Project

"Improving Forest Functions in Bengkulu Province through Community Participation in Rehabilitation of Degraded Forest by Using Local Prospective Commodities"

"EARLY GROWTH EVALUATION OF PLANTED *Dysoxylum mollissimum* and *Durio zibethinus* AT THREE LOCATIONS OF DEMONSTRATION PLOTS"

MINISTRY OF ENVIRONMENT AND FORESTRY, ENVIRONMENT AND FORESTRY SERVICE OF BENGKULU PROVINCE & INTERNATIONAL TROPICAL TIMBER ORGANIZATION (ITTO)

PD 477/07 REV.4 (F)

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EARLY GROWTH EVALUATION OF PLANTED *Dysoxylum mollissimum* and *Durio zibethinus* AT THREE LOCATIONS OF DEMONSTRATION PLOTS

(Activity 2.2.2. – Develop and establish plantation model in 2 districts)

Technical Report, December 2017

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SUMMARY

As part of project *"Improving Forest Functions in Bengkulu Province through Community Participation in Rehabilitation of Degraded Forest by Using Local Prospective Commodities"*, demonstration plots were established which contain a mixture of trees of Kayu Bawang (*Dysoxylum mollissimum* Blume) and Durian Bentara (*Durio zibethinus* Murr). Field observations were conducted in December 2017 to evaluate the early establishment of *D. mollissimum* and *D. zibethinus* and other aspects regarding to demonstration plots. The first year growth evaluation showed that *D. mollissimum* and *D. zibethinus* planted at demonstration plot in North Bengkulu performed better than their congeners grown at demonstration plots in Seluma. At the Air Ketahun Limited Forest Production of North Bengkulu, the average of plant diameter was about 2.5 cm with 182.6 cm for the average height of plant. On the other hand, in two locations of demonstration plots in Seluma Regency, the average diameter of *D. mollissimum* seedlings was under 2 cm. At the Air Ketahun Limited Production Forest of North Bengkulu, the average diameter of *D. zibethinus* plants after one year of planting was 1.9 cm with about 89.4 cm of the height average. On the other hand, at the Giri Mulya Village, the average diameter of *D. zibethinus* seedlings was only about 1.3 cm with about 64.9 cm of the height average. Even, at the demonstration plot at Air Talo Limited Production Forest, none of *D. zibethinus* survived due to uncontrolled of pest, i.e. wild hogs. Therefore, plant tending treatments need to be improved. Based on plant growth on the field, the priority of this ITTO project can be focused on the intensive taking care of plants at the demonstration plots at Air Ketahun Limited Production Forest in Bengkulu Utara and Giri Mulya Village in Seluma. This considers the number and composition of plants, the existence and commitment of community groups, and coordination with field staff in applying stand tending treatments. Community participation also needs to be improved in order to achieve the objectives of the program.

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1. INTRODUCTION

1.1. Background

One activity during the ITTO project PD 477107 Rev.4 (F) "*Improving Forest Functions in Bengkulu Province through Community Participation in Rehabilitation of Degraded Forest by Using Local Prospective Commodities*" is to establish demonstration plots. The demonstration plot was designed to contain a mixture of trees of *Dysoxylum mollissimum* Blume (*kayu bawang*) and *Durio zibethinus* Murr (*durian bentara*). At the project location in the North Bengkulu Regency, a five hectare demonstration plot was placed in the production forest area which had turned into secondary forest. On the other hand, the demonstration plots at the project location in the Seluma Regency were divided into two locations, i.e. two hectares in the production forest and three hectares in the village owned land area.

Before the demonstration plots were planted with the two species of *D. mollissimum* and *D*. *Zibethinus*, the land was cleared for site preparation. However, before the land clearing activity was conducted, the tree species composition, vegetation density and population attributes established in the area was observed. The site productivity index was also determined.

The field observation results showed that before *D. mollissimum* and *D*. *Zibethinus* were planted in the locations of demonstration plots, several species were found. There are 18 species of trees at the demonstration plot location in North Bengkulu and there are 13 species of trees at the location in Seluma Regency. Most of the species are categorized as pioneer species, such as *Macaranga, Arthocarpus* dan *Alstonia* which commonly grow on secondary or disturbed forests. Species found at the locations were on different growth stages. Several species were found at all development stages, i.e. saplings, poles and trees, such as *Balakata baccata* and *Alstonia scholaris*. Other species were only found in form of saplings or poles.

Vegetation productivity of the area was observed by measuring the rate of diameter increment per year. By dividing the average diameter of the stand with the assumed stand age the rate of diameter increment per year was estimated. The average diameter annual increment of larger individuals (trees and poles) occurring in both locations of demonstration plots was more than 3 cm per year. The growth rate of trees at the observed location on Air Ketahun limited production forest was 3.61 cm diameter increment per year. At the observed location on the Air Talo limited production forest, the diameter of saplings growing on the land that had been idle for two years also increase about 3.15 cm per year.

