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Gunung Walat Educational Forest: from bare land to forest stand

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Abstract

Gunung Walat Educational Forest (GWEF) was bare land in 1951 and dominantly covered by *Imperata cylindrica* and shrub. A plantation was established in 1959 by the forestry district, followed by the Faculty of Forestry of Bogor Agricultural University (IPB). Recently, enrichment planting was also conducted under the management of the forest administrator. The total forest area is 359 ha, which is mostly covered by agathis (*Agathis loranthifolia*) and pine (*Pinus merkusii*) stands. Enrichment planting is being done to recover damaged areas, in collaboration with companies with carbon sink schemes. The forest is surrounded by villages in which villagers collaborate with the forest administrator for agro forestry activities and resin extraction of agathis and pine trees. Agro forestry activity is characterized by the planting of rice, cassava, banana, coffee, and medicinal plant under the stands. Some faunas are also found in the area as wild faunas. All expenses of GWEF can be covered from self income generating activities, especially resin production and public services, which provides a unique example of how a small scale forest management can survive without cutting the trees. In addition, GWEF has been providing other services for people such as educational, recreation and support for local people's needed of fire wood.

1. Introduction - background

In 1951 Gunung Walat was bare land and mostly covered by *Imperata cylindrica*, grass and shrubs. The activity of reforestation was started in 1959 with an agathis plantation by the West Jawa Forestry Division. The total area is 359 ha, located in Sukabumi, 56 km from Bogor city Indonesia, between 6°53'35"-6°55'10" S and 106°47'50"-106°51'30" E, with mountainous topography ranging from steep (15-25%) to very steep slopes (>40%).

Gunung Walat Education Forest (GWEF) was established in 1969 and the management of GWEF has been conducted by the Faculty of Forestry Bogor Agricultural University (IPB) since 14 October 1969, based on a Decision Letter from the Forestry Head of West Jawa Province. The location of GWEF is shown in Figure 1.

Since IPB got the mandate, reforestation has started with schemes including sylviculture practices by students, planting many tree species, and recently rattan, bamboo, and also some medicinal herbs were found. The forest stand is predicted to be about 10,855 m^3 agathis,

9,471 m^3 pine, 464 m^3 puspa, 132 m^3 sengon, and 88 m^3 mahogany. Agathis and pine trees produce resin and it is sold as the main income generating activity.

