Development of an integrated approach to the implementation of forest management and decision support tools for DFID forestry projects in Brazil and Guyana.

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Department For International Development,
Dendrogene Project, Belem, Brazil

P.R. van Gardingen[+]

[+]Institute of Ecology and Resource Management
The University of Edinburgh, School of Agriculture
West Mains Road, Edinburgh EH9 3JG
SCOTLAND
Phone: +44 131 535 4066
Mobile: +44 7718 925 969
Fax: +44 131 667 2601
Email: p.vangardingen@ed.ac.uk

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Executive Summary

This report was commissioned by DFID Brasilia to consider the potential for enhancing linkages between the *Dendrogene* project in Brazil and the Guyana Forestry Commission Support Project in Guyana. The consultancy followed initial contacts with the *Dendrogene* project to discuss possible applications of the management tool SYMFOR in Brazil. SYMFOR was developed for application in the Dipterocarp forests of Indonesia under a DFID Forestry Research Programme project (R6915).

This report concludes that there is significant potential to increase the development impact of DFID projects by developing improved linkages between projects and better integration of the software tools that they use. Specific recommendations are made in relation to the *Dendrogene* and GFC projects. It is also suggested that these projects would benefit from increased co-operation with other projects in the region, particularly the Iwokrama and ECTF/Barama project in Guyana. The interest shown in developing a version of SYMFOR for the Amazon illustrates the potential for wider linkages between DFID forestry projects.

The development of a more integrated approach to the implementation of forest management and decision support tools by DFID forestry projects would be associated with additional costs which are unlikely to be funded from existing project budgets. This issue, will therefore require a dialogue between projects and DFID management to establish the need and desirability for such activities and possible sources of additional funding

Summary of Recommendations

This section contains a summary of the recommendations contained in this report.
These are collated by section.

Section 3.2 Applications of TREMA

1 The *Dendrogene* and GFC projects should jointly review their requirements for software tools to support the storage, processing and analysis of inventory and sample plot data. There is an opportunity to develop a system that strengthens linkages and common requirements by building on previous experience (including TREMA). End users of the information should be involved in the design process.

2 The projects should consider adopting the concept of a common "minimum dataset", format and naming conventions to promote sharing of information and tools.

3 The software tools should be implemented for use in the Windows environment to be compatible with other applications. If the system is to be developed from the DOS version of TREMA, this should be done by design and re-implementation, rather than translation from the DOS system.

4 The design process should stress the application of pre-existing software tools when possible. The package requires a direct link to standard mapping (/GIS) packages such as ArcView or Surfer.

Section 3.3 Applications of Dendrobase

5 Potential applications of the Dendrobase to generate genetic and spatial data for use by spatial growth models should be evaluated by the *Dendrogene* project. This could enable the integration and assessment of the importance of aggregation of species to link genetic and ecological indicators of sustainability.

Section 3.4 Applications of Ecogene

6 The growth and mortality functions implemented in Ecogene should be updated to make them more closely related to the growth and yield models applied by the *Dendrogene* project.

Section 3.5 Applications of CAFOGROM

7 The cohort-based growth and yield model currently being developed for Guyana is the appropriate tool matching existing needs with data and availability of local skills.

Section 3.6 Comparison and choice of growth and yield models

8 The choice of an appropriate growth and yield model to be applied as part of the *Dendrogene* project requires more specific determination of needs by the project. The project should foment dialogue with other interested parties to seek definition and linkage with more general management needs.

9 The performance and outputs of the CAFORGROM and SYMFOR models should be compared using the same datasets. This work should then lead to a decision tree for the choice and application of these tools. DFID's Forestry Research Programme should be approached to consider a strategic comparison involving more than one target country or region.

Section 5 DFID Guyana Forestry Commission Support Project.

10 The GFC project should establish a working group on growth and yield and silviculture involving all relevant stakeholders and organisations. This group should act as a focal point to identify the need for and stimulate further work in this area.

Section 6.1 Iwokrama Project

11 The Iwokrama project should be encouraged to evaluate the relevance of management tools being developed by DFID under the *Dendrogene* and SYMFOR projects. The evaluation would need to consider potential sources of funding for activities to implement these tools by Iwokrama.

12 Iwokrama staff and counterparts should be invited to any planned joint meeting of the *Dendrogene* and GFC projects to discuss sharing of management tools and information.

Section 6.3 Tropenbos Guyana Project

13 DFID should monitor the implications of the closure of the Tropenbos Guyana project planned for 2001. The suggested establishment of a NGO to take responsibility for the plots and associated research should be supported.

Section 7.1 Linkages between software tools to develop integrated forest management and decision-support tools

14 Linkages between tools and their applications should be driven by users. Project staff and their local counterparts from the GFC and *Dendrogene* projects should meet. The IUFRO meeting "*Integrated Management of Neotropical Rain Forests by Industries and Communities*" 4-8 Dec 2000, Belem, Brazil would be a suitable venue for such discussions. It would be appropriate for DFID to arrange a 1-2 day satellite meeting to discuss possible linkages between projects. It is likely that this combination would also be of interest to colleagues from the Indonesian MFP.

15 Local ownership of tools and their application is essential to the long-term sustainability and development impact. The lack of suitable staff in the GFC could be countered by strategic partnerships with other projects in Guyana.

Section 7.2 Potential for enhanced links between projects and regions.

16 DFID national and regional programme offices should be more pro-active in identifying possible linkages between projects

Section 7.3 Support issues.

17 DFID's forestry advisors should consider collating a group of "supported" tools for forestry projects. This activity should be linked to discussions on suitable methods to fund the technical support for these tools, where such support is likely to benefit more than a single project.

18 There needs to be more dialogue within DFID on the desirability of improved linkages between projects to develop a more integrated approach to (and common tools supporting) sustainable management of tropical forests. Additional sources of funding are likely to be required to support these activities.

Abbreviations.

BFMP	Berau Forest Management Project (EU, Indonesia)
BPK	Forestry Research Institute, Samarinda Indonesia
CIFOR	Center for International Forestry Research
Dendrogene	DFID, *Dendrogene* project, Brazil
DFID	Department for International Development
ECTF	Edinburgh Centre for Tropical Forests
EU	European Union
FAO	Food and Agricultural Organisation (United Nations)
FRIM	Forest Research Institute of Malaysia
FRP	Forestry Research Programme (DFID)
GFC	Guyana Forestry Commission
Inhutani I	State owned forestry concession, East Kalimantan, Indonesia
ITFMP	Indonesian Tropical Forestry Management Project (DFID)
IUFRO	International Union of Forestry Research Organisations.
MFP	Multistakeholder Forestry Programme (DFID, Indonesia)
MoFEC	Ministry of Forestry and Estate Crops (Indonesia)
NTFP	Non-timber forest products
PSP	Permanent sample plot
SYMFOR	Sustainable Yield Management for Tropical Forests. (DFID, Growth model)
TPTI	Indonesian Selective Logging and Replanting System.

1 Introduction

1.1 Background

1.1.1 The purpose of this report was to identify the potential to link approaches resulting from DFID projects supporting the development of sustainable forest management in SE Asia and S. America. Contact between the regions was initiated by discussions between DFID and CIFOR staff during the IUFRO World Forestry Congress in Kuala Lumpur, Malaysia in August 2000.

