every potential of the plants in the peat forest.

4. Conclusion

Based on the research that has been carried out in the peat forest of Tengku Dacing Village, several conclusions can be drawn, namely: there are 28 types of understorey plants in the peat forest of Tengku Dacing Village, 15 types of plants that have the potential as medicinal plants and 6 types of plants that have the potential as ornamental plants. potential as a basic material for handicrafts (mats), the diversity of understorey species in the peat forest of Tengku Dacing Village is not too high, as evidenced by the Diversity Index value of 1.86. The understorey that dominates the peat forest of Tengku Dacing Village is Carex cryptostachys, the distribution pattern of plants in Tengku Dacing Village the peat swamp forest in Tengku Dacing Village is grouped, as evidenced by the Morisita Index value of 1.54.

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