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Diversity of Vegetation in The Natural Forests of Londut Samosir Regency

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ABSTRACT

Londut protected forest contains mixed forest vegetation in the form of natural forest vegetation and there is forest vegetation of former industrial plant forest management, as well as natural tusam vegetation (Pinus*merkusii),* also has the privilege of existing conditions that still have natural biodiversity in the form of natural tropical forest vegetation. The research aims to find out the variation and dominance of the type of forest vegetation contained in the area, so that initial information will be obtained in the framework of planning and management of the area. The implementation of research is carried out by the determination of plot methods, and the creation of inventory plots, the creation of inventory plots according to growth rate, inventory path, measurement of vegetation dimensions, and identification. The inventory plot method is carried out with a net system *(nested sampling)* with an inventory path length of 500 m with a repeat of 5 lanes whose placement is evenly spread over the Londut forest area to get representation. The results showed 31 types of vegetation growing in the region. Based on the diversity of types included in the moderate category as well as the value of the level of the type in the low class. The dominance of vegetation types at the level of seedlings, stake, and poles is occupied by hosting vegetation types *(Quercus sp)* with magnitudes of 25.90%, 33.94%, and 37.61% respectively. For the level of trees dominated by the type of Tusam (Pinus*merkussii)* 57.71%.

1. Introduction

The Lake Toba area has forests that are partly planted forests and some are still in natural condition. Forests in this area mostly fall into the category of protected forests that have been proposed as germplasm preservation areas, species conservation, and protected areas such as river borders, land with steep marbles, and others that have been set limits and confirmed. (Kholibrina, 2017).

The existence of protected areas in one area is directly related to efforts to ensure the supply of environmental services in the form of water and oxygen for human life. The determination of the function of forest areas as protected forests aims for the benefit of water systems, preventing the danger of floods, landslides, maintaining soil fertility, and the availability of oxygen directly. The common thread of establishing a forest area as a protected forest is to ensure a support system for human life in the area below it.

The increasing intensity of natural forest clearing through natural forest management activities and the conversion of natural forests into industrial plantation forests has caused the quantity and quality of natural forests to shrink. The production of wood from natural forests is known to cause the degradation of natural forests and the conversion of natural forests into industrial plantations, oil palm plantations, rubber plantations, and others not only cause biodiversity loss but also has led to the supply of environmental services, especially water and oxygen, not optimal.

The conversion of natural forests into industrial plantation forests that have been directly in various regions in Indonesia is felt to have caused various environmental problems, especially in the function of hydrology in one area. The existence of plant forests in

suatau areas is thought to have caused a spring drought that causes agricultural land not to be fully used as a source of livelihood due to the unavailability of water for agricultural activities.

Industrial plantation forests are considered to be the main cause of droughts that occur in agricultural areas. Various problems involving the declining productivity of agricultural land due to water unavailability with various other follow-up problems have caused the community to reject the existence of industrial plantation forests in one area. The policy of stopping the management of industrial plantation forests by a business entity in Samosir Regency needs to be addressed and observed by stakeholders, to avoid sabotaging forest land and ensuring regional certainty. Establishing the status of the londut forest group in Samosir regency as a protected forest area is a wise and prudent step.

Londut protected forest contains mixed forest vegetation in the form of natural forest vegetation and there is forest vegetation of former industrial plant forest management, as well as natural tusam vegetation (Pinus*merkusii).* This forest area has the privilege of existing conditions that still have natural biodiversity in the form of natural tropical forest vegetation, and is suspected to be the remaining natural forest owned by the Samosir regency.

Like a forest with geological conditions affected by the tectonic volcanic events of Mount Toba, this natural tropical forest has ecological characteristics and a level of forest productivity that is different from other natural tropical forests.

About the management of protected forests which are ecosystems upstream from Pangururan City, the londut forest area is very important to be managed, regarding aspects of hydrology and environmental services. In line with the planning, stakeholders in this case the North Sumatra Forest Service through the Forest Stakeholder Union is preparing its planning by establishing the Londut protected forest area (eco-areaem upstream) as part of the nature conservation area plays a role in supporting the life of the city is the capital of Samos is Regency(Pangururan) as an eco-eruption downstream.

