



Cultivation of *Dyera polyphylla* (swamp jelutung)

Tanjung Jabung Timur District, Indonesia(1°20'S, 104°05'E)

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Jelutung (*Dyera polyphylla*) plantation on deep peat at Sungai Aur, Jambi, 2003. After 6 years, the trees are tapped for latex. This particular stand is about 8 to 9 years old. Note the ferns and other undergrowth, which indicate the site is too dry.

Summary

Swamp jelutung is a member of the periwinkle family (Apocynaceae) and largely restricted to peatlands of Sumatra and Borneo. It is a large tree that can attain a reach heights of 50–60 m. The trees produce a fine, light wood used for carving and pencils, and a latex that is used for a variety of purposes, including chewing gum, dentistry and insulation material. Due to over-harvesting and the loss of peat swamp forest habitat, the species is listed as vulnerable by the International Union for Conservation of Nature (IUCN). Since the 1990s, various trials have been carried out in the peatlands of Jambi province. From 1991–2004, a commercial company (PT. Dyera Hutan Lestari or PT DHL) established a 2 000 ha swamp jelutung plantation on deep to very deep peat at Sungai Aur, along the Batanghari River. Latex tapping was done after 5–6 years. As the hydrology had not been restored, problems occurred with peat desiccation and fires spread from adjacent unmanaged areas. Ninety percent of the plantation was destroyed by fire, and the plantation has since largely been abandoned. Since 2009, The World Agroforestry Center (ICRAF) and the Jambi Forestry Department have begun replanting degraded peatland with swamp jelutung under an emissions reduction (REALU) programme. Initial economic studies indicate that while the annual monetary returns per ha are higher for oil palm on peat, the return on labour is higher for swamp jelutung. These results indicate that swamp jelutung might be a good alternative for smallholders.

1. Practice description

Area of the site	8 000 ha	
Current land cover/use	The area consists of a 2 000 ha jelutung (<i>Dyera polyphylla</i>) plantation, with a small area (less than 100 ha) of pulai (<i>Alstonia pneumatophora</i>). 5 000 ha consists of heavily degraded peat swamp forest and secondary fern scrub. Out of the total concession area of 8 000 ha, about 7 200 ha was considered suitable for conversion to plantation. The area is criss-crossed by a series of drainage canals with diameters varying from 2–5 m. These were originally used by loggers to extract timber, but have not been blocked and are used by PT. Dyera Hutan Lestari DHL to provide access to the site.	
Previous land cover/use	Originally the site consisted of tall, mixed peat swamp forest on deep peat. Selective logging (was carried out up to 1986, and the area became heavily degraded. Enrichment planting with <i>Dyera polyphylla</i> , <i>Gonystylus bancanus</i> and <i>Endospermum diadenum</i> was carried out by PT. Xylo Indah Pratama from 1989–1991, and continued for 1–2 years by PT Dyera Hutan Lestari. Cultivation practices switched to monoculture after 1992.	
Origin of intervention	The intervention was an initiative by a private company, PT Dyera Hutan Lestari, based in Jambi city.	
Types of intervention used in the area	<input type="checkbox"/> Rewetting <input checked="" type="checkbox"/> Drainage <input type="checkbox"/> Cultivation of crops <input type="checkbox"/> Grazing <input type="checkbox"/> Forestry <input type="checkbox"/> Aquaculture <input type="checkbox"/> Fishery <input checked="" type="checkbox"/> Other: Plantation	
Duration of implementation	Active from 1991–2004 (14 years), but in 2005 several devastating fires spreading from adjacent areas destroyed 90 percent of the plantationst. The nursery continued to be active for at least 5 years longer, providing seedlings to locals and the Forestry Department.	
Main purpose of the practice	Income generation for company and (employed) local community members. While active it also reduced GHG emissions by preventing fires and reducing dessiccation, and by maintaining a permanent tree cover.	
Level of technical knowledge	<input type="checkbox"/> Low <input checked="" type="checkbox"/> Medium <input type="checkbox"/> High	
Water table depth from surface	> -0.5 m	
Present active drainage system	Width of channels	2–5 m
	Distance between channels	~100–300 m