1.1.2 At this meeting the SYMFOR system (Sustainable Yield Management for Tropical Forests) was presented. This system has been developed by the DFID Forestry Research Programme (FRP, R6915) in collaboration with the DFID Indonesian bilateral projects (ITFMP, Indonesian, Tropical Forestry Management Project and MFP, Multistakeholder Forestry Programme). It was suggested by CIFOR that it would be useful to consider an application of SYMFOR in the neotropics. This was discussed with DFID's senior forestry advisor (Mr J. Hudson) who suggested that Ian Thompson (*Dendrogene* project, Brazil) and Neil Bird (Guyana Forestry Commission Support Project GFC, Guyana) should be approached. As a result of these contacts, the DFID Brasilia office commissioned a short-term consultancy to evaluate the complementarity between the projects and potential for linkages to enhance development impact within the context of Brazilian and Guyanan priority needs.

1.1.3 The consultant was funded to attend the one week symposium "*Modelling and experimental research on genetic processes in tropical and temperate forests*" organised by Silvolab in French Guiana. During this meeting information on SYMFOR was presented and discussions were held with staff from the *Dendrogene* project (**9.2**).

1.1.4 After the completion of the workshop in French Guiana, the consultant travelled to Guyana to meet with staff from DFID's project supporting the institutional strengthening of the Guyana Forestry Commission (GFC). A presentation on the applications of SYMFOR was made to project and GFC staff and invited guests. Further discussions were held with staff from DFID, GFC and other local projects and institutions (**9.3**). The visit was timed to coincide with a short-term input from Mr Denis Alder who had been commissioned by the GFC project to develop a yield regulation system to be used by the GFC and industry.

1.2 Expected outputs

1.2.1 The consultant was required to produce the following outputs:

- Presentation on applications of SYMFOR to the Silvolab symposium, French Guiana.
- Presentation on applications of SYMFOR to the GFC, Guyana
- Visit report identifying complementarity of the different software and discussing possible development strategies in the context of Brazilian and Guyanan priority needs.

1.2.2 Further details are outlined in the terms of reference for the visit (**8**).

2 An overview of SYMFOR and applications in Indonesia.

2.1 **Development of SYMFOR.**

2.1.1 SYMFOR (http://www.symfor.org) was originally developed as a growth and yield simulation model under the DFID (ODA) bilateral forestry programme in Indonesia (ITFMP, Indonesian Tropical Forestry Management Programme). In 1997 the development of SYMFOR was moved to be supported under the DFID Forestry Research Programme (FRP, Project R6915). This work was conducted in collaboration with the Forest Research Institute based in Samarinda Indonesia (BPK) and a state-owned forestry concession Inhutani I. The new project emphasised the development of tools to apply existing sources of growth and yield data, (particularly Permanent Sample Plot, PSP data) to develop and evaluate ecological and economic criteria of sustainability. During this project SYMFOR has been developed from a simple growth and yield model, to a set of tools to support the sustainable management of tropical forests.

2.1.2 The project was designed to develop tools that could integrate information and make it more readily *available* and *usable* by target stakeholders or beneficiaries. These were identified as forest researchers, managers and decision-makers and policy formers. The benefits to other stakeholders such as rural poor communities were identified to flow from improved information and knowledge being available to enhance their participation in more equitable forest management.

2.1.3 The work aimed to:

- Integrate results from research on Dipterocarp forests in Indonesia in a form that made information and new knowledge available to an extended group of forest stakeholders.
- To applying Scientific Knowledge and Information to support the development of sustainable and equitable resource management.
- To develop and evaluate ecological and economic indicators of sustainability linked to existing and alternative systems of forest management in Indonesia.

2.1.4 The structure of the SYMFOR framework is illustrated in Figure 1 showing that there are three independent model components. The framework uses PSP data for both calibration and application.

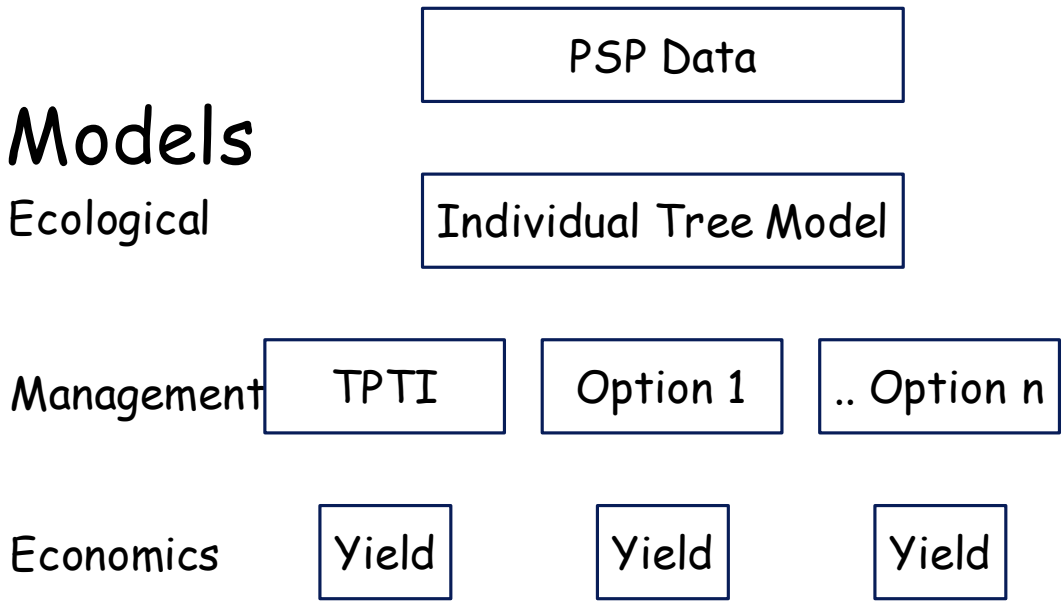

Figure 1. Structure of the SYMFOR framework

Ecological Model.

2.1.5 The ecological model is a spatially explicit, individual-based model that simulates the processes of individual tree growth, mortality and recruitment. These processes are simulated separately for different ecological species groups (10 groups for the Indonesian data set) (Phillips *et al.*, 2000; Brash, Phillips & van Gardingen, 2000). The ecological model is described in a number of publications (Phillips & van Gardingen, 2000; Phillips, Brash & van Gardingen, 2000; Phillips, McLeish & van Gardingen, 2000a; Phillips, McLeish & van Gardingen, 2000b). Further information and copies of some reports may be obtained from the project web site http://www.symfor.org (Brash & van Gardingen, 2000).

Management Model

2.1.6 The management model simulates the most important management interventions applied to the forest. The details of a management model will be country specific, but there is likely to be significant overlap of treatments. In the Indonesian context the important components of the management model are as follows:

1. Tree selection

- Minimum diameter limit by commercial species group
- Minimum stem quality

2. Yield regulation

- Maximum stems ha^{-1}
- Maximum volume extracted
- Minimum economic volume
- Length of cutting cycle

3. Felling technique

- Directional felling (+/-)

4. Extraction

- Skid trail planning (+/-)

5. Thinning

- Thinning by cutting
- Thinning by poisoning
- Selection of trees by species group
  – minimum diameter
  – maximum diameter
  – Maximum stem quality.