Research that aims to find out the variation and dominance of the type of forest vegetation contained in the area, so that initial information will be obtained in the framework of planning and management of the area.

2. Method

This research was conducted in the Londut Forest Area of Ronggurnihuta District of Samosir Regency of North Sumatra Province which is at an altitude of approximately 1,560 meters above sea level with an area of ± 700 ha.

The necessary materials and equipment include all types of trees contained in the plot of the research plot, tally sheet, GPS, tape meter, label, type identification book, and stationery.
The implementation of research is carried out by the determination of plot methods, and the creation of inventory plots, the creation of inventory plots according to growth rate, inventory path, measurement of vegetation dimensions, and identification.

Seedling level vegetation type data is measured from an inventory plot measuring 1m x 1m or an area of 0.0001 ha with footage of vegetation type data, individual number, and presence of vegetation types. The type of vegetation data measured from the inventory plot measured 5m x 5m or an area of 0.0025 ha with footage of vegetation type data, number of individuals, and presence of vegetation types. Pole-level vegetation type data is measured from an inventory plot measuring 10m x 10m or an area of 0.01 ha with footage of vegetation type data, individual number, and presence of vegetation types. While the tree-level vegetation type data is measured from an inventory plot measuring 20m x 20m or an area of 0.04 ha with footage of vegetation type data, individual number, and presence of vegetation types.

The inventory plot method is carried out with a net system*(nested sampling)*with an inventory path length of 500 m with a repeat of 5 lanes whose placement is evenly spread over the Londut forest area to get representation.

Data analysis is done through vegetation analysis using Microsoft Excel 2010 including:

a. Abundance of Type
   To find out the most and dominant types at the location of the study is done based on the Important Value Index (INP), on the basis according to Alikodra (1989) *in* Sihombing (2012) As follows:

   INP = KR + FR
   where:

$$\mathrm{KR} = \frac{\text{Density in One Type}}{\text{Density of all Types}} \times 100$$

$$\mathrm{FR} = \frac{\text{Number of Plots Found of One Type}}{\text{Total Plot Count}} \times 100$$

Information: KR = Relative Density
FR = Relative Frequency

b. Diversity
Diversity of types is calculated according to the Shannon-Wiener index of diversity (Magurran, 1988) As follows:

$$\mathrm{H}' = \sum_{i=1}^{n} \mathrm{pi\ Ln\ pi}$$

where:
H' = Type diversity index (Shannon-Wiener index diversity)
pi = Proportion of individual type 1 against all types
Ln = Log 2.7183

c. Type Level Index
The theall-type index is a measure of type spark plug distrain forest ecosystems about the spread of other types also in the constellation of space. The leveling of the type is calculated based on the comparison of the type diversity index, namely:

$$\mathrm{E} = \frac{\mathrm{H}'}{\mathrm{Hmax}}$$

where:
E = Generality of the type
H' = Type diversity index
Hmax = The highest level of diversity of the type, obtained from
$\mathrm{H\ max} = \frac{\mathrm{Log\ (S)}}{\mathrm{Log\ 2.7183}}$
(S) = Number of types

3. Results and Discussions

3.1 Seedling Level Type Composition

Based on the results of inventory recapitulation that has been done on seed-level plots, data is obtained as outlined in Table 1.

Table 1 Recapitulation of Composition and Dominance of Seed Level Youth

No	Vegetasi	K	F	KR (%)	FR (%)	INP (%)

