

**ITTO PROJECT PD 16/95 REV. 2 (F)**

**FOREST HEALTH MONITORING TO MONITOR THE SUSTAINABILITY OF  
INDONESIAN TROPICAL RAINFORESTS (INDONESIA)**

**EX-POST EVALUATION REPORT**

**Submitted to:**

**INTERNATIONAL TROPICAL TIMBER ORGANIZATION – ITTO**

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## ABBREVIATIONS AND ACRONYMS

BIOTROP	Southeast Asian Centre for Tropical Biology
EPA	Environmental Protection Agency (USA) (see USEPA)
EU	European Union
FHM	Forest Health Monitoring (project)
FMU	Forest Management Unit
GOI	Government of Indonesia
ITTA	International Tropical Timber Agreement
ITTO	International Tropical Timber Organisation
LEI	Indonesian Certification Institution
MOF	Ministry of Forestry (Indonesia)
NFI	National Forest Inventory (Indonesia)
NGO	Non-Government Organisation
N.P.	National Park
ref	Reference to List of Documents and References (with serial number of title)
SEAMEO-BIOTROP	See BIOTROP
SFM	Sustainable Forest Management
UNEC	United Nations Economic Commission for Europe
USDA-FS	United States Department of Agriculture – Forest Service
USEPA	United States Environmental Protection Agency (EPA)

## **PART I: EXECUTIVE SUMMARY**

### **1. INTRODUCTION**

ITTO has implemented 5 projects in Asia to provide demonstration areas and model forests for sustainable forest management. One of these is the Forest Health Monitoring Project PD16/95 Rev 2 (F) which has been due for evaluation for some considerable time since the completion of the report at the end of the year 1999.

### **2. EVALUATION PURPOSE AND SCOPE**

The ex-post evaluation had the primary purpose to provide a concise diagnosis with respect to achievements, outputs, reasons for successes and failures, contribution to ITTO Objective 2000, and lessons for future projects.

The scope of the mission was to assess and evaluate the major contributions of the project to the policies of the Indonesian Government and to public awareness, the project's efficiency and effectiveness, in terms of performance, costs and benefits, development and dissemination of scientific knowledge and technical information.

### **3. PROJECT DESCRIPTION**

#### **3.1 Background Information**

The project is embedded in the mainstream development of the assessment and monitoring of the national forest resource which began in the 1960s. It adds an essential ecological and environment component to the current National Forest Inventory (NFI) of Indonesia. Global Climate Change and El Nino Irregularities provide the project with relevance and a sense of urgency.

#### **3.2 Objectives**

The project, Forest Health Monitoring (FHM), is conceived and designed to supply information on the "forest health" as a supplement to the production-orientated NFI.

#### **3.3. Outputs**

The major outputs of the first phase of FHM is the practical testing of a method transferred by the USDA-FS from the USEPA, the establishment of a set of cluster plots for trial, education, demonstration and the creation of awareness of the urgency of the issue as well as the realisation that much more has to be done before FHM can fulfil its purpose.

### **4. CONCLUSIONS**

#### **4.1 Appropriateness and feasibility of design**

- The strategic value of the project design is somewhat obscured by a certain ambiguity and inconsistency of the interchanging use of the terms "forest health", "forest sustainability" and "forest condition".
- The terminology to indicate levels of parameters was also lacking consistency with respect to assessment questions criteria and indicators. These facts cause confusion with respect to the hierarchy of the assessment objectives (productivity, biodiversity, vitality, site quality).
- The unambiguous correlation between some indicators and the subject of assessment or related criteria, such as between biodiversity and health, is questionable. This is also the case for the relation between sub-indicators and indicators such as decaying trees, productivity and health, crown transparency and productivity.

- The consistency of project design (logical framework) was formulated according to the hierarchy of the logical framework. The different levels of the logical structure were consistently distinguished.
- The five specific objectives could have been combined into two or three objectives. Outputs comprise more substance than reference to reports (plots established rather than a report on established plots).

#### 4.2. Participation of stakeholders

- The project development processes distinctly demonstrates a supply driven process. However, little documentation on the actual process of project development was available. The influence of USDA and EPA dominates but that of BIOTROP, Indonesian government departments, provincial and district authorities, forest managers and other forest-related actors and stakeholders, is less apparent.
- Involvement of these actors was insufficient at the inception of the project to assure full consent with project design and unconditional preparedness to integrate the developed monitoring method into the NFI system, but involvement appears to have increased as the project progressed.
- The chief stakeholders are, nationally, the Government, which shows active interest through the MOF. Local stakeholders are concessionaires who take advantage of the FHM plots for training company personnel.

#### 4.3. Efficiency

The NFI management staff might have had a greater input in organisational aspects in the project. Frequent personnel turnover in MOF did not benefit the project process or the effective transfer of knowledge.

The support of the US team seemed to have faded out during project implementation, reportedly, for political reasons.

The evaluation team did not come across convincing evidence of a fruitful and genuine cooperation between BIOTROP and CIFOR in this project, which would have been particularly desirable in the social and socio-economic aspects.

The number of Steering Committee members was limited to five persons. Forest managers (concession holders), were not among the members.