2. Implementation of activities, inputs and cost

N	Establishment of activities	Input/materials	Duration	Cost
1	Establishing of 2 ha nursery	Clearing and levelling, construction of roofing, establishing pumps for watering, training of staff, sourcing of jelutung seeds, planting, tending, hardening of seedlings. Obtaining a sufficient supply of jelutung seeds has proven to be difficult, as <i>Dyera polyphylla</i> flowers and sets seed only every 4–5 years.	Established in the first 6 months of year–1, but continued until the present time.	Medium
2	Preparing sites and planting	Clearing of area prior to planting of jelutung seedlings, transport of seedlings to site (staff and boats), planting and watering, provision of initial fertilizer and weeding. Investments in infrastructure have been high because of the difficulty of access in the peat swamp.	Annually, 60–500 ha were planted, usually in 1–2 months prior to the wet season	High
3	Tending and harvesting	Replacing of dead seedlings, keeping area around seedling clear of weeds during years 1–2; removal of climbers and other woody species; initial latex tapping in year 5, normal regular tapping; collecting and transport of collected latex to main camp; processing and transport to Jambi and other cities, ultimately to Malaysia and Singapore.	Continual, except at the peak of the wet season (no tapping) and on occasions during driest months, when low water levels prevent access by boat.	Medium

3. Environmental characteristics

Climate	<input checked="" type="checkbox"/> Tropical <input type="checkbox"/> Temperate <input type="checkbox"/> Boreal	
Average annual rainfall	2300–2500 mm	
Altitude	6 m a.s.l. (max.)	
Slope	Much less than 1 %	
Peat depth (cm)	<input type="checkbox"/> ≤ 30 <input type="checkbox"/> 30–50 <input type="checkbox"/> 50–100 <input type="checkbox"/> 100–300 <input checked="" type="checkbox"/> >300	
Peatland type based on the water source	<input type="checkbox"/> Fen <input checked="" type="checkbox"/> Bog <input type="checkbox"/> Undefined	
Hydrologic network	The peatland is part of a dome that lies adjacent to the Batanghari River, the main river of Jambi Province and the longest on Sumatra. Small streams originally led from the dome to this river. However, with the excavation of numerous canals, the original hydrology has been greatly modified.	
Main vegetation species	Before practice	Mixed peat swamp forest, with dominant species: <i>Alstonia penumatophora</i> , <i>Camposperma coriaceum</i> , <i>Dyera polyphylla</i> , <i>Koompassia malaccensis</i> and <i>Tetramerista glabra</i> Undergrowth includes sedges and ferns.
	During practice	Replaced by plantation species: jelutung (<i>Dyera polyphylla</i>) and pulai (<i>Alstonia penumatophora</i>), both of which also occur in the original vegetation. Undergrowth is a dense sward consisting of only a few fern and sedge species.
Water quality	Water pH	3–4