1	Hoting (*Quercus sp*)	176	99	10.58	15.33	25.90
2	Simartolu (*Schima wallicii*)	265	55	15.93	8.51	24.44
3	Sarimartullik (*Macaranga lowii*)	200	54	12.80	8.20	21.00
4	Modang (*Alseodaphne Noronha*)	213	53	12.02	8.36	20.38
5	Makadamia (*Macadamia ternilfora*)	89	47	9.38	4.95	14.33
6	Appiras (*Macaranga gigantea*)	67	43	5.35	7.28	12.62
7	Abbis (*Mallotus barbatus*)	78	37	4.03	6.66	10.68
8	Simarbosi-bosi (*Heritiera simpliciflora*)	45	35	4.69	5.73	10.42
9	Tusam (*Pinus merkussii*)	156	32	4.69	4.64	9.33
10	Hau Tele (*Podocarpus neriifolius*)	35	30	2.70	5.42	8.12
11	Bane-bane (*Calopyllum inophyllum*)	78	30	2.10	4.64	6.75
12	Antuang (*Sapium baccatum*)	34	29	2.04	4.49	6.53
13	Haundolok (*Eugenia* sp)	26	19	2.70	2.94	5.65
14	Sialagundi(*Rhodolia teysmannii*)	45	19	2.10	2.79	4.89
15	Sitorop (*Artocarpus elastic*)	21	18	1.56	2.94	4.50
16	Sibola (*Cratoxylon* sp)	35	18	2.22	2.17	4.39
17	Turi-turi (*Lithocarpus Cyclosorus*)	37	14	1.26	2.79	4.05
18	Tada-tada (*Palagium edule*)	32	7	1.92	1.08	3.01
19	Rasamala (*Altingia exelsa*)	32	7	1.92	1.08	3.01
Sum		1.664	646	100.00	100.00	

Source: Primary Data processed, 2020

Based on Table 1 data, it is known that 19 types of vegetation levels fill the research plot, with the Simartolutype*(Schima wallicii)*is the type that has the highest type (K) abundance of 265 plants and the lowest in the Sitorop (Artocarpus*elastic)*type with an individual number of 21. plant. The average abundance of types of all existing types is 1,664/19 = 87.6 or ~88 individuals. For vegetation that has the highest presence (frequency) is found in the type of Hoting*(Quercus sp)*99 individuals and the lowest in Tada-tada (Palagium*edule)*andRasamala (Altingia*exelsa)*with the number of individuals each seven. The average attendance of all types is 646/19 =34 individuals. Inventory results to determine the dominance of vegetation types at the seedling level on the inventory plot and data analysis, obtained relative density (KR), relative frequency (FR), and important value index (INP).

The highest Relative Density value is in the Simartolutype*(Schima wallicii)*of 15.93% of the 19 types of vegetation available and the lowest is in the Turi-Turi type*(Lithocarpus Cyclosorus)*of 1.26%. If the average value of KR is calculated then the average number of KR of 100/19 = 5.26%.
Simartolutype*(Schima wallicii),* as the type of vegetation that has the highest KR value, does not become the type of vegetation that also has the highest FR value. This can occur because the spread of *Schima wallicii* on research plots is lower than in other types, in this case by the Hoting type of vegetation *(Quercus sp)* which has the highest FR value (15.33%). Conversely, the type of vegetation that has the highest RF value does not become the type of vegetation that has the highest KR value. This is thought to be because this type of vegetation is less in number than other types.

Vegetation Hoting*(Quercus*sp) is known to be the dominant type because it has the highest Important Value Index (INP) value (25.99%). Other almost dominant types of vegetation whose value is close to the INP value of *Quercus sp* vegetation type are Simartolu type (Schima*wallicii)* 24.44%, followed by Sarimartullik*(Macaranga lowii)*21.00% and Modang (Alseodaphne*noronha)*with an ANINP value of 20.38%.

The four dominant types of vegetation found on seedling plots are endemic vegetation types in Samosir Regency, where this type grows in primary forests. While the *macaranga lowii* type is a type of pioneer commonly found in secondary forests. Based on this, it should be expected that Londut forest is no longer a primary natural forest but has experienced disturbances that could be caused by illegal logging or plantations.

3.2 Composition of Stake Level Type

Based on the results of the inventory recapitulation that has been carried out on the stake level plot with an area of 0.05 hectares, the data is obtained as outlined in Table 2.