Generally, coordination and cooperation need more attention.

Some methods which have been transferred and some instruments which were used to assess and monitor particular sub-indicators are somewhat old fashioned, difficult to operate and too little accurate. Less labour intensive and more accurate methods and equipment will enhance the feasibility of monitoring in a widespread network.

The financial resources were not sufficient (1) to equip the project with efficient working sampling and monitoring instruments and not quite satisfactory substitutes had to be used instead; and (2) to achieve all intended results.

#### 4.4. Effectiveness

The project proposal states on p.2 and 8 the development objectives as "To determine the current condition of Indonesian forest ecosystems with respect to sustainability, biodiversity (and socio-economic conditions) and subsequently to track changes and trends" and "To enable the GOI to develop appropriate policies for sustainable forest management and utilisation of forest resources".

The evaluation team appreciates this objective which is consistent with the ITTO Criteria and Indicators, and provides the rationale for this project. However, this development objective being

very ambitious, the available and required resources, political will and the potential responses of the GOI have to be thoroughly assessed.

The evaluation team recommends that the development objective to be reconsidered after a thorough analysis of problems and potentials. The outcome of this may provide a realistic basis for the development of a practical programme of assessment, monitoring and application.

- The technology transfer has been rather well accomplished, methods have developed and indicators tested and partly validated for monitoring productivity, biodiversity, vitality and site conditions.
- Establishment of 37 detection monitoring plots including 10 demonstration and 5 training plots, and additionally, 17 plots by MOF in Kalimantan.
- Companies use plots in the FMU as instruction plots for tree species identification.
- Forest Damage Inventory is a new subject in the Diploma Programme in Forest Protection, Bogor Agriculture University.
- The project has trained 129 staff members from 10 regional offices of the Forest Inventory and Planning division and 50 scientists - 36 from Indonesia and 14 from other ASEAN countries.
- Dissemination of project proceedings on methodology – 29 technical reports in 3 volumes.

#### 4.5. Project output achievement and use of resources

The major outputs of the project are the methodological technical reports which, however, fall behind as a result of the disadvantages described in Section 4.2., first bullet and 4.3, second and sixth bullet.

The established 54 plots and future additions, when monitored, will provide a valuable basis for ecological information and research, such as the study of population dynamics and soil genesis. The technical value for research could be further enhanced if expanded to include socio-economic parameters.

Not yet achieved are:

- Technology transfer on linking remote sensing techniques to ground-based NFI plots.
- Data processing and system analysis linking socio-economic parameters with the results of forest monitoring.
- Training at all levels and across stakeholders (academia, forest inventory, government, forest managers, local population).
- Effective transfer of relevant information to target groups beyond those directly involved.
- Preparation of monitoring manuals.

#### 4.6. Impacts and relevance

Major achievements of the project so far are:

- Awareness of forest department and some local government of the significance of monitoring the condition of the forests and for the need to step up the NFI from timber inventory to a more comprehensive inventory reflecting more of the elements which constitute SFM.
- Providing a basis for a common perception and a practical interpretation of SFM by BIOTROP, LEI, CIFOR, MOF, forest managers.

#### 4.7. Sustainability of intervention.

This is threatened by illegal logging, forest clearing and fire.

#### 4.8. Effectiveness as demonstration area

The overall concept is feasible and relevant to national needs and interests. The locations of the two demonstration areas are well chosen, but the plots require further development of their information value.

#### 4.9. Contribution to the achievement of ITTO Objective 2000

The concept and the design and implementation potentially contribute to the achievement of SFM by supplying early indicators of forest decline.

### 5. RECOMMENDATIONS

#### 5.1 To ITTO:

- to consider critically but favourably a new proposal for a new phase and fresh methodological start of the project.

#### 5.2 To the Executive Agency:

- to develop proposals for activities to produce the results which had to be achieved but were not, in the completed project phase.

#### 5.2 To the Government

- to ensure close integration and cooperation between NFI and FHM.

## PART II MAIN TEXT

### 1. INTRODUCTION

Ex-post evaluation of projects is one of the tools for ITTO to further improve its effectiveness and efficiency. Thematic ex-post evaluations are undertaken to gain an integrated assessment on the effectiveness, relevance and impact of projects with a common goal. In 2002 six projects were evaluated in the field of sustainable forest management implemented in Latin America. Five projects pertaining to the same theme implemented in Asia are the subject of evaluation. Thus adding valuable information to the insight already gained from the evaluation of Latin America. The projects in Asia have all been developed with the aim to provide a demonstration area/model forest for sustainable forest management. This particular feature is an important aspect of the evaluation.

One of the five projects implemented in Asia was the ITTO Project PD 16/95 Rev.2, "Forest Health Monitoring to Monitor the Sustainability of Indonesian Tropical Rain Forest (Indonesia) which was executed by SEAMEO/BIOTROP in cooperation with the Indonesian Ministry of Forestry, Republic of Indonesia. This report is the result of the ex-post evaluation of this project. The project was first conceived in the early 1990s, finally implemented in 1996 and completed at the end of 1999.

