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NATURAL RESOURCES MANAGEMENT PROJECT

BAPPENAS – Ministry of Forestry
Assisted by
USAID

AVOIDABLE LOGGING WASTE
DRAFT REPORT

Associates in Rural Development
for
Office of Agro–Enterprise and Environment
USAID – Jakarta

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REPORT NO. 37

Photo #1 Special aknowledgements to the study crew.

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PREFACE

This report is one of a number of reports produced under the Government of Indonesia's Natural Resources Management Project (NRM) that is assisted by the United States Agency for International Development (USAID).

The NRM Project, working with the Indonesian National Planning Board (BAPPENAS) and the Department of Forestry (Departemen Kehutanan), provides through a specially established project Policy Secretariat advice to BAPPENAS on natural resource issues relating to long term and short-term national planning. In addition, working with the Department of Forestry the NRM project carries out field activities in two pilot project areas one in West/Central Kalimantan and one in North Sulawesi including the preparation of management plans for the Bukit Baka - Bukit Raya National Park in Kalimantan and the Bunaken National Park in North Sulawesi. Each report addresses an aspect of the planned NRM project activities that are agreed on and laid out in an annual NRM Implementation Plan and each report aims at providing specific recommendations for future work in the area addressed.

This report looks at .....

ACKNOWLEDGEMENTS

The logistical support provided by the Sari Bumi Kusuma company and the Alas Kusuma Group, is gratefully acknowledged. Personal contacts at every level within SBK have contributed greatly to an understanding of the company's operating situation and constraints. Cooperation with respect to providing information and feedback has been very useful in keeping the study unbiased in it's assessment of current practices.

The efforts of the Kanwil in Pontianak and Palangkaraya in providing a stimulating forum for discussion, has proved most beneficial in formulating the observations and recommendations presented here as an end product of these studies.

Without the support of the NRMP staff, the successful completion of the studies and the presentation of results could not have been achieved. Their contribution is gratefully acknowledged.

The issues discussed in this report go well beyond the limits of a simple assessment of logging waste. It is hoped that lively interest shown in this work by both the forest industry and the Ministry of Forests will develop a momentum which will outlive this consultancy and will, in time, achieve the solutions intended by the recommendations contained in this report. In this regard, the many comments and suggestions offered by participants at the presentations in Pontianak, Palangkaraya, Jakarta and the many personal discussions, are acknowledged as a vital ingredient in the process of positive change.

EXECUTIVE SUMMARY

This report details the results of two NRMP field studies carried out by the "Forest Management Implementation Specialist" with the cooperation of Sari Bumi Kusuma and the Ministry of Forests. These studies concerning avoidable waste, were given top priority for implementation by both the company and the MoFr and were selected out of seven study proposals contained in the Consultant's midterm report of 1993.

Avoidable waste was defined as logs or portions of the main stem below the first major branch or fork, which are presently being left in the forest but could have been extracted as part of a normal log if the bucking of the tree had been carried out differently. Standards and criteria for assessing the waste were agreed upon by the Consultant and representatives of PT.SBK. Study areas were proposed by SBK and final selection of the study areas was made on maps provided by the Company prior to field visits.

The first study assessed all trees felled on 38.3 hectares in one logging block (petak). The study found that 11.9 cu.m./hectare of commercial quality wood fitting the definition of "avoidable logging waste", had been left in the forest. Compared to the actual volume recovered from the study area, this represents a 23.6% waste factor.

Since study number one examined only waste due to current logging practices, a second study was also carried out to examine the wood loss due to road construction practices. The study area was a road system of 14.78 km. developing a total of 1,450 ha. of primary forest. Roads had been built approximately 7 months ago in preparation of logging during 1994/95. Nine kilometers were selected for 100% sampling of commercial wood loss.

When averaged over the total study area, the volume assessed as avoidable loss was found to be 3.39 cu.m. Added to the avoidable logging waste from the first study, this brings the total avoidable wood loss to 15.29 cu.m./ha. A study of logging waste carried out in 6 HPH's in East Kalimantan by the Ministry of Forestry in 1990 found that the average avoidable waste was 13.16 cu.m./ha., thereby providing support for the assertion that current logging practices in Indonesia are strongly influenced by existing Government policies.

A detailed description of the assumptions and methodology applied to the studies are provided. A discussion of the results focuses on some major implications of the current logging utilization practices, specifically:

* Effect on unit volume costs illustrates the potential savings by providing the example of $1.17/cu.m. potential savings in road construction costs if a 20% improvement in utilization were to be implemented.

* The significance of the lost revenue attributed to the present level of logging waste is discussed.

* Assuming a 20% improvement in the utilization of the main stem volume, wood supply could be increased so that the cutting cycle could be extended to 42 years at the current level of AAC.

Section 5.0 discusses possible causes of the present wasteful logging practices under the headings of "Policy Determinants" and "Industry Determinants" An understanding of the possible causes of waste is vital to an appreciation of the significance of the recommendations provided in Section 6.0.

Causes of Waste

Policy Determinants	Industry Determinants
Perceptions (affecting monitoring and control)	Perceptions (of field situation)
Cut control policy (area/volume mechanism)	Manufacturing limitations
Royalty disincentives	Economic constraints
	Internal organization and control

Recommendations applicable to the forest industry and to the Government and are summarized as follows:

Recommendations

Policy Implications	Industry Implications
Maximize return from the HPH by adequate valuation of the wood resource	Reexamine unit volume costs and efficiencies in order to maximize profits
Introduce a differential royalty system based on wood quality (grades)	Improve sensitivity towards environmental issues (including waste)
Reexamine the validity of the 35 year cutting cycle assumption	Explore technical alternatives to wasteful practices
Tighten up the present cut control mechanism	Develop clear implementation policies (bucking standards/road engineering standards)
Introduce a waste assessment procedure	Improve internal monitoring and control
Introduce clearly stated waste reduction targets	
Shift the emphasis of monitoring to more qualitative field assessment of the industry's performance.	

An objective of this study was to focus attention on the issue of avoidable logging waste in the light of looming wood shortages and growing environmental concerns. It is acknowledged that these are two, small and area specific studies and are, therefore, primarily of indicative value.

The discussion and recommendations in this report advocate the examination of economic incentives in reducing waste. Avoidable waste as defined in this report shoud, therefore, be viewed as an economic opportunity rather than a liability.

ACRONYMS AND DEFINITIONS

AAC	-	Annual Allowable Cut
ARD	-	Associates in Rural Development
BAPPENAS	-	Badan Perencanaan Pembangunan Nasional/*National Development Planning Board*
bucking	-	cutting a tree into a log; cross-cutting
cm	-	centimeter
cu.m.	-	cubic meters
dbh	-	diameter at breast height (1.3m above point of germination)
Dinas Kehutanan	-	Provincial Forest Department
DR	-	Dana Jaminan Reboisasi/*Reforestation Fee*
ha	-	hectare
HPH	-	Hak Pengusahaan Hutan/*Forest Concession*
IHH	-	Iuran Hasil Hutan/*Forest Product Royalty*
ITTO	-	International Tropical Timber Organization
JPT	-	Jatah Produksi Tahunan/*Annual Production Quota*
KANWIL	-	Kantor Wilayah/*Regional Office (of the MoFr)*
KEPPRES	-	Keputusan Presiden/*Presidential Decree*
km	-	kilometer
Knappel	-	Logs buryed under the subgrade to provide stabilization and indirect drainage.
LHP	-	Laporan Hasil Produks/*Production Report*
LHC	-	Laporan Hasil Cacah/*Cruising Report*

MoFr	-	Ministry of Forestry
NRMP	-	Natural Resources Management Project
Petak	-	administrative and organizational forest management unit of 100 hectares demarcated as a 1000m by 1000m square.
Pohon Inti	-	mother trees or nucleus trees designated as future crop trees in the TPTI system of forest management.
RKPH	-	Rencana Karya Pengusahaan Hutan/*Long Term (20 year) Management Plan*
RKT	-	Rencana Karya Tahunan/*Annual Work Plan*
Road Right-of-Way	-	Total area felled along the road corridor during road construction
SBK	-	Sari Bumi Kusuma
TOR	-	Terms of Reference
TPTI	-	Tebang Pilih Tanam Indonesia/*Indonesian Selective Cutting and Planting System*
USAID	-	United States Agency for International Development

1.0 INTRODUCTION

1.1 The NRM Project

The Natural Resources Management Project (NRMP) is a policy and research driven program within the Indonesian National Planning Board (BAPPENAS) and the Ministry of Forestry (MoFr). The program is funded by the United States Agency for International Development (USAID) and the International Tropical Timber Organization (ITTO), and implemented by Associates in Rural Development (ARD), a private consulting firm.

The natural production forest management, community development, research, and park planning elements of the project in West and Central Kalimantan benefit from the participation of the private sector cooperant, PT. Sari Bumi Kusuma (SBK) of the Alas Kusuma Group.

1.2 Natural Production Forest Management

Under the NRMP, the MoFr has chosen to examine policies and practices with the aim of improving the management of natural production forests. Prior developments in the project identified the need to strengthen the existing team of experts with the addition of two coordinated consultancies in the area of natural production forest management. The first consultancy deals with evaluation of existing plans. The present report is the second in a series of three reports prepared as part of the second consultancy and deals with the results of two field studies concerning the quantification of logging waste.

1.3 Terms of Reference (TOR)

The position of "Forest Management Implementation Specialist" is the second part of a dual consultancy in the area of natural production forest management and is the signatory of this report. The tasks assigned to this consultancy particularly relevant to the subject matter of these studies are stipulated by the TOR, as follows:

> ". . . provide technical recommendations on how to improve the present . . . cutting and harvesting methods . . . "

This report conforms to the output requirements of the TOR by providing,

> ". . . recommendations based on field work on improvements needed in logging . . . and cutting practices. . . "

1.4 Subject of the Report

This report deals with the results of two studies originally proposed for implementation in the Consultant's mid term report, "Guidelines and Implementation Issues Concerning Natural Production Forest Management". The studies will be referred to separately as:

Study No. 1 **"Quantification of Avoidable Logging Waste"**; and,

Study No. 2 **"Quantification of Commercial Wood Loss due to Current Road Construction Practices".**

1.6 Organization of Report

The subject of logging waste is somewhat contentious, and hence an effort has been made to clearly define the criteria and standards applied to the assessment of waste in the two studies. Results of the studies are presented along with indicative analyses suggesting possible implications of the current utilization standards on both the unit volume costs of production and the royalty aspects of these practices.