Table 2 Recapitulation of Composition and Dominance of Stake Level Youth

No	Vegetasi	K	F	KR (%)	FR (%)	INP (%)
1	Hoting (*Quercus sp*)	167	146	16.90	17.04	33.94

2	Simartolu (*Schima wallicii*)	145	116	14.68	13.54	28.21
3	Sarimartullik (*Macaranga lowii*)	105	99	12.25	11.44	23.68
4	Modang (*Alseodaphne Noronha*)	121	98	10.63	11.55	22.18
5	Makadamia (*Macadamia ternilfora*)	100	98	10.12	11.44	21.56
6	Appiras (*Macaranga gigantea*)	67	56	6.78	6.53	13.32
7	Abbis (*Mallotus barbatus*)	34	31	3.74	3.50	7.25
8	Simarbosi-bosi (*Heritiera simpliciflora*)	37	30	3.44	3.62	7.06
9	Tusam (*Pinus merkussii*)	34	28	3.44	3.27	6.71
10	Hau Tele (*Podocarpus neriifolius*)	32	27	3.24	3.15	6.39
11	Bane-bane (*Calopyllum inophyllum*)	24	20	2.43	2.33	4.76
12	Antuang (*Sapium baccatum*)	21	19	2.33	2.10	4.43
13	Haundolok (*Eugenia* sp)	21	19	2.13	2.22	4.34
14	Sialagundi(*Rhodolia teysmannii*)	21	19	2.13	2.22	4.34
15	Sitorop (*Artocarpus elastic*)	23	18	2.13	2.22	4.34
16	Sibola (*Cratoxylon* sp)	12	10	1.21	1.17	2.38
17	Turi-turi (*Lithocarpus Cyclosorus*)	9	9	0.91	1.05	1.96
18	Tada-tada (*Palagium edule*)	7	7	0.81	0.82	1.63
19	Rasamala (*Altingia exelsa*)	8	7	0.71	0.82	1.53
Sum		988	857	100.00	100.00	

Source: Primary Data processed, 2020

The distribution of data in Table 2, known in the stake levelmudgy plot, 19 types fill it. The Hoting type*(Quercus sp)* is the type that has the highest abundance (167 individuals). While the lowest type of abundance is found in the type of Tada-tada*(Palagium module)* with the number of individuals 7. While the average abundance of types of all types is as many as 52.0 individuals.

The highest Relative Density value is in the Hotingtype*(Quercus sp)*of 16.09% of the 19 types of vegetation found, and the lowest in the type of Rasamala*(Altingia exelsa)*by 0.71%. From the data obtained the average relative density (KR) of 5.26%.

Simartolutype*(Schima wallicii),* as the type of vegetation that has the highest KR value, does not become the type of vegetation that also has the highest FR value. This can occur because the spread of Simartolu on research plots is higher than in other types. The distribution of data on the table outlines that the value of the Important Value Index (INP) simartolu dominance (33.94%), and Rasamala*(Altingia exelsa)*is the type that has the lowest INP value (1.53%). This kind of composition is still the same as the seedling level.

3.3 Pole Level Type Composition

Based on the results of the recapitulation of inventory that has been carried out on the pole-level plot on a plot area of 1.25 hectares, the data is obtained as outlined in Table 3.

Table 3 Recapitulation of Pole-Level Composition and Dominance

No	Vegetasi	K	F	KR (%)	FR (%)	INP (%)
1	Hoting (*Quercus sp*)	41	37	17.83	19.79	37.61