2.1.7 The management model can be implemented using any combination of the above treatments. More complex systems have been developed for a number of specific applications, including the evaluation of a proposed strip planting system, and the commercial exploitation of the residuals from thinning.

Economic model

2.1.8 SYMFOR was implemented to develop and evaluate economic indicators of the silvicultural component of sustainable forest management. There were several suitable economic models available for concession management in Indonesia. One of these was adapted for use with SYMFOR (Dadang Fadilah, 1999). This approach meant that there were minimal data requirements to develop the economic analysis. The framework required only the following:

- Yield estimates from SYMFOR
- Estimates of the crops of specific silvicultural and harvesting activities.

2.2 Applications of SYMFOR

2.2.1 SYMFOR has been used in Indonesia by a number of local user groups. The applications have included yield prediction, policy analysis and education. User groups have included the Ministry of Forestry and Estate Crops (Research, Policy), Private sector (Yield regulation, management planning), universities (Research, teaching) and NGOs (Research, policy analysis). It is beyond the scope of this report to present examples of all of these applications. Instead, a summary of some results is presented with reference to the complete work.

Policy analysis.

2.2.2 SYMFOR has been used as a component of several seminars and publications supporting the debate on the revision of forest management guidelines and prescriptions in Indonesia. The Indonesian forest management system is highly prescriptive and defined as a set of regulations as the Indonesian Selective Logging and Replanting system (TPTI). The work with SYMFOR combined with other analytical studies (e.g. (van Gardingen, 1998)) were combined to produce the recommendations presented in the final publications of the DFID Indonesian ITFMP (DFID, 2000b) and the earlier European Union funded workshop on "Yield scheduling to support the second cycle of forest harvesting" (Silver Hutabarat *et al.*, 2000; DFID, 2000a).

2.2.3 The interactive mode of SYMFOR has been used to graphically demonstrate the benefits of activities such as the combination of yield regulation and planned skid trails by reducing damage to the residual stand and inhibiting the establishment of pioneer species. This is illustrated below, where the conventional TPTI system is compared with an alternative using yield regulated to a maximum of eight stems per hectare combined with reduced impact logging and planned skid trials.

2.2.4 The example shows that the total area disturbed by logging (Figure 2) is greatly reduced when reduced impact logging techniques are combined with a suitable method of yield regulation. This can be seen in terms of the large extent of simulated skid trails (yellow), and the areas of associated skidder damage (red triangles). It can be seen that the lack of directional felling techniques means that many logs are poorly aligned with the resulting skid trails, resulting in additional damage. In contrast, the reduced impact logging example shows a greatly reduced extent of skid trails and that stems are well aligned with the planned network of skid trails.

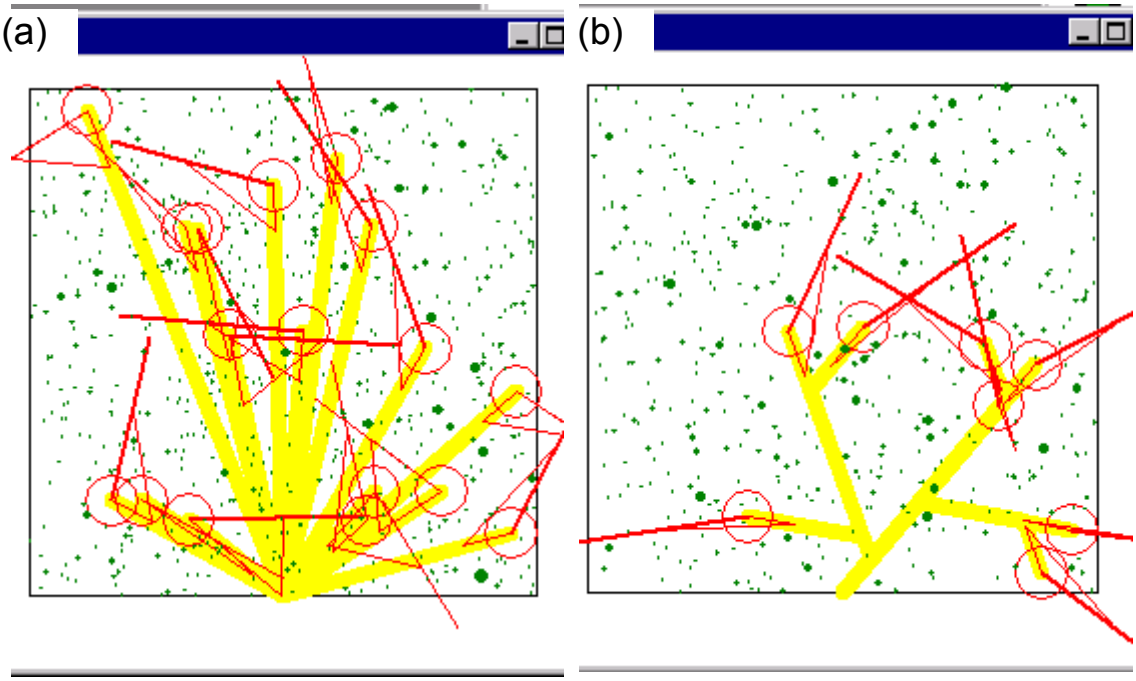

Figure 2. Comparison of conventional logging (a) with reduced impact logging combined with yield regulation (b). Map showing felled trees and skidding damage (red) and the main skid trails (yellow). A total of17 stems were extracted for the conventional system whilst the harvest was limited to 8 stems for the RIL treatment.

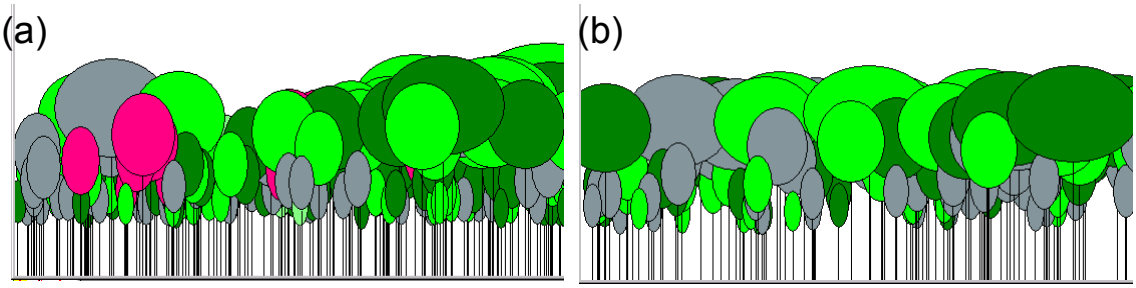

Figure 3 Representation of the ecological composition of the forest at the end of a 35 year cutting cycle. The conventional treatment (a) shown in Figure 1 is compared with the reduced impact logging (b). Green crowns represent the commercial dipterocarp species, whilst grey crowns represent commercial non dipterocarp species. The red crowns in (a) represent the pioneer species which invade the disturbed areas. Other non-commercial species groups are not shown.

2.2.5 The ecological benefits of the reduced impact logging treatment are clearly demonstrated in Figure 3. The conventional logging treatment is predicted to result in a significant increase in the proportion of pioneer species (red crowns) remaining in the stand at the end of the 35 year cutting cycle.

