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**NATURAL RESOURCES MANAGEMENT PROJECT**

BAPPENAS – Ministry of Forestry  
Assisted by  
USAID

**ECONOMIC ISSUES ASSOCIATED WITH  
THE TPTI MANAGEMENT SYSTEM**

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

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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 the economic activities of logging under the Indonesian Selective Cutting and Planting (TPTI) system as a preliminary report. It specifically looks at financial issues of the TPTI and addresses harvest activities noting that there is a definite need for a more comprehensive examination of the cost of the silviculture prescription in the planting stages of natural production forest management.

## ACKNOWLEDGEMENTS

The terms of reference for this technical assistance could not have been completed without the help of a number of people. These facilitated my understanding of the TPTI, provided introductions to key people directly involved with important issues confronting the silvicultural system, and who helped to insure that the myriad of logistical arrangements were as tight as possible.

At the DGPH in the Ministry of Forestry Ir. Sopari and Ir. Iskandar helped to provide important initial guidance in fulfilling the TOR. Pak Sopari also arranged for my counterpart, Ir. Djoko Wahjono of Gadjah Mada University. Pak Djoko was invaluable in several instances in helping to understand and clarify technical discussions and in assistance with the field visit to the HPH. Mr. Christopher Bennett, Forestry Advisor for the NRMP, was also very instrumental in all phases of this consultancy, making sure that key contacts were established and logistical arrangements were accomplished. Chris also greatly facilitated my understanding of the Ministry's activities within PH.

In Kalimantan, NRMP staff Dr. Roy Voss, Sukarman, and Ms. Cory all took time to further complicate their full schedules to assist my work from the Pontianak side. Ir. Gusti and Ir. Fachri, of the Alas Kusuma Group were particularly helpful in helping me to grasp some of the reporting and analytical components required of a HPH in implementing the TPTI.

Finally, NRMP short-term consultants, Dr. Ian Armitage and Mr. Art Klassen, were very important in helping me understand numerous details about the management planning and implementation process for natural production forests in Indonesia.

## EXECUTIVE SUMMARY

Economic and financial variables attributable to the implementation of the Indonesian Selective Cutting and Planting System (TPTI) are not regularly assessed in a comprehensive manner. The Terms of Reference for this technical assistance were designed to begin an initial assessment of the economic issues associated with the TPTI. Although the more global economic variables are intrinsic in this assessment, the focus is predominantly on financial issues of the TPTI and it specifically addresses the post-harvest activities.

The assessment indicates that rigorous financial analyses are not a part of, nor are they required to be, part of the monitoring process incorporated in the TPTI. There is a definite need for more comprehensive examination of the costs of the silvicultural prescriptions in the planning stages of natural production forest management. This yields a number of benefits including a better understanding of the financial implications of planned activities to the forest concession holder and a more accurate assessment of the true economic rent of the TPTI for Indonesian policy makers.

This report presents an initial discussion, based on field observations and simple examples, of areas that need to be explored and implemented in order to move this understanding in a positive direction. It is not intended to be a definitive discussion, but rather one which will help to begin set priorities and stimulate debate on reporting and monitoring all costs of the TPTI.

## ABBREVIATIONS AND ACRONYMS

AAC	Annual Allowable Cut
DG	Directorate General
DINAS	Provincial Forestry Office (under the governor's office)
Et	Designation for year of harvesting under the TPTI
HPH	<i>Hak Pengusahaan Hutan</i> , Forest Concession
ITT	<i>Inventarisasi Tegakan Tinggal</i> , Post-harvest inventory under the TPTI
KANWIL	<i>Kantor Wilayah</i> , Provincial Forestry Office (under the MoFr)
MoFr	Ministry of Forestry
NRM, NRMP	Natural Resources Management Project
ODA	Overseas Development Assistance (Great Britain)
PH	<i>Pengusahaan Hutan</i> , Forest Utilization
TA	Technical Assistance
TPTI	<i>Tebang Pilih Tanam Indonesia</i> , Indonesia Selective Cutting and Replanting System
TOR	Terms of Reference
USAID	U.S. Agency for International Development

# I. INTRODUCTION

## 1.1 Objectives of this Technical Assistance

The terms of reference for this short-term technical assistance (see Appendix 1) were established as part of the USAID-funded Natural Resources Management Project's (NRMP) ongoing work with the Pilot Management Area in West/Central Kalimantan. Its primary focus is in the area of natural production forest management and it is designed to address cost issues related to the Indonesian Selective Cutting and Replanting System -- *Tebang Pilih Tanam Indonesia*, or TPTI. This work also complements two additional, and concurrent, technical advisories within the NRMP on natural production forest management planning policy and implementation.

In initial discussions with officials of the DG of Forest Utilization (PH) it was noted that the TOR called for information that was quite far-reaching for the time period allotted. Consequently, the decision was made to narrow the focus to the cost issues associated with the post-harvest steps of the TPTI, but at the same time couched within the broad cost issues of the whole silvicultural system. The main outputs from this technical assistance would then be:

- a discussion of major cost issues of the TPTI;
- an assessment of specific costs, where possible, associated with TPTI post-harvest steps; and
- recommendations for research and further study aimed at increasing efficiency, and cost reductions in implementing the TPTI.

It was also noted that the work would attempt to capitalize on the continuing relationship between the NRMP and PT. SBK of the Alas Kusuma Group with their HPH in Central Kalimantan. To facilitate the field investigation the DGPH assigned the consultant a counterpart from, Universitas Gadjah Mada, Ir. Djoko Wahjono, a Master's degree student with specific interests in the TPTI.