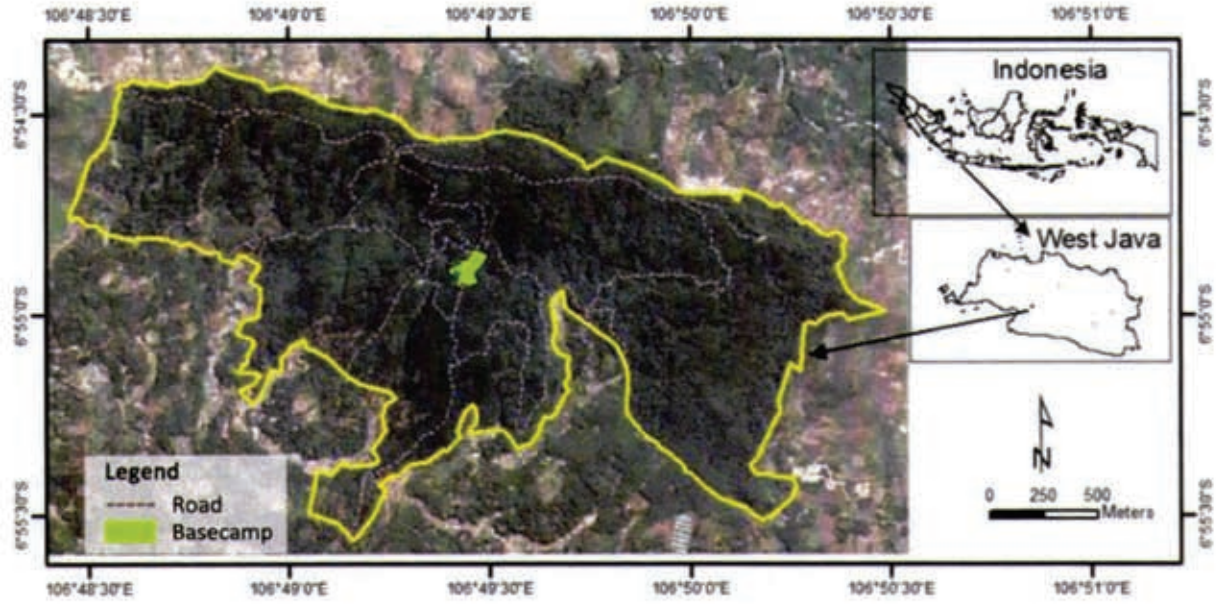

Figure 1. *GWEF in Sukabumi District, West Java, Indonesia.*

2. Reforestation

In the year 1951 existing soils in the area were categorized as red soils (Podsolic and Latosol) and Lithosol. Lithosol is soil which is very shallow (less than 20 cm) and is dominated by rock or stone (high degree of stoniness). High degrees of Lithosol were found especially in the north-eastern part, and such condition posed some problems for tree planting efforts. At that time, according to interviews with elderly locals around the GWEF, the environmental condition for agriculture bad with frequent flooding during rainy season and frequent drought during dry season due to lack or absence of forest in the area. Such conditions created problems for local people who wanted to cultivate wetland rice. Therefore, the Local Forestry Service Office and University of Indonesia (University of Indonesia, Faculty of Agriculture, Forestry Department, which in 1963 became IPB) took the initiative to develop forest in the 359 ha area, with initial planting of agathis. Planting activities were conducted by local people around the Gunung Walat area and IPB, and every year each batch of new forestry students was assigned to plant 4 hectares of forest. The Faculty of Forestry IPB students became the main tree planters in the GWEF area, and the tradition of tree planting by forestry students in the area continued until the year 1979 (HPGW 2010).

The tree species being planted for the first time (in the year 1951) was agathis because basically this species requires shade in the initial stage of its growth, and the small seedling of this species could utilize the natural side shade created by the existing shrub and alang-alang. For utilizing the side shade, agathis was planted by clearing (slashing and eliminating the alang-alang and shrub) in only very small patches (70 cm x 70 cm) for each seedling or planting hole of agathis. Shrub and alang-alang outside the whole patches were not slashed, to

serve as side shade for the small seedlings of agathis. After the planted agathis reached height of 200 cm, the cleared area was increased because the agathis did not need shade anymore.

A problem encountered during the initial planting activity was the high degree of stoniness of the soils in the area, especially at the north-eastern side. An attempt to alleviate this problem was the generous use of organic matter (addition of compost) in the form of composted goat or sheep manure in the planting hole during the initial planting. Goat manure at that time could be easily obtained from traditional goat or sheep husbandry practiced by local people. The agathis stand has been growing well around the base camp and reached a diameter of 60-80 cm and a height of 30-40 m, as shown in Figure 2.

Figure 2. *Agathis stand around base camp.*

In 1973 about 53% of the GWEF area was covered by some tree species, and in 1980 almost all area was covered by forest stands consisting of agathis (*Agathis lorantifolia*), pine (*Pinus merkusii*), puspa (*Schima wallichii*), africa wood (*Maesopsis eminii*), mahogany (*Swietenia macrophylla*), rasamala (*Altingia excelsa*), rose wood (*Dalbergia latifolia*), *Gliricidae* sp, sengon (*Paraserianthes falcataria*), meranti (*Shorea* sp), and mangium (*Acacia mangium*), the forest stand is shown in Figure 3 (HPGW 2010).