Yield Analysis

2.2.6 Indonesian users of SYMFOR have conducted a number of studies of expected yield under different management scenarios for areas of primary and logged-over forest (Farida Herry Susanty & Edy Sardjono, 2000; Ayi Suyana & Sukarya, 2000). This work has clearly shown that yields are not sustainable when the TPTI system is applied strictly to primary forest. The problem is further accentuated when TPTI is applied to areas of logged over forest. This can be illustrated by material developed by the consultant for a SYMFOR training course. Figure 4 shows simulated harvests for three groups of commercial dipterocarps following the TPTI specification. It demonstrates that the second harvest (year 35) is very significantly lower and that sustainable levels of production seem to be reached after the third harvest (70 years) at a level of around 40 m^3 ha^{-1}. Alternative systems linked to yield regulation (either 8 stems ha^{-1} or a maximum volume of 50 m^3 ha^{-1} have since been evaluated and seem more likely to be viable and details of these are in the process of being approved for publication.

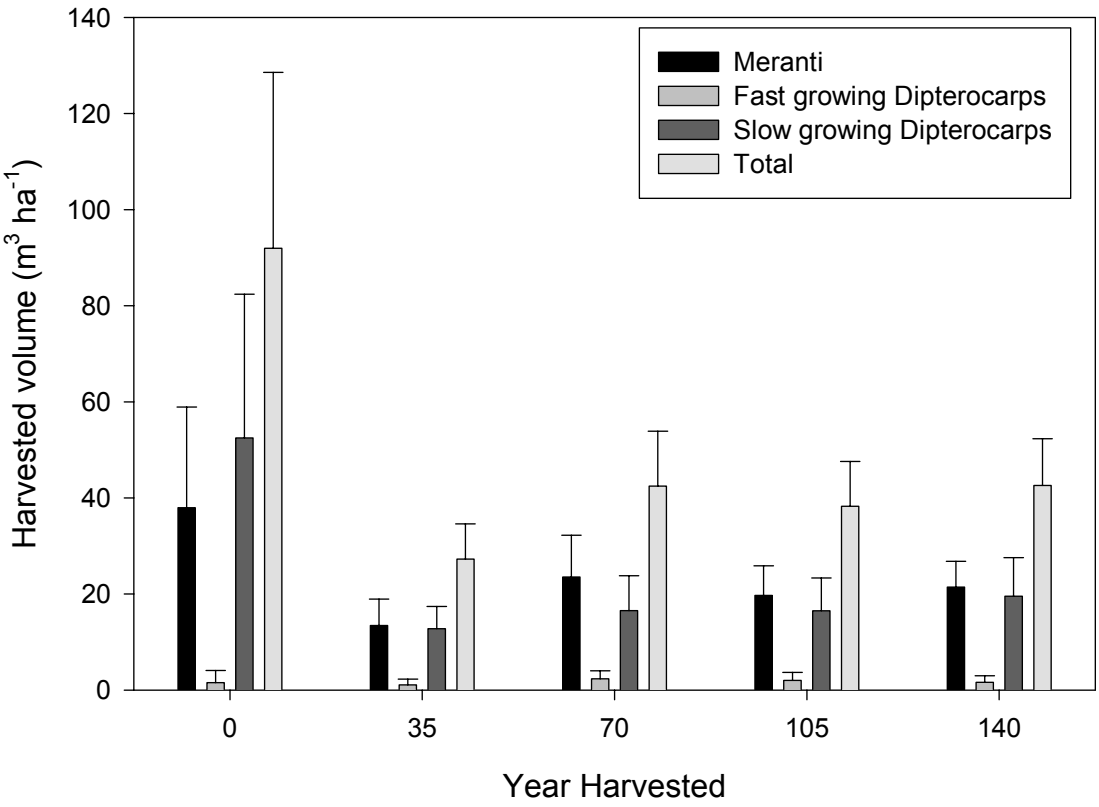

Figure 4 Harvested volume for a sequence of harvests simulated using a specification for the TPTI silvicultural system and a 35 year cutting cycle. The simulation used twelve plots of primary forest. Year 0 represents a simulated harvest on primary forest. Data are the mean ± 1 standard error calculated from data resulting from the simulations. Ten replicate runs were completed per plot and the average of these were used to calculate the means in this figure (n=12).

Economic analysis

2.2.7 Staff of the Forest Research Institute Samarinda, in conjunction with DFID and EU project staff have produced an economic analysis of forest management procedures in Indonesia. An initial report has compared different options (McLeish & Farida Herry Susanty, 2000) and shows that a system of forest management based around effective planning and reduced impact logging is effective and potentially financially viable. This work is continuing. The most important component of this work has been to identify the following key findings:

1. Effective *planning* and *harvesting* are the only management interventions that can currently be justified on financial grounds.
2. Most other activities need to be justified in terms of intangible benefits.

2.3 Developing a user community in Indonesia and the Asia Pacific region.

2.3.1 The work with SYMFOR in Indonesia has been able to illustrate problems with existing systems of forest management and propose viable alternatives that are ecologically and economically sustainable. There has, however, yet to be significant uptake of these concepts. Recent work in the Indonesian context has started to define the process and uptake pathway that takes new knowledge relating to forest management to modify both policies and practice. This shows that *local ownership* and full *participation of stakeholders* is essential to ensure implementation.

2.3.2 The stakeholders will only promote uptake, when there is a *local perception of need agreed between stakeholders* that has not been imposed externally (e.g. by international consultants). The perception of need may, however, take time to develop. Initially in Indonesia, only researchers were interested in discussing issues relating to silviculture and yield regulation. For this reason DFID and other agencies promoted a *process of dialogue* over several years to expose a wider range of stakeholders to the issue.

2.3.3 This dialogue now involves most of the key stakeholders from selected local communities, from local NGOs and universities through to regional and national government and international agencies (Donors and international NGOs). Now that there is general agreement (and perception) of the problems, the dialogue is shifting to possible ways to improve the situation. The key to potential success of the process will be that there are local actors driving the dialogue and that external support (e.g. DFID) is limited to supporting local needs, rather than imposing solutions. The application of SYMFOR in this context is being promoted through a number of multistakeholder user groups.

Multistakeholder User Groups.

2.3.4 Local application of SYMFOR to support dialogue on development issues will be supported through a series of *local initiatives* involving potential users of either SYMFOR (as an analytical tool) or information and knowledge generated through application of the tools. There are currently four initiatives being proposed to the new DFID Multistakeholder Programme in Indonesia.

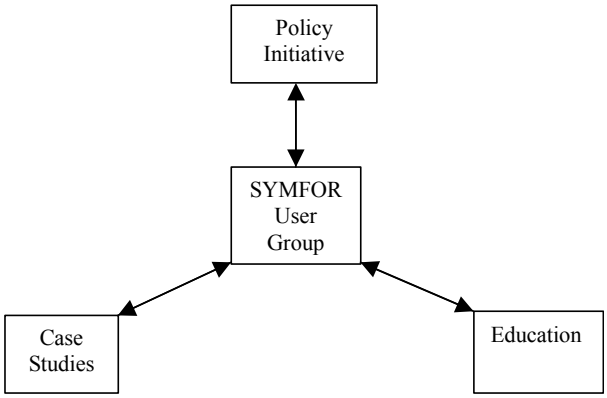

Figure 5. National initiatives involving SYMFOR that have been proposed under the DFID Multistakeholder Forestry Programme in Indonesia. (Case studies will be integrated by the user group.

