International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 20 No. 2 Feb. 2016, pp. 516-525

http://www.ijisr.issr-journals.org/

Association of White Aloes (*Aquilaria Filarial*) with the Dominant Tree Species on the Forest Vegetation in Melinani Backwoods, Manusela Village Seram District, North Maluku

Pamella Mercy Papilaya

Biology Education Study Program FKIP Unpatti, Indonesia

ABSTRACT: Aloes are included to a non-timber forest product and they were a natural potential of Indonesian forest. In Maluku, aloes are more common founded in the Southeast Maluku district, Southwestern Maluku and Centreal Maluku. In Indonesia there were16 kinds of trees that can produce an aloes including 6 species grows in Maluku region, but they have not been commercially used by the society in the Maluku region. White Aloes (*Aquilaria filarial*) were the one of local Maluku that often found in the Manusela village Seram West part. Studying the association of white Aloes (Aquilaria filarial) plant ecology, it was very important to obtain the maximum results, especially in the land utilization system, the plant cultivation technique, as well as the type that suitable to plant jointly with the white Aloes (Aquilaria filarial) plant. Types that have the strongest association ability were the spouse of *Aquilaria filarial* and *Ficus elastic*. *Aquilaria filarial* and *Cananga odorata*. Types that have a weakest association ability with the *Aquilaria filarial* were *Euchaliptus sp*. Based on the analysis results of cluster, the type of which is considered capable to assosiate with the white Aloes (Aquilaria filarial) were: (a) *Aquilaria filarial* and *Euchaliptus* sp; (b) *Aquilaria filarial* and *Ficus elastic*; (c) *Aquilaria filarial* and *Cananga odorata*; (d) *Aquilaria filarial* and *Cananga odorata*; and (e) *filarial Aquilaria* and *Miristica fatua*.

KEYWORDS: Association, white aloes (*Aquilaria filarial*), melinani backwoods, Manusela village, seram district, north Maluku

1 INTRODUCTION

Aloes begin to know by the Indonesia people in about the year of 1200 that shown by the trade history in the form of exchange (barter) between the people of South Sumatra and West Kalimantan with traders from mainland China, Kwang Tung. The society gained the Aloes as an adopt result from the nature forest by using natural died trees by the products form such as clumps, flakes and powder which was a waste of the cleaning process. In line with the development of science, chemical industry technology and pharmaceutical industries, as well as it is supported by the development of medicine and treatment paradigm for re-use the natural plant materials (back to nature), aloe products beside to be required as the perfume industry and cosmetics material, as much as needed as an herbal medicine ingredient, for treatment of stress, asthma, rheumatic, inflammation of kidney and stomach, anti-biotic material of tuberculosis, as well as tumors and cancer (Sumarna, 2012).

Aloes are included to non-timber forest products that were a natural potential of Indonesian forests. The spread of trees that can produce aloes in Indonesia were Sumatra, Java, Kalimantan, Sulawesi, Maluku, Papua and Nusa Tenggara. In Maluku, aloes were more common found in the region of Southeast and Southwestern Maluku. Aloes were a resin that obtained from a microbial infection in a tree of the family of *Thymeleacea*, *Leguminoceae* and *Euforbiacea*. In Indonesia there were 16 kinds of trees that can produce an aloes and among six of them were a species that growed in the Maluku region (Sumarna, 2002). Among these six kinds, there were three types had a good quality such as *Aquilaria malaccensis*, *Aquilaria filarial* and *Aetoxylon sympethallum*. Kind that categorized as a good quality produced a resin with a distinctive aroma. Aloes are used for a fragrance and pharmaceutical materials.

Corresponding Author: Pamella Mercy Papilaya

Aloes actually have not yet commercially exploited by the society in Maluku region. Moreover it has not even penetrated to the national market or traded widely yet. According to the head of forestry department (Dishut) Maluku, the non-timber forest products in Maluku have not been used commercially to increase the revenue. Because the non-timber forest products were quite abundant and spread throughout the whole regencies. It is explained that the non-timber products were widely spread in Buru, Ceram, Yamdena, Kei Besar and southest Island in the Southwest Maluku district (MBD). But unfortunately, the potentials have not been exploited commercially or traded to other regions (Bakorluh, 2013).

Studying the ecology of white Aloes plants association (Aquilaria filarial) which was the one of local kinds from the Manusela Maluku village, it was very important to obtain the maximum result, especially in the system of land utilization, cultivation technique these plants, as well as the suitable types to be plant togetherly with the white Aloes (Aquilaria filarial). By checking off the characteristics of environment with the plants that are planted, then we would increase the success of future harvest potential. In addition, the damage of environment can also be prevented. By studying the ecology of the plants, it would made us to be understand the appropriate and careful techniques to to take the best benefit of vegetation without damaging.