Based on this direction the field investigations carried out under this technical assistance (TA) were primarily from a financial perspective, not an economic one. The discussions which follow deal primarily with the costs confronted by a HPH in implementing the TPTI on the ground.

Appendix 2 provides a general timetable for the TA. This is complemented by a list of persons contacted in Appendix 3. It is also important to point out that due to unfortunate circumstances the staff primarily responsible for TPTI activity planning and decision-making were unavailable at the PT. SBK HPH in Kalimantan Tengah at the time of the field investigation. Valuable insights and discussions were held, however, with PT.SBK foremen responsible for daily implementation of TPTI activities, and with Alas Kusuma Group staff in Jakarta and Pontianak.

## 1.2 Overview of the TPTI in the Context of Cost Accounting

The objectives of TPTI, a silvicultural system which focuses on harvesting and regeneration, are to monitor the utilization of natural production forests and to improve timber added values in the residual stands. Specific steps are outlined in the system with the aim of developing a mixed species of the remaining standing stock which will serve as a sustainable source of raw material supply for Indonesia's forest industry.

Guidelines, including a timetable, for each of the eleven steps shown in Table 1 are elaborated in the annex to the Ministry of Forestry's (MoFr) Decree of the Director General of Forest Utilization No. 564/KPTS/IV-8PHH/1989 dated 30 November 1989. Annex D of this report presents a summary of each of these steps and the main activities to be implemented at each stage.

Cost estimates called for in each step of the guidelines appear to reflect only those direct costs based on the daily labor requirements for its implementation. National standards have been calculated and are used as guidelines by the HPHs in developing their cost projections required in the management planning process. Each HPH provides the Dinas and Kanwil authorities in the province where they operate with an annual TPTI cost projection followed by a quarterly update of actual expenditures against each step. From the one example of this process that we were able to obtain in the field, per unit (direct) costs were running considerably ahead of the projections.

Because indirect costs are not included in this reporting process an incomplete picture of the total costs attributable to each TPTI step results. Logging chances that are remote, mountainous, and involve extreme logistical planning and expense in terms of transport are on an equal footing with those HPHs which may have different operating costs due to site differences that are not as extreme. Consequently the true economic rent as reflected in stumpage values, may not be the real one. The reporting and monitoring of the total costs associated with each TPTI step is only partial and therefore provides incomplete information for policy and decision-makers concerned with establishing licenses, fees and royalties which impact on forest industry. A more thorough

understanding of the TPTI-related costs by the HPH's which incur them, and by the Dinas and Kanwil officials charged with monitoring them, could result in a more effective and sustainable implementation of the TPTI activities.

Table 1. Main steps in TPTI implementation.

Step Description		Timetable for implementation
1.	Planning of a concession working area	Et-3
2.	Annual timber inventory	Et-2
3.	Infrastructure/road construction	Et-1
4.	Cutting/felling operation	Et
5.	Refining (liberation cut)	Et+1
6.	Residual stand inventory	Et+1
7.	Nursery/seedling preparation	Et+2
8.	Replanting/enrichment planting	Et+2
9.	Forest tending, Phase I	Et+3
10.	Forest tending, subsequent phases a. Refining (liberation) b. Thinning	Et+4 Et+9,+14,+19
11.	Protection and research	Continuous

Et represents the year of forest product harvesting

Source: Djamaludin, S. 1991. The implementation of Indonesian Selective Cutting and Replanting (TPTI) silviculture system for timber improvement in logged-over areas. In: Proceedings of the Fourth Round-Table Conference on Dipterocarps. SEAMEO BIOTROP, Bogor (Indonesia). pp. 95-110.

## II. EXAMINING POST-HARVEST ACTIVITIES

### 2.1 TPTI Guidelines and their Implementation

HPH's are required to fulfill each of the TPTI steps for each bloc (petak) designated for harvest regardless of the cost to the company. The consequences for non-compliance are a reduction in the HPH's annual allowable cut -- until such time as the HPH completes the required activities to the satisfaction of the Ministry. In order to insure the flow of raw material to the mill the HPH will at least do the minimum required under each step, and most likely in the least costly manner. The only costs monitored by Dinas and Kanwil for these activities are the direct ones -- primary the labor attributed to the individual activity. Transport costs, administration, facilities, maintenance on equipment, overhead are all major costs that are not included, but are especially significant in remote sites such as the PT. SBK concession. This means that the operational costs of the TPTI program for the concessionaire are not monitored relative to economic gains from timber extraction and forest tending activities. Further, from a purely financial viewpoint, costs of the post-harvest activities expressed in present value terms are not even weighed against the intended benefits that the silvicultural prescriptions of the TPTI are planned to bring. Other than profits that can be realized from the initial harvest at Year Et, there appears to be little incentive, other than the threat of withholding the ACC of a future cutting bloc, to carefully invest in post-harvest TPTI steps.

A more thorough understanding of the implications of implementing the silvicultural prescriptions could be gained with a more diligent assessment. This would need to include both direct and indirect costs for each of the steps and could allow for at least a break-even analysis. The results could then be compared to the expected benefits (timber and non-timber) assumed to accumulate at the subsequent harvest due to implementing the particular activity. A slightly more sophisticated approach could combine the assessments of the post-harvest steps in what is essentially a discounted cashflow. This and other analytical techniques are discussed in more detail below.

A greater incentive to invest in the TPTI, or any silvicultural system, can be gained if there is first, a detailed planning effort that not only provides accurate information prior to harvest, but also allows for planned growth and harvests in the residual stand. Secondly, investment in the silvicultural prescriptions will apt to be done in a more sustainable manner if there is an allowance for flexibility in the implementation of specific activities.