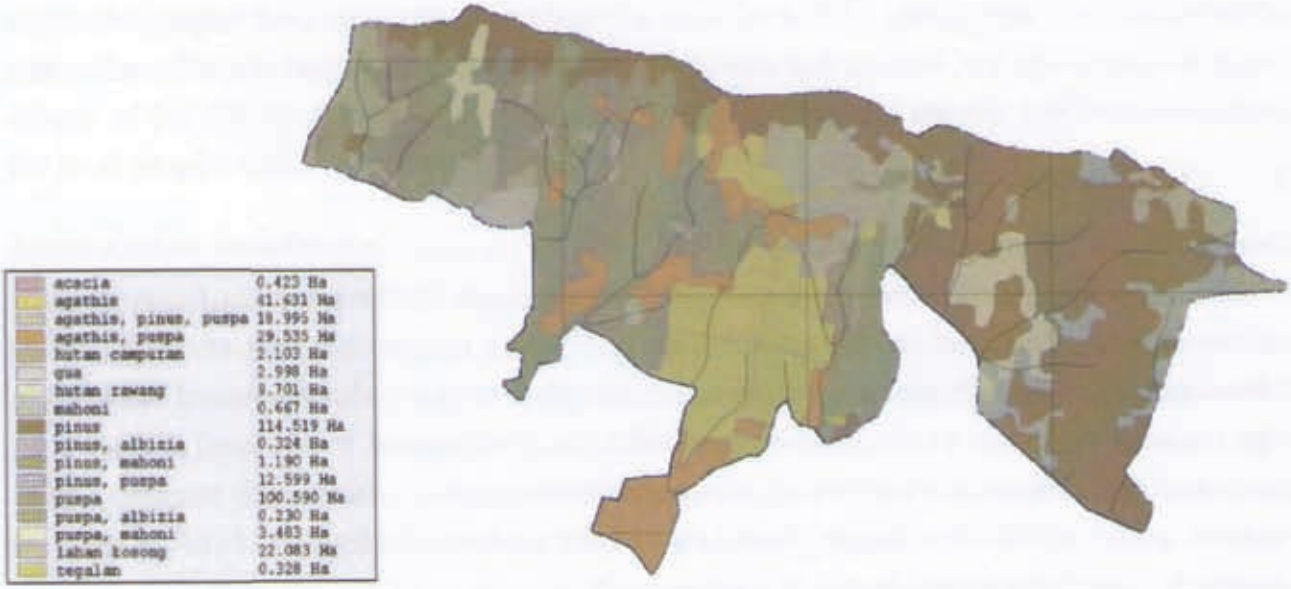

Figure 3. *Forest stands and tree species in GWEF.*

In 2011 the GWEF has 95% of forest cover, and within 191 ha that correspond to the present forest management plant, there are different forest types such as pure pine, agathis, and puspa. There are also mixed stands of the species above and other species like mahogany, sengon, africa wood, rasamala, rose wood, meranti, mangium, american kapok (*Ceiba pentandra*), *Gliricidae sepium*, and other species. The total number of tree species is about 44 including 2 rattan species and 13 bamboo species. The forest stand information is shown at Table 1.

The table describes forest stand structure and size of research area regarding age, number of plots and the amount in which harvesting activities have been applied. The definitions of the five stands are based on the inventory data and stand description. Enrichment planting is still carried out to replace extracted trees or disturbed areas. Furthermore in some forest area 68 species of medicinal shrub have been found, e.g. cardamom (*Curcuma xanthorriza*), and ginger (*Zingiber officinale*), and also agro-forestry e.g. banana (*Musa* sp), coffee (*Coffea robusta*), cassava (*Manihot utilissima*), and pineapple, all vegetations are growing under an open canopy of few trees such as *Swietenia macrophylla*, *Agathis loranthifolia*, *Schima wallichii*, *Maesopsis eminii* and durian (*Durio zibethinus*).