Monk (2000) explained that there were two practical usefulness of the local research that have a unique properties, such as (1) for protection and utilization of the biodiversity, and (2) assessing the impacts that may arised due to the environment changes. Thus, the specific part of the biodiversity study and the environmental impact were the identification of kind indicators in the ecological system. This importance was useful in monitoring the population of a species, especially to determine the type of function in the community. According to Samways *et al* (in Monk, 2000) that some components are conducted to determine a species as indicators are (1) the diversity of taxonomy, (2) abundance, (3) distribution, (4) the role of these types, and (5) how extent the species were easily to be known.

Each plants species are required an appropriate environmental conditions to live, so that the live requirements of each species were different, where they are only occupied a suitable environment for their life. Each plant was a result of the conditions where the plant life, so the plants that are determined as the dominant one can be used as an environmental indicators (Barbour et al., 1987). Understanding the species association was an important in the ecology of a species. In a community, there were a number of biotic and abiotic factors that are affected the distribution and species interactions. The exitance of interaction between species would generate an association between specific where its pattern is determined by whether those species are choosen or avoid the same habitat, it has a rejection or appeal power, or interact power. This association can be positive, negative or no association (Kurniawan, 2008). This research aimed to determine the kinds of tree that were dominating and have a high importance valie in the forest Meliani village Manusela as well as the one that capable to associate with white aloes tree (Aquilaria filarial).

2 RESEARCH METHOD

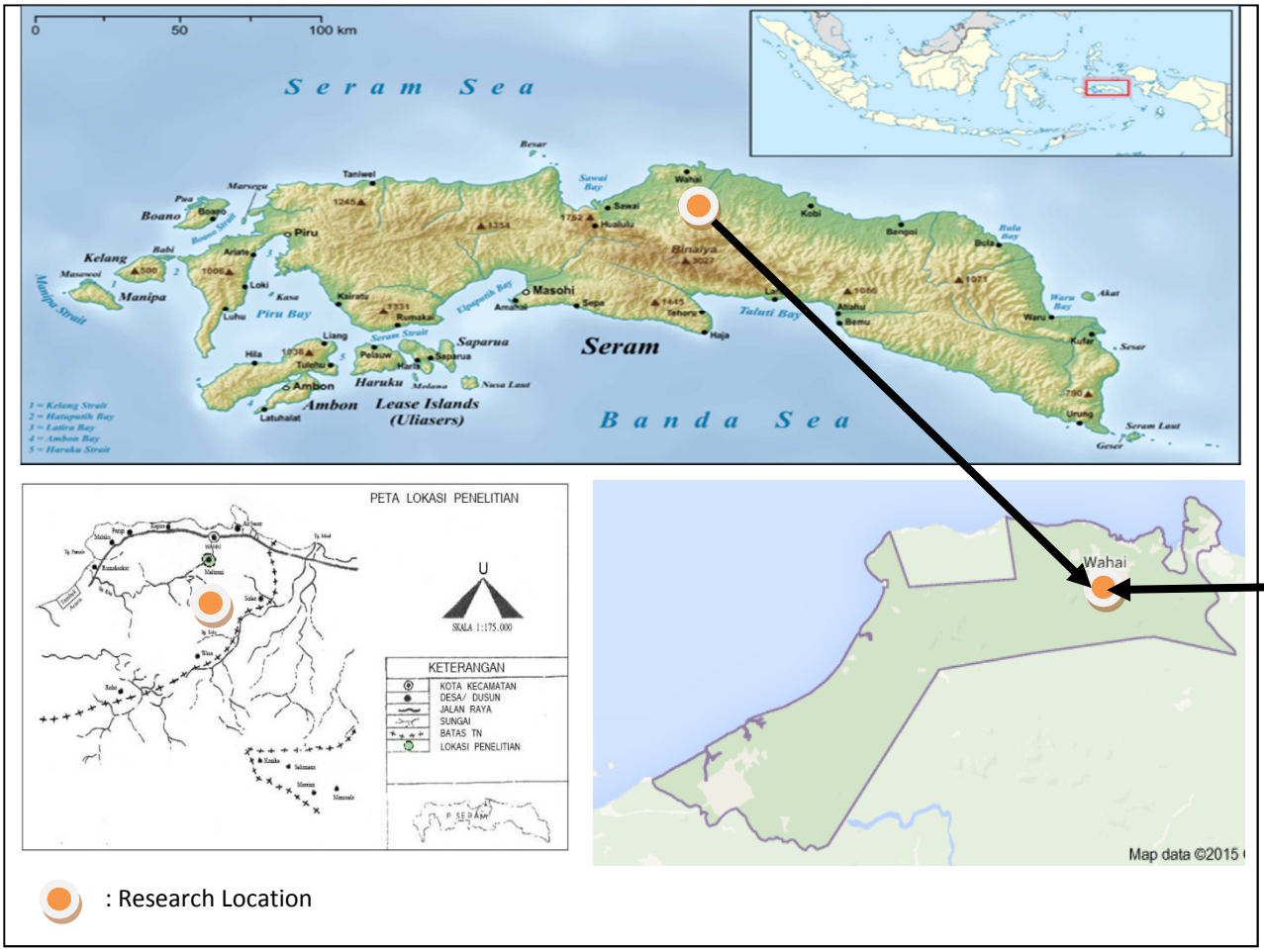
The study was conducting in a region of Manusela village, that was in the Melinani backwoods, Manusela village, Maluku, situated at a height of 20 m above sea level until 120 m above sea level. The astronomical position was 48'4,76 LS - 57'14,23 LS and 22'29,16 BT - BT 31'11,6. The wide area of the research was about ± 0.4 Ha. The boundaries of the region as follows:

North: bordering with Wahai village

West: bordering with Sawai village

East: bordering with Kobi village

South: bordering with Binaya Mount



DATA COLLECTION TECHNIQUE

Preceding this research is carried out the data collection firstly in the form of literature. Then it is conducted an exploration/survey to determine the general image and determine the location of the research. The determination of the location is chosen by considering that it representatively the whole of region to study the diversity of kinds of tree .the research that have been conducting is used by two approaches: 1). Vegetation analysis that is aimed to study the composition of which trees species was dominant in a study area, as well as its data quantitative and 2). Vegetation analysis that is aimed to study the types of trees that were able to associate with the white aloes (Aquilaria filarial).

This research is conducted by using the method without a plot, that is by using a Point Center Quarter Method. Some land utilization in a forest region of Melinani backwoods, Manusela village is divided into three research stations by each extensive of the station was doing the pick out a small portion about 35 points. Each point had a size about 20mx20m^2. The whole trees that have a stem diameter ≥ 10 cm (height 130 cm from the ground).

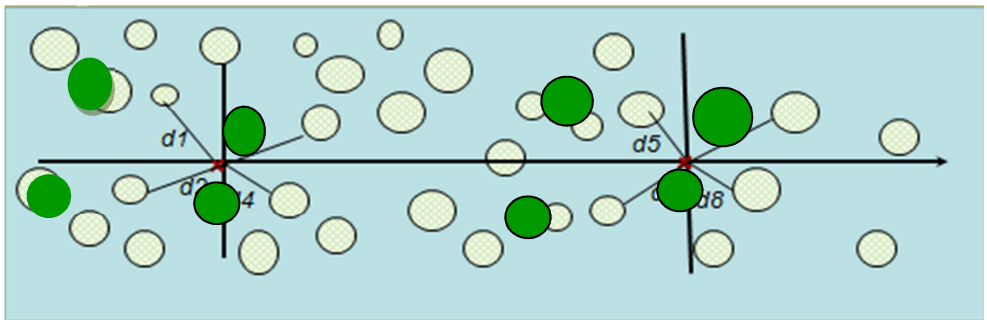


Figure 1. Point Center Quarter Method

Vegetation analysis that is obtained through the steps:

1. Calculating the density value (K), Frequency (F), and dominance (D). Furthermore, the Importance Value Index (INP) from each species is derived from Relative Density (KR), Relative Frequency (FR), and relative dominance (DR).
2. Analysis of the data to determine the association between each type based on the Mueller Dumbois and Ellenberg, 1974: Soegianto, 1994

a. Determining the types of forests composer vegetation that have an important value index about 10% or more.

b. Conducting the calculation to determine the existence of association between the types of vegetation by using 2 x 2 contingency tables, that is by beginning with the type that has a highest Importance Value Index.

The form of 2 x 2 contingency table is shown in the Table 1.

Table 1. contingency tables

		A Species		
		There	Not There	Total
B Species	There	a	b	m = a + b
	Not There	c	d	n = c + d
	Total	r = a + c	s = b + d	N = a + b + c + d

Descriptions:

a: The numbers of field plots that was containing the species A and B
b: The numbers of field plots that was containing the species A only, B was not
c: The numbers of field plots that was contain the species B only, A was not
d: The numbers of field plot that was not containing the species A and B
N: The number of all plots
mnrs : (a+b)(c+d)(a+c)(b+d)

To determine the existence of association tendency or not would be use the X^2 test (Chi-square test) that had a formula:

(X^2) count= $\frac{N(ad-bc)^2}{(a+b)(a+c)(c+d)(b+d)}$

Chi-square value count than compared by the chi-square value tables on the free degree was equal with one on the 5% test level.

Based on this comparison, it can take a conclusion that:

1. If the value of Chi-square count was greater than the value of Chi-square table, so that the varying types was conducting a real association on the test level.

2. If the Chi-square value was smaller than the value of Chi-square table, so that the varying types was conductiong an unreal association on the test level.

