DEVELOPMENT OF SILVICULTURAL TECHNIQUES FOR NATIVE TREE SPECIES OF PEAT SWAMP FORESTS IN INDONESIA

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2012

INTRODUCTION

- Many peat swamp forests in Indonesia have been degraded.
- Logging, fires, conversion pressure to plantation becomes the main cause of peat swamp forest destruction in Indonesai.
- Indonesia has declared its readiness to reduce emission of greenhouse gases (GHG), especially carbon.
- Peat land area size of around 21 million ha has created significant contribution toward CO2 emission of around 1 billion tons per year (BAPPENAS, 2009).

- Planting of native tree species, such as meranti (*Shorea balangeran*), ramin (*Gonystylus bancanus*), geronggang (*Cratoxylon arborescens) and tumih* . (*Combretocarpus rotundatus*) is an appropriate ecological solution.

- Rapid and easy procurement of planting stocks through cutting materials, constitute a potential solution for the problem of planting stock procurement.

CONDITION OF DEGRADED PEAT SWAMP

Condition of ramin tree (*Gonystylus bancanus*) in primary peat swamp forest.

Geronggang (*Cratoxylon arborescens*) which is able to grow in bush land in Ex PLG in Central Kalimantan

Belangeran (*Shorea balangeran*), a commercial species which is able to grow in ex-PLG in Central Kalimantan.

Tumih (Combretocarpus rotundatus) which is able to grow in bush land in the area of ex-PLG di Central Kalimantan

RESEARCH METHOD

RESEARCH LOCATIONS

1. Study of Planting Stocks Propagation

- Cutting source: Central Kalimantan (wildlings)
- Preparation and planting of cutting
- Species : tumih (*C. ratundatus*) and geronggang (*C. arborescens*)

2. Evaluation of Planting, Planting trial and Prediction of Carbon sequestration

- Sebangau National Park, Central Kalimantan

Research materials and equipments Propagation of planting stocks

- Wildlings of belangeran (*S. balengeran*), geronggang (*C. arborescens*) and tumih (*C.rotundatus*).
- Hormone IBA 100 ppm, NAA 100 ppm, hormone IBA and NAA 50 – 50 ppm.
- Equipments: *pot – tray* (15 pairs), writing materials, label paper, measuring glasses, ruler, and twig cutter