Possible causes of the waste are discussed under the broad headings of "Policy Determinants", which deals with the Government's role in the issue of utilization waste, and "Industry Determinants", which discusses the role of the forest industry in the implementation of current utilization practices.

Recommendation of both a policy and a technical nature are provided in section 6.0 of the report.

2.0 OBJECTIVES

The overall objectives of the studies proposed in the mid term report are as follows:

* Generate data which will help to convince company officials to improve management practices for both immediate economic benefit and ultimately achieving sustainable forest management.

* Provide a better, factual basis for further analysis of the TPTI guidelines and related policy directives, with the ultimate intention of providing specific recommendations for improvements to these guidelines.

Observations in a wide range of logging operations throughout Indonesia indicate that a large volume of commercially valuable wood is being left in the forest by the logging operations. Past examinations of possible causes for the generally poor level of utilization indicate that there are strong determinants within existing Government policy which act as disincentives for improved utilization.

The purpose of this report is to present the results of two studies which provide a limited quantification of commercial wood loss due to current logging and road construction practices. The report will focus on the policy determinants which result in the present utilization standards and will indicate both policy and technical initiatives which should be implemented to improve the current level of resource utilization.

The studies were conducted in what is considered a good concession and the standard of utilization is considered typical for the forest industry in Indonesia. The criteria and standards for evaluating and measuring avoidable waste were set and agreed to by the Company after detailed technical discussions and are presented in the following section of the report.

3.0 METHODOLOGY

3.1 Definition of Avoidable Waste

A clear definition of "avoidable waste" is a prerequisite to any further discussion regarding it's causes and implications or possible corrective measures which might be proposed in order to understand and improve the present level of utilization.

In 1990, the Ministry of Forestry acknowledged the need to minimize logging waste throughout the passage of Decree No. 212/KPTS/IV-PHH/90 issued by the Director General of Forest Utilization and entitled "Pedoman Teknis Penekanan dan Pemanfaatan Kayu Limbah Pembalokan" (Technical Guidelines for Minimization and Utilization of Logging Waste). The decree defines legitimate logging waste from HPH's regulated through the TPTI system as:

1. No wood from a stated list of species considered "fancy" or decorative wood with special uses;

2. Roundwood less than 30 cm. in diameter with no length limitations; or,

3. Roundwood less than 2 meters in length, with no diameter limitations.

The decree also provides general, illustrated guidelines of the considerations and steps needed to efficiently utilize the trees designated for logging and to minimize the damage to the residual stand.

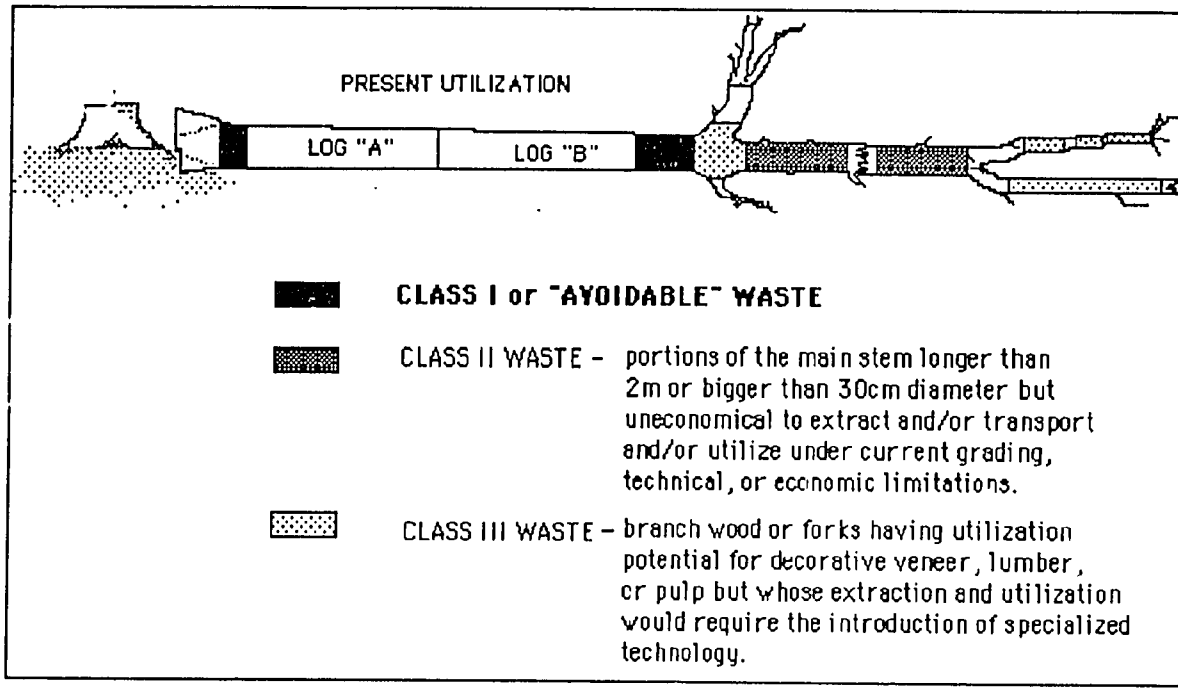
Logging waste is a subject mentioned by virtually every study conducted in the forestry sector in Indonesia. Estimates of 30% or more are commonly attributed to logging waste left in the forests yet hard data is virtually impossible to find.

For the purposes of the two studies discussed in this report:

"Avoidable logging waste" is defined as wood originating on the main bole of commercially valuable trees below the first major branch or fork and conforming to current industrial utilization standards but left in the forest as a result of bucking practices. Implicit in this definition is the assumption that if the bucking standards had been different, the "avoidable waste" could have been taken out of the forest as part of the normal logging and transportation operation. Avoidable logging waste was referred to as "Class I" waste in the initial study proposal (Figure 1).

"Avoidable wood loss due to current road construction practices" will include commercially valuable species used in the construction of the road or not salvaged from the road "right-of-way" during, or shortly after construction of the road. Excluded from this definition will be commercial wood used in the construction of culverts or bridges and, wood wasted through improper bucking standards.

Figure 1 **Categories of Logging Waste**



Details of the utilization standards and assessment criteria applied in these studies is discussed in the following section.

3.2 Utilization Standards and Assessment Criteria

Avoidable logging waste, as defined in these studies, is known to originate from different portions of the main stem as a result of existing utilization practices. Criteria for assessing and measuring avoidable waste were agreed upon after discussions with SBK. The following diagrams and technical assessment criteria summarize this agreement and formed the basis for all field measurements.

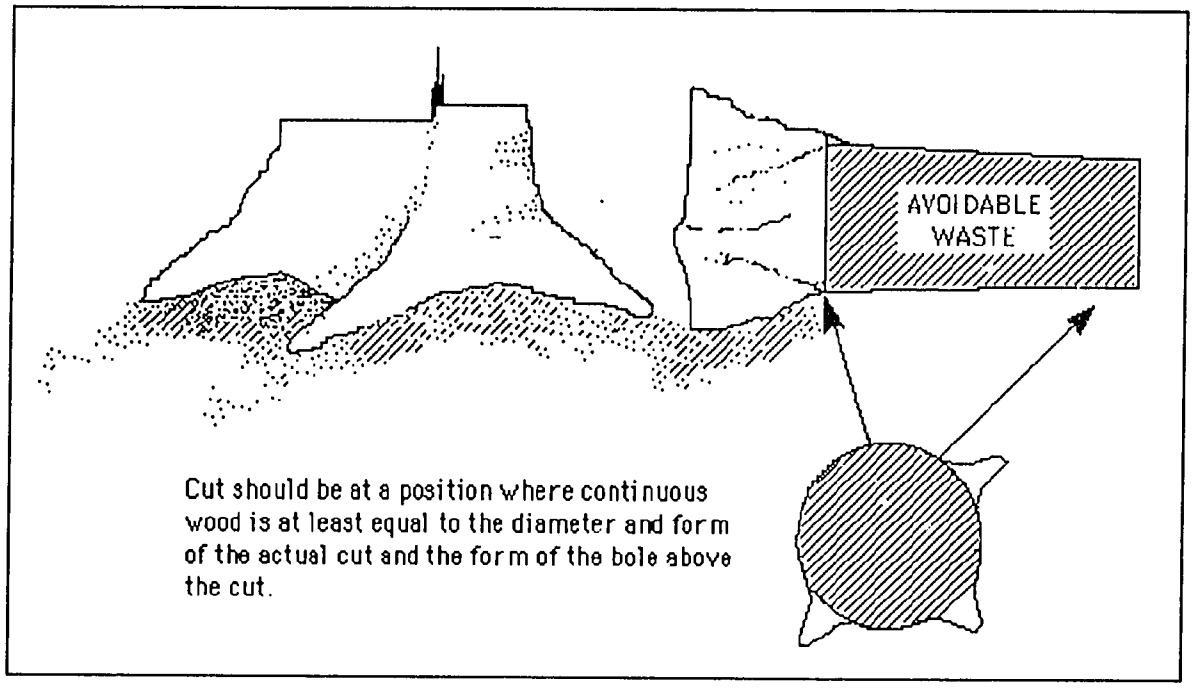
3.2.1 High Stumps

Government regulations require that the maximum stump height should be 1.3 meters or 20 centimeters above the buttress, whichever comes first. While this adequately deals with the majority of commercial species which are heavily buttressed, it was found that some species which were not buttressed could be cut below the 1.3 meter mark. Criteria for assessing excessive stump height, therefore, emphasized the form of the main bole at the point of felling (see Figure 2).

3.2.2 Butt Waste

The point of assessment on any excessively long buttress logs left in the forest was defined as the point at which the cylindrical diameter of solid wood becomes discontinuous as the buttress becomes more pronounced and the main stem of the tree begins to diminish in size. Utilization of the main bole down to this point could require the faller to trim off a small portion of a buttress. Volume assessed as "avoidable waste" in this category represents high quality veneer wood (see Figure 2).

