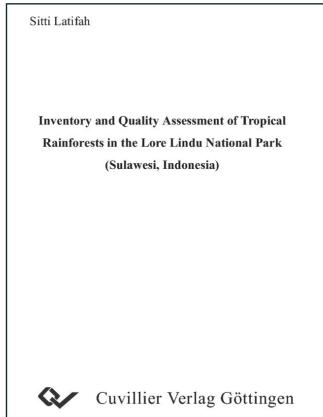Sitti Latifah (Autor)

# Inventory and Quality Assessment of Tropical Rainforests in the Lore Lindu National Park (Sulawesi, Indonesia)

Sitti Latifah

**Inventory and Quality Assessment of Tropical**

**Rainforests in the Lore Lindu National Park**

**(Sulawesi, Indonesia)**

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# 1. Introduction

## 1.1 Forests and timber production in Indonesia

In 2002, forests covered approximately 109.96 million hectare in Indonesia. This is about 57.22% of the total land area of 192.16 million ha. This forest area is classified according to its function as production, limited production, protection, conservation, and conversion forest. The area and the typical use of these various classes is given in Table 1.

**Table 1.**

Forest area in Indonesia

| Forest classification | Area | | Type of use |
|---|---|---|---|
| | **Million Ha** | **%** | |
| Production forest | 27.82 | 25.3 | Timber and non-timber production |
| Limited production forest | 16.22 | 14.8 | Low-intensity timber and non-timber production |
| Protection forest | 29.04 | 26.4 | To serve environmental functions |
| Conservation forest | 23.21 | 21.1 | Wildlife and habitat protection |
| Conversion forest | 13.67 | 12.4 | Clearance, permanent conversion to another form of land use |
| Total | 109.96 | 100.0 | - |

Source : Ministry of Forestry (2003)

With the allocation of more than 50% of the area for production, Indonesia became a significant producer of tropical hardwood logs and lumber, plywood and other boards, and pulp. The forest is presently still one of the most valuable resources in Indonesia. Prior to the economic crisis, resource-related exports from the natural forests were an engine of economic growth. Forest-based exports (plywood, furniture, and pulp) rose from around 200 million US dollars in the early 1980s to more than 9 billion USD per annum in the mid-1990s. In 1997, just before to the economical crisis, the total output from forest-related activities was about 20 billion dollars or 10% of GDP (Gross Domestic Product). Royalties and other government revenues from forest operations exceeded 1.1 billion dollars per annum (WORLD BANK, 2001).

Timber is still the dominant forest product in Indonesia, and its utilization is the basis of many industries. Forest Watch Indonesia (FWI, 2002) stated that timber products are a major source of national revenue. In 1997, the forestry and wood processing sectors accounted for 3.9 % of the GDP, and exports of plywood, pulp and paper were valued at 5.5 billion USD.

This amount was nearly half the value of oil and gas exports, and represented nearly 10% of total export earnings.

The Ministry of Forestry (2002) stated that before 2000 annual timber production from natural and plantation forest was approximately 25.40 million $m^3$. By 1998, the government received 7.52 million USD in revenues from the primary forest commodity export alone.

These data illustrate the magnitude of the area and how valuable the forestry sector is for Indonesia. Conditions have changed rapidly since the economic crisis in 1998. Although the area, as well as the production of forest products sank during the past five years, forest products are still important for Indonesia. Production sank from about 25.317 million $m^3$ in 1995 to 17.2 million $m^3$ in 2000. Details of timber production from 1996 to 2000 are given in Table 2.

**Table 2.**

Timber supply from all legal sources

| Source of production | Production (1000 $m^3$) | | | | |
|---|---|---|---|---|---|
| | **1996** | **1997** | **1998** | **1999** | **2000** |
| Production forest | 15,596 | 16,224 | 11,867 | 8,599 | 7,661 |
| Conversion forest | 7,232 | 9,525 | 7,249 | 6,239 | 4,644 |
| Community forest | 603 | 1,214 | 719 | 957 | 232 |
| State-controlled timber plantation in Java | 1,912 | 1,604 | 1.718 | 1,890 | 898 |
| Industrial plantations | 474 | 426 | 480 | 44,844 | 3,779 |
| Total | 25,817 | 28,992 | 22.035 | 22,531 | 17,214 |

Source: Ministry of Forestry, March 2001 quoted by FWI (2002)

Timber from the forest may be regarded as the final stage in the development of a living tree and it should be utilized wisely. There are several problems related to the planning of timber utilization in Indonesia. BUDIAMAN (2002) stated that timber utilization in Indonesia is, for the most part, poorly planned without consideration for the soil and the remaining stand, and also for economical and ecological sustainability. In addition, the use of the timber is usually limited to the best part of the trees. More than one third of the felled trees remain in the forest, although in Indonesia the raw material of the wood exists abundantly. Furthermore, due to the concession system implemented in Indonesia, an area of 11.7 million hectares has already been degraded.

This condition has been strengthened by the information from the Indonesian forestry ministry (2002) that there was a difference between legally wood supply and demand of around 32.84 million m$^3$. This number comes from the report that the annual legally felled wood supply is 25.25 million m$^3$, but the need of the industry sector is 58.24 million m$^3$. The WORLD BANK (2001) reported that in 1998 there was a shortfall of 57.7 million m$^3$ between the legally supply and demand of timber. The difference was fulfilled by the illegal cutting, not only from production forest but also from protected areas, national park area and other reserve conservation areas. This situation illustrates the poor planning of the utilization of forest products, especially the timber or wood.