Experimental Design

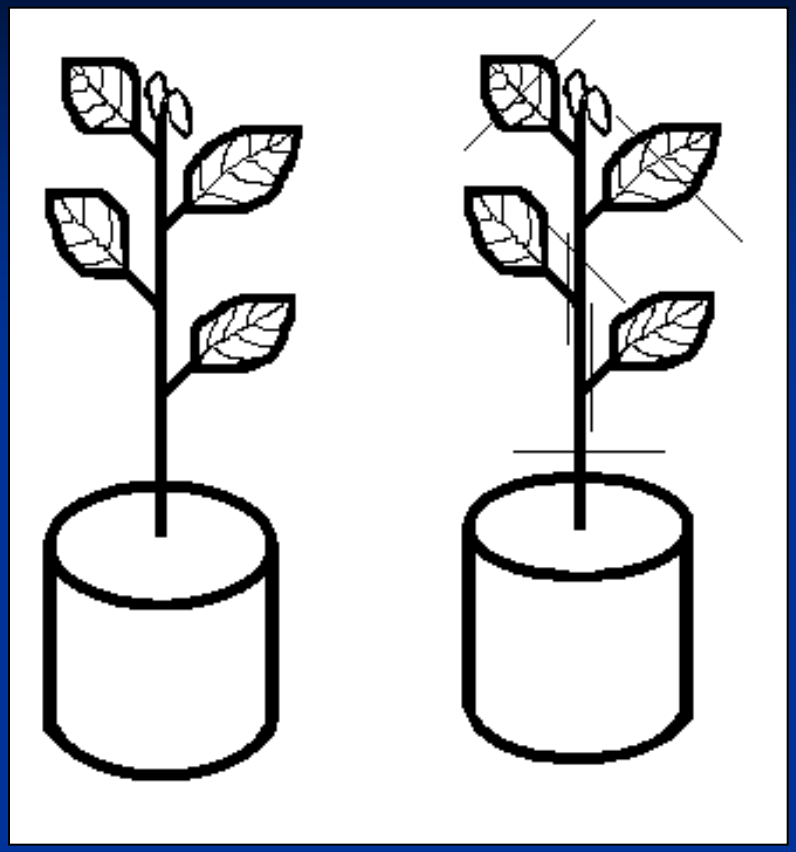
Completely Randomized Design

- Hormone IBA 100 ppm (A)
- Hormone NAA 100 ppm (B)
- Hormone IBA 50 ppm and NAA dosage 50 ppm (C)
- Control (O)

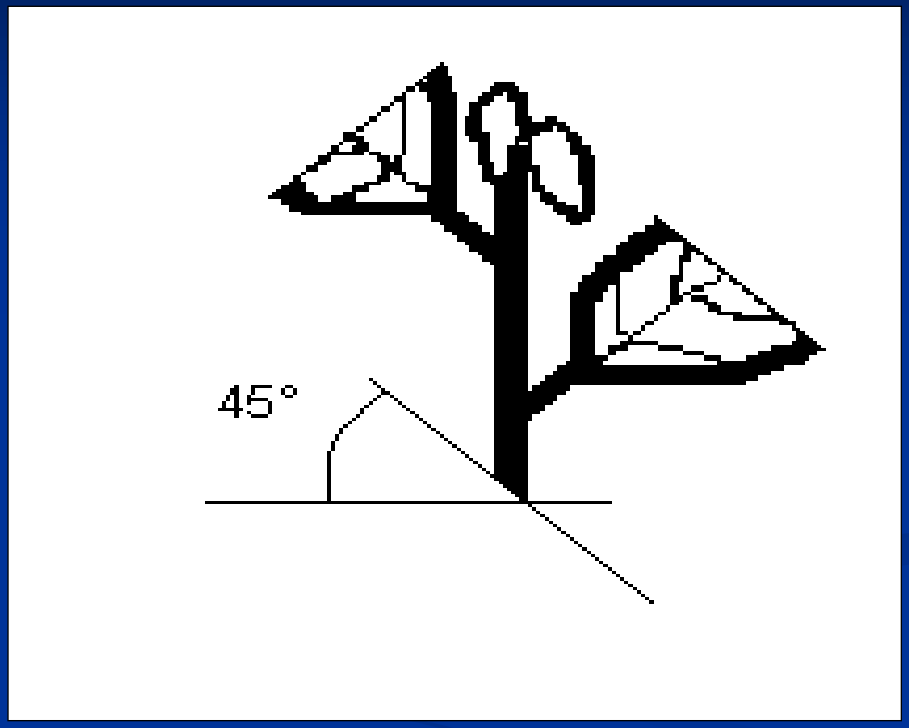
Each treatment possessed three replications, and each replication contains 50 shoot cuttings, so that the total number of observation unit was 750 shoot cuttings.

Variables being observed

- Surviving percentage of cutting
- Number of roots
- Length of roots
- Fresh weight of root
- Dry weight of root
- Fresh weight of shoot
- Dry weight of shoot



Procedure of preparing the cutting materials



Technique of trimming the lower par of the cutting.

Condition of propagation house for shoot cutting

RESULTS AND DISCUSSION

Shoot cutting from ramin seedlings had 100 % success rate with various media

Surviving percentage of belangeran seedling shoot cutting (*S. belangeran*) with treatment of plant growth substance.

No.	Treatments	Number of planted shoot cuttings	Number of rooted cuttings	Percentage (%)	SE (%)
1.	IBA 100 ppm	150	76	50.67	2.40
2.	NAA 100 ppm	150	116	77.33	10.70
3.	IBA 50 ppm NAA 50 ppm	150	87	58.00	0.00
4.	Control	150	98	65.33	2.91

Results of Analysis of Variance, the effect of plant growth substance on various growth variables of belangeran.