However, it needs to be considered that most of the species growing on the area are fast growing pioneer species, such as *Macaranga* sp and *Alstonia* sp. As most of them are fast growing species, the annual increment may be higher. Susila (2010) found that the annual increment of fast growing species *Duabanga moluccana* was about 3 cm per year, depending on the stand age. The average diameter of annual increment of the stands growing on the areas, it can be concluded that site productivity index in both areas are relatively good.

Table 1. The average of annual diameter increment of different growth stages of stand, which is a result of the average of diameter dividing by stand age

Location	Growth stage	The average of diameter (cm)	Stand diameter increment (cm/year)
North Bengkulu - Air Ketahun limited production forest	Trees	21.63	3.61
	Poles	12.25	2.04
Seluma - village owned land	Trees	18.95	3.16
	Poles	12.14	2.02
Seluma - Air Talo limited production forest	Sapling	6.3	3.15

Notes:

- Stand age at Air Ketahun limited production forest: 6 years
- Stand age at Giri Mulya Village owned land: 6 years
- Stand age at Air Talo limited production forest: 6 years

Before seedlings were planted, areas of demonstration plots were manually cleared. Trees were cut down and shrubs were cleared (Fig. 1). This clearing is to prepare the land to be ready to be planted, which was referred to the technical design. Seedlings of *D. mollissimum* and *D*. *Zibethinus* were planted at the end of December 2016 and early January 2017.

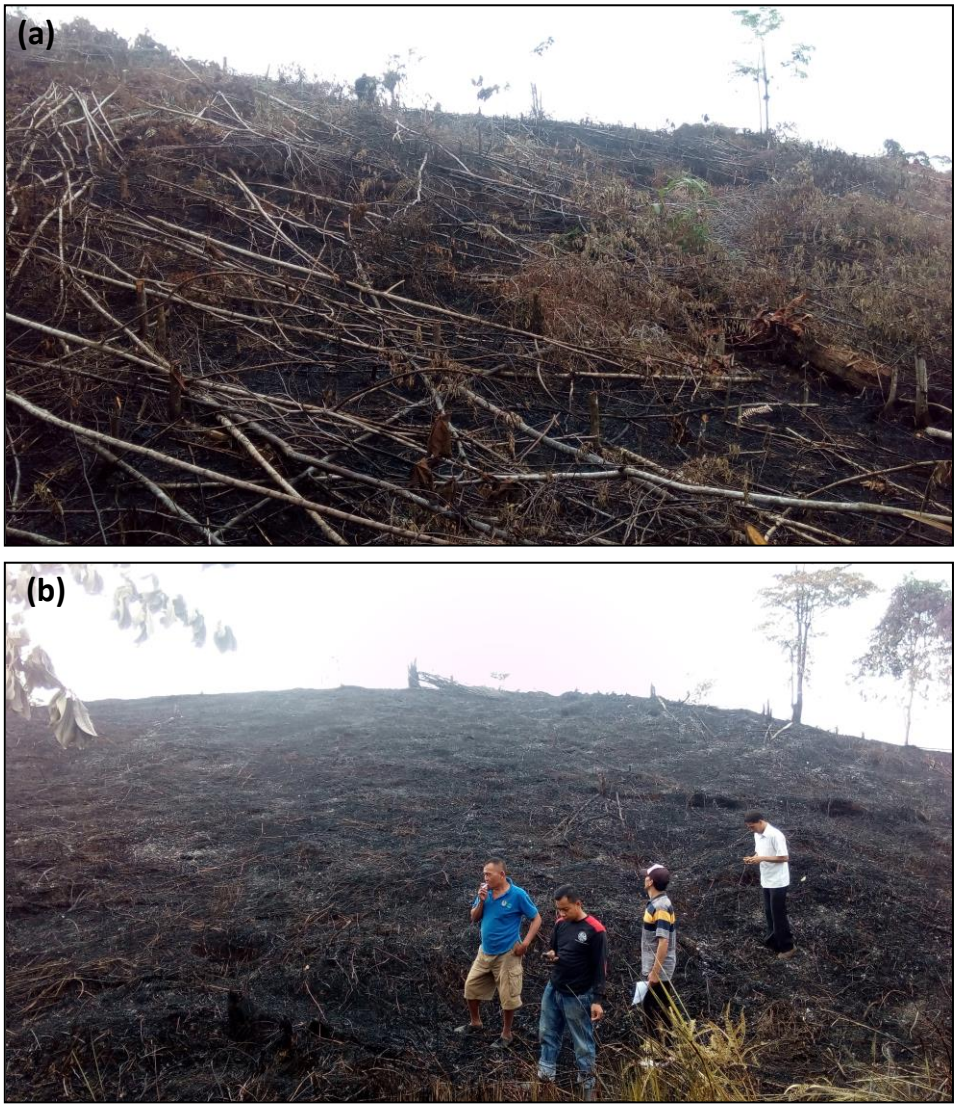

Figure 1. The condition of the area of demonstration plot at Limas Village (Air Ketahun Limited Production Forest) Bengkulu Utara after vegetation was cut (a) and cleared (b)

1.2 Objectives

In order to achieve the objectives of the program, many aspects need to be considered. The application of appropriate planting and stand tending techniques is a key to grow a well developing forest plantation. The first year growth evaluation aims:

1. To observe the growth rate of *D. mollissimum* and *D*. *Zibethinus* seedlings by measuring their diameter and heights;
2. to collect information on treatments that have been applied to those plants;
3. to provide suggestions for improvement of forest plantation establishment.

