



Jelutung (*Dyera polyphylla*) agroforestry on drained peatlands

Tanjung Jabung Barat district, Jambi province, Indonesia, 0° 59' 19.99" S - 103° 20' 11.04" E

Hesti Lestari Tata, Forest Research and Development Center, Bogor, Indonesia.



Jelutung (*Dyera polyphylla*) 15 months after interplanting on an oil palm farm, while galangal and ginger were interplanted as cash crops. *Dyera polyphylla* was planted in an effort to rehabilitate the peat forest and as a solution to the land tenure conflict in the peat forest reserve of Bram Itam, Tanjung Jabung Barat district, Jambi province, Indonesia.

Summary

Dyera polyphylla, which is locally known as 'Jelutung', is a tree that produces latex. The latex is used for a number of products including chewing gum, insulation and tubing. The wood is soft and bright coloured and can also be used for pulp, plywood, pencils, wooden toys, and much more. It grows naturally on peat swamp forests in Sumatra and Kalimantan (Indonesian part of Borneo). As deforestation increases, the Jelutung trees are decreasing. To restore degraded peatlands, Jelutung was promoted as part of a reforestation plan. This effort was initiated in 2009 in Tanjung Jabung Barat district, Jambi province, by the Forest District office. Jelutung was inter-planted in the Bram Itam peat forest reserve that has been occupied by migrant farmers. Our study on peatland agroforestry showed that Jelutung can be planted with other tree crops, such as oil palm, rubber and coffee (*Coffea liberica*). There is a long history of cultivating tree crops on peatlands in Tanjung Jabung Barat district. Farmers usually made a small channel or ditch (locally known as 'parit cacing') manually after opening the forest or shrubs to drain water. They also know how to control water during the dry season, by putting wooden planks or plastic sheeting near the channel outlet. Water management may keep peat moist during the dry season. The water table during the period of measurement varied among demo-plots. The lowest water table was 89 cm in a plot of oil-palm and Jelutung. Enrichment planting using Jelutung in the existing tree crops would increase biomass and carbon sequestration. Farmers would get additional income from the Jelutung latex and cash crops such as galangal dan ginger. Farmers have also been able to protect their land and farms from fire. No fire occurred in the demo-plots between 2013 and 2015. In conclusion, community collaboration is essential to peatland management.

1. Practice description

Area of the site (ha)	2 ha (2 demo-plots)	
Current land cover/use	Agroforest of <i>Dyera polyphylla</i> and tree crop (e.g. oil palm)	
Previous land cover/use	Degraded peatland. It was cleared by slash and burn in 2008. The oil palm was then planted in 2009, while <i>Dyera polyphylla</i> was interplanted in 2013.	
Origin of intervention	a Post Doc Research	
Types of intervention used in the area	<input type="checkbox"/> Rewetting <input type="checkbox"/> Drainage <input type="checkbox"/> Cultivation of crops <input type="checkbox"/> Grazing <input checked="" type="checkbox"/> Forestry <input type="checkbox"/> Aquaculture <input type="checkbox"/> Fishery <input checked="" type="checkbox"/> Other <input type="text" value="Non timber forest product (latex)"/>	
Duration of implementation	2013-2015	
Main purpose of the practice	Enrichment planting of monoculture tree crops with native peatland tree species (Jelutung) to study effect of dolomite on growth of Jelutung in different agroforestry systems.	
Level of technical knowledge	<input type="radio"/> low <input checked="" type="radio"/> medium <input type="radio"/> high	
Water table depth from surface (m)	Within a year ranged from -0.21 to -0.89 m	
Present active drainage system (m)	Width of channels	<input type="text" value="0.65 m"/>
	Distance between channels	<input type="text" value="50 m"/>
Subsidence (cm year ⁻¹)	Before practice	<input type="text" value="no data available"/>
	After practice	<input type="text" value="5 cm/year"/>