2.3.5 At the national level three initiatives are proposed.

SYMFOR User group (& case studies)

2.3.6 The SYMFOR user group will act to support all users of the software tools and act to disseminate results from studies and applications. The users group will support a number of case studies in different regions that will be implemented by universities, NGOs and government research institutions. In at least one case, a proposed study will be conducted in partnership with a local community supporting community based forest management, and another proposes a link with an industrial concession interested in supporting the process of certification. In the medium term there has been active discussion of methods to extend the work to support the sustainable production of non-timber forest products (NTFP). The SYMFOR user group is proposed jointly by a local university and a NGO.

Policy group

2.3.7 The policy group has been proposed by the planning department of the Ministry of Forestry and Estate Crops (MoFEC). This group will act as a user of information and knowledge generated by the user group. The group will use related information from other relevant sources and aims to review policies and technical guidelines relating to forest management as part of the revision of the national forest plan for Indonesia. Its most important role will be to promote dialogue between stakeholders to encourage changes in policies and implementation of forest management practice

Education group

2.3.8 The Education group aims to address identified needs to support and improve forestry curriculum in Indonesia. A significant component of the curriculum is specified centrally (at national level), with additional material is proposed by each educational institution. A consortium of Indonesian universities is proposing to use SYMFOR as a tool to develop improved curriculum material, initially in the areas of silviculture and forest ecology.

Regional groups

2.3.9 A separate initiative has been proposed for a regional initiative for the province of East Kalimantan. This proposal has been led by the local university (Universitas Mulawarman) with strong support from regional government, NGOs and local communities.

2.4 Lesson-learning. Developing SYMFOR applications in other regions.

2.4.1 There has been interest in the application of SYMFOR outside Indonesia. The Forest Research Institute of Malaysia (FRIM) expressed an interest in developing a local application. This proposal has been discussed more widely and led to a proposal to extend the process to a network of countries in the Asia Pacific Region. This proposal is being led by the Edinburgh Centre for Tropical Forests (ECTF) in conjunction with FAO (Bangkok) and CIFOR (Indonesia). In the neotropics, the potential to apply SYMFOR in Brazil and Guyana is the purpose of this report funded by DFID Brasilia.

2.4.2 The adaptation and adoption of tools such as SYMFOR requires a series of steps to ensure that the required research will lead to the achievement of development objectives. The development and uptake processes will need to be designed for each country (or region) to meet the needs of specific stakeholders. There are however several important lessons that can be transferred from the Indonesian projects. These are summarised in Table 1 and their relevance to potential applications in Brazil and Guyana will be discussed in subsequent sections.

Lesson	Explanation
Treat SYMFOR as a process	The development of SYMFOR has been part of a process intended to raise the profile of forest management issues among stakeholders. This process has included: • Promoting dialogue between stakeholders. (local perception of need) • Collation and analysis of existing data • Production of the tool "SYMFOR" • Production of case studies and briefing notes • Dissemination of findings to stakeholders • Initiation of policy dialogue
Promote dialogue between stakeholders	• Joint perception of needs • Empowering previously marginalised groups • Promotes lesson learning and common understanding • Enhances uptake • The SYMFOR project has been used as a tool to bring groups together.
Local ownership	The process of dialog identified key local players who became motivated to take ownership of the process, the tools and the resulting analysis and policy debate. • Local ownership led to local initiatives for uptake.
Local skills	The SYMFOR process has been linked to training resources provided under the Indonesian Bilateral programme. This has facilitated the development of a group of local actors who are now involved directly with application and dissemination.[1] • A local skill base is required to support uptake of the tools. If this does not exist, it may be developed through associated training activities (higher education or professional development courses). • In the absence of local skills to apply the tools, the process can progress through dialogue based on *local knowledge and expertise*. This can be supported using materials from other regions (lesson learning) This process will often identify needs and motivated individuals and organisations capable of developing local initiatives.

[1] Three out of the four local initiatives are being led by individuals previously supported for training by DFID.

Lesson	Explanation
Data requirements	The data required to develop SYMFOR already existed but were not readily available. There were two problems, firstly a reluctance to release information to international researchers and secondly lack of quality control. Similar situations are known to exist in many other tropical countries. The process of obtaining access data was very slow (3-8 years). The impediments were only broken through involving local stakeholders. It was also noted that there were questions of confused ownership of data linked to other development projects. • Local ownership and involvement in the process is essential for access to data. • Commercial companies are initially reluctant to release data, but will do so when they perceive a direct benefit to their core activities. • Local researchers need to be involved in processing and analysing information. They normally require training and technical support in this activity. • It may be necessary to negotiate with other development projects (Donors) to obtained agreement for access to data.
Integration of tools	SYMFOR was only one tool available in Indonesia to support the process. Other relevant tools were linked to the planning processes (Inventory, GIS), growth and yield prediction at the concession level and economic models. • The uptake and impact of SYMFOR has been enhanced through its integration with other tools supporting forest management.
Integration of development projects	There were seven development projects with activities in Indonesia that had activities related to the development and application of SYMFOR (DFID 2, GTZ 2, EU 2, Tropenbos 1). Progress in each project was enhanced when projects worked together (and were perceived to do so) to develop complementary approaches. Progress was impeded when there was *a perception* of conflict between development projects (*even if such conflict did not exist*).
Regional co-operation	Issues relating to tropical forest management have moved into the international arena through the debate of environmental impacts, sustainable management and certification. This has generated a need and demand to regional co-operation to share knowledge and address common problems. The initiative proposed by FAO to extend the application of SYMFOR to other regions of the Asia-Pacific is one example of a response to the demand.
International learning opportunities	Discussions among tropical forest researchers at the IUFRO world congress identified the potential for increased learning and co-operation between individuals and organisations in the main tropical regions (Africa, Asia-Pacific and the Neotropics). This report is a direct consequence of these discussions and should be considered as a activity supporting this process.

Table 1 Lessons from the development of SYMFOR in Indonesia that may be relevant to similar projects (or processes) in other countries and regions.

3 Software tools applied by the *Dendrogene* and GFC projects

3.1 Background

3.1.1 A number of other software tools applied by the *Dendrogene* and GFC projects were identified during the consultancy. This section summarises these tools and then identifies the potential for linkages that could improve implementation of the projects, promote dialogue between projects and thus increase impact on development targets.

3.1.2 Two database packages are in use, TREMA is used by both projects to manage data from inventory and permanent sample plots. Dendrobase has been developed by Dr Bernd Degen and is used from the *Dendrogene* project. Closely related to Dendrobase is the Ecogene simulation model for gene flow also developed by Bernd Degen. The *Dendrogene* project has available, CAFOGROM a cohort based simulation model of growth and yield developed under an earlier DFID project. This same model is now being adapted for use for yield scheduling in Guyana under a short-term consultancy by Dr Denis Alder.

3.2 Applications of TREMA

3.2.1 TREMA (http://www.trema.co.uk) is a relational database that has been developed as a flexible system to store and process information from inventory and sample plot campaigns. The development of TREMA has been supported through application by a number of DFID projects in several countries. The programme is implemented in the DOS version of Foxpro, which can be run under Windows. The DOS version does not, however, support dynamic exchange of information (data) with other Windows applications (via the clipboard, as objects or through dynamic data exchange).