Figure 2 Illustration of Butt Waste

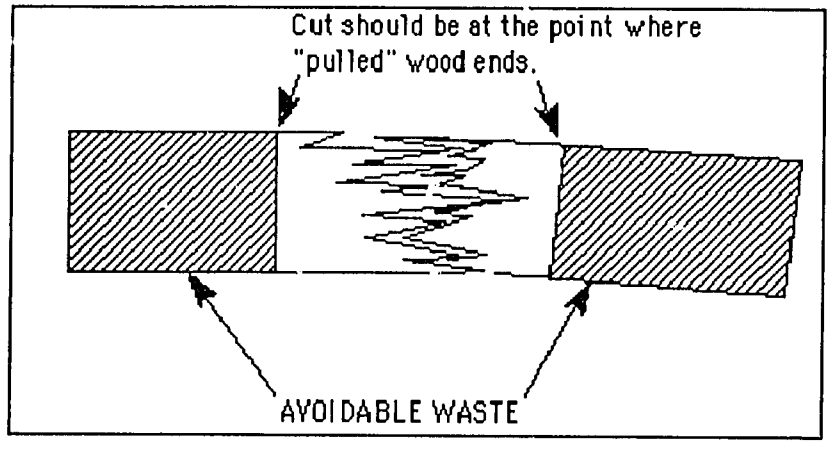


3.2.3 Waste Adjacent to a Break

In the case of a break in the main stem, the cut should be in a position where "pulled wood" ends.

Short pieces of logs bucked to meet length requirements or to remove a minor defect from a main log, were assessed for potential according to quality guidelines, and are included in this category.

Figure 3 Illustration of Waste Adjacent to a Break



Photo#2 Excessively high stumps were usually easy to assess.

3.2.4 Left Logs

During the skidding operation, logs were sometimes missed and have been measured as "left" logs.

Trees which may not be cut and were marked as "pohon inti" are sometimes pushed over during road construction or during skidding operations. If such trees were within the diameter range of the study and if they were of good form and of commercial species, they were included in this category.

> It has been repeatedly stated that company policy is to salvage all commercial logs from the road right-of-way during or shortly after road construction. Since road construction is completed from six to twelve months prior to logging,it is recognized that logs left in the road right-of-way for this period of time are generally not salvageable due to sap rot,

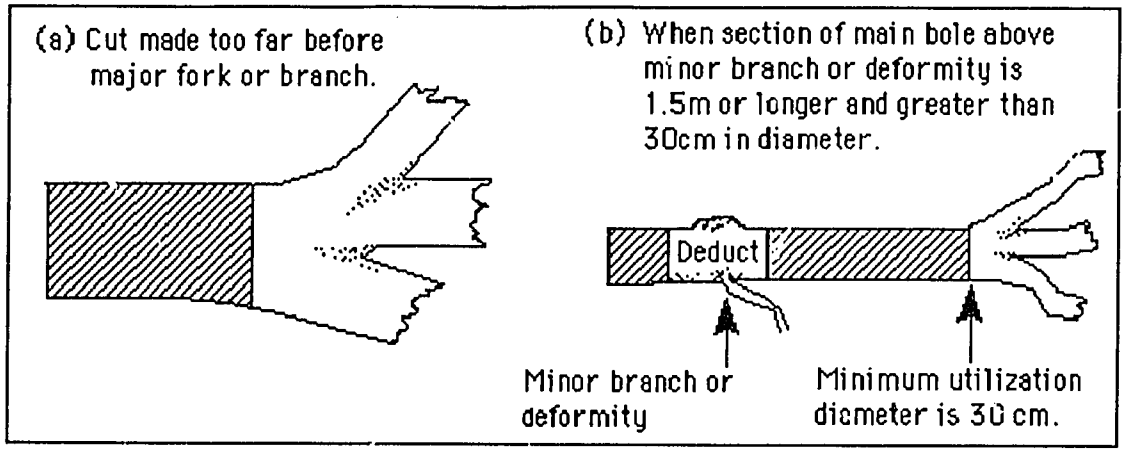
Photo#3 Butt waste accounted for 17.27% of logging waste

Photo#4 Left logs accounted for 48.89% of logging waste.

beetle attacks or splitting of the log. "Left" logs were a major component of the assessment of commercial wood loss during Study No. 2.

3.2.5 Top Waste

Figure 4 Examples of Top Waste



Photo#5 Top waste was often high quality wood

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Photo#6 Top waste was the second largest category accounting for 28.19% of avoidable waste.

3.2.6 Knappel

The burying of logs to form a stable base for the subgrade is still commonly practiced. These logs are referred to as "Knappel", the Dutch work for logs, and are often used on wet sections of the road, in minor stream crossings, or in the saddle of ridges where high fill is required.

Company policy states that only defective or noncommercial logs shall be used for this purpose, however, it had been observed that large numbers of commercially valuable logs were being used for this application.

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Knappel were assessed and measured according to species and quality criteria set out in this study. In most cases, diameters could be measured on both ends of the logs as they protrude out of the subgrade. Logs with a hole on one end were not sampled.

Photo#7 Diameter of knappel could usually be measured at both ends. If only one end was visible, a taper factor of 0.7 was applied to the volume equation.

3.2.7 Bridges

The original proposal for study number 2 called for an assessment of wood loss due to overdesigned bridges or major drainage structures. In applying the study, it was found that such an assessment was not practical, hence excess commercial wood used in the construction of a bridge or drainage structures was not assessed.

3.3 Selection of Study Areas

After discussions regarding the objectives and methodology proposed for the study, SBK suggested study areas and provided sketch maps of the study areas. For Study No. 1, selection of the study portion of the petak was done in the HPH office prior to visiting

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the site. After sampling criteria had been agreed upon, the study areas were visited jointly by the study team and SBK in order to confirm the acceptability of the sampling criteria.

Petak 843A located in the Darap Valley, was proposed as the study area for Study No. 1 . This petak had been logged during September and October, 1993. The petak straddles the Darap River and supported a high quality and high volume Dipterocarp forest dominated by the Meranti Mera species group (see Figure 5). Terrain conditions varied from gently sloping to very steep. Approximately 10% of the Petak was not logged due to excessive slope conditions. All extraction activities had been completed but pioneer vegetation was not yet a problem in terms of hiding logging waste.

Study No. 2 looked at roads which had been constructed in the past year but on which no general logging had been carried out. Due to access problems and an ongoing road construction program, the company proposed the road network developing petaks 820 to 821, 862 to 867, 908 to 912, and 954 as a suitable study area in which extraction of right-of-way wood had also been completed (see Figure 6).

Selection of the study sections of the road system was made on the map provided by SBK prior to visiting the field locations in order to achieve impartiality in choice of areas to sample.

3.4 Data Collection and Compilation

3.4.1 Field Sampling and Measurements

1. All roads, major skid trails, and the limits of the study area no. one were surveyed (Figure 5).

2. All felling locations within study area no. 1 were visited and all remaining portions of the main stem were assessed for avoidable waste according to the criteria set in section 3.2.
   All pieces measured were marked by a fluorescent pink ribbon and numbered.

3. Wherever possible, diameter under bark was measured directly to the nearest centimeter. Where not possible, girth was measured and converted to diameter.

4. Based on an assessment of average bark thickness, 3 centimeters was deducted from the diameter calculated from girth measurements to obtain under bark diameter.

5. In Study No. 2, all preselected road sectioned were inspected along the entire length of the sections and commercially valuable logs were measured and recorded according to the category of "left" log or "knappel".

6. The minimum length required for a log or piece of the main stem to be assessed as a "left" log was 6 meters. Shorter pieces were not assessed unless they fitted the criteria for another recognized category.