Forest management planning is being addressed under two related TA's of the NRMP; one is assessing the policy environment needed to encourage sound forest management planning. The second is examining the actual implementation of plans in the field, and what specific strategies can be undertaken to improve implementation of the TPTI steps through better, and more thorough planning.

### 2.1.1 Prospects for Greater Economic Efficiency of the TPTI

Often, spending more time and expending a few more resources in the initial stages -- especially in TPTI steps 1, 2, and 3 -- could result in significant cost savings to the HPH, a healthier, more vigorous residual stand that will respond better to silvicultural treatments and a more valuable resource at the end of the next rotation. Obviously, results of this type of planning cannot be demonstrated economically at the present given the fact that the implementation of TPTI is essentially in its infancy.

Efforts related to implementing other silvicultural systems around the world have shown, however, that investment in careful forest management planning does have ecological and financial rewards in the post-harvest period. It is not unreasonable to assume that the same should be true for the TPTI, or its off-shoot alternatives. The research and protection activities called for under the TPTI are positive steps in obtaining information that can be integrated in future planning exercises.

The logic presented in the TPTI guidelines allows for systematic monitoring of the various activities and a straight-forward, year-by-year implementation. In the course of our field investigation it was evident in several instances that the rigid universal application of the timing of the activities may be counterproductive given the level of training of the labor actually doing the tasks required. The silvics of the dipterocarps is also a factor in the timing of the TPTI steps and may also have, in some instances, important cost implications that affect investment decision-making by the HPH.

### 2.1.2 Potential Cost Reductions

Taking a specific example, experienced PT. SBK staff feel that conducting the liberation cut (*pembebasan*) and the inventory of the residual stand (*inventarisasi tegakan tinggal, ITT*) in Year Et+1 may be premature. If it is, then the immediate follow-on TPTI steps, nursery/seedling procurement (*pengadaan bibit*), enrichment planting (*penanaman/pengayatan*) and Phase I tending (*pemeliharaan tahap pertama*) could also be affected. At the HPH sites visited and in the course of discussions with PT. SBK staff there were good arguments from an ecological perspective to have more flexibility in implementing these post-harvest steps.

In the logged-over areas it is difficult to determine in Year Et+1 the extent of natural regeneration of many of the commercial species, let alone how the population will develop spatially on the site. This factor has important implications for a liberation cutting team arriving on the site and re-disturbing it. Damage assessment to be done by the ITT teams are also apt to be inaccurate so soon after logging; many of the nucleus trees in the residual stand are still in the process of recovering from the shock of the logging activity. Residual stand mortality also often doesn't manifest itself until several years following harvest.

Professional staff at PT.SBK note that a much more accurate assessment of the dynamics of the residual stand, i.e., damage to residual trees, extent of natural regeneration, and the distribution of surviving poles, saplings, and emerging seedlings, is much easier to identify and analyze two to three years following the harvest cut. (Note that under the TPTI, these activities are required in the first year, Et+1, following harvest.) If this is true, it has not only significant implications for TPTI options, but also could have significant cost impacts for the HPH as well.

By postponing, consolidating, and perhaps even eliminating activities within the TPTI cost reductions could occur at a number of points. A cost savings in the post-harvest steps has the potential for integrating flexibility into the system and providing more incentive to the HPH to invest in activities that are apt to be more beneficial to the residual stand. Cost reduction would occur in a number of areas. First, the direct cost of labor would go down because there is the potential for integrating teams to conduct activities in the same time period. Secondly, a cost savings could also be realized from the indirect costs (administration, transport, equipment, overhead, etc.) associated with the integration or elimination of activities. A third benefit of implementing a more flexible approach would come simply from the timing of the costs in the cashflow -- more resources would be freed up in the years immediately following harvest -- resources that could be invested in other activities. Annex E presents examples of how opportunities for flexibility could be analyzed in a simple cost cashflow analysis. These examples should not be taken as final, but simply as being illustrative of ways that altering TPTI activities could be initially looked at from a cost perspective. Additional discussion on analyzing costs (and benefits) of silvicultural prescriptions are presented in the next section.

## 2.2 Analyzing TPTI Costs

In order to gain a more thorough understanding of the total costs of TPTI activities an in-depth analysis of the implementation of each step is required. Although these analyses are beyond the scope

of this TA, an indication of what is required is discussed in this section, and in the recommendations which appear in subsequent sections.

The objectives of any cost analysis of the TPTI, or any silvicultural system, should include:

- more efficient implementation of specific activities by the HPH, aimed at financial cost savings;
- simplification of the monitoring tasks required by Dinas and the Kanwil; and
- insuring the sustainability of Indonesia's production forest resource base.

An initial step in this process involves obtaining a more detailed understanding of each individual TPTI step activity. This requires an input analysis to examine the physical resource units needed to achieve the targets stipulated by the silvicultural system. It is important to capture data that are used to calculate both direct costs and indirect operational expenses. Unit costs are then assigned and a cashflow developed, most likely for the whole rotation period (e.g., 70 years). A discounted cost analysis using prevailing discount rates is then calculated to arrive at one figure representing an indicative value for the specific TPTI step being examined.

At present, most of these data are proprietary and would require a close working relationship with HPH accounting staff and key decision-making personnel. Proxy values could be used, but would require validation with a number of cases to determine if the data used are within realistic ranges. This could be accomplished by trained HPH staff and through the use of modeling by trained Kanwil and Dinas personnel, or by employing independent consultants to assist with the analyses (as well as provide training in model development and interpretation).