2. Implementation of activities, inputs and costs

N	Establishments of activities	Inputs/materials	Duration	Cost
1	Interview with a candidate from the participating farmers to assess their preferences re. tree species, their knowledge about peat, cultivation practices on peat and their motivation and expectations from the research project.	Questionnaire	2 weeks	Low
2	Seedlings of <i>Dyera polyphylla</i> were bought from two vendors who had certification of the seed source from a legible custodian. The seedlings were then transferred to participating farmers who need to also care for the seedlings before planting. The number of seedlings per farm depends on distance between planting.	Height of seedlings ranged from 30-50 cm. Seedlings were kept in the shade close to the planting site.	About 2 weeks before planting	Medium. Seedling price depends on the location of the vendor.
3	Site preparation: line planting, hole planting and planting seedlings. No new ditch was established, as a ditch was established by the farmer in the early stages of the land preparation.	Seedlings of <i>D. pollyphylla</i> were planted on the existing farm. <i>Dyera's</i> seedlings were interplanted between the tree crops. Planting distance is 8m x 8m on oil palm. Each <i>Dyera</i> seedlings was fenced off using oil palm midribs to prevent a wild-pig attack.	1 month	Medium. The participating farmers were involved during these activities.
4	Maintenance: replanting (one month after planting) and circular weeding twice a year.	One month after planting, the dead seedlings were replaced with new seedlings. Every 6 months, grass and woody climbers around the seedlings were manually removed. The Jelutung's performance during 18 months was monitored.	Two years	Low. The participating farmers were involved during these activities.

Remarks After the research project was completed, the participating farmers regularly maintain their farms.

3. Environmental characteristics

Climate	<input checked="" type="radio"/> tropical <input type="radio"/> temperate <input type="radio"/> boreal
Average annual rainfall (mm)	1313 mm
Altitude (m a.s.l.)	max. 10 m a.s.l.
Slope (%)	1 %
Peat depth (cm)	<input type="checkbox"/> ≤ 30 <input type="checkbox"/> 30-50 <input type="checkbox"/> 50-100 <input checked="" type="checkbox"/> 100-300 <input type="checkbox"/> >300

Peatland type based on the water source	<input type="radio"/> fen <input checked="" type="radio"/> bog <input type="radio"/> undefined							
Hydrologic network	The peatland is part of Tungkal river, which has many rivulets. The river flows to the South China sea, so that the river, rivulets and artificial channels are affected by the tides. Many artificial channels (ditches) have been established over the years for transportation.							
Main vegetation species	<p>Before practice</p> <p>In the patchy peat swamp forest of Bram Itam, the dominant species are <i>Dyera polyphylla</i>, <i>Payena sp.</i>, <i>Camptosperma sp.</i>, <i>Eugenia spp.</i>, <i>Shorea sp.</i>, <i>Alstonia penumatophora</i>.</p> <p>The degraded peatland was dominated by <i>Macaranga spp.</i>, <i>Vitex sp.</i>, ferns and <i>Imperata cylindrica</i>.</p> <p>After practice</p> <p><i>Dyera polyphylla</i> was interplanted with tree crops like oil palm, rubber and coffee. Cash crops, including galangal and ginger are planted along the border of the farm.</p>							
Water quality	<table border="1"> <tr> <td>Water pH</td> <td>3-4</td> </tr> <tr> <td>Water turbidity (FTU)</td> <td>not available (n.a)</td> </tr> <tr> <td rowspan="2">Dissolved organic carbon content (mg L⁻¹)</td> <td>After practice n.a</td> </tr> <tr> <td>Before practice n.a</td> </tr> </table>	Water pH	3-4	Water turbidity (FTU)	not available (n.a)	Dissolved organic carbon content (mg L ⁻¹)	After practice n.a	Before practice n.a
Water pH	3-4							
Water turbidity (FTU)	not available (n.a)							
Dissolved organic carbon content (mg L ⁻¹)	After practice n.a							
	Before practice n.a							

4. Socio-economic dimension

Local stakeholders	<p>The villagers of Mekar Jaya villages.</p> <p>The peat swamp forest reserve of Bram Itam is managed by the Forest Management Unit of Bram Itam in coordination with the Forest Service of Tanjung Jabung Barat district, Jambi province, Indonesia.</p>
Land tenure	The peat swamp forest reserve of Bram Itam was occupied and cultivated by farmers.
Land, water, and other natural resource access and use rights	Inside the forest area, the community get access to the forest through rivers and channels.
Conflicts	Inside the forest area, land tenure conflicts occurred between the community (mostly migrants) and the government (e.g. District Forest Service).
Conflict resolution mechanism	The village groups, supported by ICRAF, proposed that