2. APPLIED METHODOLOGY

2.1 The locations of demonstration plots

There are two locations allocated for the demonstrations plots for the project "*Improving Forest Functions in Bengkulu Province through Community Participation in Rehabilitation of Degraded Forest by Using Local Prospective Commodities*". They are located in the North Bengkulu and Seluma Regencies, Bengkulu Province. In the North Bengkulu Regency, the demonstration plot is located in the Limas Jaya sub-village, Urai Village, Ketahun District. In the Seluma regency, the demonstration plots are located in the Giri Mulya Village, Ulu Talo District.

In the North Bengkulu, the demonstration plot is placed in the area of Air Ketahun Limited Production Forest (Register 70). Air Ketahun Limited Production Forest covers about 14,447 ha land areas. Landsat digital image analysis in 2014 showed that the area of Air Ketahun Limited Production Forest has turned into mixed agricultural lands of about 12,685 ha. The rest is shrubs, residential areas and secondary forests. Before the area was cleared, the location for the demonstration plot was occupied by a mixture of shrubs and secondary forests.

In the Seluma regency, the demonstration plots were divided into two locations, i.e. three hectares in the village owned land area and two hectares in the Air Talo Limited Production Forest. Giri Mulya Village has ten hectares of village owned land near the Air Talo Limited Production Forest. Before land clearing, the area was non-productive area and was dominated by shrubs. The village owned land is located next to village the main road. The area stretches along the road with flat to hilly topography and it is about 200 – 250 m above sea level.

Air Talo Limited Production Forest covers about 2,282 ha land area. Some of the forest areas have been illegally occupied by community for agricultural

activities. People often open the forest sporadically and they utilize the area for shifting cultivation. So, they conducted agricultural activities at the opened area and then they left it for new area. They grow a variety of plants, such as rice, eggplant, cucumber, tomatoes and especially coffee. However, most of the forest illegal occupiers do not live nearby (Giri Mulya Village). They come from places that are relatively far from the forest area.

2.2 Data collection time and techniques

Field observations were conducted to collect data for first year growth evaluation of *D. mollissimum* and *D*. *Zibethinus* were collection. Field work was conducted at the end of December 2017. Fifty seedling of *D. mollissimum* of each location of demonstration plot were taken as samples. All surviving seedlings of *D*. *Zibethinus* at Giri Mulya Village Seluma Regency and 100 seedlings of *D*. *Zibethinus* at Air Ketahun Limited Production Forest, Bengkulu Utara regency were measured their diameters and heights. Activities to take care *D. mollissimum* and *D*. *Zibethinus* plants were recorded through reports provided by project technician and interview with field operators and the community.

2.3 Data analysis

Data analyses included the average diameter and height of *D. mollissimum* and *D*. *Zibethinus*. At the time of observation, the seedling had been one year old. Land productivity index was approached by observing the vegetation productivity (Smith, 1996).

3. RESULTS AND DISCUSSION

3.1 Records of first year stand tending

The growth of seedlings for the first year differed between locations of demonstration plots. Records of growth and seedling tending treatments of *D. mollissimum* and *D*. *Zibethinus* could be seen on Tables 2 and 3.

Table 2. The number of surviving seedlings and plant tending treatments during the first year at the village owned land of Giri Mulya Village and Air Talo Limited Production Forest, Seluma Regency

Plant tending	**Demonstration plot location**	
	Giri Mulya Village	**Air Talo Limited Production Forest**
Number of surviving seedlings of *D. mollissimum*	Per August 2017, the number of surviving seedlings of *D. mollissimum* was about 750 individuals	Per August 2017, the number of surviving seedlings of *D. mollissimum* was about 360 individuals
Number of surviving seedlings of *D*. *Zibethinus*	Per November 2017, the number of surviving seedlings of *D. Zibethinus* was 26 individuals	Per November 2017, none of seedlings of *D. Zibethinus* survived
Enrichment planting for *D. mollissimum*	In August 2017, 250 seedlings were planted for enrichment	In August 2017, 200 seedlings were planted for enrichment
Weed control	Weeds had been chemically eradicated twice (August and the end of November 2017)	Weeds were chemically sprayed once in August 2017
Pest control	Surviving *D*. *Zibethinus* seedlings were fenced in November 2017	
Fertilizer application	NPK fertilizer was applied to plants twice	NPK fertilizer was applied to plants once