In the course of the field investigation it was learned that the Alas Kusuma Group in Pontianak does use spreadsheet software (QuattroPro) for conducting cashflow analyses. It is not known to what level of detail this is used in examining decision options for TPTI implementation. (One suspects that TPTI indirect costs for all TPTI activities implemented by the HPH are categorized under one general overhead classification.)

The ODA-Indonesia Tropical Forest Management Project is currently developing a cashflow model for direct application in the field. Input values are being collected from a number of HPHs with the aim of developing a better understanding of costs and benefits of the TPTI. Careful refinement, including updates, of this model's inputs

and outputs could prove quite valuable in assessing activities and developing management strategies for natural production forests.

There are also a number of computer software packages currently available that are directly applicable to analyzing forest resource management systems. A couple of these, available at a relatively modest cost (\$100 - \$600 US), might be applicable to Indonesia. They could be applied on a pilot basis, and if successful, training in their use and development could be extended to forest industry personnel as well as Kanwil and Dinas staff who could use them as effective monitoring tools.

One integrated software package, INFORM3 (\$250 US) has received widespread application with a number of silvicultural systems. It has also recently been purchased by the World Bank for use in Malaysia. It includes programs for entering, editing and processing inventory data, projecting tree growth and conducting financial analysis. This software, and similar packages can also be customized to local conditions, and in some cases integrated with GIS data to allow for mapped data layers that can provide valuable planning tools. Other software, such as ACES (\$100 US) and CASH (\$100 US), function as simulators which can provide decision-makers and resource monitors with the opportunity to ask "what if?" types of questions -- again planning tools that would help gain a more thorough understanding of the cost implications associated with silvicultural prescriptions.

On a cautionary note, it is doubtful that any of these software packages could be immediately applied to the TPTI. Our preliminary investigation indicates that close cooperation would be required with the HPHs in order to obtain the data in a form acceptable to these "off-the-shelf" packages. Their use, however, in the forest management planning process certainly warrants further investigation for their application in Indonesia. Preliminary background information on a number of these software packages are presented in Appendix 7.

### III. CONCLUSIONS AND DISCUSSION

Management planning of any silvicultural system must be done in both an ecological and economic context. Although the silvicultural prescriptions may be accurate for insuring a healthy and adequately stocked residual stand, inadequate attention to the real economic costs of implementing the prescribed activities will probably not result in a sustainable system. The investigations conducted in the course of this TA were not adequate, nor were they intended, to provide a thorough assessment of the cost issues associated with the silvicultural system, the TPTI, being applied across Indonesia. This preliminary investigation has revealed, however, that current costing of its related activities is apparently incomplete. It appears that the system only requires monitoring of certain direct costs and as such does not take into account all the indirect costs incurred in implementing the targeted activities. If this does not happen on a wide scale, true economic rent cannot be determined and the overall sustainability of the system could be in jeopardy.

The Indonesian TPTI is essentially a prescription of silvicultural activities. According to the case investigated in this TA the relative costs of implementing the whole system can be broken down, approximately, into three major areas:

- Prefelling (TPTI Steps No. 1-3) 35%
- Harvesting (TPTI Step No. 4) 55%
- Post-harvest (TPTI Steps No. 5-11) 10%

Given this, detailed planning to achieve good cost control and efficiencies in implementation would be most effective if most of the resources were to be concentrated on the prefelling and harvesting. Careful planning at the initial stages has direct impact on the residual stand. Expending more resources at Et-3 and Et-2 can often reduce the extent (and cost) of activities required in the post-harvest steps aimed at maintaining a healthy and adequately stocked residual stand for subsequent harvests.

Although implementation of all the requisite TPTI activities has not been through a complete cycle there are a number of activities, such as the protection and research activities stipulated in Step No. 11, in place that will help provide information for future decision-making. These appear initially to be a beginning for a more complete understanding of the effects of the silvicultural prescriptions called for under the TPTI. Information is very incomplete, however, to make an assessment of the true economic incentives necessary for insuring the sustainability of the system as it is currently being implemented by the HPHs.

A number of points are elaborated below which could help to gain a better comprehension of some of the cost issues which are associated with the TPTI. This is by no means intended as an exhaustive list, but it could be used to guide further discussion, analyses, and research.

- The emphasis of any economic investigation needs to be placed within the context of detailed management planning and implementation for natural production forests. The complementary TAs under the NRMP in this area will also highlight the fact that knowledge gained through economic/financial analysis fits tightly with silvicultural prescriptions.
- More flexibility in implementing the TPTI steps could enhance their success and also be more financially palatable for the HPHs responsible for implementing them.
  - . The TPTI is now applied across Indonesia as one system, regardless of site and access variations. This has significant impact on the assessment of true economic rent associated with the system.
  - . Slight alterations in the timing, or the configuration, of implementing the steps should be investigated for their effects on the residual stand and the resulting costs to the HPH. Improvements to either, or both, could result in better compliance.
  - . Alternatives, or alterations, to TPTI steps such as strip-felling techniques could also be investigated as to when their implementation, and under what conditions, they would be financially viable to the HPHs.
- To obtain a more thorough understanding of the total costs of each TPTI activity pilot studies could be conducted with one, or several, HPHs to conduct a physical input analysis to examine unit costs required to achieve TPTI targets as they are currently defined. This could be subsequently applied to a financial analysis of these costs.
  - . Assuming that one has good growth and yield data for the residual stand, the discounted benefits accruing from the activities (timber and non-timber values attributable to the implementation of the TPTI) could be applied in a net present value cashflow analysis.
  - . The application of existing computer software should also be investigated as a tool for facilitating these analyses. They can also be assessed for their value as both training and monitoring tools (for HPH staff, Kanwil and Dinas officials).