	<p>they receive a community forestry license from the Ministry of Environment and Forestry of Indonesia. This is a long process that is still ongoing. Once the villagers get the license, which is valid for 35 years, they can manage the forest area and utilize the forest products, even though the land still belongs to the state.</p> <p>Unsecured lands are usually prone to fire. However, the demo-plots in all sites (inside and outside the forest) did not have any fires in 2015 despite the long drought. The participating farmers actively protected their farms from fire.</p>
Legal framework	The farmers who occupy the forest area by planting tree crops, such as oil palm (now interplanted with <i>Dyera</i>) need to have a community forestry license.
Products derived from the peatland	<p>Wood of Jelutung is used for pencils, matches, pulp and plywood. Latex is used for chewing gum, insulation, tyres and tubing and its resin can be used in cosmetics and varnish.</p> <p>Farmers presently get income from the planted tree crops and cash crops (such as ginger and galangal).</p>
Market orientation	In the past, Jelutung latex was exported to Singapore, Malaysia and Japan. There is, however currently no market due to the availability of synthetic latex. However, Jelutung that is planted in an organic, ecologically friendly farming system can be promoted as "green" peatland products. It is a challenge to re-open the international latex market.

5. Assessment of impacts on ecosystem services

1 highly decreasing/ 2 moderately decreasing/ 3 slightly decreasing/ 4 neutral/ 5 slightly increasing/ 6 moderately increasing/ 7 highly increasing

Provisioning services	Agricultural production	4
	Food security and nutrition	6
	Employment	4
	Income	6
	Non-timber forest products (NTFPs) yield	7
	Livelihoods opportunities	6
	Resilience and capacity to adapt to climate change	5
Other	<input type="text"/>	<input type="text"/>
Socio-cultural services	Gender equality	5
	Learning and innovation	6
	Other	Conflict resolution

Regulating services	Waterborne carbon (DOC) loss	4
	Fire frequency	4
	Biodiversity	5
	Subsidence rate	5
	Other	<input type="text"/>
Off-site benefits	Water quality	4
	Frequency of flooding	4
	Other	<input type="text"/>

6. Climate change mitigation potential

1 highly decreasing/ 2 moderately decreasing/ 3 slightly decreasing/ 4 neutral/ 5 slightly increasing/ 6 moderately increasing/ 7 highly increasing

Impact	Rate	Estimate (t ha ⁻¹ year ⁻¹ , CO ₂ eq)	Remarks
Net GHG emission	2		GHG emissions were not measured directly. It is assumed that by enriching woody trees in an agroforestry system with the existing monoculture tree crops, biomass and carbon sequestration would increase. <i>Dyera polyphylla</i> is a native peat swamp tree species, which does not need drainage and dolomite to increase soil pH.
CH ₄ emission	4		
CO ₂ emission	2		
N ₂ O emission	4		
Increase carbon sequestration/storage aboveground	6		

7. Additional information

Further reading:

1. Tata HL, Van Noordwijk M, Jasnari, Widayati A. 2015. Domestication of *Dyera polyphylla* (Miq.) Steenis in peatland agroforestry systems in Jambi, Indonesia. *Agroforestry Systems*. DOI 10.1007/s10457-015-9837-3. <http://link.springer.com/article/10.1007%2Fs10457-015-9837-3>
2. Tata HL, Bastoni, Sofiyuddin M, Mulyoutami E, Perdana A, Janudianto. 2015. Jelutung Rawa: Teknik Budidaya dan Prospek Ekonominya ("Swamp jelutung: cultivation techniques and economic prospects"). World Agroforestry Centre-Southeast Asia Regional Programme. Bogor. ISBN: 978-979-3198-78-1
3. Agung P, Novia CY, Jasnari, Galudra G. 2012. Menuju Pengelolaan Hutan Lindung Gambut Lestari di Tanjung Jabung Barat. Brief No 24. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 4p.