Figure 5 Map of Study Area No.1

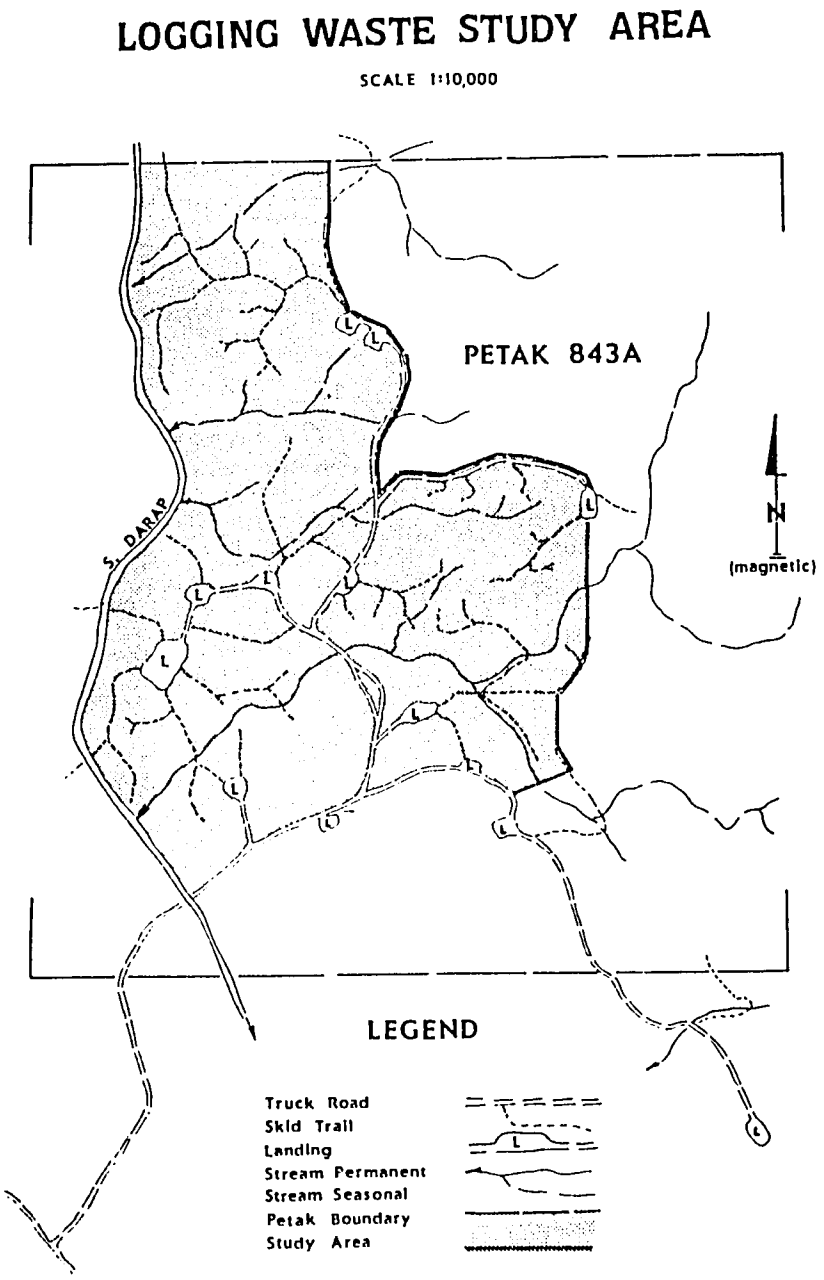
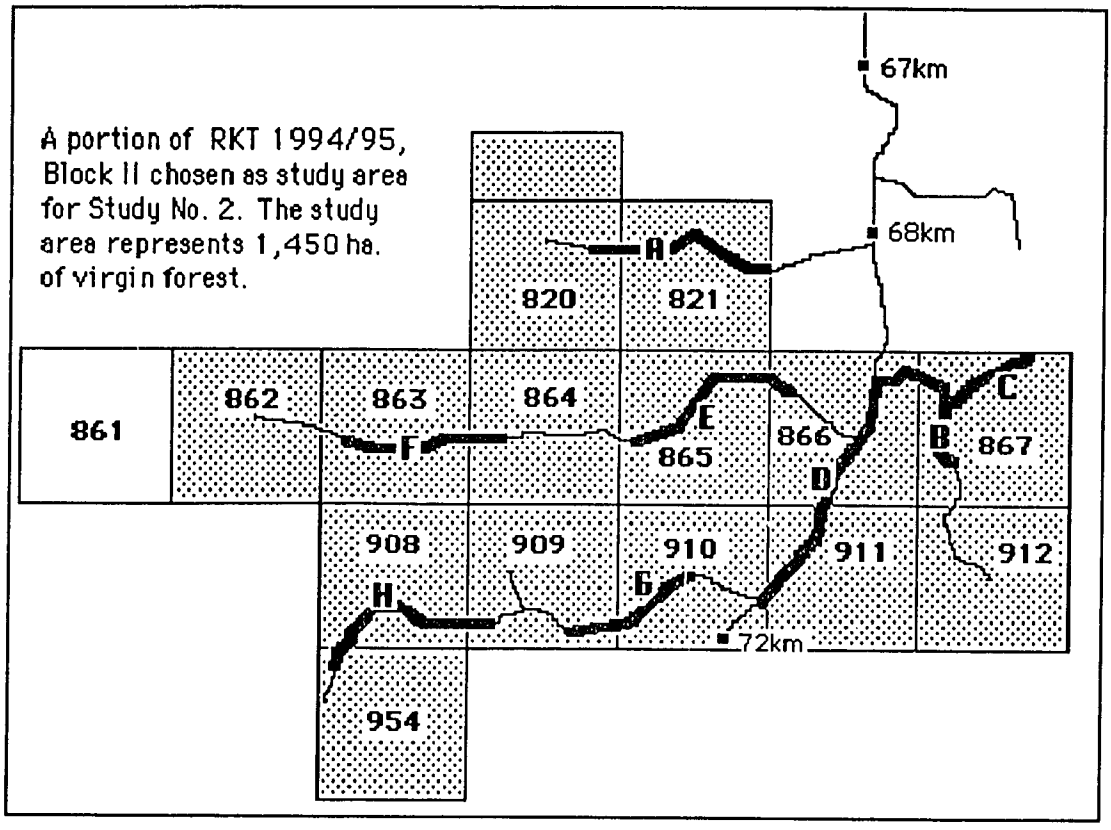


Figure 6 Study Area No. 2



Photo#8 Typical ridge top road with knappel section on the saddle.

3.4.2 Assessment of Defects

1. Holes were accepted only in the first study and only if they occurred in sections of the log with an under bark diameter of no less than 50 centimeters and if the maximum hole diameter was 25% or less of the diameter of the section being assessed (see Figure 7).

2. Minor defects were tolerated only as defined in Table 1 and the appropriate grades were assigned (in Study No. 1 only).

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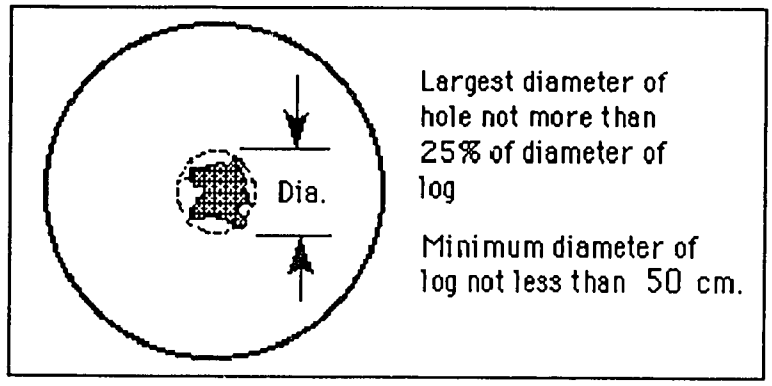
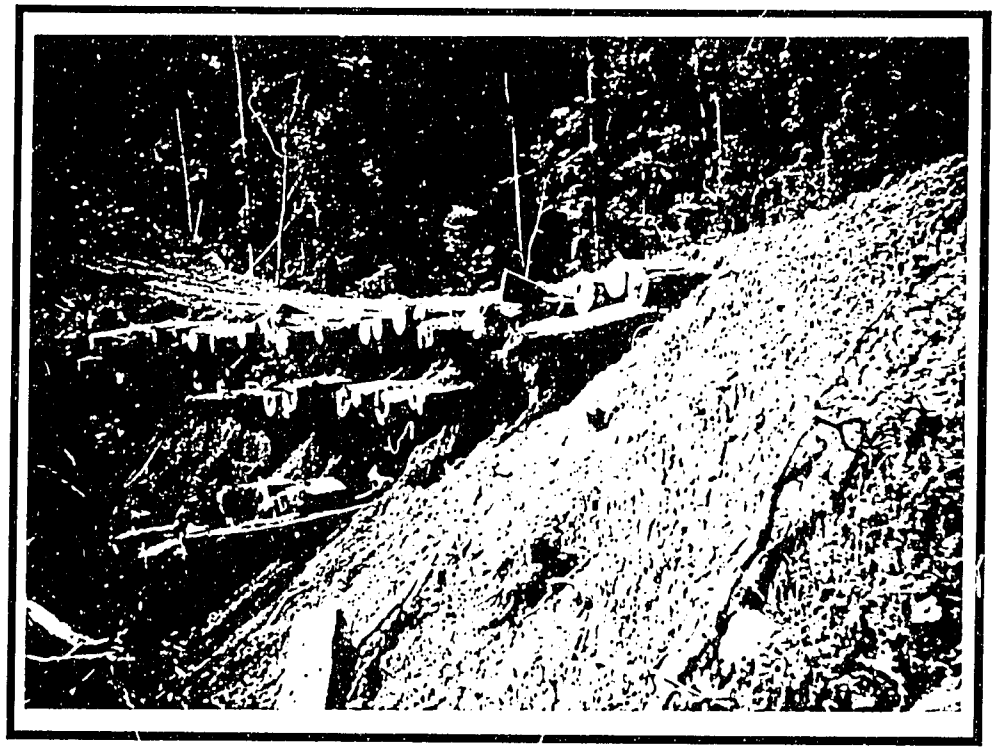
Figure 7 Determination of Maximum Hole diameter



3. In the case of minor deformities or branches (Figure 4) where a section of the main bole volume extended past the minor deformity for at least 1.5 meters and where the form and quality of the section was suitable for the manufacture of veneer, the entire section was measured and a length deduction was recorded for the minor deformity.



Photo#9 This knappel section on road segment "B" contained 226 cu.m. of sound logs of commercial species.

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4. In Study No. 2, no attempt was made to assess utilization potential of logs which had a hole of any size.

3.4.3 Grades

An attempt has been made to grade the waste assessed in Study No. 1 according to the following abbreviated rules extracted from the Indonesian Grading Rules (see Table 1). Principle characteristics applied to the assessment of grade were diameter, hole, form and knots or eyes. End split and ring shake was considered only in extreme cases since most of the wood being assessed had already been lying in the forest for at least four months.

Table 1 Quality Criteria and Grades

COMMENTS	GRADE #1	GRADE #2	GRADE #3
Min. Diam.	50 cm under bark	50 cm under bark	30 cm under bark
Form/character	cylindrical no spiral grain	cylindrical no spiral grain	roughly cylindrical some spiral grain
End Split	10% of length (not into heartwood)	20% of length	30% of length
Knots/Eyes	1 per 3m; 4cm diam.	1 per 2m; 6cm diam.	3 per 4m; 15 cm diam.
Heart Rot/Hole	not permitted	10% of diam. only if diam. 50cm+	25% of diam. only if diam. 50 cm+
Ring shake	20% of diam.	30% of diam.	40% of diam.

3.4.4 Species

Table 2 presents the list of commercial species recognized by the company along with the species codes. Many of these local names represent a large number of distinct species which are generally recognized by a single trade name.

For Study No. 2, "Ulin", a protected but commercially sought after species was also measured. Current regulations ban the commercial felling of Ulin, however, the regulations do not deal with the issue of utilization of Ulin cut during the construction of roads. This issue will be discussed in subsequent sections of this report.

Table 2 **Common Names and Codes for Commercial Species**

COMMON NAME	CODE	COMMON NAME	CODE
DIPTEROCARPS		Nyatoh	NTH
Meranti	MRT	Bintangur	BTG
Meranti Merah	MM	Durian Burung	DRG
Meranti Putih	MP	Benuang	BNG
Meranti Kuning	MK	Medang	MDG
Melapi	MLP	Rengas	RGS
Merawana	MRW	Kempas	KPS
Keruing	KRG	Kulim	KLM
Kapur	KPR	Ulin	UL
Bangkirai	BKR	Kumpang	KPG
Mersawa	MSW	Mentawa	MTW
Resak	RSK	Ubah	UB
NON DIPTEROCARPS		Menjalin	MJL
Sindur/Paru Paru	SDR	Mahabai	MHB
Geronggang	GRG	Simpur	SPR
Jelutung	JLT	Kampili	KPL

3.4.5 Volume Equations

For the compilation of avoidable waste measurements in Study No. 1, the geometric equation for the volume of a cylinder was applied. In the case of "left logs", mid diameter was either measured directly as the girth or, the average of the two end diameters was used to calculate volume, depending on which measurement was easier to obtain.