- On a larger scale, the spatial distribution of the residual stand is rarely considered when evaluating second harvest potential. The financial costs of extraction of clumped or highly dispersed distribution could be assessed over a range of site conditions. (One would expect significant cost variations from the initial harvest layout if log haul and skidding distances are changed.)
  - Our investigation also noted that the present re-inventory system (ITT) only includes areas undamaged by log transportation activities. The cost implications of potential and future yields are significant if estimates do not allow for probable losses from road and skid-trail construction.
- Curran and Kusneti (NRMP Report No. 4) noted that the large number of dipterocarp removals from the virgin forests appear not to being "replaced" by significant volumes of in-growth of other commercial species. Without changes in forest industry operations a significant shift in dipterocarp availability at the concession level will affect the type, and certainly the quality, of export products currently manufactured at the mill. A study investigating the impact of this type of development is certainly warranted on an economic scale, if not on a mill by mill basis.
- The impact of specific activities could also be done at the micro scale, perhaps through a series of financial impact investigations through individual thesis research by forestry students and/or HPH research analysts.
  - One example would be to assess the financial implications of tree seedling survivorship 1-2 years following planting (PT. SBK has begun to collect data that could be used as inputs to such a study.) If the data are good, a comparative cost analysis could be done with steps required to ensure adequate natural regeneration without enrichment planting.
  - TPTI guidelines only stipulate the direct costs of planting activities and do not include the numerous indirect costs that a HPH must incur to carry out specific activities. This may be a very important consideration in how the HPH allocates its budget for other (required) activities.
- PT. SBK has also expressed a genuine interest in examining the effects of its *Bina Desa* program on the economy of the area surrounding the concession. Although this is a broad request, and most likely would be case specific, it would provide useful insights to the program and perhaps indicate what specific aspects could be curtailed or enhanced.

#### IV. RECOMMENDATIONS

A number of specific recommendations follow from the discussion above which can be used to help guide the options for follow-on to this assessment. These include:

1. Ensure that financial analyses of HPH operations are integral parts of the overall planning process. These will be most effective in the 5-year operational plans.
2. Conduct at least two pilot studies (one per TPTI step) aimed illustrating the impact of indirect costs on the implementation of the TPTI. Conduct a comprehensive physical input analysis followed by the application of unit costs in each of the steps and apply a discounted cost analysis. (Steps 5 through 8 are good initial candidates for these studies)
3. Investigate the potential for off-the shelf computer software as planning, training and monitoring tools to be used with silvicultural systems applied in Indonesia.
4. Using discounted cash flow analyses (with direct and indirect costs) examine the impact of postponing and/or integrating post-harvest TPTI steps.
5. Encourage financial analysis of specific activities of the TPTI to examine their efficiency as silvicultural tools under the system. Individual thesis research, contracted consultants, and/or HPH research analysts could be employed to examine such issues as planting vs. natural regeneration in the residual stand and what are the real costs of insuring planted tree seedling survivorship to the second liberation stage.
6. Design a case study to examine the economic impact of the *Bina Desa* program, as developed and implemented under one or two HPHs, on the communities immediately surrounding (and inside) the HPH.

## Appendix 1: Terms of Reference Forestry Consultant

### I. 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 a need to strengthen the present field team with additional assistance to examine the economics of activities after logging under the Indonesian Selective Cutting and Planting (TPTI) system. Specific tasks and outputs of this technical assistance are designed to complement the efforts of project counterparts and the long-term advisory team. These are outlined below.

### II. Tasks

1. Meet with MoFr officials in Jakarta for briefing and discussions on the existing TPTI system and MoFr endeavors to formulate a new TPTI system based on the outcome of studies in five pilot areas. Take into account the MoFr guidelines for TPTI implementation. This will be followed by further discussion with the Kanwil in Pontianak.
2. Visit Bukit Baka-Bukit Raya. In collaboration with GOI counterparts and SBK, look at the economics of logging under the Indonesian Selective Cutting and Planting (TPTI) system. Prepare recommendations for modifying the TPTI system. This will include examining forest stocking levels, and estimating growth rates and yields of commercial species, based on field observations and available data.
3. Advise SBK on the statistical validity of SBK's ongoing TPTI research and recommend improvements. Close consultation with LITBANG researchers working at SBK will be required.
4. Review existing research on TPTI (SBK research and others) based on available documents and consultations. Make recommendations for others important areas which should be studied/researched.

### III. Outputs

1. A final report for presentation to the MoFr covering tasks 2, 3 and 4. The draft to be presented and discussed with GOI counterparts in Pontianak and Jakarta, NRM/ARD advisors, SBK and USAID.
2. A seminar on the consultants' findings to be held at the MoFr to be prepared by PH.

### IV. Reporting

The consultant will report to the NRMP Chief of Party working closely with MoFr (PH) in Jakarta, the Kanwil, PH counterpart and the NRM/ARD Forestry Advisor (MoFr), Natural Forest Production Management consultant and other advisors in Pontianak and Bukit Baka and SBK.

### V. Location

Jakarta, Pontianak and Bukit Baka.

### VI. Duration

Twenty-six (26) working days with possible extension.

### VII. Qualifications

1. A master's or preferably PhD degree in Forestry.
2. Ten (10) years' experience working on forestry management issues in developing countries.
3. Good spoken and written English and preferably Indonesian.