No.	Variables	P-value
1.	Root length	0.4900
2.	Root fresh weight	0.1700
3.	Root dry weight	0.7900
4.	Shoot fresh weight	0.2500
5.	Shoot dry weight	0.0330 *

*) Significant effect at 5 % level

Root shape from shoot cutting of *Shorea balangeran* seedlings

Surviving percentage of tumih (*C. rotundatus)* shoot cutting from seedlings with treatment of plant growth substances

No.	Treatments	Number of shoot cuttings being planted	Number of surviving shoot cutting	Average survival percentage (%)	SE
1	**Average A**	50	43	82.67	**0.050**
2	**Average B**	50	42	83.33	**0.031**
3	**Average C**	50	48	70.67	**0.197**
4	**Average D**	50	43	90.67	**0.050**

A = Treatment IBA 100 ppm
B = Treatment NAA 100 ppm
C = Treatment IBA 50 ppm – NAA 50 ppm
D = Control

Results of analysis of variance of the effect of plant growth substance on various growth variables of tumih (*C. rotundatus*)

No.	Variables	P-value
1	Survival percentage of cutting	0.1542
2	Number of roots	0.0000 **
3	Length of root	0.3550
4	Root fresh weight	0.0610
5	Root dry weight	0.110
6	Shoot fresh weight	0.1260
7	Shoot dry weight	0,8070

**) highly significant effect

Root growth of tumih cutting at treatment NAA 100 ppm

Growth condition of tumih cutting in the plastic cover (propagation box)

Condition of shoot emerging from tumih cutting with Treatment of NAA 100 ppm

Survival percentage of shoot cutting of geronggang (*C. arborescens)* seedlings with treatment of plant growth substance

No.	Treatments	Number of cuttings being planted	Number of surviving cutting	Average surviving percentage (%)	SE
1	Average A	50	36	46.67	0.090
2	Average B	50	20	60.67	0.099
3	Average C	50	24	43.33	0.031
4	Average D	50	36	44.00	0.040

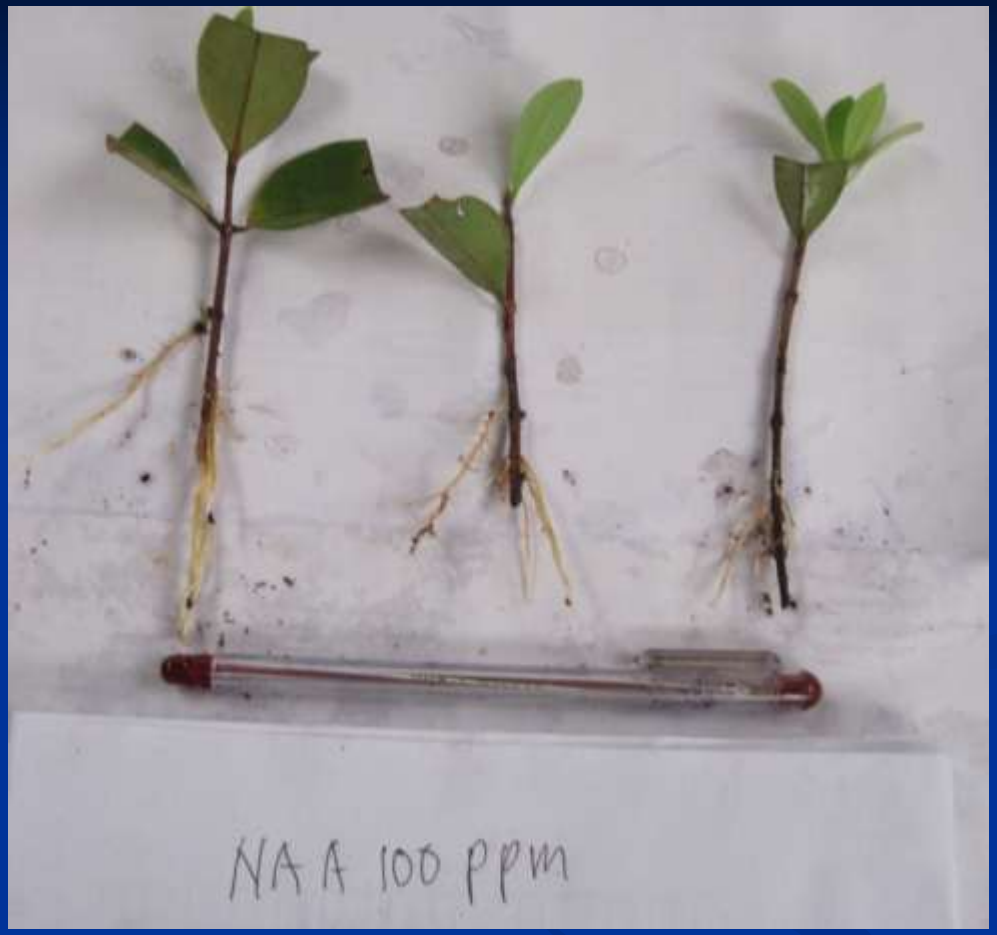
A = Treatment of IBA 100 ppm
B = Treatment of NAA 100 ppm
C = Treatment of IBA 50 ppm – NAA 50 ppm