2	Modang (*Alseodaphne Noronha*)	43	28	18.70	14.97	33.67
3	Simartolu (*Schima wallicii*)	34	27	14.78	14.44	29.22
4	Rasamala (*Altingia exelsa*)	22	19	11.74	9.09	20.83
5	Makadamia (*Macadamia ternilfora*)	27	17	9.57	10.16	19.73
6	Motton (*Litsea sp)*	12	8	5.22	4.28	9.50
7	Turi-turi (*Lithocarpus Cyclosorus*)	7	7	3.04	3.74	6.79
8	Sarimartullik (*Macaranga lowii*)	7	7	3.04	3.74	6.79
9	Bane-bane (*Calopyllum inophyllum*)	6	6	2.61	3.21	5.82
10	Tusam (*Pinus merkussii*)	5	5	2.17	2.67	4.85
11	Haundolok (*Eugenia* sp)	4	4	1.74	2.14	3.88
12	Hapas-hapas (*Exbucklandia populneus*)	4	4	1.74	2.14	3.88
13	Andulpak (*Sapium barbatu)*	4	4	1.74	2.14	3.88
14	Sibola (*Cratoxylon* sp)	3	3	1.30	1.60	2.91
15	Sialagundi (*Rhodolia teysmannii*)	3	3	1.30	1.60	2.91
16	Antuang (*Sapium baccatum*)	3	3	1.30	1.60	2.91
17	Tada-tada (*Palagium edule*)	2	2	0.87	1.07	1.94
18	Sarimarnaek (*Pterospermum javanicum)*	1	1	0.43	0.53	0.97
19	Juhar (*Samanea saman)*	1	1	0.43	0.53	0.97
20	Sitorop (*Artocarpus elastic*)	1	1	0.43	0.53	0.97
Sum		230	187	100.00	100.00	

Source: Primary Data processed, 2020

The distribution of vegetation species as outlined in Table 3, found 20 types of pole-level vegetation with the type of Modang*(Alseodaphne Noronha)*has a high abundance (43 individuals) and three types of which sarimarnaek (Pterospermum*javanicum),* Juhar (Samanea*saman,* and Sitorop (Artocarpus*elastic).*) has the lowest abundance (one individual), thus the average abundance of this type at the rate of this pole is 12 individuals.

The frequency of presence of each type on the mast-level plot is found in the Hoting type*(Quercus sp)*of 37 in id with an average type presence of 9 invites. The dominance of the type on the plot based on the highest Relative Density value is found in the Modangtype*(Alseodaphne Noronha)*of 18.70% of the 20 types of vegetation available, and the lowest is the same as the spread of the type 0.43%. The results of inventory and data processing obtained an average relative density of 5.00%.
The distribution of the data also illustrates that the type that has a relative density is not automatic as the type that has the highest relative frequency.

The Important Value Index (INP) on the pole-level plot, found that the Hotingtype*(Quercus sp)*was 37.61%, and the lowest was in the three types of 0.97% each found in sarimarnaek*(Pterospermum javanicum),* Juhar (Samanea*saman),* and Sitorop (Artocarpus*elastic).*

Interestingly, the plot of the pole level, that four types of vegetation at the seedling level to the level of the pole are not found, among them Appiras*(Macaranga gigantea),* Abbis (Mallotus*barbatus),* Simarbosi-Bosi (Heritiera*simpliciflora),* and Tele*(Podocarpus neriifolius)*are not found in the plot. It is suspected that the Londut forest area is a secondary forest that has been disturbed. In the process of succession, the presence of these types of pioneers generally begins shortly after the disturbance or damage to the forest.

3.4 Composition of Tree Level Type

Based on the results of inventory recapitulation that has been carried out on phon-level plots on a plot area of 5 hectares, data was obtained as outlined in Table 4.

Table 4 Recapitulation of Tree-Level Composition and Dominance

No	Vegetasi	K	F	KR (%)	FR (%)	INP (%)
1	Tusam (*Pinus merkussii*)	90	78	29.03	28.68	57.71