Table 3. The number of surviving seedlings and plant tending treatments during the first year at Air Ketahun Limited Production Forest, North Bengkulu Regency

Plant tending	Demonstration plot location at Air Ketahun Limited Production Forest
Number of dead seedlings of *D. mollissimum*	Per November 2017, the number of dead seedlings of *D. mollissimum* was about 100 plants
Number of surviving seedlings of *D. zibethinus*	Per November 2017, the number of dead seedlings of *D. mollissimum* was about 75 plants
Enrichment planting for *D. mollissimume*	Enrichment planting had been conducted twice
Weed control	Chemical application and manual method were applied for weed control
Pest and disease control	- Fungi were controlled by fungicides - Seedlings of *D. Zibethinus* were fenced for protection from pest (wild hogs)
Fertilizer application	NPK fertilizer was applied to plants twice

3.2 The average diameter and height of plants

Diameters and heights of *D. mollissimum* seedlings varied for each demonstration plot location (Table 4 and Figs. 2, 3 and 4). At the Air Ketahun Limited Forest Production, the average of plant diameter after one year was about 2.5 cm with 182.6 cm for the average height of plant. On the other hand, in two locations of demonstration plots in Seluma Regency, the average diameter of *D. mollissimum* seedlings was under 2 cm. In general, seedlings of *D. mollissimum* planted in demonstration plot at Air Ketahun Limited Production Forest of North Bengkulu were growing better than seedlings planted at the demonstration plots in Seluma Regency.

Table 4. The average diameter and height of *D. mollissimum* after one year of planting at three locations of demonstration plots

Demonstration plot location	The average diameter (cm) ± Standard deviation	The average of height (cm) ± Standard deviation
Air Ketahun Limited Production Forest	2.5 ± 0.6	182.6 ± 55.5
Giri Mulya Village	1.6 ± 0.6	109.7 ± 44.3
Air Talo Limited Production Forest	1.7 ± 0.5	147.9 ± 35.6

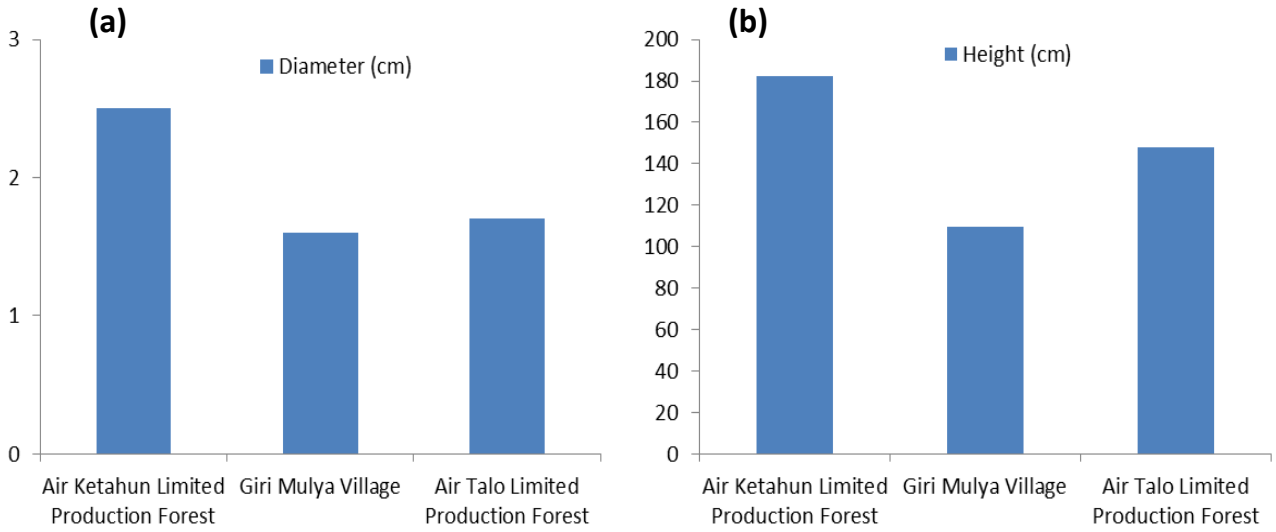

Figure 2. The average diameter (cm) (a) and height (cm) (b) of *D. mollissimum* at three locations of demonstration plots

Figure 3. The growth of *D. mollissimum* after one year of planting at demonstration plot at Air Ketahun Limited Production Forest of North Bengkulu

Figure 4. The growth of *D. mollissimum* after one year of planting at demonstration plots at Giri Mulya Village (a) and Air Talo Limited Production Forest (b dan c) in Seluma Regency

Diameters and heights of *D. zibethinus* seedlings also varied for each demonstration plot location (Table 5 and Figs. 5, 6 and 7). Even, at the demonstration plot at Air Talo Limited Production Forest, none of *D. zibethinus* survived due to uncontrolled of pest, i.e. wild hogs. At the Air Ketahun Limited Production Forest of North Bengkulu, the average diameter of *D. zibethinus* plants after one year of planting was 1.9 cm with about 89.4 cm of the height average. On the other hand, at the Giri Mulya Village, the average diameter of *D. zibethinus* seedlings was only about 1.3 cm with about 64.9 cm of the height average. *D. zibethinus* seedlings grew faster at the Air Ketahun Limited Production Forest of North Bengkulu than *D. zibethinus* seedlings grown at demonstration plot in Seluma Regency.