### 2. EVALUATION PURPOSE AND SCOPE

The primary overall purpose of a project evaluation is to provide a concise diagnosis of the project related to Demonstration/Area/Model Forests for Sustainable Forest Management so as to point out the successful and unsuccessful outcomes, the reasons for success and failures, and the contribution of the projects towards the achievement of ITTO's Objective 2000, and to draw lessons that can be used to improve similar project in the future as well as to make



recommendations on the need for similar projects and on the effectiveness of the demonstration area/model forest approach to promoting sustainable management.

The evaluation was carried out in July 2003, three and a half years after the completion of the project, at the request of the ITTO Secretariat following the decision taken by the Committee on Reforestation and Forest Management in November 2002. A team of three experts studied relevant documents as produced by the projects, visited the project sites and Head Quarters of the Executing Agencies and discussed with local authorities and beneficiaries of the project matters relevant to its assignment.

The evaluation team followed in general terms the guidelines as contained in the ITTO Manual for Project Monitoring, Review and Evaluation and the specific terms of reference (see Annex I). The assessment would focus on project design, efficiency and effectiveness, including the demonstration area/forest model approach to promote sustainable forest management. Subjects for scrutiny and analysis for evaluation of the FHM according to the terms of reference of the mission were in particular:

- appropriateness and logic of design, concept and assumptions
- achievement or otherwise of the objectives
- participation of stakeholders
- efficiency of procedures and use of funds
- impact and relevance for target groups
- actual outputs and resource use compared with the proposal
- effectiveness of resource use
- effectiveness of concept and implementation of demonstration areas
- contribution to ITTO Objective 2000.

The terms of reference spell out the following issues for recommendations:

- The needs for similar projects in the future.
- The objectives of such future projects.
- Innovative approaches/designs for projects aiming at promoting sustainable forest management in the tropics.
- Appropriate target groups, i.e., countries, government organizations, forestry sector, local communities.
- The organizational arrangement of the projects.
- Follow-up and evaluation practices.
- Supplemental, alternative activities, processes, procedures, and/or follow-up programmes in the field of Sustainable Forest Management.
- Further actions needed to sustain or increase the intended effects on sustainable forest management and Objective 2000 and to draw conclusions which may be of relevance to other ITTO projects in the field of sustainable forest management.

### **3. THE PROJECT, PD 16/95 REV. 2 (F) FOREST HEALTH MONITORING TO MONITOR THE SUSTAINABILITY OF INDONESIAN TROPICAL RAINFOREST (INDONESIA)**

#### **3.1 Background Information**

The project is embedded in the mainstream development of the assessment and monitoring of the national forest resource which began in the 1960s. It adds an essential ecological and environment component to the current National Forest Inventory (NFI) of Indonesia. Global Climate Change and El Nino Irregularities provide the project with relevance and a sense of urgency.

#### **3.2 Objectives of the Forest Health Monitoring (FHM) Project**

Already in the 1960s, the precursor of the current Indonesian National Forest Inventory adopted a camp-unit cluster design to facilitate fieldwork in the logistically difficult rainforest in a

statistically acceptable manner. In 1989, the current National Forestry Inventory (NFI) continued the concept by adopting a similarly efficient cluster pattern. The design includes clusters of nine one-hectare plots, eight of which are temporary and one permanent. The clusters are systematically distributed on a 20km grid. The focus of the NFI is on production. The objective is to sample, estimate and monitor commercial timber volume, volume increment and losses (mortality, area) of the forest growing stock.

The Forest Health Monitoring (FHM) was conceived in 1995 as an ecological supplement of NFI to supply data on what were considered to be primary indicators of "forest health". "Forest health" was assumed to be indicated by selected parameters of tree productivity (diameter growth), crown projection, trunk quality, damage, biodiversity of the tree population, canopy complexity (storeys), kind and quantity of surface litter and humus, plant- available (exchangeable) bases in the mineral soil, by-passing direct cycling. A simple, linear relationship between these parameters and health was postulated, but this assumption may not hold in all cases. Some of the parameters may, in cases, be not or only loosely associated with the condition of "forest health". Consequently, the assumption that suitably calibrated and in combination, these parameters jointly would indicate forest ecosystem health and general condition as a value on a scale, may not stand up to scrutiny.

The assumption, however, that long-term monitoring should reveal status, change and trends (ref. 5) is plausible. The general objectives of the FHM Project are consistent with and relevant to national policy reviews which are politically unavoidably forced on government by the forest resource decline and the impending threat of Global Climate Change.

The addition of socio-economic parameters is being contemplated for the obvious reason that the political, social and economic conditions in the environment cause indirect and direct impacts which affect forest health.

The original proposal for an FHM project contained the following specific objectives:

- (1) identification (and definition) of indicators and techniques which are suitable for assessing and monitoring forest (ecosystem) health and its changes by measuring certain parameters; amend these with socio-economic indicators;
- (2) design and implementation of FHM sampling within the NFI scheme and to report on the establishment of the FHM in natural and plantation forests in technical reports;
- (3) establishment of special demonstration and training plots in various forest types and conditions for the benefit of Indonesia and the Southeast Asian region;
- (4) linking remote sensing with ground monitoring in the combined NFI and FHM schemes, and to report on the result and the chances to use information on changes in the A-storey of tropical rainforests and planted forests as an early warning signal;
- (5) use of FHM data for scrutinising NFI data on productivity and report the results with respect to productivity (increment).