2	Modang (*Alseodaphne Noronha*)	42	36	13.55	13.24	26.78
3	Hoting (*Quercus sp*)	30	26	9.68	9.56	19.24
4	Rasamala (*Altingia exelsa*)	24	21	7.74	7.72	15.46
5	Makadamia (*Macadamia ternilfora*)	23	19	7.42	6.99	14.4
6	Bane-bane (*Calopyllum inophyllum*)	16	14	5.16	5.15	10.31
7	Sibola (*Cratoxylon* sp)	14	12	4.52	4.41	8.93
8	Antuang (*Sapium baccatum*)	13	10	4.19	3.68	7.87
9	Turi-turi (*Lithocarpus Cyclosorus*)	11	10	3.55	3.68	7.22
10	Simartolu (*Schima wallicii*)	10	9	3.23	3.31	6.53
11	Haundolok (*Eugenia* sp)	6	6	1.94	2.21	4.14
12	Motton (*Litsea sp)*	5	5	1.61	1.84	3.45
13	Rabbittik (*Glochidion sp)*	5	5	1.61	1.84	3.45
14	Sarimartullik (*Macaranga lowii*)	3	3	0.97	1.10	2.07
15	Tintin Surat (*Broussonetia papyrifera)*	3	3	0.97	1.10	2.07
16	Sarimarnaek (*Pterospermum javanicum)*	2	2	0.65	0.74	1.38
17	Tada-tada (*Palagium edule*)	2	2	0.65	0.74	1.38
18	Hau Tele (*Podocarpus neriifolius*)	2	2	0.65	0.74	1.38
19	Simattarasa (*Actephilla sp)*	2	2	0.65	0.74	1.38
20	Sialagundi (*Rhodolia teysmannii*)	1	1	0.32	0.37	0.69
21	Jabi-jabi (*Ficus rubidis)*	1	1	0.32	0.37	0.69
22	Haumbang (*Talauma rubra)*	1	1	0.32	0.37	0.69
23	Sitorop (*Artocarpus elastic*)	1	1	0.32	0.37	0.69
24	Junjung Buhit (*Ficus sp)*	1	1	0.32	0.37	0.69
25	Hapas-hapas (*Exbucklandia populneus*)	1	1	0.32	0.37	0.69
26	Sitolu Bulung (*Vitex pubescens)*	1	1	0.32	0.37	0.69
Sum		310	272	100.00	100.000	

Source: Primary Data processed, 2020

Based on the results of inventory and data processing, it was found that 27 types of trees were found on tree-level plots. Based on Table 4. Tusam (Pinus*merkussii)*is vegetation that has the highest abundance(90 individuals). While endemic/local types are the lowest include Sialagundi*(Rhodolia teysmannii),* Jabi-jabi (Ficus*rubidis),* Haumbang (Talauma*rubra),* Sitorop (Artocarpus*elastic),* Junjung Buhit (Ficus*sp),* Hapas-hapas (Exbucklandia*populneus),*andSitolu Bulung (Vitex*pubescens)*. The average abundance of types on such plots is 12 individuals.

The dominance of the type at the tree level, a known type of vegetation Tusam *(Pinus merkussii)*has a high relative density value, as well as the frequency of relatif and dominance of the type with important values that are also high.
This condition is thought to be because the type of tusam is vegetation that spreads higher than other types of vegetation. While the vegetation types Sialagundi*(Rhodolia teysmannii),* Jabi-jabi (Ficus*rubidis),* Haumbang*(Talauma Rubra),* Sitorop*(Artocarpus elastic),*Junjung Buhit (Ficus*sp),* Hapas-hapas (Exbucklandia*populneus),*andSitolu Bulung (Vitex*pubescens)* are the types of vegetation that value the lowest FR and INP.

3.5 Diversity of Types

The ecological value of londut protected forest vegetation can be known through calculations including Shannon-wiener index diversity. (Magurran, 1988). The calculation results of data processing as shown in Table 5.

Table 5 Shannon-Wiener Type Diversity Index.

No.	Jenis Vegetasi	Total	ni/N	ln ni/N	H´
1	Simartolu (*Schima wallicii*)	476	0.149	-19.014	0.284