## Appendix 2: Consultant's Timetable

13 - 20 Sept 93            **Jakarta:** Initial background research, meetings and discussions with NRMP staff, MoFr and Alas Kusuma Group officials

21 - 28 Sept 93            **Pontianak:** Meetings, discussions and research concerning TPTI activities in West Kalimantan; coordination with Kanwil, Dinas, Alas Kusuma Group, and Litbang via NRMP

29 Sept - 04 Oct 93        **Bukit Baka/Bukit Raya:** Visit PT. SBK field operations and on-the-ground discussions with SBK managers and NRMP field staff

05 - 06 Oct 93            **Pontianak:** Follow-on discussions with Alas Kusuma Group and Kanwil with focus on TPTI activities in PT.SBK HPH in Bukit Baka/Bukit Raya; begin draft report and debrief Kanwil and other interested parties on major points

07 - 09 Oct 93            **Jakarta:** Finalize draft report for presentation to MoFr PH; oral debriefing on/about Saturday, 09 Oct.

Total days:            27, including international travel; 6-day week assumed

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### Appendix 3: Persons Contacted

#### Jakarta, Ministry of Forestry

Ir. Sopari S.W.	Planning & Programming Division Directorate General of Forest Utilization, MoFr
Ir. Iskandar	Planning & Programming Division Directorate General of Forest Utilization, MoFr
Ir. Beringin	Technical Implementation Unit, TPTI Directorate General of Forest Utilization, MoFr
Dr. Alastair Fraser	Programme Coordinator, ODA TFM Project
Mr. Simon Henderson	Agricultural Economist, ODA TFM Project
Mr. Bill Maynard	Research Economist, ODA TFM Project
Ir. Djoko Wahjono	Fakultas Pasca Sarjana, University Gadjah Mada, Yogyakarta

#### Jakarta, NRMP

Dr. Colin MacAndrews	Chief of Party
Mr. Chris Bennett	Forestry Advisor
Ir. Ismail MAZ	Program Assistant, Forestry
Dr. Erik Scarsborough	Macroeconomist
Dr. Ian Armitage	Short-term Consultant, Forest Management Planning
Mr. Art Klassen	Short-term Consultant, Forest Management Implementation

#### Jakarta, Other

Ir. Nana Suparna	General Manager, Forestry Department, Alas Kusuma Group
Mr. Jerry Bisson	NRMP Project Officer, USAID

Pontianak

Ir. Soehendar                      Division Head, Planning & Programming,  
Kanwil, Kalimantan Barat

Ir. Darwis Syukur                  Sub. Project Manager, Litbang

Ir. Sjachrun Sjahibar              Research Staff, Litbang

Dr. Roy Voss                        Forestry Research Advisor, Team Leader  
Kalimantan Barat, NRMP

Ir. Mamat                            Manager of Forestry Activities, Alas  
Kusuma Group

Ir. Fachri Mashuri                  Forester, TPTI, Alas Kusuma Group

Ir. Gusti Hardiansyah              Cost and Research Analyst, Alas Kusuma  
Group

Ir. Joko Hardjono                  Production Forest Management, Kanwil,  
Kalimantan Barat

Ir. Basuki                            Planning & Programming, Kanwil,  
Kalimantan Barat

Ir. Hiar Buchori                    Forest Utilization, Kanwil, Kalimantan  
Barat

Bukit Baka/Bukit Raya

Ir. Adlin                            Logging Unit Camp Manager, PT. SBK,  
Suruyan Hulu

Ir. Kuswadi                        Silviculture Activities Foreman, PT. SBK,  
Suruyan Hulu

Ir. Bambang                        Pre-harvest & Harvest Activities Foreman,  
PT. SBK, Suruyan Hulu

Ir. Mering Ngo                    Social Forestry Advisor, NRMP, Kalimantan

Mr. Elmo Drilling                  Natural Forest Management Advisor, NRMP,  
Kalimantan

Dr. Jim Jarvie                      Short-term Consultant, Taxonomy  
Specialist, Harvard University & NRMP

**Appendix 4:  
English Summary  
Guidelines for the Indonesian Selective Cutting  
and Replanting System**

-- Tebang Pilih Tanam Indonesia, TPTI --

<u>Stage</u>	<u>Timing</u>
1. <b>PENATAAN AREAL KERJA</b> Working Area Organization	Et- 3
2. <b>INVENTARISASI TEGAKAN SEBELUM PENEBAANGAN (ITSP)</b> Stand Inventory Before Felling	Et- 2
3. <b>PEMBUKAAN WILAYAH HUTAN</b> Infrastructure Establishment	Et- 1
4. <b>PENEBAANGAN</b> Felling	Et
5. <b>PEMBEBASAN</b> Liberation Cutting	Et+ 1
6. <b>INVENTARISASI TEGAKAN TINGGAL (ITT)</b> Inventory of Residual Stand	Et+ 1
7. <b>PENGADAAN BIBIT</b> Seedling Procurement/Nursery	Et+ 2
8. <b>PENANAMAN/PENGAYATAN</b> Replanting/Enrichment Planting	Et+ 2
9. <b>PEMELIHARAAN TAHAP PERTAMA</b> Forest Tending, Phase I	Et+ 3
10. <b>PEMELIHARAAN</b> Forest Tending, Subsequent Phases	
A. <b>PEMBEBASAN</b> Liberation	Et+ 4
B. <b>PENJARANGAN</b> Thinning	Et+ 9
C. <b>PENJARANGAN</b> Thinning	Et+14
D. <b>PENJARANGAN</b> Thinning	Et+19
11. <b>PERLINDUNGAN DAN PENELITIAN</b> Protection and Research	Continuous

## 1. WORKING AREA ORGANIZATION

Et- 3

The objective of this step is to determine the annual working areas within the concession. (The TPTI also suggests dividing each working area into cutting blocks of/about 100 ha each.)