Table 5. The average diameter (cm) (a) and height (cm) (b) of *D. zibethinus* at three locations of demonstration plots

Demonstration plot location	**The average diameter (cm) ± Standard deviation**	**The average of height (cm) ± Standard deviation**
Air Ketahun Limited Production Forest	1.9 ± 0.4	89.4 ± 33.9
Giri Mulya Village	1.3 ± 0.3	64.9 ± 23.8

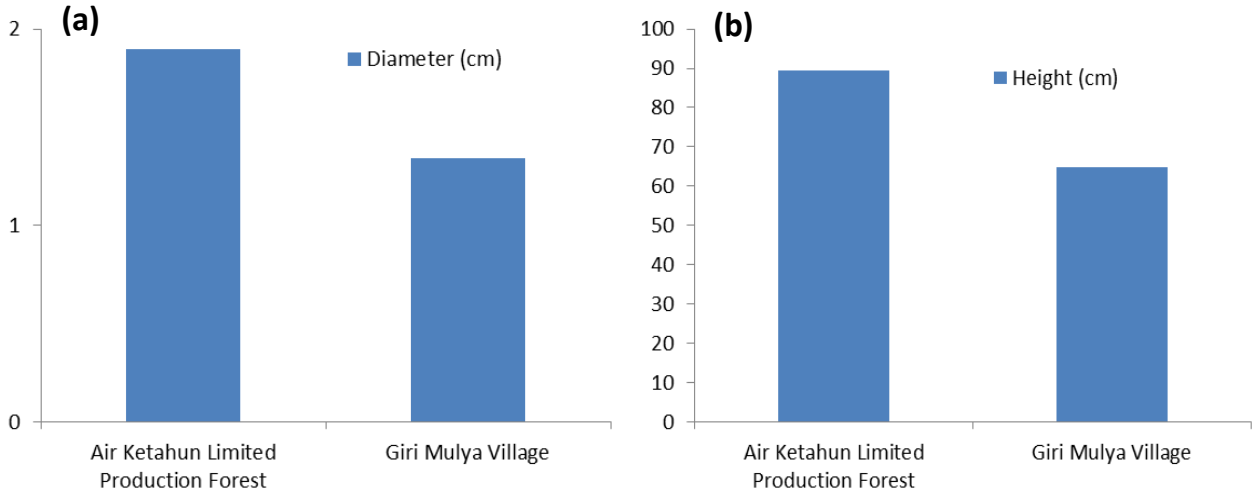

Figure 5. The average diameter (cm) (a) and height (cm) (b) of D. zibethinus at two three locations of demonstration plots

Figure 6. The growth of *D. zibethinus* after one year of planting at demonstration plot at Air Ketahun Limited Production Forest of North Bengkulu

Figure 7. The growth of *D. zibethinus* after one year of planting at demonstration plot at Giri Mulya Village in Seluma Regency

3.3 Evaluation regarding to plant growth and demonstration plots

D. mollissimum could grow between in area with altitude 0 - 1000 m above sea level with average rainfall between 500 - 3500 mm/year. This species could grow in most kinds of soils. However, it will grow best on fertile and loam soils with well aeration (Dinas Kehutanan Provinsi Bengkulu, 2003). In relation to this, all demonstration plot locations fit with these criteria.

D. zibethinus has a high level of adaptability. It could grow and proliferate in tropical area with maximum altitude of 800 m above sea level, rainfall between 1500 – 2500 mm/year, average air temperature between 22 – 32^{o}C, loam soils with well drainage and aeration, and pH between 6 – 7. *D. zibethinus* is widely spread in Bengkulu.

Apriyanto (2003) found that *D. mollissimum* grown on a monoculture plantation in Bengkulu Tengah Regency had an annual diameter increment up to 1.9 cm/year until the stand was 9 years old. Based on research in Karang Tinggi and Lubuk Sini villages, Bengkulu Tengah Regency, Apriyanto (2003) also found that the average diameter of one year old *D. mollissimum* was about 2.6 cm with about 3 m height average. The average diameter of *D. mollissimum* became about 5.4 cm when it was two years old. However, based on research in Bengkulu City, Depari *et al.* (2017) found that one year old *D. mollissimum* grown in polyculture had an average diameter of about 1.5 cm with 2.1 m height average (planted in polyculture with coconut) and an average diameter of about 1.3 cm with 1.3 m height average (planted in polyculture with oil palm).