Commitments have been made by the Indonesian government to correct the poor condition of the forests. Some of these are directly connected with forest inventory activities and the utilization planning of forest products, especially timber, namely:
- Promote forest resource valuation as the basis of national forest program formulation
- downsizing and restructuring the wood-based industry to reconcile demand with the supply of raw materials, and raise the competitive capacity
- recalculating the true value of timber (FWI, 2000; WORLD BANK, 2001 and Ministry of Forestry, 2002).

Forest inventory activities in Indonesia are basically aimed at exploring and collecting the complete data and information on the actual forest resource, the natural forest resource potential and the environment. This was done through survey methods related to the status and the forest physical condition, the flora and the fauna, human resources, and social conditions within the community inside and around the forest. The results of these forest inventory activities would then be used as the basis of forest reserve establishment, the arrangement of a forest resource balance, forest planning and a forest information system (Indonesian Forestry Act No. 41, 1999).

Based on the 'Indonesian Selective Cutting and Replanting' system, a forest is conducted inventory in production forests before and after cutting activities. The inventory before cutting is performed to collect information on the number, species, diameter and merchantable volume of the tree which will be cut, or protected and left as nucleus trees (diameter 20-49 cm with 25 trees per ha) and the condition of these nucleus tree (health stem and crown). The

objective for the inventory after cutting was different and recorded the dimensions and general condition (e.g. crown defect) of the remaining trees.

Unfortunately, the forest inventory activities that should be the key for successful forest management is becoming only a mere information provider. For example, the information gained from this inventory comprises only a number of trees, basal area and volume per hectare after diameter class and species groups. There is no further information related to the actual condition of the stand that would make it easier for the users to make decisions. Until now, the estimation of the stand value is based solely on volume and species groups. The stand potency information cannot be connected with the estimation of utilization planning, because there is no information pertaining to stand quality. This estimation can be misleading, because it cannot show the true condition of the stand value. It is not realized that information on the more or less valuable stand can be gained by such a quality assessment.

Some studies (see Table 3) have shown that there was only little difference between the utilized and the discarded portions. This result shows, that the standing trees have a potential value that is much higher than the value of the portion actually utilized.

**Table 3.**

Some research related with the utilization grade in some South East Asian countries

| Source | Number of Sample felled trees | Utilized portion (%) | Discarded portion (%) |
|---|---|---|---|
| 1.   ATTC, Malaysia | - | 54.0 | 46.0 |
| 2.   Sarawak Hill Forest | - | 56.8 | 43.2 |
| 3.   Ullu Besut Forest, Malaysia | 49 | 65.9 | 34.1 |
| 4.   Pelagat Forest Reserve, Malaysia | 73 | 56.4 | 43.6 |
| 5.   ITTO | 100 | 53.5 | 46.5 |
| 6.   Nusa Tenggara Barat, Indonesia | 50 | 51.9 | 48.1 |
| 7.   Jambi, Indonesia | 52 | 60.5 | 39.5 |
| Average | - | 57.0 | 43.0 |

Source: BUDIAMAN (2002)

LOETSCH (1973) stated, that particularly in tropical 'virgin' forests, there is a predominate proportion of trees affected either by external defects, internal decay or both. Such defects, according to degree of severity, diminish the merchantable volume, influence the utilization potential and accordingly also the value. The ratio between the gross volume (between stump and crown point) as assessed by an inventory and the net volume obtained after logging, may

vary between 10:8 and 10:3. It is evident that an inventory result consisting merely of the gross volume is nearly useless for the planning of logging operations in many forest areas. Hence, adequate assessment procedures for determining the timber quality in the widest sense are a necessity.

Even in intensively managed forest, it is seldom that any stand is exclusively stocked with sound, defect-free timber. In tropical 'virgin' forest in particular, the proportion of trees with defects is preponderant. The type of defect affects the merchantable volume and the value of the tree. In tropical forest, the relationship between the gross and the net volume can be as great as 10:8. Consequently, many inventories require a quantification of timber quality (KÖHL, 1993).

The information on tree quality is of great importance for calculating the value of a stand and giving assortment structure information. The results also have considerable meaning for forest resource management, especially for the optimal utilization of wood as a major utilisable forest and forests product, which are always influenced by market conditions.

## 1.2 Objectives of the study

This study was conducted within the German-Indonesian research project of "Stability Rain Forest Margin" (STORMA) under the Z-1 program (Theme: 'Monitoring von Zustand und Veränderung der Wald- und Landschaftsmonitoring').

The main objective of this study was to investigate the possibility of implementing the quality assessment concept in the forest inventory activity for standing trees in Indonesian natural forests. In addition, other objectives of this study are:

1. to provide alternative information, namely quality information of standing trees. This information is very useful for estimating the real tree value. The information gained by an inventory activity would thus be more detailed and could be used to estimate the stand value,
2. to implement and establish quality measurements methods for trees, which could be applicable for standing tree in the tropical natural forest,
3. to establish the quality key that could be used in the tropical natural forest.