### 3.3 Outputs

The outputs are the training of personnel, the establishment of plots, the preliminary development of a tentative procedure and the initiation of a link with NFI. Details are given in section 4.5.

## 4. CONCLUSIONS

### 4.1 Appropriateness of design

The project has been designed without prior formal problem analysis and goal definition, and without benefit of the logical framework, which was not available yet. Consequently, the project

was not designed in focussed, goal-orientated manner. The project purpose and objectives were defined in general terms and a technique which was developed for temperate forests by the USDA-Forest Service and offered to Indonesia, was adopted and applied with little change to achieve these objectives.

The requirement to complement the NFI determined the pattern of plot distribution and, to some extent, of plot design. Plot positions had to coincide with the permanent sample plots of the NFI and their design had to be compatible spatially and procedurally with that of the NFI. The plot geometry followed the USDA-FS example, but might have been simpler to suit the difficult working conditions in tropical rainforests.

The intended addition of socio-economic parameters to the FHM scheme poses a problem to data collection and data synthesis which has not yet been satisfactorily solved. The plot clusters are located in the forest while the socio-economic data have to be obtained from neighbouring migrant or settled ethnically diverse communities. The subsequent data processing and synthesis require a concept of multi-tiered and complex system model structure which has still to be evolved.

The procedures and parameters for sampling in the forest plots were copied from the "Forest Health Monitoring Field Methods Guide" of the USDA-FS/EPA (ref. 10) with hardly any modification. Some notes in this guide apparently indicate that it had been modified in 1997 by the USDA-FS for use in the Baltic States of Europe, but not for use in the tropics. It was offered to BIOTROP for use in Indonesia, obviously without substantial alterations to the procedures, descriptions or illustrations (ref. 11). Neither does the guide or accompanying correspondence refer to the long-standing experiences with forest decline surveys and mature procedures of the forest condition monitoring in the EU or to the UNEC for Europe Sampling And Monitoring Manual, 1994. The USA team also supplied to BIOTROP a manual on quality standards of performance, the so-called Quality Assurance Project Plan (ref. 9) which is universally applicable. The manual is relevant and useful to the FHM Project. It contains definitions of high quality standards to assure high quality standards of measuring and evaluating its project such as the FHM.

The selection of the locations for the first FHM trial and the demonstration and training plots are satisfactory for the purpose. However, some underlying assumptions on the relationship between island size and stress for forest ecosystem have subsequently proved untenable. After establishment, unforeseen events such as illegal logging, fire and clearing for agriculture destroyed some plots.

The mensurational difficulties of measuring, logistic obstacles to reach plot locations and, consequently, the high costs of operating the FHM as a large-scale sampling scheme favour close integration and simultaneous execution of measurements of NFI and FHM. For the same reason, a suggested increase of sampling intensity from the 20km grid of the NFI to a 10km grid of the FHM, which would cause a 4-fold increase of the number of plots, appears impracticable, at least premature. Any decision in this direction must be based on a thorough cost-benefit analysis of a sufficient database.

#### 4.2 Participation of stakeholders

Major stakeholders are, nationally, the Government of Indonesia, the Ministry of Forestry (MOF) and the general public. The MOF is obviously positive and very interested to develop the FHM into a practicable sensor of condition, change and trends of forests in Indonesia. The MOF seems to welcome full integration of the FHM into the NFI.

Whether the public takes a real interest and actually feels concerned is open to question. Public attitude will depend on the effectiveness of future publicity campaigns, including effective demonstration of the programme, field activities and results by the MOF and BIOTROP in the media, in schools and in demonstration plots in the forest. The training plots in Gede Pangoro N.P. and Gunung Walat Educational Forest, for example, are ideally placed and suited for the purpose (ref. 8). The local timber companies seem to be interested in using the FHM plots for training their staff in timber tree species identification.

Potentially, local populations, timber concessionaires and other land-users are likely to benefit from the information which is expected to be produced by FHM. Also likely to benefit from the information are research institutions in the field of phenology, ecology, environment, especially those concerned with the effects of climatic fluctuations and change on the environment. Finally, the Indonesian Government will depend on it for the formulation of policies.

The Steering Committee was involved from the beginning of designing the project and included: (Members to be added by BIOTROP)

#### 4.3 Efficiency

##### (1) Organizational

The project team under Professor Suriyanto gives the impression to be highly motivated and familiar with the aims, strategies and procedures of the project.

The demonstration to the evaluation team of the field work in FHM plots in Gede Pangoro N.P. and Gunung Walat Educational Forest indicated a high standard of training of the team, but efficient performance is hindered by the use of inadequate instruments and procedures which should be corrected and updated as soon as sufficient funds become available.

A comparison of work input in 21 plots between NFI and FHM plots has indicated a considerably higher input per unit area in the FHM plots. This is a cautioning against an increase of sampling intensity (density of plots, frequency of re-measurement). This relatively high input may be the result of the use of less efficient instruments and laborious techniques as a result of shortage of funds (see above) and, the academic nature of the project design and narrow focus. This could be mitigated by closer cooperation and eventual integration of the FHM in the broader context of assessment and monitoring procedures of the NFI.