To determine the associations were positive or negative, it is used a formula (Ludwig and Reynolds, 1988) as follows:

$$E(a) = \frac{rm}{N} = \frac{(a+c)(a+b)}{N}$$

Based on this formula, so that there were two association types (Ludwig and Reynolds, 1988), namely:

1. The positive association, if a> E (a) means the species pair is occurred togetherly more often than what is expected.
2. The negative association, if a <E (a) means the species pair is occurred togetherly less often than what is expected.
3. Association analysis based on the power size

According to Ludwig and Reynolds, 1988, there were three sizes to get the association namely *Ochiai Index*, *Dice Index* and *Jaccard Index*. From these three indexes is tended had a zero value when there was no association and it has one value when the association was maximum. The *Dice* and *Ochiai* size were using by the ratio a/m and a / r, ie the value from the emergence rate of 2 species than the species emergence total of A and B.

Ochiai index (OI) is explained in a geometric a/m and a/r averages, namely:

$$OI = \frac{a}{\sqrt{a+b}\sqrt{a+c}}$$

Dice index (DI) is explained in a balance average of a/m and a r, namely:

$$DI = \frac{2a}{2a+b+c}$$

Jaccard Index (JI) was the value proportion of plots (PU), where the species is appeared as the total value of the PU when the one of the species types was determining by:

$$JI = \frac{a}{a+b+c}$$

Where a = the plot number of its discovering the both types (A and B), b = the plot number of "A" types discovering, c = the plot number of B type discovering, the association is occured on the interval of 0-1 values.

3 RESULTS AND DISCUSSION

A. WHITE ALOES COMPOSITION AND OTHER TREES' SPECIES COMPOSER

Based on the observation and research results in a natural forests of Melinani backwoods, Manusela village, Seram district, north Maluku, it is discovered a species of aloes that were consisting by white aloes and 28 other types of composer on the 105 plots that is used. Interaction that was happening between the specieses and caused a positive association were also influencing by a factor of population density and High Monk frequency (2000). The high enough of frequency and density in the population would be create a higher attraction between species in order to use the existing environment, to create the stable living conditions. This condition gave a meaning that the interactions is occurring naturally in a community, can be survive for a long time period, during the community were in a balance state. This statement is strongly supported a forest vegetation condition of Melinani backwoods, Manusela village, Seram district, North Maluku. Because, if it seens from the density and frequency parameter values in the field, it is highly supported for the strong positive interactions between existing species.

Based on the obtainable research data, the kinds of trees that are founded at the research site were consisting by 4 classes, namely Dicotiledaneae, Eudicots, Liliopsida, and Magnoliopsida, 23 families, namely Thymeleaceae, Moraceae, Burseraceae, Myristicaceae, Sapindaceae, Annonaceae, Ebenaceae, Euphorbiaceae, Rubiaceae, Verbenaceae, Sapotaceae, flacourtiaceae, Malvaceae, Tetramelaceae, Apocynaceae, Magnoliaceae, Myrtaceae, Arecaceae, Fabaceae, Salicaceae, Clusiaceae, Calophyllaceae, Dipterocarpaceae, Anacardiaceae, 29 genus, namely Aquilaria, Ficus, Canarium, Myristica, Pometia, Cananga, Diospyros, Macaranga, Trycospermum, Adina, Anthocephalus, Vitex, Palaquium, Homalium, Ceiba, Octomeles, Endospermum, Alstonia, Michelia, Eucalyptus, Arenga, Metrosideros, Pterocarpus, Homalium, Garcinia, Calophyllum, Shorea, Eugenia, Dracontomelon, and 29 species, namely the *Aquilaria filarial, Ficus elastic , Canarium indicum, Myristica futua, Pometia piñata, Cananga odorata, Dyosphiros maritime, Macaranga sp, Trycospermum sp, Adina fagifolia, Antosephalus macrophyllus, Vitex cofassus, Palaquimnyortoh, Homalium foctidum, Ceiba pentandra, Octomeles sumatrana,*

Endospermum malacense MA, Alstonia scholaris, Michelia champaca, Euchaliptus sp, Arenga Sp, Metrosideros rugosa, Pterocarpus indicus, Homalium temuntesum, Garcenia dulcis curz, Callophyllum inophyllum, Shorea sp, Eugenia aquea, Dracontomelon dao.

Recapitulation results of the observation, the measurement and calculation based on the division of plot used, so that the composition of the constituent types of natural forest of Melinani backwoods, Manusela Village, Seram District, North Maluku was *Aquilaria filarial*. Based on the calculation, it is known that the highest individual number of *Aquilaria filarial* was 177 trees' individuals. The number of tree species that were finding in the research location shown that the white Aloes (*Aquilaria filarial*) was a constituent of natural forest trees' species of Melinani backwoods, Manusela Village, Seram District, North Maluku.