3.2.2 TREMA is currently being implemented in the Windows environment. Both projects were aware of the details of the new implementation. Both projects considered that there had been delays in the implementation. Gavin Nicol from the GFC project indicated that these delays have the potential to impact on their work programme. Concern was also expressed at the lack of information describing the Windows implementation.

3.2.3 The *Dendrogene* project proposes to apply TREMA to manage data from field inventory before and after logging. The pre-logging inventory will be used to evaluate the impact of alternative strategies for tree selection linked to the application of the Ecogene simulation model. Current legal requirements for inventory records commercial tree species greater than 45 cm diameter at breast height. Some companies record commercial species above 35cm but the project argues for the expansion of this to all species. In the longer term they are considering the advantages of lowering the limit to 21 cm (75 cm girth).

3.2.4 The *Dendrogene* project wishes to link their inventory data stored in TREMA with an appropriate growth and yield simulation programme. The current inventory data will not be sufficient for growth and yield predictions. For this reason it is intended to implement a higher intensity sub sample (lower minimum DBH). These data will be used for the growth and yield predictions. Ian Thompson was considering a dynamic link between TREMA and the growth and yield prediction model. It is noted that this would much simpler to implement when TREMA is re-implemented as a Windows package. TREMA offers the potential to implement much more realistic scenarios for the selection of trees for harvesting when linked to an individual based model such as SYMFOR. At present SYMFOR and most other models can at beast implement generalised rules derived from management prescriptions.

3.2.5 The GFC project uses TREMA to manage data from Inventory and permanent sample plots. The inventory system is the most important component of their work with TREMA as it represents the data processing system for their inventory data. The project's experience with the current system is that it is entirely reliant on support from external consultants. An intensive learning and training period led to a very successful implementation. The GFC project has now specified new requirements for TREMA. These issues relate to additional functionality, specifically statistical analysis of inventory data. The features have been promised but delivery is slow. They reported a 1-2 month response to their requests.

3.2.6 The GFC experience of the DOS version of TREMA is that it is an extremely useful system supporting their work, but found that the way that it is implemented impeded effective utilisation (and training). It was noted that TREMA was a research tool that has moved into operational management. For this reason the DOS version has complex menu system and that the software (and its menus) contained many obscure options which where not required by most users. *It was firmly stated that the systems flexibility was compromising its useful functionality.* It was suggested that the Windows implementation needed to have a simple user interface and should mainly contain the basic functions. The consultant notes that GFC users of TREMA did not appear to have had much input into the design specifications of the new Windows implementation.

3.2.7 Discussions with Dr Denis Alder identified a problem that the flexibility of the TREMA system (for example, different field names) meant that analysis procedures need to be customised for each locality (and implementation of TREMA). This issue reduces the potential for benefits associated with sharing the tool between projects. It is suggested that the concept of a "minimum data set" with set field names and information requirements would be a significant improvement on the current implementation to create the potential for synergies between projects.

3.2.8 Both projects have concluded that a system to store and process inventory and PSP data will be an important tool to support the achievement of project and development objectives. Whilst both projects approve of the concept of TREMA, there is a requirement for its implementation to fully updated to be better integrated with other (Windows based) software tools currently in use. The GFC project staff expressed the opinion that mapping procedures should not continue to be integrated within TREMA. They require a direct interface to standard mapping or GIS tools such as ARCView as this is a well established tool in the GFC and its partner organisations. An alternative view was presented by the *Dendrogene* project, where staff expressed the opinion that there are advantages in maintaining integrated mapping procedures within TREMA. These were stated as reduced software and training costs for small-scale enterprises and communities.

3.2.9 This consultant notes that alternative approaches to develop similar solutions and tools have been developed by DFID and other donor projects in other regions. The Indonesian ITFMP supported the development of a Growth and Yield Data System (GYDS) (Rombouts, 1997; DFID, 2000b) which was subsequently used to develop a concession growth and yield scheduling system by the European Union BFMP project (Rombouts, 1998). An important feature of this system was the advanced process of data validation used to improve the quality of the stored data. This aspect of the system proved to be extremely valuable during the calibration of SYMFOR. It is also noted, that the DFID consultant (Dejan Lewis) who produced the final version of the GYDS, now works in Guyana for the ECTF/Barama project.

Recommendations

1. The *Dendrogene* and GFC projects should jointly review their requirements for software tools to support the storage, processing and analysis of inventory and sample plot data. There is an opportunity to develop a system that strengthens linkages and common requirements by building on previous experience (including TREMA). End users of the information should be involved in the design process.
2. The projects should consider adopting the concept of a common "minimum dataset", format and naming conventions to promote sharing of information and tools.[2]
3. The software tools should be implemented for use in the Windows environment to be compatible with other applications. If the system is to be developed from the DOS version of TREMA, this should be done by design and re-implementation, rather than translation from the DOS system.
4. The design process should stress the application of pre-existing software tools when possible. The package requires a direct link to standard mapping (/GIS) packages such as ArcView or Surfer.

3.3 Applications of Dendrobase

3.3.1 Dendrobase is a relational database developed for the *Dendrogene* project by Bernd Degen. It is implemented in Microsoft Access and is currently designed for single user operation. It is not used by the GFC project and is unlikely to be directly relevant to this projects core activities of institutional strengthening. It is intended that the system will form the basis for the collation and sharing of information of genetics and breading systems for selected species as part of the *Dendrogene* project. It will also be used to provide information (actual and synthetic) for application in the Ecogene simulation model.

3.3.2 The project intends to implement a version of the Dendrobase over the internet as part of its key function to integrate information to generate knowledge. This implementation will need to address issues related to distributed access to a shared database. The *Dendrogene* project will address these planning and implementation issues early in the year 2001.

3.3.3 The *Dendrogene* project will use information generated from the Dendrobase for use by Ecogene and potentially TREMA (Artificial spatial datasets). The information contained in the database could be processed to generate information of relevance to a spatial growth model such as SYMFOR. The most important aspects would be the generation of a proxy linked to growth and the generation of artificial datasets to examine the effects of spatial aggregation on ecological indicators of sustainability in managed forests. The consultant notes that this analytical approach could be of significant interest to similar projects in other DFID regions (e.g. SE Asia)

Recommendations

5. Potential applications of the Dendrobase to generate genetic and spatial data for use by spatial growth models should be evaluated by the *Dendrogene* project. This could enable the integration and assessment of the importance of aggregation of species to link genetic and ecological indicators of sustainability.

[2] This approach has been adopted very successfully for agricultural research and is promoted by the FAO.

3.4 Applications of Ecogene

3.4.1 Ecogene is a comprehensive model that simulates genetic processes and breading systems that can be applied to managed tropical forests developed by Dr Bernd Degen. The revision of the model is being supported under the *Dendrogene* project. The model is implemented in Microsoft Visual Basic and is linked to an Access database. Information collated and generated by the Dendrobase system is used as input data in Ecogene.

3.4.2 The model is a stochastic model and replicate runs are used to describe the impact of difference management scenarios on genetic processes. It is intended that TREMA should be used to provide data to initialise some of these simulations.

3.4.3 Ecogene includes very simple growth and mortality functions based on competition. These differ significantly from those applied in the growth and yield models that could potentially be applied by the *Dendrogene* project.

Recommendations

6. The growth and mortality functions implemented in Ecogene should be updated to make them more closely related to the growth and yield models applied by the *Dendrogene* project.