The Steering Committee of five members is selected from a narrow professional segment. Major stakeholder and interest groups are not yet represented.

##### (2) Financial

The requested and allocated funds were not sufficient to meet the ambitious targets of the project. However, as long as the focus and definition of "forest health" are vague, simple linear relationships are a crucial assumption with respect to essential cause-effect chains, and the trustworthiness of some indicators is unproven, a slow start with low funding seems adequate and prudent. Under these conditions, a slowly progressing trial-and-error period is less risky than a well-funded rapid start. Therefore, the scant funding of the initial phase of the FHM project appears appropriate, even if this has involved the application of not fully satisfactory technology (e.g. a very rudimentary soil sampling procedure with unsophisticated instruments, very subjective visual canopy density measurement by an obsolete type of "densiometer").

The very comprehensive audit reports by an independent auditor, Messrs. Moermahadi & Co., Registered Public Accountants, for the financial years 1996, 1997, 1998, 1999 and 2000 give evidence of prudent spending within the estimates and testimony of conformity with International Accounting Standards.

On 31<sup>st</sup> December, 2000, when auditing ended, only US\$10,155.23 remained unspent. This was spent on publication cost, in agreement with ITTO

#### 4.4 Effectiveness

The somewhat ambiguous project objectives, the project's irritatingly foreign design and the low level of funding do not immediately suggest that scientific edge position and operational practicability are achievable. The available human and financial resources are scant. However, the presentations and discussions at SEAMO-BIOTROP, Bogor, produced evidence of awareness of the fact that forest health, while being an elusive concept, is very likely to become

an important practical issue in future. It is very probable that social pressures and environmental changes will push forests outside and beyond the "normal" range of health fluctuations into the range of permanent instability, decline and collapse. Consequently, when this happens, a well-tested and operational methodology would have to be available to diagnose the state of forests and landscapes effectively.

The project has not developed beyond the initial development-by-trial phase. Work is being done effectively in the field and in the laboratory within restrictions caused by the financial limitations and the methodological inadequacies. The effectiveness of the project as a whole can only be assessed and judged fairly after it has been methodologically updated, financially up-graded, integrated in the NFI scheme and thus become fully operational.

For the same reasons and because of lack of evidence, the effectiveness of the six training courses for Malaysia, Cambodia, Thailand, Philippines, Myanmar and Vietnam, cannot be assessed. The effectiveness appears to have been satisfactory for the Indonesian participants and Indonesia.

#### 4.5 Project output achievement and use of resources

Outputs of the project are the following achievements:

- (1) 29 technical reports published in 3 volumes (ref. 7) describe methods and results of the plot samplings. Some tentative survey results on socio-economic and cultural conditions (Report No.27 in ref. 3, No. 28 in the full length collection) cannot yet be procedurally linked to the forest plot sampling. This is due to the existence of an intrinsic sampling and processing problem which the Evaluation Team suggested to solve in cooperation with CIFOR, to which both sides agreed.
- (2) Establishment of 37 cluster sample plots (so-called detection-monitoring plots). Of these, 10 are demonstration plots and 5 are training plots. 3 plots were destroyed by fire following illegal logging and 2 by illegal logging alone. This equals 13.5% of all plots in five years and indicates a serious threat to NFI and FHM. The MOF established 17 cluster plots in the Malinau and Nunukan areas, North East Kalimantan.
- (3) Training of 129 Indonesian staff from regional offices of the NFI/MOF and 50 ASEAN scientific personnel from Indonesia, Malaysia, Cambodia, Thailand, Philippines, Myanmar and Vietnam.
- (4) Technology to link ground and aerial data was tried at a preliminary and very restricted scale. The project could not produce its own remote sensing data, as videography could not be made available by MOF. It is doubtful that at this early stage of development videography would have produced the results which were expected. The air-ground data link was not yet established, concrete result concerning the feasibility of the FHM system as an early warning system could not be expected.
- (5) Technology for use of FHM methods and software to analyse productivity (Reports No.13 and 14 in ref. 3). These reports do not give precise details of mensurational methods, statistical mathematics and the effects of oscillations of growth and growth-affecting factors (especially climatic factors) on productivity as indicator. Consequently, the value as output cannot be assessed.

The completion report somewhat surprisingly states that "The increment of annual diameter growth was found to be of little importance and, hence, it is suggested that diameter growth measurement should -only- be monitored every 5 years." (ref. 3, p.4, (1.10)). It was not quite clear what the authors really meant. Also for this reason, the question of the suitability of diameter increment as indicator of health remains open. The notorious mensurational problems of changes of trunk diameter and crown size (ref. 3, p.4, para 2) will have to be reviewed and solved before their value can be assessed and decisions can be made.