The association of white Aloes (*Aquilaria filarial*) with other species was an abstraction based on the totality of the types of homogenous and floristic that closely related to each other. (Whittaker, 1975; Fajri and Saridan. 2012), stated that the positive association meant, indirectly some type have a good relationship or the dependency each other, while the negative associations significant indirectly several types have a tendency to negate or exclude others or it is also meant that two types have an influence or different reactions in its environment.

In the ecology of a species, the species interaction in a community would be influence by the biotic and abiotic factors. The interaction between species would generate an association between specific, which the pattern is determined by whether these species have chosen or avoided the same habitat, have a power of rejection or appeal, or even un-interacted. This association can be positive, negative or there was no any association (Soegianto, 1994). The analysis results of aloes association and other of natural forests' types composer of Melinani backwoods, Manusela Village, Seram District of North Maluku can be seen in Table 2.

Table 2. Calculation results of Chi-square contingency Result among 45 species of trees in the forest of Melinani backwoods, Manusela Village, Seram District of North Maluku

No.	Species Pairs	X^2	X^2 Tab.	a	E(a)	Association Type
1	*Aquilaria filarial – Ficus elastic*	0,00	3.84	13	13.0	**Negative**
2	*Aquilaria filarial – Canarium Indicum*	0,00	3.84	10	10.0	**Negative**
3	*Aquilaria filarial – Cananga odorata*	0,00	3.84	11	11.0	**Negative**
4	*Aquilaria filarial – Macaranga sp*	0,00	3.84	9	9.0	**Negative**
5	*Aquilaria filarial – Dyosphiros maritime*	0,00	3.84	9	9.0	**Negative**
6	*Aquilaria filarial – Pometia piñata*	0,00	3.84	8	8.0	**Negative**
7	*Aquilaria filarial – Myristica futua*	0,00	3.84	10	10.0	**Negative**
8	*Aquilaria filarial – Euchaliptus sp*	0,00	3.84	2	2.0	**Negative**
9	*Aquilaria filarial – Trycospermum sp*	0,00	3.84	5	5.0	**Negative**
10	*Ficus elastic – Canarium Indicum*	5,49	3.84	4	6.5	**Negative**
11	*Ficus elastic – Cananga odorata*	1,98	3.84	8	6.5	**Positive**
12	*Ficus elastic – Macaranga sp*	0,02	3.84	6	5.85	**Positive**
13	*Ficus elastic – Dyosphiros maritime*	0,02	3.84	6	5.85	**Positive**
14	*Ficus elastic – Pometia piñata*	3,04	3.84	4	5.85	**Negative**
15	*Ficus elastic – Myristica futua*	0,22	3.84	6	6.5	**Negative**
16	*Ficus elastic – Euchaliptus sp*	0,22	3.84	1	1.3	**Negative**
17	*Ficus elastic – Trycospermum sp*	0,66	3.84	4	3.25	**Positive**
18	*Canarium Indicum – Cananga odorata*	1,82	3.84	4	5.5	**Negative**
19	*Canarium Indicum – Macaranga sp*	0,11	3.84	4	3.5	**Positive**
20	*Canarium Indicum – Dyosphiros maritime*	0,20	3.84	5	4.5	**Positive**
21	*Canarium Indicum – Pometia piñata*	0,20	3.84	5	4.5	**Positive**
22	*Canarium Indicum – Myristica futua*	0,80	3.84	6	5	**Positive**
23	*Canarium Indicum – Euchaliptus sp*	0,02	3.84	1	0.9	**Positif**
24	*Canarium Indicum – Trycospermum sp*	0,07	3.84	2	2.25	**Negative**
25	*Cananga odorata – Macaranga sp*	0,00	3.84	4	4	**Negative**
26	*Cananga odorata – Dyosphiros maritime*	0,74	3.84	4	4.95	**Negative**
27	*Cananga odorata – Pometia piñata*	0,02	3.84	4	3.85	**Positive**

No.	Species Pairs	X^2	X^2 Tab.	a	E(a)	Association Type
28	*Cananga odorata – Myristica futua*	0,20	3.84	6	5.5	**Positive**
29	*Cananga odorata – Euchaliptus sp*	0,02	3.84	1	1.1	**Negative**
30	*Cananga odorata – Trycospermum sp*	3,30	3.84	1	2.75	**Negative**
31	*Macaranga sp – Dyosphiros maritime*	0,002	3.84	4	4.05	**Negative**
32	*Macaranga sp – Pometia piñata*	7,59	3.84	1	4.05	**Negative**
33	*Macaranga sp – Myristica futua*	1,82	3.84	6	4.5	**Positive**
34	*Macaranga sp – Euchaliptus sp*	0,09	3.84	1	0.8	**Positive**
35	*Macaranga sp – Trycospermum sp*	1,11	3.84	1	2	**Negatif**
36	*Dyosphiros maritime – Pometia piñata*	0,30	3.84	3	3.6	**Negatif**
37	*Dyosphiros maritime – Myristica futua*	1,82	3.84	6	4.5	**Positive**
38	*Dyosphiros maritime – Euchaliptus sp*	1,82	3.84	0	0.9	**Negative**
39	*Dyosphiros maritime – Trycospermum sp*	1,11	3.84	1	2	**Negative**
40	*Pometia piñata – Myristica futua*	0,20	3.84	4	4.5	**Negative**
41	*Pometia piñata – Euchaliptus sp*	0,02	3.84	1	0.9	**Positive**
42	*Pometia piñata – Trycospermum sp*	0,61	3.84	3	2.25	**Positive**
43	*Myristica futua – Euchaliptus sp*	2,78	3.84	0	1	**Negative**
44	*Myristica futua – Trycospermum sp*	0,47	3.84	1	1.6	**Negative**
45	*Euchaliptus sp – Trycospermum sp*	2,22	3.84	1	0.5	**Positive**