2	Modang (*Alseodaphne Noronha*)	419	0.132	-20.290	0.267
3	Sarimartullik (*Macaranga lowii*)	355	0.111	-219.472	0.245
4	Hoting (*Quercus sp*)	352	0.110	-22.032	0.243
5	Tusam (*Pinus merkussii*)	351	0.110	-22.061	0.243
6	Makadamia (*Macadamia ternilfora*)	155	0.049	-30.234	0.147
7	Abbis (*Mallotus barbatus*)	145	0.046	-30.901	0.141
8	Bane-bane (*Calopyllum inophyllum*)	137	0.043	-31.469	0.135
9	Appiras (*Macaranga gigantea*)	101	0.032	-34.517	0.109
10	Rasamala (*Altingia exelsa*)	91	0.029	-35.560	0.102
11	Sibola (*Cratoxylon* sp)	75	0.024	-37.494	0.088
12	Haundolok (*Eugenia* sp)	70	0.022	-38.183	0.084
13	Sialagundi(*Rhodolia teysmannii*)	70	0.022	-38.183	0.084
14	Antuang (*Sapium baccatum*)	68	0.021	-38.473	0.082
15	Turi-turi (*Lithocarpus Cyclosorus*)	67	0.021	-38.621	0.081
16	Simarbosi-bosi (*Heritiera simpliciflora*)	77	0.024	-37.230	0.081
17	Hau Tele (*Podocarpus neriifolius*)	59	0.019	-39.893	0.074
18	Tada-tada (*Palagium edule*)	43	0.014	-43.056	0.058
19	Sitorop (*Artocarpus elastic*)	32	0.010	-46.011	0.046
20	Motton (*Litsea* sp)	17	0.005	-52.336	0.028
21	Hapas2 (*Exbaucklandia populneus*)	5	0.002	-64.574	0.010
22	Rabbittik (*Glochidion* sp)	5	0.002	-64.574	0.010
23	Andulpak (*Sapium barbatus*)	4	0.001	-66.805	0.008
24	Sarimarnaek (*Pterospermum javanicum*)	3	9E-04	-69.682	0.007
25	Tinting surat (*Broussonetia papyrifera*)	3	9E-04	-69.682	0.007
26	Simattarasa (*Actephilla* sp)	2	6E-04	-73.737	0.005
27	Juhar (*Samanea saman*)	1	3E-04	-80.668	0.003
28	Jabi-jabi (*Ficus rubidis*)	1	3E-04	-80.668	0.003
29	Haumbang (*Talauma rubra*)	1	3E-04	-80.668	0.003
30	Junjung buhit (*Ficus* sp)	1	3E-04	-80.668	0.003
31	Sitolu bulung (*Arthocarpus elasticus*)	1	3E-04	-80.668	0.003
	Sum	**3.187**	**1.0000**	**-148.9902**	**2.6897**

Based on the data processing conducted, it can be known the Index of Diversity (Shannon-Wiener index diversity) in the area of the research plot on 31 types of vegetation amounted to 2.6897. According to Magurran (1988), The value of the diversity index of londut forests can be summed up in the medium category (H' = 1.5 – 3.5).

3.6 Type Level Index

The theall-type index is a measure of type spark plug distriin forest ecosystems about the spread of other types as well as constellations of space.

Sihombing (2012), State the magnitude of the type below 3.5 indicates the level of the low type, above 3.5 - 5.0 in the medium category, and above 5 in the high category.

The results of data processing to see the leveling index of types in the forest area of Londut Samosir Regency through observational plots are obtained results as outlined in Table 6 below.