- (6) Raising awareness of the MOF and some local governments of the need for monitoring the states and processes in the permanent forest estate and to extend the scope of the NFI to include ecologically, economically and socially relevant parameters to provide essential information for SFM. This output is of great value.
- (7) Academic impact and general dissemination of information at least among forestry professionals and practitioners seems to be satisfactory. Forest damage assessment, inventory and monitoring has been included as subjects in the diploma programme in Forest Protection at the Faculty of Forestry, Bogor Agricultural University; field practices are conducted for students and FHM personnel in Gunung Walat Educational Forest; 3 volumes of technical reports have been published but still require rigorous editing; use of FHM plots by companies to train personnel in timber species identification which may improve the security of the plots; enhancement of the appreciation of tropical rainforest and plantation forest as ecosystem (ref. 12).

#### Under-achievements

Shortcomings of general nature are:

Cooperation, mutual contribution and coordination were at best weak, sometimes non-existent, during all phases of the project between the principal interest groups of BIOTROP, LEI, CIFOR, MOF and forest managers in concession areas. However, the use of the NFI plots as location of FHM plots paves the way for coordination, cooperation and integration, which will ease amalgamation of NIF and FHM.

The straight adoption of the USDA-FS and US-EPA blueprints (ref. 9, 10, 11) almost automatically, led to the alluring, but fallacious assumptions of general causal inter-relationships, linear correlations and functional associations between "forest health" and such parameters as productivity, biodiversity, decay, damage, mortality, crown transparency and canopy density. The adoption was in the framework of technology transfer and the AE recognises that these assumptions require thorough scrutiny, and that USA guide (ref. 11) need to be adapted to the conditions of the Indonesian rainforest.

Effective scrutiny, testing and adaptation have been further hindered by the cancellation, for security reasons, of a second visit by the USDA-FS team to Indonesia.

More specific shortcomings are:

- (1) failure to link remote sensing with monitoring on the ground
- (2) not really efficient data management and evaluation
- (3) not training and educating stakeholders who are outside the NFI and FHM
- (4) weak information dissemination, especially to politicians, national government, NGOs and members of the civic society.

#### 4.6 Impact and relevance

##### (1) Impact

The project has already contributed to the growing awareness and anxiety among politicians, bureaucrats, the academia and segments of the public that forest resources decline and the health of forests and landscapes, and the people in them, may be threatened. Eventually, the project is also likely to develop the urgently needed, practical and problem-orientated instrument of monitoring the conditions and processes in natural and man-made forests. This will not only have an impact on the forest and environmental policies of the Government of Indonesia, particularly, of the MOF, but also on the efforts to restore and secure forest and forestry sustainability generally.

##### (2) Relevance

The rationale of the project lies in its development objective "To determine the current condition of Indonesian forest ecosystems with respect to sustainability, biodiversity (and socio-economic conditions) and subsequently to track changes and trends". The relevance of this very ambitious objective is based on two issues. First is the international concern about sustainable socio-economic development in Southeast Asia and, related to this, about global and regional atmospheric pollution and the consequent long-term climatic changes which affect forests, forestry and agriculture. The second issue is the national concerns about the natural and man-made events which have affected and diminished the forest resource in Indonesia in recent decades. These events are chiefly illegal logging, exploitative and careless overlogging, encroachment by temporary shifting or settled agriculture, deforestation to plant trees, and more recently destructive overlogging by "investors", that is, licensees, of forests approved by District Authorities as community forest in customary communal territory. All these events have damaged and continue to damage and destroy pristine forests (vegetation, water, soil), managed natural and planted forests at large scale. Consequently, these led to forest resource and environmental decline. This resource decline and destruction may be seen as a general deterioration of forest health and FHM will have to provide information on this persistent phenomenon.

### (3) Conclusion on impact and relevance

In assessing effectiveness, impact and relevance, it must be clearly recognised that measurements as in this project (especially of diameter, crown diameter, soil chemistry, litter thickness) will produce useful and reliable data only after several periodically repeated and consistent measurements of high mensurational standard and efficiency. Therefore, the proof of change and reliable results will become politically, economically and operationally acutely relevant and useful only after a considerable period of monitoring. In temperate forests, at least 10 years of change and monitoring are needed, in tropical rainforests definitely more. Three cycles of measurements of the National Forest Inventory, i.e. 15 years, appear to be a minimum. The alternative to measure the FHM plots more frequently, i.e. annually, may be desirable, but is impractical. The conclusion is that efforts to improve FHM technology should be stepped up immediately.

### 4.7 Sustainability of interventions

Experience has already shown that there is a chronic threat that FHM and NFI plots are damaged or destroyed completely by fire, illegal commercial logging and interference by local people in the form of cultivation, timber theft or vandalism and, more recently, assertion of communal customary territorial claims and forest land rights (e.g. forest destruction in the Malinau area).

The sustainability of FHM is linked to the sustainability of the NFI which depends on government's policy and its enforcement.

### 4.8 Effectiveness as demonstration area

The effectiveness of the concept of the FHM project suffers from two deficiencies. Firstly, an inconsistency of use and vagueness of definition of such crucial terms as sustainability, biodiversity, productivity and forest health cause ambiguities and uncertainties. Secondly, a lack of structural consistency within the logical framework creates a certain vagueness and imprecision of indicators, means of verification, assumptions and hypotheses.