Results of analysis of variance of effect of plant growth substance on various variables of geronggang (*C. arborescens*) shoot cuttings from seedlings

No.	Variables	P-value
1	Surviving percentage of cutting	0.0610
2	Number of roots	0.9170
3	Length of roots	0.1170
4	Root fresh weight	0.3930
5	Root fresh weight	0.1950
6	Shoot fresh weight	0.9750
7	Shoot dry weight	0.9060

There were no treatments which have significant effect

Condition of geronggang growth in propagation box



Rooting condition of geronggang cuttin at treatment of NAA 100 ppm

EVALUATION OF PLANTING OF RAMIN SHOOT CUTTING FROM WILDLINGS (3 YEARS OLD)

Planting year 2004 :

Treatment	Diameter (cm)		Height (m)	
Open	7.23 ± 1.62	a	2.9 ± 0.7	
Water inundation	6.82 ± 2.65	a	3.6 ± 1.5	a
Under shade of stand	3.89 ± 1.62	b	1.9 ± 0.07	b

Ramin growth in the field from shoot cutting

Results of evaluation of planting in the project of Gerhan in the province of Central Kalimantan as large as 0.25 ha in Sebangau National Park, at 5 years of age

No.	Species	Total number of individuals	Average diameter	Diameter increment (cm/year)	Average height (m)	Height increment (m/year)
1	belangeran	179	9.3	1.86	4,25	0.85
2	jelutung	46	5.39	1.08	4,10	0.82
3	rubber	20	4.94	0.99	4,00	0.8
4	tumih	8	9.67	1.93	4,05	0.81
	Total	253				

Growth of seedlings of belangeran and jelutung at 5 years of

Rehabilitation of peat swamp forest in Central Kalimantan

CONCLUSION

- Propagation of ramin species through shoot cutting produced 100 % survival percentage. Those of belangeran 50.67 – 77.31 %
- Those of tumih 82.67 – 90.67 %, whereas those of geronggang 43.33-60.67 %.
- Hormone treatment of NAA 100 ppm, IBA 100 ppm and IBA 50 ppm+NAA 50 ppm produced significant effect on number of roots and shoot dry weight of belangeran shoot cutting

- Perlakuan hormon NAA 100 ppm, IBA 100 ppm dan IBA 50 ppm+NAA 50 ppm memberikan pengaruh nyata terhadap jumlah akar untuk jenis tumih
- Tanaman yang ditanam oleh Dinas Kehutanan seluas 400 ha dengan jarak tanam 3 m x 3 m menghasilkan persen tumbuh lebih dari 90 %.

SARAN

- Perbanyakan tanaman dengan stek pucuk untuk jenis ramin, belangeran, tumih dan geronggang merupakan salah satu alternatif mendapatkan anakan yang berkualitas dan seragam
- Penanaman rehabilitasi model Gerhan dengan jenis belangeran dengan jarak tanam 3 m x 3 m memberikan hasil yang baik sehingga dapat dijadikan salah satu model rehabilitasi di hutan rawa gambut yang terdegradasi.


TERIMA KASIH