In general, *D. mollissimum* at demonstration plot in North Bengkulu was growing better than two other demonstration plots in Seluma Regency (Table 4). The growth of *D. mollissimum* seedlings for the first year was not as well as the growth of *D. mollissimum* plants in Central Bengkulu studied Apriyanto (2003). However, the growth was better than *D. mollissimum* seedlings planted in Bengkulu City (Depari *et al.*, 2017)

D. zibethinus seedlings planted at demonstration plot in North Bengkulu was also growing faster than plants at both locations in Seluma. Some studies found that the average diameter of one year old *D. zibethinus* seedlings was about 2 cm. Therefore, the growth of *D. zibethinus* at demonstration plot in North Bengkulu was rather ideal.

Early establishment is a crucial period for tree seedlings. Hence, plant tending, such as weed control and fertilizer application, is an important thing to do. Weed may affect the growth of plants as it may compete with tree seedlings to absorb water and other nutrients. Consequently, this competition could reduce the optimum wood volume that can be harvested from certain stands. Weed control during early establishment of plants will improve the growth of seedlings (West 2006). Well growing seedlings during first years of establishment will influence the rate of growth for the next years.

At the demonstration plots at Air Ketahun Limited Production Forest (North Bengkulu) and Giri Mulya Village (Seluma), weeds had been controlled twice by applying chemical eradication. Weeds had also been controlled by manual method at demonstration plot at Air Ketahun Limited Production Forest. During field observation, it could be seen that weeds (shrubs) were very dense at both locations in Seluma. It certainly affected the growth of *D. mollissimum* and *D*. *Zibethinus* plants. Therefore, the intensity of weed eradication needs to be increased.

Pests and diseases also need to be controlled. The death of plants at demonstration plot the Air Talo Limited Production Forest was due to predation by wild figs. At the demonstration plot in North Bengkulu, woody fences were established surrounding *D*. *Zibethinus* seedlings. This method was effective to avoid wild fig predation. On the other hand, fences for *D*. *Zibethinus* seedlings at Giri Mulya Village were just built recently.

Other types of pest that are commonly found to attack *D. mollissimum* and *D*. *Zibethinus* plants are insects, such as *Xystrocera globosa*, *Pteroma plagiophelps*, *Valanga nigricornis*, *Cryptotermes* sp and *Polyrhachys dives*. According to Utami (2012), *Xystrocera globosa* is the most common insect to become pest for *D. mollissimum*. On the other hand, commonly found diseases to infect *D. mollissimum* and *D*. *Zibethinus* plants include root rot (*Rigidiporus* sp), leaf spots and death shoots. Disease infection may occur at any stage of plant growth. Setiadi (2006) said that root rot could cause high rate of death for *D*. *Zibethinus* seedlings. The control of weeds, pests and diseases should become a priority for *D. mollissimum* and *D*. *Zibethinus* plants at demonstration plots, so the plants could grow better.

The other thing is that the planting was not exactly following the technical design, for example at the demonstration plot at Air Ketahun Limited Production Forest, North Bengkulu. This was due to real condition at the field. Therefore, planting lay out needs to be remapped according to real condition at the field, including plant composition and position. Plant lay out could then be used for field visit guidance.

A long term objective of ITTO Project PD 477107 Rev.4 (F) is to contribute to sustainable management of forest in Bengkulu Province through forest rehabilitation and improvement of community welfare by planting local prospective tree species. Activities of the program are directed to implement appropriate technology and to increase community participation. Therefore, the establishment of demonstration plots serves as model for the community. *D. mollissimum* and *D*. *Zibethinus* plants should be well treated, so it could grow well. Stand tending intensity, including enrichment planting, weed control and also eradication of pests and diseases, has to be improved. If the plants are growing well, then it will serve as a good example for the community.

Community participation also needs to be improved. From the evaluation, it can be said that the plant growth at the demonstration plot in Bengkulu Utara was

very good. However, it was less of community participation. On the other hand, *D. mollissimum* and *D*. *Zibethinus* plants were not growing very well, but it seems to be that there was community participation during the program.

4. CONCLUSIONS AND RECOMMENDATIONS

The first year growth evaluation showed that *Dysoxylum mollissimum* and *Durio zibethinus* planted at demonstration plot in North Bengkulu performed better than their congeners grown at demonstration plots in Seluma. At the Air Ketahun Limited Forest Production of North Bengkulu, the average of plant diameter was about 2.5 cm with 182.6 cm for the average height of plant. On the other hand, in two locations of demonstration plots in Seluma Regency, the average diameter of *D. mollissimum* seedlings was under 2 cm. At the Air Ketahun Limited Production Forest of North Bengkulu, the average diameter of *D. zibethinus* plants after one year of planting was 1.9 cm with about 89.4 cm of the height average. On the other hand, at the Giri Mulya Village, the average diameter of *D. zibethinus* seedlings was only about 1.3 cm with about 64.9 cm of the height average. Even, at the demonstration plot at Air Talo Limited Production Forest, none of *D. zibethinus* survived due to uncontrolled of pest, i.e. wild hogs.