Descriptions :

A: Observation of measurement point number that was containing species A and B
E (a): The expected value for all a
X¬2: Chi-square count
X2 tab. : Chi-square table
Positives: If the value of a> E (a)
Negatives: If the value of a <E (a)

Based on Table 2, it can be seen that from 45 pairs of tested species, there were 17 types of species pairs with a jointly event between type that are associated in agreater condition than what is expected. It meant that these types of pairs had the same response toward the differences environmental in the community that is existed in a natural forest of Melinani backwoods, Manusela village, Seram District of North Maluku.

Meanwhile, 28 other species pairs have a jointly event between the types that have been smaller associating than what is expected. Thus, these types have different responses to the environmental changes in the community. Besides the tendency to came out or abolish each other, between the two pairs types of each that was allegedly a competition between each pairs of species it self. The emergence of this competition due to pairs of the species types have the same needs to love, meanwhile the sources that was supporting a life needs itself in a limited circumstance.

According to (Indriyanto 2010; Siwi. 2015), INP was a quantitative parameter to assert the dominance (mastery level) types in a plant community. The dominant types in a plant community would have an INP's high value than others that are considered or strongly suspected have an association with the white aloes trees (Aquilaria filarial. It is Also described by Mueller Dumbois and Ellenberg, (1974): Soegianto, (1994), to determine the tree compiler species of the forest vegetation are used the tree species that have an importance value index about 10% or more. the types of trees that have an importance value index about 10% or more is presented in Table 3.

Table 3. White Aloes and Types of Forest Vegetation Compiler of Melinani backwoods, Manusela Village, Seram District of North Maluku which have the importance value index greater than 10%.

No	Species Name/ Scientific	KR(%)	FR(%)	DR(%)	INP
1	*Aquilaria filarial*	15,24	14,08	9,00	38,32
2	*Ficus elastic*	8,57	9,15	8,20	25,92
3	*Canarium indicum*	7,62	5,63	11,66	24,91
4	*Cananga odorata*	7,14	7,75	6,78	21,67
5	*Macaranga mappa*	6,19	6,34	8,88	21,41
6	*Dyosphiros maritime*	6,19	6,34	5,13	17,66
7	*Pometia piñata*	7,14	5,63	4,73	17,50
8	*Myristica futua*	7,14	5,63	3,42	16,20
9	*Euchaliptus sp*	1,43	1,41	11,45	14,29
10	*Trycospermum sp*	4,76	3,52	4,76	13,04

The strength-weakness proving of an association between *Aquilaria filaria* with other species in the surrounding was using an *Ochiai Index*, *Dice Index* and *Jaccard Index* (Ludwig and Reynolds. (1988): Saridan et al, (2012)). Analysis results was the aloes association and types compiler of a natural forest of Melinani backwoods, Manusela Village, Seram District of North can be seen in Table 3.

Table 4. Calculation results of Ochiai Index, Dice Index, Jaccard index between White Aloes and types of natural forest Compiler of Melinani backwoods, Manusela Village, Seram District of North Maluku

No.	Species Pairs	OI	DI	JI
1	*Aquilaria filarial – Ficus elastic*	0.81	0.74	0.59
2	*Aquilaria filarial – Canarium Indicum*	0.71	0.67	0.50
3	*Aquilaria filarial – Cananga odorata*	0.74	0.71	0.55
4	*Aquilaria filarial – Macaranga sp*	0.67	0.62	0.45
5	*Aquilaria filarial – Dyosphiros maritime*	0.67	0.62	0.45
6	*Aquilaria filarial – Pometia piñata*	0.63	0.57	0.40
7	*Aquilaria filarial – Myristica futua*	0.71	0.67	0.50
8	*Aquilaria filarial – Euchaliptus sp*	0.32	0.18	0.10
9	*Aquilaria filarial – Trycospermum sp*	0.50	0.40	0.25

Descriptions:
OI: Ochiai Index
DI: Dice Index
JI: Jaccard Index

The analysis results on Table 3 is showed that actually the third values of the association index ranged between 0.1 to 0.8. The kind that has most powerful ability was a pair of *Aquilaria filarial* and *Ficus elastic* with *Ochiai index* about 0.8062; *Dice index* about 0.7428; and *Jaccard index* about 0.5909. Then it followed by a pair of *Aquilaria filarial* and *Cananga odorata* with *Ochiai index* about 0.7416; *Dice index* about 0.7096; and *Jaccard index* about 0:55. The weakest type that was associating with *aquilaria filarial* is *Euchaliptus sp* with *Ochiai index* about 0.3162; *Dice index* about 0.1818; and *Jaccard Index* about 0.1.

