JAMBI AS A CENTER OF GENETIC RESOURCES OF THE THREATENED TREE SPECIES `IRONWOOD` (*Eusideroxylon zwageri* T. et B.)

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Jambi Province

Jambi province is located geographically between 0° 45′ to 2° 25′ latitude South and 101° 10′ to 104°55′ longitude East. It is separated by Riau province in the North, Berhala gulf in the East, South Sumatra in the South and West Sumatra in the West (Anonymous, 1997a).

The total surface of Jambi province is about 45.000 km^2. Plains form the larger part of the province, but in the West, there is the Barisan Range with the highest mountain of Sumatra, Kerinci mountain (3800 m). In the North, a part of Tigapuluh Mountains (800 m) are in the Jambi province and in the center, there is a small hilly area, The Duabelas Mountains (450 m). Batanghari is the largest river in Jambi province. It flows upstream in a longitudinal depression in a southeast direction through the low area of East Sumatra, parallel to the Tigapuluh Mountains. The northeast running downstream part breaks through the anticlinorium, to which the Tigapuluh Mountains belong (Verstappen, 1964).

The total forest area of Jambi province was about 2.604.443.94 ha in 1996/1997 (Anonymous, 1997b). Ecosystem types and bio-natural resources are various, separated from low land forest until mountain forest formation. The important wildlife species of Jambi that have been protected are Sumatra Tiger (*Panthera tigris sumatrae*), Sumatra Elephant (*Elephas maximus sumatrensis*), Sumatra Rhinoceros (*Dicerorhinus sumatrensis*) and Wild Goat (*Capricornus sumatrensis*) while the most valuable plant species that have been protected are ironwood (*Eusideroxylon zwageri* T. et B.), pacet wood (*Harpoulia* spp), Pine–kerinci strain (*Pinus merkusi*) and the giant flowers (*Amorpopholus titanum* and *Rafflesia arnoldi).*

2. Ironwood, its conditions and variability in Jambi

The habitat of ironwood is on low land forest (500 meters and rarely until 625 meters above sea level). Ironwood grows in Kalimantan, South and Southeast Sumatra (Jambi, Palembang, Bengkulu, Siak and Indragiri), the southern part of West Sumatra and Philippines (Beekman, 1949). In Jambi, ironwood grows in Senami natural grand forest,

Durian Luncuk I and Durian Luncuk II with the areas are about 15.500 ha, 30.3 ha and 44.5 ha respectively. According to the decree of Indonesia Ministry of Forestry number 34/kpts-I/1987, Durian Luncuk I and II are purposely for ironwood conservation.

In order to conserve the existing Ironwood in Jambi that is decreasing parallel to the time, Governor of Jambi Province issued the decree no. 522.12/760/PP, 25 January 1989. This decree regulated the forest product concession and put ironwood into protected tree species. The Jambi Governor also issued a circular letter in 1995 to straighten up Ironwood distribution and trading in Jambi. Nationally, according to Indonesian Ministry of Agriculture decree no. 54/Kpts/UM/2/1972, Ironwood included into the protected tree species and restrict cutting to trees over 60 cm diameter at breast height. Indonesia also has been banned the export of it.

Peluso (1992) informed that Ironwood is a timber that is simultaneously scarce, extremely useful in both `traditional`and `modern` enterprises, and so slow in term of time and number of regeneration that it may be called a nonrenewable resource in a loose interpretation of the term; generations, sometime centuries, pass before it grows into its most useful mature form.

Furthermore, Oldfield *et al.* (1998) showed that ironwood is included in the list of threatened tree species. Ironwood is one of the most renowned timbers of Borneo, the decline of which was first noted in 1955. Population reduction caused by overexploitation and shifting agriculture has been noted in the following regions: Kalimantan, Sumatera, Sabah, Sarawak and the Philippines. The regeneration of it in logged-over forest is limited. So far, the species has only been planted on a small scale because the supply of seeds and seedlings is inadequate.

The wood is used for making furniture, window and door frames, harbors, heavy constructions, roofs, bridges, railway sleepers, marine pilling, boat constructions, fence posts, heavy duty industrial flooring, shingles and vehicle body work. The seed also can be used as a skin medicine.

Soeroto (1999, pers. comm.) in Irawan (1999), stated that, Senami natural forest has four varieties of *ironwood namely, bulian sirap, bulian daging, bulian tanduk* and *bulian kapur*. Each variety has different wood characteristics. *Bulian sirap* is easy to split; hence, it is suitable for roofs. *Bulian tanduk* is the hardest. It is suitable for construction work. *Bulian daging* and *bulian kapur* are suitable for construction too, even though they are not as hard as *bulian tanduk*.

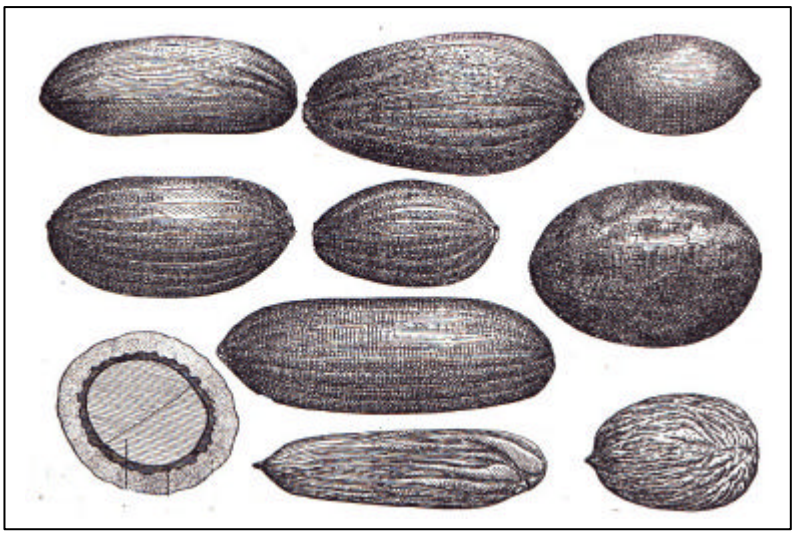

Figure 1. Variation of fruits in *E. zwageri*. Tranverse section through fruit showing sarcocarpuim, putamen and cotyledons (De Wit, 1949)

Figure 2. The different performance of bulian seedlings. Left: A seedling with reddish leaves in young stage. Right: A seedling with green leaves even in young stage. (Irawan, 1999).