In relation to the results of growth evaluation, several recommendations as follow:

1. Plant tending treatments need to be improved. Enrichment planting has to be conducted more and weed control must be more intensive. Application of fertilizer and the control of pests and diseases must be done.
2. Plant lay out on the field has to be re-mapped. Those demonstration plots are examples. This project does not only consider the potential of woods from the stand, but also non-woody forest products, such as fruit of *D. zibethinus*. At the age of 6 – 7 years, *D. zibethinus* is predicted to produce fruits. *Durian bentara* is a high quality *durian*. Therefore, the combination of *D. mollissimum* and *D. zibethinus* is projected to provide benefits for the community.
3. Based on plant growth on the field, the priority of this ITTO project can be focused on the intensive taking care of plants at the demonstration plots at Air Ketahun Limited Production Forest in Bengkulu Utara and Giri Mulya

Village in Seluma. This considers the number and composition of plants, the existence and commitment of community groups, and coordination with field staff in applying stand tending treatments. However, the surviving *D. mollissimum* seedlings can be continuously monitored by Integrated Management Unit of Protection Forest Seluma Regency.

4. Community participation needs to be improved. This is can be done by involving forest extension officer in order to raise people's awareness on the important of forest rehabilitation, with considering benefits for the community.

5. Community civil organization should be empowered. Groups of community can be facilitated to access forest area, such as through social forestry program.

BIBLIOGRAPHY

Apriyanto E. 2003. Pertumbuhan Kayu Bawang pada Tegakan Monokultur Kayu Bawang di Bengkulu Utara. *Jurnal Ilmu-Ilmu Pertanian Indonesia* 5(2): 64-70.

Depari, E. D, Nugroho, P.B.A, Yansen & Saprinurdin. 2017. Pertumbuhan Awal Kayu Bawang (*Dysoxylum Mollissimum* Blume) dengan Sistem Polikultur Kelapa Dan Polikultur Kelapa Sawit. Seminar Nasional Silvikultur, Banjarbaru, Kalimantan Selatan.

Dinas Kehutanan Provinsi Bengkulu. 2003. Budidaya Tanaman Kayu Bawang. Bengkulu. Dinas Kehutanan Provinsi Bengkulu, Bengkulu.

Setiadi. 2006. Bertanam Durian. Penebar Swadaya. Jakarta.

Smith, D. M. 1996. The Practice of Silviculture. Wiley, New York

Susila, I. W. W. 2010. Riap Tegakan Duabanga (*Duabanga moluccana* Bl.) di Rarung Research Forest. *Jurnal Penelitian Hutan dan Konservasi Alam* **7 (1)**: 47-58

Utami, S. 2012. Pengendalian Hama dan Penyakit Kayu Bawang (*Disoxylum mollissimum*). Badan Penelitian Kehutanan, Palembang.

West P. W. 2006. Growing Plantation Forests. Springer-Verlag, Berlin.

ANNEXES

Annex 1. Data of diameters and heights of *Dysoxylum mollissimum* seedlings at demonstration plot at Air Ketahun Limited Production Forest, North Bengkulu Regency

No	Diameter (cm)	Height (m)
1	2.5	187
2	2.3	171
3	3.0	207
4	2.5	209
5	2.0	160
6	1.8	167
7	3.8	284
8	1.7	150
9	3.0	180
10	1.7	160
11	1.0	120
12	3.5	327
13	2.2	190
14	1.4	110
15	3.8	283
16	2.5	70
17	1.8	144
18	2.5	203
19	3.4	233
20	2.1	206
21	2.2	150
22	2.2	155
23	2.2	175
24	2.2	150
25	1.9	153
26	2.2	150
27	1.9	156
28	2.2	140
29	2.2	131
30	1.6	152
31	2.5	203
32	3.5	172
33	2.2	208
34	1.5	210
35	3.0	161
36	2.7	168
37	1.9	285
38	3.3	160
39	3.0	190
40	2.3	170

No	Diameter (cm)	Height (m)
41	3.0	130
42	3.9	328
43	2.6	200
44	2.7	120
45	2.7	284
46	2.7	80
47	2.7	145
48	2.4	204
49	2.7	234
50	2.4	207

Annex 2. Data of diameters and heights of *Durio zibethinus* seedlings at demonstration plot at Air Ketahun Limited Production Forest, North Bengkulu Regency

