Saving an iconic species

Efforts are under way to conserve the genetic diversity of an important Indonesian timber species that is now under threat

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Young ones: *Ulin* seedlings ready to be planted at the genetic conservation garden. The seeds come from several provenances of mother trees. *Photo: Murniati*

Indonesia's tropical rainforests contain many timber species of high economic value. One of them is Borneo ironwood (*Eusideroxylon zwagery* Teijsm. and Binn.), known in Indonesia as *ulin* (and as *belian* in Malaysia). *Ulin* wood is dense (with an average specific gravity of 1.04 and Class 1 strength and durability; Martawijaya et al. 2005), yet it is easily worked. It is used widely for various purposes, such as construction pylons in wetlands, shingle roofs, house frames and doors. The future of *ulin* in the wild is increasingly uncertain, however. This article describes the species and some of the conservation efforts underway to conserve it.

Habit and fruit

A member of the Lauraceae family, *ulin* is an evergreen tree that grows up to about 50 m in height. Its bole is straight; usually branchless to a maximum of 20 m; sometimes slightly fluted at the base; 150–220 cm in diameter at breast height; and buttressed. It has a red or grey-brown bark with thin cracks. The crown is dense and the leaves are arranged spirally (Soerianegara and Lemmens 1994). The fruit of *ulin* are egg-shaped, and pointed or blunt-tipped. Their size varies in the range of 10–18 cm in length and 7–10 cm in diameter. Each fruit contains only one seed (Yusliansyah et al. 2004).

Ecology

Ulin is a lowland primary forest species native to Indonesia and other countries in the region. It occurs naturally on the islands of Sumatra, Bangka Belitung and Borneo. Sidiyasa (2011) reported that *ulin* grows under the following conditions: up to an altitude of 500–625 m above sea level; on both flat and sloping areas; on well-drained soils with low to moderate pH and low fertility; and in areas with an average annual rainfall of 2500–4000 mm and relatively high humidity.

Genetic diversity

Information on the genetic diversity of a species is essential for designing an appropriate sampling strategy for genetic conservation purposes. Data on the genetic diversity of *ulin* have been reported by several authors using RAPD (random amplified polymorphic DNA) analysis. Studies by Sulistyowati et al. (2005) on the diversity of four provenances of *ulin* in East, Central and West Kalimantan (Sepaku, Seruyan Hulu, Sumber Barito and Nanga Tayap), by Rimbawanto et al. (2006) on the diversity of five provenances of *ulin* in East Kalimantan (Kutai National Park, Meratus, Sungai Wain, Samboja and Lempake) and by Widyatmoko et al. (2011) on the diversity of two provenances of *ulin* in Sumatra (South Sumatra and Jambi provinces) all indicated that genetic diversity is still high in *ulin* populations. Widyatmoko et al. (2011) found no evidence of genetic degradation from trees to wildlings within the populations they studied.

Four varieties of *ulin* have been identified on the basis of seed morphology: exilis ("slender"), ovoidus ("rounded"), grandis ("big") and zwageri (which has a moderate, cylindrical seed shape rounded at the ends). Irawan (2005 and 2011) reported that genetic variation among these varieties is high and verified that the morphological variability between them has a genetic basis.

Under threat

The main threat to *ulin* is a loss of habitat, but this is exacerbated by high demand for its wood, which has led to high prices and increased logging, including illegal logging. On the other hand, there are also challenges in

the regeneration of the species. It grows only slowly: in one study, the average annual diameter growth increment (AAI) of *ulin* in logged-over forests was 1.9–2.7 mm, while in a genetic resource conservation garden the AAI was measured at 2.21 mm (Murniati et al. 2013).

The species is becoming rare in natural forests; it is mostly found today only in national parks, protected forests, forest research areas and remote production forests. It is listed as vulnerable (A1cd+2cd ver 2.3) in the IUCN Red List of Endangered Species, which means, among other things, that the species faces a high risk of extinction in the wild in the medium-term future (IUCN 2013).

Conservation efforts

Conservation should be interpreted as part of a continuum between research, use and protection (Waluyo, 2002). *In-situ* conservation can be conducted by conserving stands and forests, establishing on-site arboreta, and planting seedlings or wildlings in depleted forests (enrichment planting). *Ex-situ* conservation efforts may include establishing dedicated plantations, seed orchards and genetic resource conservation gardens, and collecting and storing seeds or other reproductive material. As well as conserving genetic diversity, genetic resource conservation gardens can provide genetic materials for breeding programs and help maintain a broad genetic base for the species.

Various efforts have been undertaken by government and other stakeholders to conserve the species through improved management and enrichment planting in its natural habitat (*in-situ* conservation), and planting outside its natural habitat (*ex-situ* conservation), both with mixed results. Under a recently concluded ITTO project[1], five *ulin* seed source sites were identified in each of five provinces (Jambi, South Sumatra, West Kalimantan, Central Kalimantan and East Kalimantan). In addition, primary forests that could be set aside as *ulin* conservation areas were identified, namely:

- an *ulin* seed source area belong to private company PT Itciku, an *ulin* stand in the Samboja Research Forest, and the Reserve Forest in Bukit Soeharto, all in East Kalimantan Province;
- an *ulin* forest in Kiham village in Central Kalimantan Province; and
- the arboretum of PT Suka Jaya Makmur in West Kalimantan Province.

Efforts have also been made to improve the *ex-situ* conservation of *ulin*, both by government and privately. *Ex-situ* conservation sites of *ulin* include the Sumberwringin Research Forest in East Java; the arboretum of the Center for Forest Conservation and Rehabilitation Research and Development in Bogor, West Java; the Suban Jeriji Research Forest, South Sumatra; the Barabai City Forest, South Kalimantan; and the Sempaja Arboretum and the office yard of the Forestry Research Center for Dipterocarps in Samarinda, East Kalimantan.

A 1.5-hectare genetic resource conservation garden of *ulin* has been established in the Kemampo Research Forest, Banyuasin District, South Sumatra Province. Activities undertaken there include: the exploration and selection of mother trees; the collection of genetic materials (seeds); seedling preparation; the planting out of seedlings to the field plot; and plot maintenance. The genetic materials were collected from five *ulin* provenances: Batanghari, Jambi Province (ten mother trees); Sarolangun, Jambi Province (six mother trees); Musi Banyuasin, South Sumatra Province (seven mother trees); Musi Rawas, South Sumatra Province (six mother trees); and Kalimantan (East Kalimantan and Central Kalimantan provinces; multiple mother trees).

The *ulin* genetic resource conservation garden is expected to function as a back-up for *in-situ* conservation, and it can also generate useful data on growth and other aspects of the species. The genetic resource conservation garden should not be relied on as the sole element in the species' conservation: like any site, it is vulnerable to external risks such as fire; nor does it capture the full extent of the species' diversity. The best genetic conservation strategies combine *ex-situ* and *in-situ* components and a long-term plan for their upkeep in the face on continuing environmental and land-use change.

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Big trees: Clockwise from top left - The largest known *ulin* tree in Indonesia, growing in Kutai National Park, East Kalimantan. *Photo: Pradjadinata*; An *ulin* seed orchard in the Mambang Custom Forest, South Sumatra Province. *Photo: Murniati*; *Ulin* fruits. *Photo: Effendi*; A seed inside an *ulin* fruit. *Photo: Nugroho*

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The completion report of project PD 539/09 Rev.1 (F) is available on request from the ITTO Secretariat (tetra@itto.int).