Table 6 Vegetation Type

No.	Types of Vegetation	Total	H´	E
1	Simartolu (*Schima wallicii*)	476	0.284	0.009
2	Modang (*Alseodaphne Noronha*)	419	0.2668	0.009
3	Sarimartullik (*Macaranga lowii*)	355	0.2445	0.008
4	Hoting (*Quercus sp*)	352	0.2433	0.008
5	Tusam (*Pinus merkussii*)	351	0.243	0.008
6	Makadamia (*Macadamia ternilfora*)	155	0.147	0.005
7	Abbis (*Mallotus barbatus*)	145	0.1406	0.005
8	Bane-bane (*Calopyllum inophyllum*)	137	0.1353	0.004
9	Appiras (*Macaranga gigantea*)	101	0.1094	0.004
10	Rasamala (*Altingia exelsa*)	91	0.1015	0.003
11	Simarbosi-bosi (*Heritiera simpliciflora*)	77	0.081	0.003
12	Sibola (*Cratoxylon* sp)	75	0.0882	0.003
13	Haundolok (*Eugenia* sp)	70	0.0839	0.003
14	Sialagundi(*Rhodolia teysmannii*)	70	0.0839	0.003
15	Antuang (*Sapium baccatum*)	68	0.0821	0.003
16	Turi-turi (*Lithocarpus Cyclosorus*)	67	0.0812	0.003
17	Hau Tele (*Podocarpus neriifolius*)	59	0.0739	0.002
18	Tada-tada (*Palagium edule*)	43	0.0581	0.002
19	Sitorop (*Artocarpus elastic*)	32	0.0462	0.002
20	Motton (*Litsea* sp)	17	0.0279	9E-04
21	Hapas-hapas (*Exbaucklandia populneus*)	5	0.0101	3E-04
22	Rabbittik (*Glochidion* sp)	5	0.0101	3E-04
23	Andulpak (*Sapium barbatus*)	4	0.0084	3E-04
24	Sarimarnaek (*Pterospermum javanicum*)	3	0.0066	2E-04
25	Tinting surat (*Broussonetia papyrifera*)	3	0.0066	2E-04
26	Simattarasa (*Actephilla* sp)	2	0.0046	1E-04
27	Juhar (*Samanea saman*)	1	0.0025	1E-04
28	Jabi-jabi (*Ficus rubidis*)	1	0.0025	1E-04
29	Haumbang (*Talauma rubra*)	1	0.0025	1E-04
30	Junjung buhit (*Ficus* sp)	1	0.0025	1E-04
31	Sitolu bulung (*Arthocarpus elasticus*)	1	0.0025	1E-04
	Sum	**3.187**	**2.6897**	**0.0867**

The data displayed in table 6, obtained a value of type leveling in the forest area of Londut Samosir Regency of 0.0867. Based on the amount the level of the type obtained, this forest area falls into the low category. (Magurran, 1988)

4. Conclusion

1. There are 31 types of forest vegetation in the Londut protected forest area that comes from natural forest types, pioneer types, and cultivation types. The dominance of vegetation types at the level of seedlings, stake, and poles is occupied by

hoting vegetation types (Quercus sp) with magnitudes of 25.90%, 33.94%, and 37.61% respectively. For the level of trees dominated by the type of Tusam (Pinus merkussii) 57.71%.

2. Londut Protected Forest Area based on diversity of types is in the moderate category and the leveling value of the type is in a low category.

References

[1] BPS (2017) *Badan Pusat Statistik*, *samosirkab.bps*. https://samosirkab.bps.go.id/
[2] Deshmukh, I. (1986) *Ecology and tropical biology*. Blackwell scientific publications.
[3] Heriyanto, N. M. (2007) Kajian ekologi permudaan saninten (Castanopsis argentea (BL.) A. DC.) di Taman Nasional Gunung Gede Pangrango, Jawa Barat. Sekretariat Komisi Nasional Plasma Nutfah.
[4] Kainde, R. P. (2012) Analisis vegetasi hutan lindung Gunung Tumpa, *Eugenia*. *Fakultas Pertanian Universitas Sam Ratulangi Manado, 17*(3).
[5] Kessler, P. J. A. (2000) *Pedoman lapangan mengenal jenis-jenis pohon penting daerah Berau*. penerbit Berau Forest Management Project.
[6] Kholibrina, C. R. (2017) Pemulihan Ekosistem Danau Toba. Bina Media Perintis Medan.
[7] Magurran, A. E. (1988) *Ecological diversity and its measurement*. Princeton university press.
[8] Samsoedin, I. (2009) Dinamika keanekaragaman jenis pohon pada hutan produksi bekas tebangan di kalimantan timur, *Jurnal Penelitian Hutan dan Konservasi Alam*, 6(1), pp. 69–78.
[9] Sihombing, B. H. (2012) Analisis Potensi Kawasan Lindung Areal Konsessi PT Kaltim Prima Coal dan Sekitarnya Sangatta Kalimantan Timur, *Disertasi Program Doktor Fakultas Kehutanan Universitas Mulawarman, Samarinda*.