Table 1. *Quantitative stand information.*

Stand	Age (Year)	Area (ha)	Area (%)	Har. Area (Ha)	No.of Plots
Pinus merkusii	40	97.02	50.9	20.23	11
Agathis lorantifolia	60	15.96	8.4	15.96	3
Schima wallichii	40	19.27	10.1	-	6
Mix Plantation	40	42.08	22.1	-	6
Secondary forest	-	16.46	8.6	-	5
Total	-	190.79	100	36.19	31

Source : Georg-August-Universität Goettingen (2010)

Fauna found in the GWEF inlcudes long-tailed macaque (*Macaca fuscicularis*), wild boar (*Sus scrofa*), wild rabbit (*Nesolagus* sp), leopard cat (*Prionailurus bengalenensis*), squirrel (*Callociurus* sp), trenggiling (*Manis javanica*), and civet (*Paradoxurus hermaphroditic*). Some species of reptiles, insects, and birds are also living in this area, and based on survey the total number of bird species is about 52 from 22 familes. .

3. Carbon Sink Activity

One of the management objectives of the GWEF is to maintain and enhance environmental benefits. To achieve this objective, the GWEF managers have been conducting forest rehabilitations on some degraded areas since 2009, implementing carbon sink projects through collaboration with some companies. Such carbon sink projects are voluntary-based schemes in which a company may invest funds in the GWEF for planting and maintaining a number of trees during a certain contract period. Currently, there are five carbon sink projects implemented in the GWEF: The Tanabe Foundation, Toso, Conoco-Phillips, and NYK projects as shown in Table 2 (Executive board of HPGW 2010).

Table 2. *Carbon shink activity.*

Company	Year	Area	Tree species	Total Tree
Tanabe Foundation	2004	10 Ha	Agathis, Puspa, Rasamala, Manglid	-
TOSO Co. Indonesia	2009-2014	10 Ha	Agathis	4,000
TOSO Co. Japan	2010-2014	10 Ha	Pine	6,000
Conoco Philips	2009; 2010	5 Ha	Agathis, Pine, Rasamala	5,000
NYK Logistics	2009	-	-	1,500

Toso's carbon sink project is a 30-year project funded by Toso Company Limited, which is a Japanese company that develops and manufactures various interior products. During the first period of collaboration (2009–2015), the company provided funding to the GWEF for planting and maintaining 4000 *Agathis loranthifolia* trees to increase the forest's carbon stocks. Tree plantings were conducted in 2009 and 2010 with total area of 10 ha (HPGW 2011). For the next 24 years of collaboration, the GWEF has to maintain the planted trees with annual funding provided by the company.

The second carbon sink project was initiated by Conoco-Phillips, an American multinational energy corporation. In 2009 and 2010, this company provided funding to the GWEF for planting 5000 trees (consisting of *Agathis loranthifolia*, *Pinus merkusii*, *Altingia excelsa*, *Arenga pinnata*, and *Coffea robusta*) on a total area of 5 ha. The third carbon sink project was funded by NYK, a Japanese shipping company. In 2009, the company provided funding to the GWEF for planting 1500 trees. This project was not only aimed at increasing carbon stocks of the GWEF, but it also aimed to improve monkey habitats. Therefore, the degraded forest areas of this project were mostly planted with fruit trees that can be used to feed wild monkeys and increase carbon stocks.

All of the carbon sink projects, especially during the planting, were conducted by the GWEF through collaborations with local peoples, students (i.e. university students or junior and senior high school students), or guests who visit the GWEF. Such collaborations provide mutual benefits among parties who are interested in improving social and environmental conditions of the GWEF. For example, tree planting activities would provide additional incomes for local peoples and enhance student's skills.