Figure 3. The different root systems of bulian. Left, bulian seeds with branching root systems and right, bulian seeds with taproot systems

The bulian varieties also reported by Heyne (1987), that there is four varieties of *Eusideroxylon zwageri* T. et. B. in West Kalimantan. The first is *belian tando* that the color is reddish brown. The second is *belian lilin,* which is very suitable for foundations and floors. The third is *belian tembaga*, which colors yellow and utilized for foundations and floors and the fourth is *belian kapur*, which is brown and the only one variety that is easy to split; therefore, it is suitable for roofs.

Each varieties of ironwood in Jambi is never thoroughly investigated, the different characteristics among them can be recognized only by local people mostly from the wood structure and also other morphological traits (see fig. 1,2, and 3).

Forester know that the fruits of ironwood differ widely in size and shape (fig. 1) They generally consider this variable shape of no specific importance and this view has been shared systematically. The timber of ironwood is known to vary but it is stated that the variation in properties of the timber has no relation with the variation in the fruits (koopman and Verhoef, 1938).

The purpose of the present study was to investigate whether actually no correspondence whatever between fruit character and other characters (flowers, leaves, timber) existed. The opinion of earlier observers was confirmed and, as no detailed investigation had been carried out till now, received a firmer basis. I found that in a single tree the shape of the fruit is constant. The size may vary somewhat (see fig. 3) but one individual produces one single kind of fruit. As in nature several kinds of fruit are found in one locality this points to the possible occurrence of **varieties or taxa** of lower rank (De Wit, 1949).

Some experiments on Ironwood that already conducted in Jambi during the recent years are:

1 Vegetation analysis of Senami ironwood forest stand in Batanghari District Jambi Province (Hastuti, Nezriyetti and Nursanti, 1999).

3. Research on cutting propagation of ironwood (*Eusideroxylon zwageri* T. et B). The result show that ironwood can be propagated by cutting (Irawan,1999).

4. Research on generative propagation of ironwood (A bachelor degree research supervised by Hanibal, MP and Bambang Irawan, MSc). The results show that when ironwood seeds were cut into three parts, each part of them still have ability to germinate and grow into a new plant (Anita, 2000).

3. Future Development

For the future, there are some plans that will be done in order to manage and to conserve ironwood variability in Jambi.

3.1. The studies and researches on ironwood

a) There is a cooperation between Forestry Research Team - Jambi University and Natural Resources Conservation Unit (BKSDA-Jambi) on a long term experimental research on the growth of ironwood. The experiment will be conducted from October 2001 in Durian Luncuk-Jambi.

b) Research on anatomical and morphological structures of ironwood will be conducted in 2001 until 2002.

3.2. Action Plans

a. Mapping of ironwood mother trees.

Based on the results of the former and the next researches, the ironwood mother trees will be marked and mapped permanently. The mother trees will be divided into each ironwood variety. These mother trees will be used as a source of research material and cultivation.

b. Ironwood breeding program

The main obstacles of breeding program in ironwood is the low rate of growth increment which lead to the problem of time. However there are some reasons to be optimistic. Firstly, there are four potential varieties of ironwood in Jambi. Those varieties must be managed in order to find the specific characteristics of each variety. In the future, each variety could be plant separately according to the economical and ecological point of view. Secondly, among the ironwood population within varieties there must be some trees which have better performance than the others e.g. better growth performance and better wood quality. Thirdly, ironwood does not only grow in Jambi but also grow in other regions e.g. Kalimantan. Therefore, variability among ironwood that grow in different regions could be occur. This geographic variability could lead to the formation of the new genotype combination. Provenance tests are necessary to conduct, to determine the direction of this variability.

Wright (1976) suggested that, in spite of the fact that trees are long-lived and less convenient test organisms than herbaceous plants, progress in the tree improvement has been rapid. Even when measured on term of years rather than generations, the percent increase in productivity has been as great for some trees as for some annuals. Each success engenders further work so that we should expects to see a constantly growing numbers of new varieties.

c. Seed and hedge orchards building

Seed and hedge orchard could be built in Jambi when the researches and breeding program could determine the genetic quality of each ironwood variety. Those seed and hedge orchards are built up by vegetative and generative propagation and the mother trees are selected from some different varieties of ironwood in order to improve the quality of ironwood trees and to maintain their genetic diversity.

d. Maintaining and increasing genetic diversity of ironwood.

The methods that can maintain or even increase the genetic diversity of ironwood are: (1). Building a mixed plantation of some ironwood varieties. (2). Turning ironwood

seed orchards into gene banks. (3). Collecting and planting some varieties of ironwood that naturally grow in other places, e.g. from Kalimantan and Sarawak .

4. Conclusions and recommendation

1. There are four potential varieties of ironwood in Jambi Province but they still require some researches to study their characteristics and utilization.
2. The lack of information on ironwood lead to the minimize effort on ironwood conservation and breeding.
3. Some researches and actions are necessary in order to conserve and to develop ironwood breeding program.
4. There is important to establish up an international cooperation to utilize the natural resources in the tropical region.

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