3.5 Applications of CAFOGROM

3.5.1 CAFOGROM (Alder & Silva, 2000) is one of a series of cohort-based growth and yield models developed by Denis Alder (http://www.bio-met.co.uk). CAFOGROM was developed in conjunction with researchers in EMBRAPA (Brazil) supported by the DFID Brazilian programme. Other versions include PINFORM for Papua New Guinea (Funded by ITTO) and SIRENA for Costa Rica (CODEFORSA Project). In common with nearly all growth and yield models, CAFOGROM requires high quality PSP data[3] for calibration. In contrast with SYMFOR, CAFOGROM is designed to run using lower quality inventory data and as such can be applied to tasks such as yield scheduling for larger areas up to concession level.

3.5.2 The model is implemented using the Microsoft Office suite of software mainly utilising Excel and Visual Basic. Data input is from text files (CSV, comma separated values). The model is entirely deterministic and thus is significantly more computationally efficient (quicker) than spatial stochastic models such as SYMFOR. The model is a very efficient and effective tool for the generation of predictions of future growth and yield at management unit level. The model can evaluate various harvesting scenarios for example yield regulation and cutting cycle length. It is an efficient tool to examine the potential for sustained yield in contrasting management systems.

3.5.3 In contrast with single tree spatial models, CAFOGROM cannot easily be used to examine alternative management strategies cannot easily be used to illustrate or examine many ecological indicators of sustainability such as the distribution of pioneer species following logging as shown in section 2.2. The choice between the existing version of CAFOGROM and alternatives including SYMFOR will thus depend on refining the reasons for applying growth models as part of the *Dendrogene* project. CAFOGROM is the appropriate tool if users require yield estimates linked to inventory data. Alternative approaches (including

[3] The data are currently stored using a custom written database system. They have not been transferred into the TREMA system.

SYMFOR) might be more appropriate if the project wishes to link genetic indicators of sustainability to ecological equivalents. This argument is strengthened if there is a requirement to depict the spatial component of the impact of logging on forest ecology.

3.5.4 CAFOGROM has not been used to develop financial indicators of sustainability, but this could easily be done using the same approach applied with SYMFOR in Indonesia.

3.5.5 A version of CAFOGROM calibrated for Guyana is being developed using the Tropenbos and Barama/ECTF data sets for calibration. It is intended that this model will be used to predict future yields from the forest using available sources of inventory data in Guyana. It is the consultant's view that this is the appropriate tool for this application.

Recommendations

7. The cohort-based growth and yield model currently being developed for Guyana is the appropriate tool matching existing needs with data and availability of local skills.

3.6 Comparison and choice of growth and yield models

3.6.1 There are many alternatives to the CAFOGROM and SYMFOR models described in detail in this report. Alternatives to CAFOGROM exist in many regions. Examples in SE Asia include DIPSIM (Ong & Kleine, 1995) (originally applied in Sabah, Malaysia) and the Yield Scheduling System YSS, (Rombouts, 1998) developed by the EU-BFMP project from the same dataset that was used to develop and calibrate SYMFOR. There are no perceived advantages to any of the alternatives.

3.6.2 A number of alternatives exist for individual and/or spatial models. Some of the most similar include FORMIX and FORMIND (Kurpick, Kurpick & Huth, 1997; Kohler & Huth, 1998; Ditzer *et al.*, 2000) and a series of individual based models developed by CIRAD Forêt (Gourlet-Fleury & Montpied, 1995; Gourlet-Fleury & Houllier, 2000). The similarity of possible applications these models is increasing, however SYMFOR is currently the most directly relevant to management as it includes a separate management model. Similar functionality is currently being developed for the CIRAD models. Of all growth and yield models, only SYMFOR has been explicitly linked with economic models, but as previously stated this could be done for all alternatives.

3.6.3 There is potential to increase developmental impact through the sharing of methods and analysis between projects and regions. For this reason it seems logical where possible, for DFID Forestry projects to utilise common tools and approaches. For this reason it is suggested that there would be little benefit in considering alternatives to CAFOGROM and SYMFOR for application in Brazil and Guyana. In contrast, it is argued that considerable benefits should be expected by expanding the user base of these tools to other areas.

3.6.4 The choice between the models should be determined by the application. It is clear that the Guyanan version of CAFOGROM is the appropriate tool for current requirements and applications. The demand for additional tools does not currently exist, but may be generated through enhanced dialogue between stakeholders. This was the process observed in Indonesia. The requirements to support the *Dendrogene* project are not yet clear and this report should form part of the dialogue required to define these requirements.

3.6.5 Discussions with staff from the *Dendrogene* and GFC projects identified a strong interest in comparing results from the cohort (CAFOGROM) and individual (SYMFOR) models using the same datasets. This could be completed for the datasets for Brazil, Guyana and Indonesia, but would require the agreement and involvement of data owners in each country. This is

initially an issue DFID's Forestry Research Programme has considered as a component of joint exit strategies for the SYMFOR (Project R6915) and the project R7278 "Humid and semi-humid tropical forest yield regulation with minimal data" involving Howard Wright and Denis Alder. The projects would welcome if this led to better integration of the tools and guidance for decisions relating to the choice of models.

Recommendations

8. The choice of an appropriate growth and yield model to be applied as part of the *Dendrogene* project requires more specific determination of needs by the project. The project should foment dialogue with other interested parties to seek definition and linkage with more general management needs.
9. The performance and outputs of the CAFORGROM and SYMFOR models should be compared using the same datasets. This work should then lead to a decision tree for the choice and application of these tools. DFID's Forestry Research Programme should be approached to consider a strategic comparison involving more than one target country or region.[4]

[4] The case for this work would be greatly strengthened if the DFID development projects and local stakeholders express their need and support for the activity to the management of DFIDs FRP. The case should state that this is strategic research question requiring a comparison between countries and regions and that it would lead to enhanced uptake of the tools, supporting relevant bilateral project outputs and development targets.

4 *Dendrogene* project (Brazil)

4.1 Background

4.1.1 The *Dendrogene* project[5] is a DFID bilateral technical co-operation project being implemented by the Brazilian research organisation EMBRAPA Amazonia Oriental (Brazilian Agricultural Research Corporation http://www.embrapa.br). The project aims to develop mechanisms to apply scientific knowledge to sustainable forest management in the Amazon.

4.1.2 The project builds on the previous rainforest silviculture project. The project aims to address the central issue that investment in research rarely results in usable recommendations or proposals relevant to operational forest management. The activities emphasise the process of incorporating knowledge of genetic and reproductive ecology into forest management decision support tools. These tools will be used to develop and evaluate practical genetic indicators of sustainable forest management for the Amazon.

4.2 Software tools

4.2.1 The software tools being applied by the project include TREMA, Dendrobase, and Ecogene. There is a perceived need to include explicit links to models of forest growth and yield. The Brazilian version of CAFOGROM was developed for the previous silviculture project and is available for *Dendrogene*. There was an expressed desire to consider alternatives such as SYMFOR for the following reasons.

- An individual-based spatial model allows the examination of linkages between ecological indicators of sustainability with the spatial dimension of the genetic and breeding systems research in *Dendrogene*.
- There is a desire to link the genetic indicators of sustainability with relevant ecological indicators such as currently being evaluated with SYMFOR in Indonesia.
- CAFOGROM was perceived as being a tool to manage forests for volume production and not as well suited to considerations of multi-objective forest management.
- The Indonesian applications of SYMFOR have demonstrated an example of the development of a process and support tools that integrate scientific knowledge into decision making for natural resource management.