4. Other activities

The other function of the GWEF includes Field Practice for students to improve their applied knowledge. It is also well situated for pupils from the area to come for educational games and recreations. It can potentially support integrated research by students. Owing to its many natural resources, it is also a centre for research activities, integrated collaborative research has been conducted there to reveal comprehensive information on the location. Another important function for the local community is the provision of energy since most locals depend on fire wood directly from the GWEF – showing the interdependence of people and forests. Last but not least, is has attractive functions as sport and recreation area owing to its proximity to the

community. The interaction of people to environment being a sensitive issue, the GWEF has as goal to be the solution.

5. Financial Arrangement

Although the GWEF is a state-owned university forest, the government of Indonesia has not provided fully financial supports for managing the GWEF. Since 2000, the GWEF has been struggling to generate its own incomes to cover all management costs (e.g., production cost, employee salary, workers meal, and facility maintenance cost). The main income of the GWEF comes from resin productions, public services, and carbon sink projects.

Production of pine and agathis resins is the main source of the GWEF's income. In 2010, the GWEF produced resins up to 13.7 ± 4.7 tons/month, consisting of 7.8 ± 2.6 tons/month of pine resins and 5.9 ± 1.9 tons/month of agathis resins. The resin production fluctuated over months due to weather conditions, in which dry seasons (May to August) produced higher resins than rainy seasons as shown at Figure 4. In total, during 2010 the GWEF has produced resins about 165 tons, consisting of 93 tons pine resin and 72 tons agathis resin. The large resin production generated income of about 49% of the total of the GWEF's income in 2010. The resin production does not only provide economic benefits for the GWEF administrators, but it also provides economic benefits to local people who work as resin tappers. Such relatively high incomes from resin productions indicate that the GWEF could survive without cutting the trees.

The unique forest condition of the GWEF has motivated the administrators to develop public service programs. Ecotourism is a promising program implemented in the GWEF, where visitors can enjoy various activities, such as camping, mountain bike tracking, exploring caves, enjoying water springs, and watching wild faunas (e.g., birds and monkeys). In addition, the GWEF with its excellent facilities provides a comfortable place for various training activities conducted by other institutions.

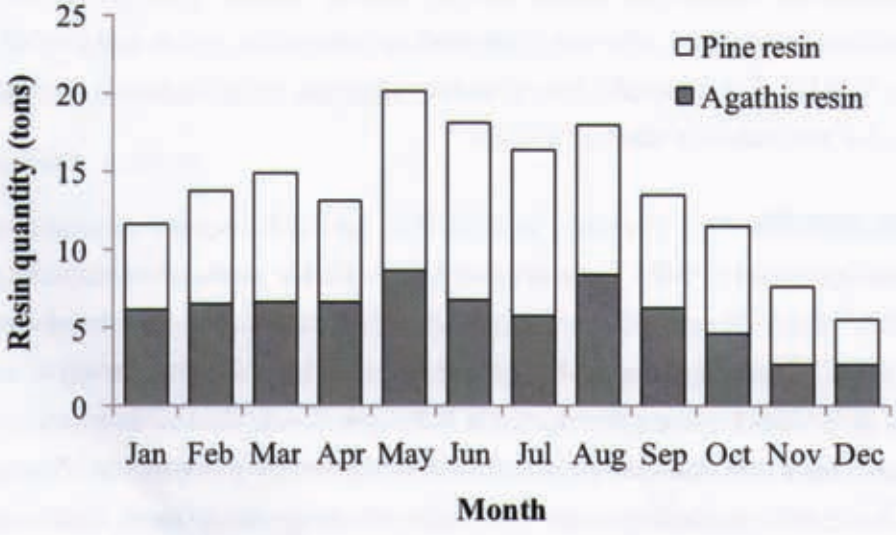

Figure 4. *Resin production of GWEF in 2010.*

6. Remarks

The transformation of bare lands into the close to nature forest of GWEF could indicate a success story of a small scale forest management in Indonesia. The forest is not for wood production but getting income from resin, eco-tourism, carbon-sink, and other activity without destroying the forest. All expenses can be covered with these activities without extracting the tree or wood, and this method can be applied to a similar forest stand.

7. Aknowledgement

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