Study No. 2 dealt only with log volumes. One of three formulae was applied based on what measurements could be obtained as follows:

1. If top and butt diameters could be measured the average of the two measurements is used. If mid girth only can be measured, conversion to diameter was carried out during compilation:

$$\text{Vol.} = (D_{average}/100)^2 \ (0.7854) \ (L)$$

2. If only the butt diameter could be measured, a taper factor of 0.7 was assumed:

$$\text{Vol.} = (0.7) \ (D_{butt}/100)^2 \ (0.7854) \ (L)$$

3. If only the top diameter can be measured:

$$Vol. = (1/0.7)\ (D_{top}/100)^2\ (0.7854)\ (L)$$

Where:

Vol.	=	volume in cubic meters
$D_{average}$	=	average or mid diameter in centimeters
D_{butt}	=	butt diameter in centimeters
D_{top}	=	top diameter in centimeters
0.7	=	taper factor
0.7854	=	ii/4
L	=	length in meters

4.0 DISCUSSION OF RESULTS

4.1 Study No.1: Quantification of Avoidable Logging Waste

The area subjected to a 100% sampling of avoidable waste was found to be 38.3 hectares (Figure 5). Waste was assessed and measured according to the categories defined in Section 3.2 and identified by the following codes:

STUM = high stump

BUTT = butt waste; no defect

BUTD = butt waste; acceptable hole deducted

BREK = waste adjacent to a break

TOP = top waste; no defect

TOPD = top waste; minor defect deducted

LEFT = left log; including pohon inti of commercial size pushed over during logging.

Gross volume recorded was found to be 471.0 cu.m. with the net volume being only slightly less at 457.5 cu.m. and broken down into the categories of waste as follows:

On a per unit area basis, the avoidable waste measured in the study area was found to be **11.9 cu.m./ha.**

Table 3 **Waste by Category: Study No. 1**

WASTE CATEGORY	NET VOLUME	AVERAGE PIECE SIZE	% OF TOTAL NET VOLUME
BREK	20.932	0.910	4.57
BUTT + BUTD	79.011	0.520	17.27
LEFT	223.675	3.550	48.89
STUM	4.930	0.183	1.08
TOP + TOPD	128.975	0.772	28.19
TOTAL	457.52		100

The category of "left" logs represents the largest portion of avoidable waste volume. Seventy-one percent of this consists of logs 60 cm diameter or bigger and 29% of the volume in "pohon inti" with mid diameters less than 60 cm but top diameters greater

than 30 cm. The pohon inti included in this study were pushed over during the course of road construction or logging activities within the study area but were not salvaged despite their commercial size and quality. The larger diameter category of "left" logs consists primarily of logs which were felled and bucked but overlooked during the skidding operation.

A brief look at the estimated and actual production volumes from the Petak No. 843A may serve to provide a suitable perspective for assessing the significance of this volume.

Petak Area	100 ha
Area Logged	90 ha
Total Gross Cruise Volume (from LHC)	7,407 cu.m.
Cruise Volume/Hectare	74.07 cu.m.
Total Net Production Volume (from LHP)	4,539.6 cu.m.
Production Volume/Hectare	50.39 cu.m.
Total Avoidable Waste	457.5 cu.m.
Avoidable Waste per Hectare	11.9 cu.m.
Avoidable waste as a % of production volume/hectare	**23.6%**

Based on the information provided by the company, the utilization factor for this petak was 0.68. If the "avoidable" waste volume is added to the recovered volume, the utilization factor would increase to 0.84 .

The study area was in what appeared to be a very productive forest area supporting large timber predominated by the Meranti Mera species group which made up 58.4% of the volume measured. Dipterocarp species in total made up 88.6% of the volume measured.

4.2 Study No. 2 - Quantification of Commercial Wood Loss Due to Current Road Construction Practices

Photo #10 Some commercial species are very susceptible to sap rot and showed advanced signs of decomposition. Salvage potential is zero.

BEST AVAILABLE DOCUMENT

Photo #11 Only 4.6% of the right-of-way waste wood was in the 31-40 cm. diameter class.

Study No. 2 looked at the commercial volume of wood either used in the construction of the road or left as log volume in the road right-of-way. Excluded from this assessment was commercial wood used in drainage structures, logs having some defect, waste due to poor bucking practices, or logs on which at least one sound end could not be measured.

A total of 9 km of primary and secondary roads were sampled with the selection of the road segments made in the office prior to commencement of the field work (see Figure 6). These 9 km were taken from a road network of 14.78 km which develop a total commercial forest area of 1,450 ha for a road density of 10.19 m/ha. Results of the field assessment are given in the following table.

BEST AVAILABLE DOCUMENT

Table 4 Road Waste by Section and Category

SECTION	KNAPPEL VOLUME	LEFT LOG VOLUME	TOTAL (cu.m.)	LENGTH (km)	WIDTH (m)	AREA (ha)
"A"	313.47	290.45	603.92	1.7	37	6.29
"B"	226.62	145.57	372.19	1.1	30	33.30
"C"	nil	145.53	145.53	0.6	26	1.56
"D"	nil	355.72	355.72	1.5	53	7.95
"E"	214.91	112.76	327.67	1.1	36	3.96
"F"	17.67	210.37	228.03	1.0	33	3.30
"G"	339.67	191.56	531.24	1.0	38	3.80
"H"	nil	429.95	429.95	1.0	34	3.4
TOTAL	**1112.34**	**1881.91**	**2994.25**	**9.0**	**37.3**	**33.56**
PERCENT	**37.15**	**62.85**	**100**			

Width of the road right-of-way was assessed every 100 meters to obtain average width and total area values. Section "D" represents a main road while the remaining segments are on secondary roads. The proportion of main road versus secondary roads sampled is fairly representative of the actual amount of the two road categories. It was observed that some extraction had taken place well into the timber adjacent to major sections of knappel. This would tend to exaggerate the volume per hectare figures for the right-of-way volumes.

The total volume of wasted wood given in Table 4 includes 62.6 cu.m. (2.1%) of Ulin of commercial size and quality. Present regulation prohibits the commercial logging of Ulin, however it is inevitable that Ulin must be felled during the construction of the roads. Since the MoFr does not have an effective mechanism in place to permit the salvage of Ulin felled during the course of road construction this commercial wood resource is presently being wasted.

The volume of logs used as knappel and assessed in the "left" category is expressed as a percentage against 10 centimeter diameter classes in Table 5.

Table 5 **Wasted Right-of-Way Wood by Diameter Class**

Diameter Class (cm)	Percent
31-40	4.6
41-50	14.1
51-60	25.1
61-70	21.6
71-80	14.5
81-90	11.0
91-100	4.9
101-110	2.5
111-120	1.7
Total	100%

In order to place the results of this study on a comparable basis with Study No. 1, avoidable wood loss, measured as 2994.25 cu.m. for the total study area of 1,450 ha. results in an overall wood loss of **3.39 cu.m./ha.**, which, when added to the avoidable waste from Study No. 1, brings the total avoidable waste up to **15.29 cu.m./ha.** or, **30.6%** assuming an average recovery of 50 cu.m./ha.

General information provided by the company indicates that;

1. Roads are built 6 to 12 months before general logging takes place.

2. It is stated company policy to salvage all commercial right-of-way logs during or shortly after the road construction activity.

3. Average road density - is approximately 12 m/ha. of which approximately 30% is main road and the remainder is secondary roads.

4. Annual logging area is 4,000 to 4,500 ha.

5. Annual road construction is approximately 48 km.

6. Actual volume recovery varies between 40 to 55 cu.m./ha. depending on timber volume and quality.

7. Average road costs vary between US$17,140/km for a main road to US$11,900/km for a secondary or unsurfaced road. Assuming 30% main roads, the weighted average road construction cost would be approximately US$13,470/km (using an exchange rate of $1:Rp.2,100).

4.3 Effect on Some Unit Volume Costs

Unit volume costs are a common way of expressing costs of production. Using the information and assumptions listed in the previous section, a unit volume road construction cost can be calculated. Hence: a recovery of 50 cu.m./ha.; an average road density of 12m/ha.; and an average road cost of US$13,470/km., will result in an average road construction cost of **US$3.23/cu.m.** This is a relatively low unit road construction cost given the value of the end product and may help to explain the relatively high level of commercial wood wasted during the construction of the road and the failure to salvage all of the commercial volume from the right-of-way.

The potential benefit to the company in salvaging all of its right-of-way wood and eliminating its avoidable logging waste can be demonstrated using the given information and assumptions.

Avoidable logging waste	11.90 cu.m./ha.
Road construction wood loss	3.39 cu.m./ha.
Total wood loss	15.29 cu.m./ha.

Assuming an average historic recovery of 50 cu.m./ha., this can be expressed as an avoidable waste of **30.6%** When applied to the average road construction cost and the annual road construction of 48 km. from an annual logging area of 4,000 ha., the road construction cost would be reduced to **US$2.06/cu.m.** for a savings of **US$1.17/cu.m.** on the road construction cost alone. For a production of 200,000 cu.m. this would result in an annual road construction savings of **US$305,604.** If the value of the additional recoverable volume is deducted from the present road cost, it could be argued that the road construction activity should be considered a "profit" rather than a cost center!

Similar, although perhaps less dramatic, cost savings can be demonstrated on the per unit production costs for activities such as skidding and road maintenance where certain fixed cost elements exist. Since actual costs are not known to the consultant, further calculations of potential savings to the company would be speculative in nature.
The data regarding the potential of improving the level of utilization as determined by the two studies are considered to be conservative estimates of the potential for increased volume recovery. Company management may want to use this data for its own extrapolations on the cost benefits possible through better utilization.

The advantages of a larger cash flow and downstream manufacturing as a result of improved utilization, are harder to quantify but just as real as the direct, unit volume cost savings. An economic analysis of the downstream economic benefits of improved

utilization, has been suggested by numerous comments made at the presentations of this waste assessment study.

4.4 Comparable Studies

Criteria applied to the two waste studies are considered to be a very conservative estimate of the avoidable waste which could be extracted from the main stem volume under current utilization standards and extraction techniques. The volume of 15.29 cu.m./ha of avoidable waste assessed in this study may be low because of the following constraints placed on the assessment.