### Major activities:

- spatial planning
- aerial photography
- measurement (of what?)
- mapping (1:25K or 1:20K, or 1:10K)
- border delineation (of what, specifically?)
- border markers established for felling blocks and annual work area

## 2. STAND INVENTORY BEFORE FELLING

Et- 2

This is stipulated as 100% cruise (presumably of the annual working area) to determine nucleus (seed/mother) trees that will form the basis of the residual stand, and the trees to be removed. The objective of this inventory is also to determine production (volume) and the annual cut of the felling block. *Presumably, this means both the volume of the residual stand and what is being marked for removal in the annual felling block?*

### Major activities:

- inventory of residual stand trees:  
tally all commercial spp with diameter > 20 cm by species name, stem diameter, description of canopy position of trees in the residual stand; mark w/yellow paint encircling at eye level
- inventory of trees for harvest:  
species name, dbh @1.3 m height, or 20 cm above plank root, and height of trunk to first branch excluding root; mark with a cross using red paint (and stump painting?)
- record the inventory on a map with a scale of 1:2000

## 3. INFRASTRUCTURE ESTABLISHMENT

Et- 1

This step includes road building, location of skid trails and any buildings needed for the harvesting and post-harvest maintenance activities. (*Are nursery sites established at this point, too?*)

### Major activities:

- measurement (of what?)

- mapping (of roads and skid trails?) using scales of 1:25K, or 1:20K, or 1:10K includes data on topography and info on the forest stand
- building roads and bridges meeting specific standards as to grade and durability
- establishing logdeck, logyard, logpond, camps
- establishing inspection trails in nurseries for planting and enrichment activities
- locating, fixing tie-points (*what are these used for?*)

#### 4. FELLING

E

Harvesting is done only within work areas already determined by the annual work plan. Trees marked for harvest have a minimum diameter limit of 50 cm diameter for commercial spp. A 35 cm limit is acceptable for Ramin. Other exceptions to the diameter cutting limit must be specified in the Annual Work Plan which must be approved by the MoF (Kanwil, Dinas??) Felling and skidding should make every effort to avoid damage to the residual stand. Protected and sacred trees (*undefined*) and those growing less than 50 m from springs are not allowed to be felled.

##### Major activities:

- felling
- bucking
- skidding
- loading
- transportation to logdecks and logyards (logpond)

#### 5. LIBERATION CUTTING

Et+ 1

Activities in this step are aimed at increasing the chances of natural regeneration and growth of commercial species in the residual stand, and to make inventory and evaluation of the residual stand easier. It is intended to cover the whole area where cutting has occurred

##### Major activities:

- removing understory shrubs and weeds (horizontal thinning)
- cutting lianes (exceptions for rattan)

## 6. INVENTORY OF RESIDUAL STAND

Et+ 1

This step is intended to assess the damage to the residual stand, determine the location of open spots and to provide an assessment of the extent and type of natural regeneration in the stand. All trees greater than 20 cm (nucleus trees) are inventoried; this is the population that is intended to form the basis for the next harvest. Poles (10-20 cm) are tallied at a rate of 10% and saplings (<10 cm, dbh, Ht>1.5 m) 5%. Standards have been established for assessing what constitutes damage to nucleus trees.

### Major activities:

- inventory of residual stand nucleus trees: includes reinspection all nucleus trees, mother (seed) trees and protected species recording extent of damage on them. The criteria for damage assessment are:
  - . >50% damage to the crown, and/or main branches are broken;
  - . more than  $\frac{1}{2}$  of the bole is girdled; and
  - . more than one-third of the buttress is damaged
  - . damaged nucleus trees are to be replaced by an alternate, marked with species name, diameter, and condition
- saplings and poles: damage assessment is not required
- mapping on a scale of 1:25K, 20K, or 10K is required of the residual stand showing locations of nursery and areas to receive planting or enrichment treatments

## 7. SEEDLING PROCUREMENT & NURSERY

Et+ 2

Nurseries are to be established for each area under the 5-year management plan with seedlings for outplanting to be established from local seed sources, wildings, or cuttings. Preference is to be given to species that will replace those species to be removed from the petaks designated in the management plan -- or to other dominant commercial species of high value. Number of plants grown annually in the nursery should reflect planting targets in the total areas to be planted, including allowances for seedling mortality in the nursery and at the planting sites.

### Major activities:

- nursery site selection (near a water source on level ground and easily accessible)
- collection and planting of nursery stock (from seed, wildings, and/or cuttings)

- daily care of nursery stock under conditions suitable for the species

## 8. REPLANTING/ENRICHMENT PLANTING

Et+ 2

Outplantings of the nursery stock are divided into two categories under this TPTI step. Replanting is called for on all open areas such as logdecks, main skid trails, along roadsides and at temporary camp sites where the soil has been severely disturbed and compacted. The purpose is mainly to reestablish cover for the site. Enrichment planting, the second category, is called for under the guidelines whenever there is inadequate regeneration of commercial species. Residual stand areas with less than 240 saplings/ha, or 75 poles/ha (evenly distributed in the stand) are considered inadequately stocked and require the enrichment planting. The guidelines state that enrichment should be in-line plantings with planting distance adjusted to field conditions and for *the purpose of forest management*. Planting is to be accomplished during the rainy season (Sept to May).