Mueller-Dombois and Ellenberg 1974 stated if the association that was there on a uniform habitat condition. However, it is have not yet indicated the presence of habitat similarity, but at least there was a description about the similarity of the environmental conditions in general. Furthermore, Barbour *et al*. 1987 described that the association was the major community type that are repeatedly founded in a few locations. Many species have a wide tolerance range that can be found in several habitats. Other types association can have a more narrow tolerance limitation, but it may possible that some individual of the species can be lived in under normal conditions and became a member of other communities.

Therefore, based on the data above, it can be argued that white Aloes (*Aquilaria filarial*) has a wide tolerance range and have a high social appeal, so it can be associate and live with the *elastic Ficus*, *Cananga odorata* and *Euchaliptus sp*. The existence of a strong association between *filarial Aquilaria* with the others three species are also caused due to the same

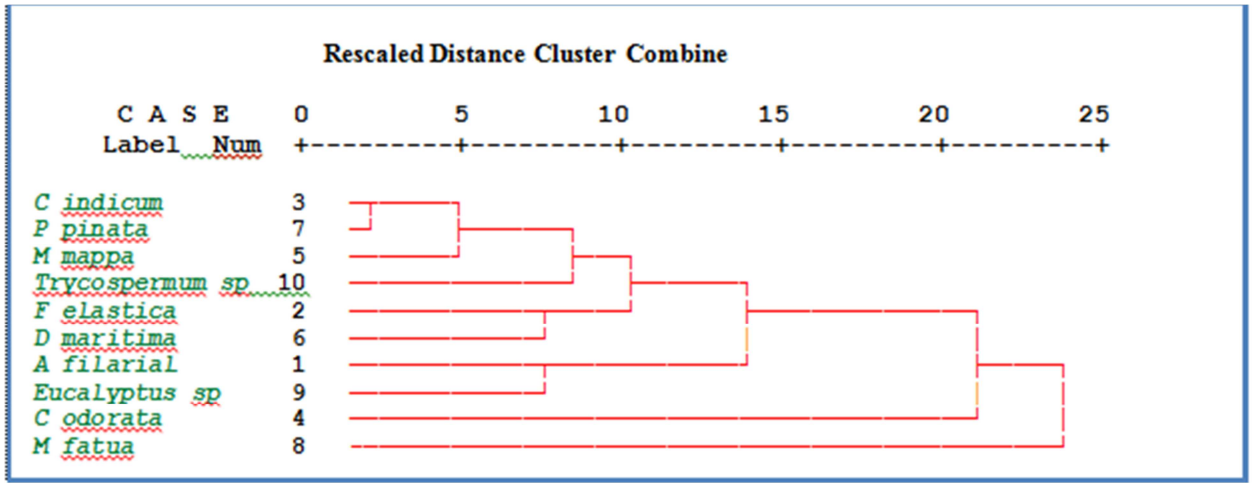
needs between these species. The same environmental needs were the one of causes of the existence of a positive relationship between species. For the large scale and the existence of species composition was very different in the two areas, so that the correlation between species can be caused the groupings that are characterized the community (Mueller et al 1974; Barbour, 1987; Indriyanto, 2010)

B. GROUPING OF TREE TYPES ASSOCIATION PAIRS IN AMBON ISLAND FOREST

Cluster analysis results of tree types of associations pairs Between White Aloes (Aquilaria filarial) and the types of natural forest Compiler of Melinani backwoods, Manusela Village, Seram District of North Maluku are divided into five groups, as follows.

1. Association pairs that were including the first group are consisted of.
   a) *Canarium indicum* and *P ometia piñata*
   b) *Canarium indicum* and *Macaranga mappa*
2. Association pairs that were including the second group are consisted of.
   a) *Pometia piñata* and *Tricospermiun sp*
   b) *Macaranga mappa* and *elastic Ficus*
   c) *Ficus elastic* and *maritime Dyosphiros*
   d) *Aquilaria filarial* and *Euchaliptus sp*
3. Association pairs that were including the third group is consisted of.
   Aquilaria filarial and *elastic Ficus*
4. Association pairs that were including the fourth group is consisted of.
   Aquilaria filarial and *Cananga odorata*
5. Association pairs that were including the fifth group are consisted of.
   a) *Aquilaria filarial* and *Cananga odorata*
   b) *Aquilaria filarial* and *Miristica fatua*