These deficiencies of more conceptual nature impair the usefulness of the established monitoring, training and demonstration plots and the training courses. Lack of consistency and logical structure stands in the way of the development of a holistic, ecosystem-orientated methodological approach. Without such integrated, interdisciplinary approach, "forest health", however defined, cannot be successfully monitored in such complex and dynamic ecosystem as the tropical rainforest.

The concept of the project suffers from the intrinsic elusiveness and vagueness of the term "forest health" and the complexity of interactions, non-linearity of correlations and spuriousness of associations in the real forest ecosystems which it aims to monitor.

The project in its present configuration is intended and designed for application at large-scale within the NFI programme at national policy level. The design had to be thoroughly restructured and adapted if it were to be applied at district or forest management unit levels as a source of information for developers and managers.

#### 4.9 Contribution to the ITTO Objective 2000

The project, if it were well designed in accordance with the political situation, natural conditions and socio-economic needs in Indonesia and applied suitable methods, would definitely be able to contribute to the achievement of the ITTO Objective 2000.

This applies to the achievement of sustainability in general and, in particular, at national level with regard to the ITTO Criterion 3, Forest Ecosystem Health and Condition, however elusive these terms may be.

### 5. RECOMMENDATIONS

#### 5.1 - To ITTO

- (1) The situation of forestry and forests in Indonesia gives the FHM and NFI projects political weight and technical urgency. FHM should, therefore, be continued with the following recommended considerations and conditions.
- (2) Promote by advising communication and cooperation between the FHM Project and similar projects and programmes outside the region, especially with member states of the EU and the coordinating centre for the forest condition monitoring in Europe.
- (3) Require that a proposal for the continuance of the project contains an account of the development of the proposal including details on participations and consultations.
- (4) The budget should provide adequate funds to achieve the objectives with assured high standards of performance. The estimates should be scrutinised accordingly.
- (5) The very active reporting and widespread dissemination of information should be continued in a future phase.
- (6) Ensure adequate qualification and independence of consultants.
- (7) Ensure that post-project evaluations are carried out soon after submission of the completion report.

#### 5.2 - To BIOTROP as executing agency

- (1) In a possible project proposal to ITTO, provide documentation on the project development process in particular with respect to involvement of stakeholders and the degree to which ownership is perceived.
- (2) Reconsider the development objective based on a blueprint exercise (assessment of means, resources, socio-economic environment and political will) and possible policy options. The outcome of this exercise may provide a realistic basis for the development of a practical monitoring programme and a plan for its implementation.
- (3) Review and reformulation of goals, objectives, including a formal problem analysis within the ITTO logical framework. Be specific and unambiguous about the object of assessment, forest sustainability, forest condition or forest health. Match the objective of future activities with a feasible blueprint of the resources, means, social environment and political will necessary to accomplish that objective.
- (4) Develop criteria for prioritisation for expanding FHM further into the NFI network; pass on monitoring concepts, methods and results continuously on a joint venture basis to the NFI Department of MOF.



- (5) Upgrading of concept and design, including evaluation of respective experiences of the EU forest-condition monitoring programme.
- (6) Scrutiny of assumptions and hypothesis with respect to their scientific soundness and technical practicability.
- (7) The relevance, soundness and effectiveness of indicators must be carefully scrutinised and only indicators which are practical, trustworthy and scientifically sound must be applied.
- (8) The feasibility, means and effects of including social and socio-economic indicators must be investigated, if possible in conjunction with CIFOR.
- (9) The feasibility of including meteorological information in the database and to add pest and disease observations in plantation FHM plots, especially with a view to the possible effects of regional and global climate change, should be considered.
- (10) Consider the practicability of renewed attempts to link remote sensing techniques to the ground-based FHM and NFI plots.
- (11) A practical guide or field manual for use in ASEAN and focussed on Southeast Asian conditions should be prepared for planning, field work and training to replace the USDA-FS manual.
- (12) FHM must be fully merged with the NFI of which it will form an integral part.
- (13) The sampling design and techniques and instrumentation must be scrutinised and brought up to the state-of-art; adequate funding must be requested based on carefully considered and scrutinised cost and benefit estimates.
- (14) The possibility and practicability of developing a separate FHM scheme to supply reliable and sufficient information for FMUs, administrative districts and possibly for provinces should be investigated; such scheme could be part of the permanent sample plots required by forest certification schemes and provide education and training to managers, administrators and the public.
- (15) Continuance of training after revision of the FHM procedure for national FHM; develop curricula for the FMU and district levels if FHM at this level should have proved feasible.
- (16) After completion of recommendations 1-4 and 7-9, continue with training for non-Indonesian personnel from ASEAN (ref. 3, Annex 1; 12).

### 5.3 - To the Government

- (1) Ensure close integration and cooperation and cooperation between NFI and FHM.
- (2) Take appropriate and effective action to safeguard the integrity of all NFI and FHM plots.
- (3) Develop and implement a scheme of public relations and education to make full use of the plots for demonstration and education.