4. Socio-economic dimension

Local stakeholders	The PT Dyera Hutan Lestari plantation lies within the territory of Sungai Aur village, which is more than 10 km from the site. In 2010, the village had a population of 1 400. People were recruited from Sungai Aur for working on the plantation (mainly men) and in the nursery (mainly women). Traditionally, persons from Sungai Aur are involved in river fisheries, trade, timber (in the past there were many sawmills) and some agriculture on the banks of the Batanghari River.
Land tenure	PT. Dyera Hutan Lestari company has a 30-year concession for the 8 000 ha area.
Land, water, and other natural resource access and use rights	Formerly, the local community had access to the mixed peat swamp forests, but this was blocked when the forest logging concession became operational in the area in the 1970s-1980s. This logging concession was transformed into an enrichment planting concession by PT. Xylo Indah Pratama)in 1989, and a largely monoculture plantation by PT Dyera Hutan Lestari in 1991–1992, giving the companies exclusive rights to the resources.
Conflicts	Security is a problem, and PT. Dyera Hutan Lestari staff have been threatened and attacked on various occasions, for example, by local illegal loggers caught felling ‘mother trees’ in the PT Dyera Hutan Lestari concession area. Wildfires. In 1997, 7 000 ha burnt including 1 769 ha of jelutung plantation, due to a fire that began in the adjacent HPH PT. Kamiaka Surya. In June 2003, a second fire raged through PT Dyera Hutan Lestari’s concession, burning 5 000 ha including 1 775 ha of jelutung and pulai plantation. This fire began at an illegal sawmill located along the Batanghari River, one km upstream of PT. Dyera Hutan Lestari’s concession area.
Conflict resolution mechanism	Via local police (for security issues) and the Forestry Service (<i>Dinas Kehutanan</i>) for the fire-related issues.
Legal framework	Indonesia’s forestry laws (No. 41 of 1999, and No. 19 of 2004) directly influence the establishment of a jelutung plantation on degraded peatland. If a forest is degraded to the point that the standing crop is below a particular amount of cubic metres per ha it is considered to be non-productive, and the area may then be converted to a plantation. In practice, many forests that have been (over-) logged are in this category. There is no stipulation specifying that the hydrology must be restored. There are regulations stating that logs must be harvested by rail in peatland forest areas, but this rule is rarely followed by concessionaires (or checked and fined in case of malpractice by Ministry of Forestry).
Products derived from the peatland	High quality latex (for chewing gum, dentistry and insulation material) and fine product timber (for pencils, boxes) from jelutung; fine product timber (for pencils and boxes) from pulai (<i>Alstonia pneumatophora</i>).
Market orientation	Latex and timber is mainly sold to Peninsular Malaysia and Singapore, but may be marketed through Jambi city

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	3
	Food security and nutrition	5
	Employment	6
	Income	6
	Non-timber forest products yield	7
	Livelihoods opportunities	6
	Resilience and capacity to adapt to climate change	4
Socio-cultural services	Level of conflicts	6
	Gender equality	6
	Learning and innovation	6
Regulating services	Waterborne carbon (DOC) loss	6
	Fire frequency	6
	Biodiversity	1
	Subsidence rate	6
Off-site benefits	Water quality	3
	Frequency of flooding	3

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	–	The assessment depends on which two states are compared. If the plantation is compared to the original mixed peat swamp forest, then all emissions are highly increased (7) and sequestration is decreased (1–2). However, the comparison below is between the highly-degraded and unmanaged state (with occasional wildlifes sweeping though) and the managed jelutung plantation.
CH ₄ emission	4	–	
CO ₂ emission	2	–	
N ₂ O emission	4	–	
Carbon sequestration/storage abovegrounds	6	–	

7. Additional information

Refer to the following publications for further details:

Giesen, W. (2004) - Causes of peat swamp forest degradation in Berbak National Park and recommendations for restoration. Water for Food and Ecosystems Programme Project on: "Promoting the river basin and ecosystem approach for sustainable management of SE Asian lowland peat swamp forests". ARCADIS Euroconsult, Arnhem, the Netherlands, 125 pp.

Muuss, U. (1996) - Anreicherungspflanzungen im tropischen Feuchtwald Sumatras - eine waldbauliche Herausforderung. FORSTARCHIV, 67:65–70. [Enrichment planting in tropical rain forest of Sumatra - a challenge in forest structure. In German, with English summary.]

Sofiyuddin M, Janudianto, and A, Perdana (2012a) - Potensi Pengembangan dan Pemasaran Jelutung di Tanjung Jabung Barat. Brief No 23. Bogor, Indonesia. World Agroforestry Centre – ICRAF, SEA Regional Office. 4p.

Sofiyuddin, M., A. Rahmanulloh and S. Suyanto (2012b) - Assessment of Profitability of Land Use Systems in Tanjung Jabung Barat District, Jambi Province, Indonesia. Open Journal of Forestry. Vol.2, No.4, 252–256. Published Online October 2012 in SciRes (<http://www.SciRP.org/journal/ojff>).

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