Figure 2. The Dendogram of Analysis Results of Grouping Association Pairs between White Aloes with the types of dominant compiler of natural forests of Melinani backwoods, Manusela Village, Seram District of North Maluku



Besides the proving of strength-weaknes of the association, it was also doing the grouping based on the Cluster analysis, the presence of white Aloes (Aquilaria filarial) that was growing in the natural forests of Melinani backwoods, Manusela Village, Seram District of North Maluku. White Aloes (Aquilaria) have an ability to association and living togetherly with *Euchaliptus sp*, *Ficus elastic*, *Cananga odorata*; and *Miristica fatua*. White aloes tree (*Aquilaria Filaria)* geographically are spread growing naturally at an altitude 0-2400 m.dpl. Biologically the Aloe producing tree plants have a mark, nature and

character of particular growth. As well as being a pioneer plant, semi tolerant towards the light, and also have a germination properties that has a low dormancy period. Aloes-producer plants, as the distribution map grows were not required a specific condition of the land and the climate. Based on these aspects, the aloes-producer planst can be developed on a kinds of soil types and climates (Sumarna, 2002)

Technically, the cultivation a high quality and high commercial value of of aloes-producer trees, besides it was ideal to developed in a various endemic regions as the distribution area growing species, it was also possible can be cultivated on the lands or the area that has a grown suitability. The expanding of cultivation is expected, in addition can be role to preserving the germplasm of resources-producer trees, and also can a role in cultivating a aloes production sustainability in the forestry sector revitalization and fostering public revenue, as well as a country exchange (Sumarna, 2003).

Thus, on a grouping of association pairs, after it is reexamined based on the emergence of type that shown in the table of coefficient distance values or dendogram that is formed, so that it can provided a image that on a principle from five grouping pairs of tree species association that are formed are considered closer to the real situation on the field, which was growing in a natural forest of Melinani backwoods, Manusela Village, Seram District, North Maluku, especially the association between white aloes (Aquilaria filarial) with another dominant tree species that are presented in Figure 2.

REFERENCES

[1] Barbour, G.M., JK Burk and W.D. Pitts. 1987. *Terresterial Plant Ecology*. The Benyamin Cummings Publishing Company, Inc. California.

[2] http://www.bakorluh-maluku.com/2013/04/hasil-hutan-non-kayu-maluku-belum-komersil. *Bakorluh April 2013*

[3] Ikhsan Noviady, Suluh Norma Siwi. 2015. *Komposisi vegetasi di Robian Tongah-tongah, Hutan Lindung Gunung Sibuatan, Sumatera Utara*. UPT Balai Konservasi Tumbuhan Kebun Raya Cibodas, Jawa Barat

[4] Indriyanto, 2010. *Ekologi Hutan.* Bumi Aksara. Jakarta.

[5] Kurniawan, A.,N.K.E, Undaharta daqn I. M.R. Pendit. 2008. *Asosiasi Jenis-Jenis Pohon Dominan Di Hutan Dataran Rendah Cagar Alam Tangkoko*, Bitung Sulawesi Utara, *Jurnal Biodiversitas* Vol 9 Nomor 3 p (199-203), Sukarta

[6] Ludwig, J.A and J.F. Reynold. 1988. Stasistical Ecology, A Primer on Methode and Computing. Jhon Wiley and Sons Inc. New York

[7] Ludwig ,J.A and J.F. Reynold. 1988. Stasistical Ecology, A Primer on Methode and Computing. Jhon Wiley and Sons Inc. New York

[8] Mueller, Dombis, Ellenberg. 1974. *Aims and Method of Vegetation Ecology*. New York, Brisbone, Toronto: Wiley International Edition.

[9] Monk, K.A, De Fretes, Y dan Lelley, G.R. 2000. *Ekologi Nusa Tenggara dan Maluku*. Alih Bahasa Kartikasari, S.N. Jakarta: Prenhallindo.

[10] Muhammad Fajri dan Amiril Saridan. 2012. *Kajian Ekologi Parashorea malaanonan Merr di Hutan Penelitian Labanan Kabupaten Berau, Kalimantan Timur*. Balai Besar Penelitian Dipterokarp,. Samarinda

[11] Soegianto, A. 1994. *Ekologi Kuantitatif.* Surabaya. Usaha Nasional.

[12] Sumarna, Y. 2002. *Budidaya Gaharu*, Seri Agribusines, Penebar Swadaya, Jakarta

[13] Sumarna, Y. 2003. *Budidaya Gaharu.* Swadaya. Jakarta.

[14] Sumarna, Y. 2012. *Budidaya Jenis Pohon Penghasil Gaharu*. Departemen Kehutanan. Badan Penelitian dan Pengembangan Kehutanan, Pusat Kehutan Pusat BALITBANG Produktifitas Hutan. Bogor.