## ANNEXES

### ANNEX 1. List of documents and references

1. BIOTROP (1996). Report on Training Workshop on Forest Health Monitoring, 6.-20.9.1996, Bogor, Indonesia. BIOTROP/FHM/96/907.
2. BIOTROP (1997 – 2000). Forest Health Monitoring Training. 8 Course and Workshop Reports, cyclostyled.
3. BIOTROP (2001). Forest Health Monitoring to monitor the sustainability of Indonesian Tropical Rainforest. Completion Report, 31.3.2001.
4. BIOTROP (1996 – 2000). FHM – Progress Reports, 1.1. – 31.12.1996; 1.1. – 31.12.1997; 1.1. – 31.8.1998; 1.1. – 30.11.1998; 1.1. – 20.3.1999; 1.1. – 27.8. 1999; 27.8.1999 – 15.3.2000.
5. ITTO–MOF–BIOTROP–USDA-FS (undated, probably 1996). Project Identification. Cyclostyled handout.
6. Indonesian Government (1994/5). Project Proposal Forest Health Monitoring to monitor the sustainability of Indonesian Tropical Rainforests. PD 16/95 rev. 2 (F).
7. Stuckle, I.C., Siregar, C.A., Supriyanto, Kartana J. (eds.) (2001). Forest Health Monitoring to monitor the sustainability of Indonesian Tropical Rainforest. Vol. I – III.
8. Supriyanto, Kasno, Nuhamara, Siregar, Sutisna, Putra, Dharmawan, Irawan (2003). Training Plot of Forest Health Monitoring: - at Gede Pangaro National Park; - Gunung Walat Educational Forest, Sakumi, Bogor; - Malinau Forest District, East Kalimantan; - Implementation in Nunukan Transboundary Forest.
9. USEPA – EMAP (1995). Forest Health Monitoring, Quality Assurance Project Plan for Detection Monitoring, EPA 620/r – 95/002.
10. USDA-FS (1997a). Forest Health Monitoring, PDR Guide. USDA FS, Wash. DC. 20090.
11. USDA-FS (1997b). Forest Health Monitoring Field Methods Guide (International – Indonesia 1997). NFHM Program, NC 27709, R. Mangold (ed.).
12. MOF-ITTO-BIOTROP, USDA-FS (1995 – 1999). Training Courses in Forest Health Monitoring. Educational Report 1 – 6.
13. SEAMEO BIOTROP PD16/95 Rev.2 (F). Statement of Activities for the period from January 1, 1996 to December 31, 1999 (incl. financial statement).
14. Moermahadi & Co. (2000). Annual Audit Reports for the financial years 1996 to 2000.
15. In addition to these published material in the list of references, the mission studied numerous loose-leaf documents, forms and reports.

## **ANNEX 2. List of Consulted Persons, Project Personnel of PD16/95 Rev. 2(F)**

### **1. Briefing at BIOTROP, 5.7.2003**

The meeting was attended by 25 persons, representing SEAMEO-BIOTROP (8), Forest Planning Department, MOF (6), Biro KLN, MOF (4), Litbang Kehutanan (2), Forestry Faculty, IBP (2).

### **2. De-briefing at BIOTROP, 15.7.2003**

12 persons, SEAMO-BIOTROP (5, Prof. Suprianto, Project Leader, Dr. D. Setiawan, Ir. E.I. Putra, Ir. U.S. Irawan, Ir. I.W.S. Dharmawan), Litbang Kehutanan (2, Dr. C.A. Siregar, Ir. U. Sutina), Forestry Faculty, IPB (2, Dr. S.T. Nuhamara, I. Kaso).

Most of the participants on 15.7.03 also joined the field demonstrations on Sunday, 6.7.03, in Gede N.P. and Monday, 7.7.03, in Walat Educational Forest.

### **ANNEX 3. Travel Itinerary of PD 16/95 Rev. 2 (F)**

- 4. July, Friday Briefing the mission on both projects at the Ministry of Forestry, Jakarta, attended by representatives of FORDA, CIFOR, INHUTANI I and II, and 3 others.
- 5. July, Saturday Briefing the mission on PD16/95 Rev. 2 (F) at BIOTROP, Bogor, attended by 22 Indonesian persons.
- 6. July, Sunday Demonstration of plot procedure in an FHM plot in near-natural forest in Gunung Gede, Parango National Park.
- 7. July, Monday Demonstration of plot procedure in an FHM plot in planted forest in Gunung Walat Educational Forest.
- 10. July, Thursday Visit to a newly established native-community forest in the Bulungan region, Kalimantan Timur, to witness the wholesale destruction of the forest ecosystem by an "investor" under contract with the village community, as one of the threats to sustainability of the FHM programme.
- 15. July, Tuesday Debriefing at BIOTROP, Bogor and in the afternoon at the Ministry of Forestry, Jakarta

#### **ANNEX 4. Terms of Reference of ex-post evaluation**

The terms of reference “**Ex-Post Evaluation of ITTO Projects in the Field of Demonstration areas/Model Forests for Sustainable Forest Management implemented in Asia**” have been issued in an 18-page document, April 2003, for:

1. PD 105/90 Rev.1 (F) Phase I, MFMA, Malaysia
2. PD 14/95 Rev.2 (F) Phase II, MFMA, Malaysia
3. PD 14/92 Rev.2 (F)
4. PD 16/95 Rev.2 (F) FHM, Indonesia
5. PD 12/97 Rev.1 (F).