1. Commercial species only,

2. Minimum top diameter of 30 cm.,

3. Main stem portions below the first major branch or fork only,

4. Maximum allowable hole diameter 25% of under bark diameter for logs with a diameter of 50 cm. or greater.

5. For left logs, if the log had a hole on one end only, no attempt was made to assess potential recoverable volume.

6. If it was not possible to measure mid diameter or at least one end diameter, the log was not recorded.

A review of the literature has revealed only one other study in which a basis for comparison exists. The study, *"Studi Identifikasi Pemanfaatan Limbah Penebangan Di Propinsi Kalimantan"*, carried out in six concessions in East Kalimantan by the MoFr in 1990, quantifies and categorizes the total tree volume left by the logging activity and also assesses noncommercial species waste and standing tree waste as defined by heavily damaged trees. For the assessment of branch volume, a minimum diameter of 15 cm. is used.

Although many of the measurements are not directly comparable to the two waste studies reported here, the 1990 study does quantify the "avoidable" waste which could be recovered from the main stem volume below the first major branch or fork using current logging technology and methods. A direct comparison of the reported results is given in Table 5 which adds support to the assertion that current standards of utilization are reasonably uniform in different parts of Indonesia.

Table 6 Comparison of Avoidable Waste

	MoFr Study 1990	NRMP Study 1994
Measured avoidable waste/hectare	13.16 cu.m.	15.29 cu.m.
Volume recovered/hectare	65.14 cu.m.	50 cu.m.
Potential for increased vol. recovery	20.2%	30.6%

4.5 Royalty Considerations

Personal observations in East, Central and West Kalimantan as well as in Maluku provinces indicated a fairly uniform standard of utilization. The single other study quoted above supports these observations very strongly.

Section 5.0 examines some of the principle determinants for the present level of utilization.

The magnitude of the potential for increased government revenue from improved utilization of what is now considered logging waste is very significant.

An indicative overview of the potential for improved government revenue capture on the roundwood volume for 1992 can be made using the following assumptions.

Approximate AAC 30,000,000 cu.m.
Approximate Average Direct Revenue/cu.m. US$20.00
(DR + IHH + Scaling Fee + License Fee)
Assuming an avoidable waste of 20%, revenue loss on the recoverable volume of 6,000,000 cu.m. can be estimated at a potential **US$120,000,000 per year.**

Revenue collection losses, less than uniformly optimal recovery, and other factors might reduce this revenue potential depending on the assumptions used. The absolute values in direct revenue loss on roundwood volume presently being sanctioned for cutting under existing guidelines and policies, would, however, still be very large.

Section 6.0 provides some recommendations on action necessary to improve utilization levels in order to achieve more cost effective extraction and greater financial gain for the industry as well as increased royalties for Government. An important element in these recommendations is the concept of differential royalty rates based on log grades.

4.6 Implications for the Wood Resource

There is a growing body of opinion and research evidence emerging both in Indonesia and throughout Southeast Asia, that growth rates of native Dipterocarps are less than those assumed in the present TPTI system. Furthermore, it is increasingly clear that failure to develop and implement clear guidelines aimed at reducing damage to the residual stand and the soils, results in a failure to meet the minimum stocking levels assumed in the TPTI system. Present post harvesting assessment procedures place inadequate emphasis on quality criteria and are therefore, largely meaningless as a measure of determining the condition of the stand after logging.

It was noted in Study Area No. 1 that an excessive number of the pohon inti were destroyed or severely damaged during the logging operation. This is a situation which can be avoided to a very significant degree. Until this situation improves dramatically throughout the HPH's in Indonesia, there is an urgent need to reexamine the validity of the basic assumptions underlying the TPTI system, namely the 35-year cutting cycle and the current AAC level.

The potential significance of the existing level of "avoidable waste" can be easily visualized. Assuming an improved utilization of **20%**, the cutting cycle could be extended to **42 years** without affecting the present AAC, thus providing a buffer in which a sustainable AAC level can be determined based on better information. The elimination of "avoidable" (Class I) logging waste combined with technically and economically achievable improvements in reducing the impact of logging on the residual stand and on the soils could make the overall objective of sustainable natural production forest management an achievable goal in the foreseeable future.

5.0 CAUSES OF WASTE

There is a very real danger that data on avoidable waste, such as those reported in this study, could trigger the wrong kind of action in terms of policy initiatives through new decrees or guidelines which may misdirect the responsibility for waste reduction and improved utilization and may be no more enforceable than some of the existing guidelines. It is important that the underlying causes of the present levels of waste, as a result of both industry actions and Government policy and regulations, be clearly understood before any changes are implemented.

5.1 Policy Determinants

The observation that the results of these two studies are not an isolated event but rather are indicative of the level of utilization for the much of the forest industry across Indonesia, strongly suggests that Government policy determinants are a major cause for wasteful logging practices.

5.1.1 Perceptions Affecting Monitoring and Control

Within the MoFr and at the Dinas and Kanwil levels, there is still a broadly held perception that wood supply is abundant and that the assumptions regarding the 35 year cutting cycle, given the existing logging methodology and the existing level of compliance, are valid and will result in a stand of equal or better volume than the original stand at year 35 after logging.

There is a growing body of knowledge which indicates that this perception is not valid. Experience in neighboring Southeast Asian countries also supports the need to reevaluate this fundamental assumption in favour of a more realistic cutting cycle. The result is that on-the-ground monitoring of unnecessarily destructive road construction, logging, and utilization practices is often overlooked in favor of "check-list" monitoring based on administrative criteria.

5.1.2 Cut Control Policy

Probably the single most significant explanation for existing utilization standards across the forest industry is the MoFr cut control mechanism. A description of the existing procedure can be illustrated in point form.

1. Gross Annual Allowable Cut (AAC) is set in the Long-Term Management Plan (RKPH) by multiplying the total estimated standing volume per hectare times the total area of available virgin forest and dividing by 35 years, assumed to be the implementable cutting cycle period.

2. 100% cruising of the area scheduled for logging the next year determines the total gross standing volume in the proposed annual felling block.

3. A TPTI evaluation factor is applied to the gross volume proposed in the Annual Working Plan (RKT). This factor is expressed as a percentage value based on a Dinas/Kanwil evaluation of the level of compliance with the previous years target TPTI activities, specifically the post harvesting activities. Hence, if the primarily administrative evaluation determines an 85% compliance, the annual logging area (1/35th of the concession area) is multiplied by 0.85 and results in a **target logging area for the RKT.** (Note: It is not clear how widespread or how uniformly this performance factor is being developed and applied.)

4. 100% cruising volume is reduced by applying;

   0.8 = a safety factor which acknowledges the damage to the residual stand during logging, and,

   0.7 to 0.9 = an exploitation factor which is an allowance for decay, waste, and breakage.

   The approved RKT now has an allowable logging area and an **allowable cutting quota** (JPT), based on the approved area, and adjusted for the two utilization factors.

5. Annual logging production is then monitored by the production reports (LHP) submitted to the MoFr every 10 days.

6. The company is now relatively free to log within the approved cutting area and the approved cutting quota limits. Because the cruising volume has been dramatically reduced by the application of the two adjustment factors, the company invariably finds it has the flexibility to "high grade" the approved area and still achieve its cutting quota.

7. There are no controls on the level of utilization and hencethere is an industry wide standard of utilization which tends to leave large volumes of "avoidable" logging waste in the forest or at roadside.

8. The same lack of controls and monitoring at the field level also results in an excessive level of damage to the residual stand.

5.1.3 Royalty Disincentives

The Indonesian Grading Rules which were developed primarily with the log export trade in mind, are inadequate in describing the wood which is being left in the forest and are an inappropriate basis for a differential royalty system in the light of the existing industrial capability and the growing demand on the wood resource.

The Ministry of Forestry has recognized the need to minimize logging waste by issuing Director General of Forest Utilization Decree No. 212/KPTS/IV-PHH/90, "Pedoman Teknis Penekanan dan Pemamfaatan Kayu Limbah Pembalakan" (*Technical Guidelines for Minimization and Utilization of Logging Waste*) in which a definition of logging waste and general guidelines on a wide range of activities aimed at achieving maximum utilization of the trees felled and minimization of logging damage are provided.

The decree also restricts the utilization of logging waste to the period of actual logging activity and limits access to this waste to HPH personnel only, thus closing the possibility of third party salvage of logging waste.

Existing tariffs for logging waste as defined in Decree No. 212/KPTS/IV-PHH/90, are set out as follows:

1. MoFr Decree No.272/KPTS-IV/1993 which sets the DR at a **US$2.00/cu.m.** for all logging waste. (Tata Cara Pengenaan, Pemungutan, Penyetoran, Penyimpanan, dan Pengunaan Dana Reboisasi/*Procedure for Assessing, Collecting, and Disbursement of the Reforestation Fee*)

2. Royalty (IHH) schedules for different species and areas is provided in "Tarif Iuran Hasil Hutan Kayu Bulat dan Bahan Baku Serpih dan Iuran Hasil Hutan Bukan Kayu Untuk Seluruh Indonesia, 1 June 1993 - 31 May, 1994" (*Tariff for Timber and Wood Waste and Non Timber Forest Products of Indonesia*). The royalty for waste wood is set at **Rp. 2,700/cu.m.,** regardless of species.

3. A fixed scaling and grading fee of **Rp. 400/cu.m.** is also assessed on any waste wood which is recovered (Decree of the Minister of Forestry No. 650/KPTS-II/1990, Pengukuran Dan Pengujian Hasil Huan/*Scaling and Grading of Forest Products*. The regular license fee does not apply to waste wood.

Only a few companies which have their manufacturing complex situated near their HPH at the end of their road system, have been able to take advantage of the royalty incentives provided in the existing legislation as described above.

For the majority of companies faced with more complex and longer transportation logistics, the economic and technical constraints to

extract and transport the small sized wood which meets the criteria of "waste", make utilization of this volume unachievable.

Utilization of what has been assessed as waste in the two studies presented here would, therefore, have to be extracted as part of a normal log and would require a change in the company's bucking practices.

Coupled with the cut control mechanism, a uniform royalty rate (DR & IHH) acts as a strong disincentive to utilize anything but the best quality portions of the main stem volume.

5.2 Industry Determinants

Responsibility for the present level of waste must also be shared by the forest industry.

5.2.1 Perceptions

The logging industry in Indonesia has expanded rapidly in the apparent assurance of a virtually inexhaustible wood supply, very low extraction costs (and high profit margins) and, Government concessions which encouraged the establishment of this industrial sector.