### Major activities:

- field site preparation
  - . site location and mapping (based on the ITT and shown on the residual stand maps)
  - . measurement (determining area and plants required)
  - . construction of infrastructure (trails and hole digging)
- transport and planting of seedlings from the nursery to the site
- planting
- post-planting survival assessment

## 9. FOREST TENDING, PHASE I

Et+ 3

This step consists primarily of release cuttings and horizontal thinnings to lessen competition on the nucleus trees and newly planted species. The guidelines stipulate that this should be done 3 to 4 months after planting. Non-commercial species and rattan that are not competing with the nucleus trees are left alone to maintain soil cover and heterogeneity (especially as alternate species and for non-wood forest products). Tending takes place only in residual stands.

### Major activities:

- underbrush cleaning and beating up
- pest and disease control (*does this mean use of chemicals?*)

- fertilization and addition of mycorrhiza, if necessary
- for nucleus trees: cleaning of lianes on the tree

#### 10. FOREST TENDING, SUBSEQUENT PHASES

This step, a continuation of the tending cited above, is periodic and covers more than one-half of the rotation period. The major objective is aimed at enhancing the growth of the residual stand and facilitating the next harvest cut. Thinning activities are focused on commercial species and are primarily vertical in nature.

##### A. LIBERATION Et+ 4

###### Major activities:

- brush control for planted species
- weed trees cut or girdled

##### B. THINNING Et+ 9

##### C. THINNING Et+14

##### D. THINNING Et+19

###### Major activities:

- vertical thinning to remove trees in serious competition with nucleus trees
- removal of damaged, diseased and suppressed nucleus trees
- thinning at Et+19 may be a precommercial thinning

#### 11. PROTECTION AND RESEARCH Continuous

Activities conducted under this step are continuous during the whole period that the concession is operational. They are broad in scope and take in not only boundary establishment, protection and research, but also include provisions for providing benefits for local communities living adjacent to and within the HPH. Protection activities must have provisions for safeguarding the forests, including employing forest guards, for each five-year management plan with the exact numbers dependent on MOF guidelines. The latter are based on forest condition, topography, nature of the disturbance to the production forest, etc.

###### Major activities:

- protection:
  - prevention of (rill) erosion

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- . fire prevention
- . protection of protected flora/fauna, incl. habitat
- . control of pests & diseases
- . guarding against illegal cutting and squatting
- establishment of a fixed control infrastructure
  - . block and compartment boundaries
  - . fire breaks
  - . firetower construction
  - . forest patrols
  - . extension program with local communities aimed at improving the "quality of life" [*Bina Desa* Program]
- establishment of experimental plot for each forest management unit (*undefined*); aimed at improving information on wet tropical forests (*N.B.: unclear what, if any monitoring is to be done on these plots*)

**Appendix 5:  
Sample Cashflow Analysis for Examining TPTI  
Post-Harvest Activities**

Spreadsheet No.	Contents
1.	Format to Examine TPTI Post-Harvest Activities
2.	Planned Direct Costs, HPH Case Data, 1993/94
3.	Projected Direct Costs from HPH Actual Data, 1993
4.	Sensitivity Analysis A: Effect of Postponing Implementation of Selected TPTI Activities

Source: Discussions with Alas Kusuma Group staff and selected PT. SBK reports (1993)

Activity	Year	El	1	2	3	4	5	6	7	8	9
Pembebasan			XXX								
Inventarisasi Tegakan Tinggal			XXX								
Pengadaan Bibit				XXX							
Penanaman/Pengayatan				XXX							
Pemeliharaan Tahap Pertama					XXX						
Pemeliharaan: Pembebasan						XXX					
Pemeliharaan: Penjarangan 1											
Pemeliharaan: Penjarangan 2											XXX

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Filename: TPTBASE.WQ1  
 CASHFLOW ANALYSIS PRESENTATION  
 TPT1 POST-HARVEST COSTS - BABE CASE  
 Costs expressed in '000 Rupiah

Activity	Year	01	1	2	3	4	5	6	7	8	9	10
Pembinaan			124732									
Inventarisasi Tegakan Dangkal			38403									
Pengadaan Bibit				208431								
Penanaman/Pengayatan				100000								
Pemeliharaan Tanah Pertama					187500							
Pemeliharaan: Pembinaan						180000						
Pemeliharaan: Penjarangan 1												
Pemeliharaan: Penjarangan 2												1000
Pemeliharaan: Penjarangan 3												
Pemeliharaan dan Penebaran		14800	14800	14800	14800	14800	14800	14800	14800	14800	14800	14800
JUMLAH		14800	177737	320031	202100	194800	14800	14800	14800	14800	14800	14800

Discounted Cost Totals:

- Rate = 10%
- Rate = 15%
- Rate = 18%
- Rate = 24%
- Rate = 30%
- Rate = 36%

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**Appendix 6: Debriefing Outline for  
KANWIL, Dinas, & Alas Kusuma Group  
06 October 1993  
Pontianak, Kalimantan Barat**

I. Review of TOR

II. Summary of Visit to PT. SBK Concession

- Contacts
- Site visits associated with TPTI
- Main discussion points with SBK staff

III. Context of Consultancy Report

- Importance of pre-felling TPTI activities
- Relationship to current NRMP short-term consultancies in natural production forest management
- Draft outline of report

IV. Points of Discussion in Draft Report

- Description of main economic variables/activities of each post-felling step of the TPTI
- Opportunities for flexibility in TPTI steps
- Analytical tools of potential use to Kanwil, Dinas and HPH (for economic analyses and monitoring of silvicultural systems)

V. Areas for Recommendations

- Emphasis on management planning
- Examples of issues requiring in-depth analyses and/or assessment
- Recommendations from PT.SBK, Kanwil, and Dinas

VI. Questions

**Appendix 7:  
Background Information on Computer Software Packages  
for Forest Management Planning and Analysis**

## Appendix 8: Selected Bibliography

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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