No	Diameter (cm)	Height (m)
1	2.2	143
2	1.6	131
3	1.1	52
4	1.4	49
5	1.8	63
6	1.4	62
7	2.2	97
8	1.6	70
9	1.9	112
10	1.6	85
11	1.6	75
12	1.6	109
13	1.6	81
14	1.6	74
15	2.2	86
16	1.6	58
17	1.6	66
18	1.6	36
19	0.6	23
20	2.2	95
21	1.6	68
22	2.2	93
23	2.2	122
24	2.2	119
25	1.6	100
26	1.6	61
27	2.2	47
28	1.6	100
29	2.2	105
30	1.6	90
31	1.6	63
32	1.6	42
33	2.5	109
34	1.6	143
35	1.6	40
36	2.2	104
37	2.2	24
38	2.2	119
39	2.2	150
40	2.2	80

No	Diameter (cm)	Height (m)
41	1.6	110
42	1.9	60
43	1.6	130
44	2.2	150
45	2.2	138
46	1.6	72
47	2.2	85
48	2.2	85
49	1.9	119
50	2.4	150
51	1.8	144
52	1.3	132
53	1.6	53
54	1.9	50
55	1.6	64
56	2.4	63
57	1.8	98
58	2.1	71
59	1.8	113
60	1.8	86
61	1.8	76
62	1.8	110
63	1.8	82
64	2.4	75
65	1.8	87
66	1.8	59
67	1.8	67
68	0.8	37
69	2.4	24
70	1.8	96
71	2.4	69
72	2.4	94
73	2.4	123
74	1.8	120
75	1.8	101
76	2.4	62
77	1.8	48
78	2.4	101
79	1.8	106
80	1.8	91
81	1.8	64
82	2.7	43
83	1.8	110
84	1.8	144
85	2.4	41
86	2.4	105

No	Diameter (cm)	Height (m)
87	2.4	25
88	2.4	120
89	2.4	151
90	1.8	81
91	2.1	111
92	1.8	61
93	2.4	131
94	2.4	151
95	1.8	139
96	2.4	73
97	2.4	86
98	1.8	86
99	1.4	120
100	2.1	151

Annex 3. Data of diameters and heights of *Dysoxylum mollissimum* seedlings at demonstration plot at Giri Mulya Village, Seluma Regency

No	Diameter (cm)	Height (m)
1	3.2	182
2	1.6	112
3	1.6	103
4	1.9	134
5	1.9	135
6	1.0	78
7	1.0	67
8	1.0	40
9	1.3	128
10	1.3	91
11	2.5	170
12	3.2	198
13	1.3	112
14	1.0	58
15	0.6	60
16	1.3	95
17	1.6	110
18	1.6	35
19	1.9	155
20	1.3	98
21	1.6	85
22	1.3	43
23	1.6	138
24	2.2	136
25	2.2	163
26	1.0	52
27	1.9	138
28	1.9	112
29	1.3	65
30	1.3	86
31	1.0	60
32	1.9	137
33	1.0	81
34	1.0	91
35	1.0	61
36	1.6	139
37	1.6	91
38	1.6	110
39	1.6	121
40	2.2	157
41	1.6	84

No	Diameter (cm)	Height (m)
42	1.9	125
43	1.0	58
44	2.2	224
45	2.2	181
46	1.3	128
47	1.3	75
48	2.2	180
49	1.9	133
50	1.3	72

Annex 4. Data of diameters and heights of *Durio zibethinus* seedlings at demonstration plot at Giri Mulya Village, Seluma Regency

No	Diameter (cm)	Tinggi (m)
1	-	52
2	-	30
3	1.3	75
4	1.0	70
5	0.6	47
6	0.8	80
7	1.6	90
8	1.6	47
9	1.6	99
10	1.6	81
11	1.3	49
12	1.3	37
13	1.6	103
14	1.6	97
15	1.6	98
16	1.9	94
17	1.0	49
18	1.6	85
19	1.6	79
20	1.3	40
21	1.3	30
22	1.3	52
23	1.0	41
24	1.3	69
25	-	55
26	-	38

Annex 5. Data of diameters and heights of *Dysoxylum mollissimum* seedlings at demonstration plot at Air talo Limited Production Forest, Seluma Regency

No	Diameter (cm)	Tinggi (m)
1	1.1	107
2	1.6	173
3	1.9	178
4	1.9	163
5	1.6	165
6	1.6	225
7	1.0	93
8	1.3	118
9	1.0	89
10	1.6	157
11	1.3	115
12	2.5	178
13	1.3	130
14	1.9	171
15	2.5	230
16	1.3	152
17	2.2	167
18	1.9	165
19	1.6	128
20	2.5	181
21	1.6	178
22	3.2	206
23	1.6	213
24	1.9	168
25	1.6	150
26	1.9	164
27	2.2	160
28	2.5	176
29	1.9	149
30	1.6	84
31	1.6	110
32	2.5	170
33	1.9	158
34	1.6	136
35	1.6	121
36	1.6	110

No	Diameter (cm)	Tinggi (m)
37	1.6	147
38	1.9	171
39	1.3	120
40	1.6	140
41	1.3	178
42	1.6	146
43	1.6	107
44	1.3	103
45	1.3	125
46	1.6	111
47	1.3	158
48	1.3	117
49	1.6	159
50	1.3	73