There appears to be a poorly developed awareness of existing operating inefficiencies and the potential for significant cost savings. This could be contributed to an overall complacency with the current modus operandi brought about by continuing high profit margins and an organizational structure which tends to alienate management from field realities, and/or to a genuine failure to appreciate the potential for improvement.

Much of the industry has used initial windfall profits to diversify into other sectors. It is not clear to what extent the forest industry has written off its future in natural production forest activities in the face of uncertainties regarding tenure and continued wood supply.

5.2.2 Manufacturing Limitations

The wood processing industry in Indonesia is heavily oriented towards plywood production. Not all of the manufacturing plants have a full range of utilization capability. As a result, the logging sector of the industry is strongly orientated towards extracting only the best quality wood for plywood production.

Government constraints to improved utilization include high tariffs on the export of rough lumber. These tariffs, originally implemented in order to stimulate the establishment of the plywood

sector and of secondary and tertiary manufacturing, may now be having a negative impact on the utilization of lower quality portions of the tree. Although an analysis of the potential impact of existing tariffs on forest utilization standards is beyond the mandate of this study, this issue may bear further investigation.

5.2.3 Economic Constraints

Transportation costs are one of the biggest production cost factors for many of the HPHs. Given the disincentives towards better utilization inherent in existing Government policy as outlined in section 5.1, there is a tendency to transport only the highest quality wood.

5.2.4 Organization and Control

The results of the waste study clearly illustrate that there are some problems with internal company control of operations. Left logs represent the highest portion of the avoidable logging waste and could be eliminated through better supervision. Stated policy regarding the salvage of all commercial right-of-way wood is not being implemented. The potential for tightening up internal control towards a more cost effective and less damaging operation is substantial throughout the industry.

6.0 RECOMMENDATIONS

6.1 Implications for Government Policy

Government policy sets the framework within which the forest industry must operate. There are clearly a number of significant adjustments which need to be made to existing policy as a prerequisite to improved utilization of the wood resource.

1. Maximize Return from the Resource. Current wasteful practices suggest that the industry places a low value on the wood resource. Part of the valuation of the resource is the royalties levied by the Government and by it's policies of permitting wasteful practices. The Government must seek to assess a suitable value for the wood resource and must implement policies which will stimulate better utilization.

2. Introduce a Variable Royalty System. A simple grade differential could significantly increases royalty for prime quality logs, maintain rates for medium quality logs, and reduced rates for lower quality logs. An appropriate grading system would not be difficult to develop. This recommendation should provide long-term incentives for improved utilization into Class II and Class III waste (see Figure 1).

3. Reexamine the Validity of the 35 Year Cutting Cycle. It is becoming increasingly clear that 35 years is an inappropriate period on which to base the calculation of an AAC. This is particularly significant in light of the present harvesting practices.

4. Reexamine the Present Cut Control Mechanism. The wasteful practices encouraged by the present cut control mechanism have been detailed in Section 5.1.3. A change to the existing procedures must also take into account changes to the 35 year cutting cycle.

5. Introduce a Waste Assessment Procedure which would be linked to AAC levels and/or penalties for non compliance with utilization targets (see item 6). Such a procedure could be part of the post harvesting requirements or an independent sampling requirement. Further studies and development of such a procedure could be the subject of specific technical assistance.

6. Introduce Clearly Stated and Quantifiable Targets for reducing the present level of logging waste and logging damage.

7. Shift the Emphasis of Monitoring from being primarily a "paper exercise" to a more qualitative and field oriented assessment of a company's performance.

6.2 Implication for the Industry

Based on the preceding discussion, a number of recommendations can be made which indicate possible ways in which improved utilization can be achieved through industry initiatives.

1. Reexamine unit volume costs and corporate wide profitability for potential benefits through increased volume recovery. An example of the potential for improved volume recovery has been conservatively assessed in this report. It is hoped that this is an incentive for a more rigorous, internal examination

2. Improve sensitivity towards environmental issues. The present utilization standards and logging methodology result in a level of waste and damage to the residual stand and to the environment which make the achievement of sustainable natural production forest management questionable. Growing public and Government awareness of these issues will make the continuation of the present utilization practices increasingly difficult to justify.

3. Explore Technical Alternatives. The elimination of avoidable logging waste as identified in Study No. 1 involves no technical modifications or additional costs. Only a change in present bucking policy is required.

   Wood loss due to present road construction practices can be largely eliminated by similar changes to internal, company policy. However, it is acknowledged that some technical factors need adjustment, specifically:

   - Through improved forest engineering practices and standards affecting allowable grade, many of the massive road fills, particularly on ridge-top locations, could be eliminated. The use of commercial logs as knappel cannot not be justified from any perspective.

   - The recovery of commercial logs from the right-of-way during road construction is an inconvenience for the road construction crew. By assigning one extraction crew consisting of a faller and an extraction machine to each road construction side, the salvage of all commercial logs could be easily achieved within the normal logging cost structure.

   - A rubber tired skidder (Cat 528B or equivalent) would be an ideal machine to carry out salvage of right-of-way logs and assist in skidding noncommercial wood to fill areas requiring knappel for road bed stabilization.

- Wooden box culverts should be constructed at all cross drainage locations to avoid reliance on hollow logs or piles of buried logs to provide drainage. This would not only reduce the consumption of commercial logs but would greatly reduce the ponding and productive site loss which is presently such a noticeable feature of SBK's road system. An excavator would be the most effective machine to use for this purpose.

4. Develop Better Implementation Policies. If the existing wasteful practices are to be eliminated, the industry will have to develop its own, internal policies and guidelines which must be disseminated to the field supervisors and laborers level. This would involve:

   - Falling and bucking standards, and
   - Forest engineering and road construction standards.

5. Internal Monitoring and Control. Much improvement can be achieved through better internal control of logging operations and clear dissemination of company guidelines to the field supervisors and operators.

APPENDIX 1: TERMS OF REFERENCE
NATURAL PRODUCTION FOREST
MANAGEMENT CONSULTANT

BACKGROUND

Under the USAID-assisted Natural Resources Management (NRM) project, the Ministry of Forestry is testing policies and practices to improve the management of natural production forests. To do this a team of advisors has been assigned to work in the Ministry of Forestry, and in the Bukit Baka-Bukit Raya National Park. This includes a Forestry Advisor in Jakarta working in MoFr, and a Forestry Research Advisor/Team Leader, a Agroforestry Advisor, a Nature Conservation Advisor and a Social Forestry Extension Advisor working in Bukit Baka. However as the project moves toward with the implementation of field activities there is an urgent need to strengthen the present field team with additional assistance in the area of natural production forest management.

This terms of reference is for two consultants, one with expertise in planning and the second with experience implementing natural production forest management efforts. The planning specialist will primarily examine the current plans and make recommendations for improvements; the implementation specialist will examine how forest utilization plans are currently implemented in the field and make recommendations on improving these practices. The two consultants will overlap and coordinate their work to ensure complementarity of efforts. An illustrative schedule for their activities is attached to this TOR.

FOREST MANAGEMENT PLANNING SPECIALIST

I. TASKS

1. Based on field inputs, review and provide recommendations to improve the following three forest utilization plans:

   a. The RKPH (Rencana Karya Pengusahaan Hutan), long-term planning for forest utilization working with the Kanwil and the Dinas in West Kalimantan and the concessionaire (PT SBK). The consultant will:

      i. review the existing guidelines for formulating an indicative plan for a long-term forest utilization (RKPH);

      ii. review how the plan can be revised to more realistically reflect general forest information in different concession areas;

      iii. identify procedures to collect general information on economic projections of the concession's forest products as well as identify the potential harvest for non timber forest products;

      iv. provide guidance for planning forest fire mitigation programs;

v. identify what procedures should be used by the Ministry of Forestry to more easily review the plan; and

vi. prepare options for improving the guidelines in formulating a long-term plan if the existing plan requires improvement.

b. The RKL (Rencana Karya Lima Tahun = Five Year Operational Plan). The advisor will review the MoFr guidance for the plan, including: identification of the plan's strength and weaknesses relative to field implementation; degree of accuracy in implementation of the plan, how to monitor progress indicating what benchmarks should be used, volume counting system of harvested logs and recommendations for improvement of these plans to enable MoFr to conduct better performance evaluations of the concession holder. He will ensure that the plan provides clear direction to subsequent logging operational plans of the concessionaire.

c. The RKT (Rencana Karya Tahunan = Annual Logging Plan). The advisor will review the existing guidelines for formulating the RKT, and provide technical recommendations for improvements.

2. The advisor will work closely with NRMP advisors and GOI officials, and coordinate work plans, approach, and outputs with the Natural Production Forest Management Implementation consultant.

II. OUTPUTS

1. A mid-term report to be completed roughly halfway through the consultancy on work completed and changes needed in the RKPH, RKL and RKT submitted through the NRMP COP to MoFr and USAID.

2. Completed field visits to PT SBK to check the RKPH, RKL and RKT in the field.

3. Brief monthly reports on work carried out to the NRM Chief of Party, the Kanwil in West Kalimantan and the NRM PIU in the Directorate General of Forest Utilization.

III. REPORTING

The consultant will report to the NRMP Chief of Party working closely with the MoFr (Kanwil and Dinas) in Pontianak and Palangkaraya. Also with the NRM/ARD Forestry Advisor (MoFr), the NRM/ARD Team Leader/Forestry Research Advisor and the NRM/ARD Agroforestry Advisor in Pontianak and Bukit Baka. He will also liaise closely with the NRM Project Implementation Unit in the Directorate General of Forest Utilization (MoFr).

IV. LOCATION

Jakarta with frequent travel to Pontianak and Bukit Baka as well as other areas as required.

V. DURATION

Six months devided into two separate consultancies of approximately three months each.

VI. QUALIFICATIONS

1. A masters or preferably PhD degree in Forestry.
2. Ten to fifteen years experience working on forestry management issues in Indonesia and/or Southeast Asia.
3. Good spoken and written English and Indonesian.

FOREST MANAGEMENT IMPLEMENTATION SPECIALIST

I. TASKS

1. Assess the implementation by PT SBK of the plans (RKPH, RKL and RKT). Guidelines for better implementation should be prepared where necessary and training provided to SBK staff (see No. 3 below).

2. Based on field work being carried out by PT SBK, provide technical recommendations on how to improve the present silviculture, cutting, and harvesting methods of the TPTI system. Also make recommendations on the feasibility of implementing the newly developed TJTK system (Tebang Jalur Tanam Konservasi = Strip Logging and Conservation).

3. Provide training where necessary for SBK staff to help improve the implementation of the RKPH, RKL, and RKT plans.

4. Coordinate efforts with the short-term Planning Specialist and assist the NRM/ARD long-term Agroforestry advisor working on the natural production forest management aspect of the NRM project in the PT SBK concession area.

II. OUTPUTS

1. Completed field visits to PT SBK with recommendations on implementation practices and areas of improvement by the SBK staff.

2. Recommendations based on field work on improvements needed in logging, silviculture and cutting practices as well as on the general TPTI system.

3. A mid-term report to be completed and submitted to GOI and USAID at the end of the first consultancy detailing work completed to date and preliminary implementation recommendations as in Nos. 1 and 2 above.

4. A brief monthly reports on work carried out submitted to the NRM Chief of Party, the Kanwil in West Kalimantan and the NRM PIU in the Directorate General of Forest Utilization.

5. A final report submitted to GOI and USAID by the end of the consultancy detailing findings and recommendations.

6. Presentation to USAID and relevant GOI officials before the submission of the mid-term and final reports.

III. REPORTING

The consultant will report to the NRMP-Chief of Party working closely with MoFr (Kanwil and Dinas) in Pontianak and Palangkaraya. Also with the NRM/ARD Forestry Advisor (MoFr), the NRM/ARD Team Leader/Forestry Research Advisor and the NRM/ARD Agroforestry Advisor in in Pontianak and Bukit Baka. He will liaise closely with the Project Implementation Unit in the Directorate General of Forest Utilization (MoFr).

IV. LOCATION

Pontianak with frequent travel to Bukit Baka, and Jakarta as well as other areas as required.

V. DURATION

Five months divided into two separate consultancies of approximately 2.5 months each.

VI. QUALIFICATIONS

1. A masters or preferably PhD degree in Forestry.
2. Ten to fifteen years experience working on forestry management issues in Indonesia and/or Southeast Asia.
3. Good spoken and written English and Indonesian.

APPENDIX 2: SELECTED REFERENCES

1. **A Review of Planning Arrangements for Sustainable Management of Natural Production Forest on Forest Concessions in Indonesia**, Ian Armitage, Oct. 1993, NRMP/MoFr

2. **Damage Controlled Logging in Managed Tropical Rain Forests in Suriname**, December 1990, J. Hendrison, Agricultural University, Wageningen, PUDOC, P.O. Box 4, 6700 AA, Wageningen, The Netherlands.

3. **Design and Construction of Forest Roads**, Trip Report, USDA Forest Service Visit to Indonesia, Aug. 31-Sept. 13, 1993

4. **Faktor Eksploitasi Meranti Di Sumatra Barat, Kalimantan Barat Dan Kalimantan Selatan** (*Logging Recovery of Meranti in West Sumatra, West Kalimantan and South Kalimantan*), Dulsalam, Forest Products Research Journal, Vol. 5, No. 2, 1988

5. **Guidelines and Implementation Issues Concerning Natural Production Forest Management**, Klassen A.W., Dec. 1993, NRMP/MoFr

6. **Harvesting and Transportation of Timber in Indonesia**, Oct. 1989, Angelo G. Mordeno and Djaban Tinambunan, FAO, Field Document No. I-4.

7. **Recommendations for Controlled Timber Harvesting in the SBK Forest Concession**, John Hendrison, August 1992,NRMP/MoFr

8. **Reduced-Impact Logging as a Carbon-Offset Method**, Conservation Biology, Vol. 7, No. 4, December 1993

9. **Statistik Kehutanan Indonesia** (*Forestry Statistics of Indonesia*), 1989/1990, Secretariat Jenderal Departmen Kehutanan, Jakarta, 1991

10. **Studi Identifikasi Pemanfaatan Limbah Penebangan di Propinsi Kalimantan Timur**(*Study to Identify the Uses of Logging Waste in East Kalimantan Province)*, Departemen Kehutanan, Directorat Jenderal Pengusahaan Hutan, Jan. 1991

11. **The Forest Management Practices of P.T. Kayu Lapis Indonesia**; a report by The Tropical Forest Conservation Program of the International Union for Conservation of Nature and Natural Resources to, The ADB and the MoF, Government of Indonesia; Peter F. Burgess and Dominique Laurent, Feb. 1989

12. **The Implementation of the Indonesian Selective Cutting and Replanting (TPTI) Silviculture System for Timber Improvement in the Logged-Over Areas**, Djamaludin, Fourth Round-Table Conference on Dipterocarps, 1991, Biotrop Special Publication No. 41, Bogor Indonesia

13. **Volume Dan Klasifikasi Limbah Penebangan Pada Beberapa Pengusahaan Hutan Di Aceh Dan Kalimantan Timur** (*Volume and Classification of Logging Waste at Several Forest Companies in Sumatra and Kalimantan*), Sampe Radja Simarmata dan Dusalam, Forest Products Research Journal, Vol. 2, No. 2, 1985

NRM/ARD CONSULTANCY REPORTS

NO.	TITLE	AUTHOR
1.	Procurement Plan For Research Equipment at Bukit Baka and Equipment Installation at Samarinda Forestry Research Station	Roy Voss
2.	Agroforestry in Bukit Baka/ Bukit Raya	W.G. Granert
3.	Pengukuran dan Pemetaan Topografi Sebagian Daerah Taman Nasional Bukit Baka/Bukit Raya	Sahri Denny, cs
4.	Applied Research Recommendations for Production Forest Management An Economic and Ecological Review of the Indonesian Selective Cutting and Replanting System (TPTI)	Lisa Curran & Monica Kusneti
5.	Balancing Forest and Marine Conservation with Local Livelihoods in Kalimantan and North Sulawesi	Jill M. Belsky
6.	Proposal to the GOI and USAID for the Development of Comprehensive Environmental and Natural Resources Accounts (CENRA) for Economic Planning and Management	Henry Peskin & Joy Hecht
7.	Bukit Baka Mini–Hydraulic System Implementation Plan	Michael Johnson
8.	Final Report: Bukit Baka – Bukit Raya 1992	Roy Voss
	Station Protocol: Bukit Baka – Bukit Raya 1992	Roy Voss
	Research Protocol: Bukit Baka – Bukit Raya 1992	Roy Voss

NO.	TITLE	AUTHOR
9.	Environmental Education and Awareness in Bukit Baka (vol.1)	Nancy Bergau
	Environmental Education and Awareness in Bukit Baka Guide to Environment and Fire Campaign (vol.2)	Nancy Bergau
10.	Recommendations for Controlled Timber Harvesting in the SBK Forest Concession	John Hendrison
11.	Cruiser Identifications at SBK and Local Uses of Trees by Local People	Jim Jarvie
12.	Community Water Supply Feasibility Study for Bukit Baka–Bukit Raya, Kalimantan	Rick McGowan & Alfonso Rieuwpassa
13.	Report on NRM Library Consultancy September – December 1992	Dachlan Cartwright
14.	Livelihoods Strategies and Marine Resource Among Residents of Bunaken National Park, North Sulawesi: Recommendations for Local Involvement in Park Management	Jill M. Belsky
15.	A Competitive Awards Scheme for Applied Forest Management and Nature Conservation	Peter R. Burbridge
16.	Design of a Management Information System for the Natural Resources Management Project	Joy Hecht
17.	Environmental Education and Awareness Strategy for Bukit Baka – Bukit Raya National Park (volume 1)	Nancy Bergau
	NGO Training for a Local Environmental Education and Awareness Strategy (volume 2)	Nancy Bergau
18.	Water Supply and Sanitation (WS&S) Program in Bukit Baka – Bukit Raya, Kalimantan Program Status Report	Rick McGowan

NO.	TITLE	AUTHOR
19.	The Role of NGOs in Supporting the NRM Project in Bukit Baka – Bukit Raya National Park	Marcel de Brune
20.	Integration of Provincial Regional Development Planning into the Bukit Baka – Bukit Raya National National Park Management Plan	E. Edwards McKinnon
21.	Communications, Information, and Education Strategy for Bunaken National Park	Nancy Bergau
22.	Report on the Preparation of a Design for a Study of the Natural Resource Impacts of Marine Sector Policy During the Second Long–Term Development Plan Period	Andrea S. Katz
23.	Management Information System for the Natural Resources Management Project Report on the Second Mission to Jakarta July – August 1993 (Volume 1)	Joy Hecht
	Management Information System for the Natural resources Management Project User Manual and Technical Documentation (Volume 2)	Joy Hecht
24	Water Supply and Sanitation Program in Bukit Baka – Bukit Raya, Kalimantan Status Report No. 2	Jonathan Hodgkin
25.	Report on Communities Living Within Reach of The Bukit Raya National Park in Kalimantan Tengah	Michael Heppell
26.	Effective Protection and Natural Resource Management in Indonesia	Janis Togashi
27.	Biological Conservation in the Sustainable Management of Production Forest	Jim Jarvie
28.	Economic Issues Associated with the TPTI Management System	Steven E. Dennison
29.	A Review of Planning Arrangements for Sustainable Management of Natural Production Forest on Forest Concessions in Indonesia An Interim Report	Ian Armitage
30.	Eco–Tourism Development in Bunaken National Park and North Sulawesi	Richard Sandler

NO.	TITLE	AUTHOR
31.	Environment and Development in Indonesia An Input – Output Analysis of Natural Resource Issues	Clive Hamilton, et al
32.	Survei Pemanfaatan Tumbuhan Obat di Nanga Juoi, Kecamatan Menukung, Kalimantan Barat	Izefri
33.	Mid Term Report: Guidelines and Implementation Issues Concerning Natural Production Forest Management	Art W. Klassen
34.	Village Sketch Mapping at Bukit Baka – Bukit Raya National Park, West Kalimantan	Alix Flavelle
35.	Pengkajian Lembaga Swadaya Masyarakat (LSM) Terpilih di Kalimantan Barat dalam Memperkokoh Proyek Pengelolaan Sumber Daya Alam (NRMP)	Sih Yuniati & Haryono
36.	Strategi Produksi Media Penyadaran Masyarakat untuk Taman Nasional Bunaken dan Perencanaan Produksi Prioritas Pertama dan Kedua	Harijanto Suwarno