4.2.2 The rational for the choice of a growth and yield model to support the *Dendrogene* project was discussed in section **3.6.** It was suggested there, that the project needs to define its own specific needs and foment dialogue with other interested parties to seek definition of more general management needs.

4.2.3 Tools being developed or applied by the *Dendrogene* project may be of relevance to projects in Guyana and other regions. The information in Dendrobase will be of interest to staff in the GFC to be able to compare characteristics of the Guyanan forest with other regions of the Amazon. Both the Dendrobase and Ecogene tools could be relevant to the development of a management plan in the Iwokrama forest. The Dendrobase and related analysis tools could easily be applied in the SE Asian context and are relevant to the application of SYMFOR in this region and may be relevant to other activities under the new Indonesian MFP. Better communication between projects would greatly assist these linkages.

[5] Project code 087-502-025

5 DFID Guyana Forestry Commission Support Project.

5.1 Background

5.1.1 The Guyana Forestry Commission Support Project[6] is in its second phase and is implemented as a combination of technical co-operation and financial aid. The project aims to strengthen the GFC which has been unable to fulfil its mandate to guide, service, monitor and regulate the provision of forest benefits. Significant problems include the lack of suitably trained staff and supporting institutional and policy frameworks. The project aims to address these problems by direct assistance to the GFC and by supporting associated institutions and organisations.

5.2 Software tools

5.2.1 The GFC project has applied TREMA to support their inventory programme and is developing a local version of CAFOGROM to support their needs for growth and yield prediction. Previous sections of this report have indicated that this is the appropriate choice of software tools appropriate to local data and staff availability. It was apparent, that these applications would benefit from improved communication with other projects using similar approaches.

5.2.2 The discussion of possible applications of the SYMFOR tool indicated that it would be inappropriate to develop applications within the GFC. Whilst suitable high-quality data are readily available, the GFC does not have staff available for this activity. The process leading to the development of SYMFOR in Indonesia was however directly relevant to the GFC. The dialogue between stakeholders on growth and yield issues commenced with a presentation by Dr Denis Alder and then continued with the presentation on SYMFOR. Neil Bird suggested that the level of interest in these seminars indicated that it would be timely to create a discussion group on growth and yield as a forum for further progress.

5.2.3 The SYMFOR seminar was attended by staff from a number of other projects and organisations (ECTF/Barama, University of Guyana and Iwokrama). It was apparent to the consultant that the grouping of projects and individuals represented a resource that is not yet being fully utilised by the GFC. Any activity such as the proposed working group on growth and yield and silviculture should be encouraged as a method to promote enhanced stakeholder participation in forest management issues. Other possible linkages are discussion in a subsequent section (**6**)

Recommendations

10. The GFC project should establish a working group on growth and yield and silviculture involving all relevant stakeholders and organisations. This group should act as a focal point to identify the need for and stimulate further work in this area.

[6] Project codes: 107-004-006, 107-502-005, 107-994-020

6 Other relevant projects

6.1 Iwokrama Project

6.1.1 Iwokrama is a international project that aims to demonstrate how tropical rain forest ecosystems can be conserved and sustainably managed will making a substantial contribution to national and international development. The project has direst responsibility for the management of 360,000 ha of forest in Guyana. Half of the forested area will be managed as a reserve, whilst the other half will be managed for the production of forest products. DFID has made the most significant contribution to the support of this project.

6.1.2 Discussions with Iwokrama staff identified a strong interest in evaluating the potential of SYMFOR to support the generation and subsequent evaluation of the management plan for the reserve. The strong link to research and the University of Guyana would make this project a suitable host for such an activity. This would also lead to the possibility of developing curriculum material for the University, supported by SYMFOR and analysis of local data.

6.1.3 Whilst Iwokrama does not have suitable data, their links to the Tropenbos Guyana and ECTF/Barama projects would make these available. The tools being developed by the *Dendrogene* project in Brazil are also directly relevant to the Iwokrama objectives. The review of DFID support[7] for Iwokrama planned for November 2000 would be one opportunity to consider the potential for improved linkages between projects.

Recommendations

11. The Iwokrama project should be encouraged to evaluate the relevance of management tools being developed by DFID under the *Dendrogene* and SYMFOR projects. The evaluation would need to consider potential sources of funding for activities to implement these tools by Iwokrama.
12. Iwokrama staff and counterparts should be invited to any planned joint meeting of the *Dendrogene* and GFC projects to discuss sharing of management tools and information.

6.2 ECTF/Barama Project

6.2.1 The Edinburgh Centre for Tropical Forests project in Guyana aims to support the development of improved forest management practices by the Malaysian owned Barama timber company. It is one of the few examples of a private company making a commercial decision to invest in research activities supporting sustainable forest management. The project has established a set of permanent sample plots make these data freely available to other organisations.

6.2.2 There is evidence that this project is resulting in modified behaviour of the company and now selected field staff. It is recognised that change will be an inherently slow process, but that since the company has expressed demand, it is likely to occur.

6.2.3 Barama has demonstrated commitment to dialogue related to improved forest management. This commitment combined with the information that the project is generating (for example on the implementation of reduced impact harvesting) suggests that the project should be invited to play a greater role in the co-operation between projects in the region.

[7] Project code 781-629-043

6.3 Tropenbos Guyana Project

6.3.1 The Tropenbos Guyana project represents the most significant investment in forest related research in Guyana. This project has established and maintained a set of permanent sample plots that represent the most important resource for forest management studies in the country. Recent studies on reduced impact harvesting (van der Hout, 1999) have greatly added to the value of this resource. Financial constraints in the Netherlands have led to a decision to terminate the Tropenbos Guyana project in 2001. All other organisations in Guyana recognise the potential loss to the country if the Tropenbos plots are allowed to fall into disuse. Tropenbos are developing an exit strategy for the project that proposes to establish a local NGO that will take over responsibility for the plots and associated research. The financial implications of this plan were not apparent. This process needs to be monitored by the DFID projects in Guyana.

Recommendations

13. DFID should monitor the implications of the closure of the Tropenbos Guyana project planned for 2001. The suggested establishment of a NGO to take responsibility for the plots and associated research should be supported.

6.4 CIFOR Sustainable Forest Management Programme

6.4.1 CIFOR recently established a new Sustainable Forest Management Programme. The process leading to the current consultancy and this report was initiated as part of the strategic planning meeting for this programme during discussions between CIFOR and DFID staff. The presence of CIFOR staff in Belem and their planned research activities suggest that CIFOR should also be considered as a possible partner for improved collaboration between organisations.

7 Potential to strengthen linkages between projects and regions.

7.1 Linkages between software tools to develop integrated forest management and decision-support tools

7.1.1 The previous sections have identified areas where there is potential for benefits resulting from improved linkages between software tools and applications. TREMA is the only package currently used by both projects. The key requirements identified above are summarised here:

- TREMA needs to be implemented as a full windows application
- TREMA users need to be consulted about the design of the new implementation.
- The concept of a standard minimum dataset should be discussed.

7.1.2 Potential linkages between tools and applications should be driven by demand from users rather than the software developers. It was clear that this requires enhanced dialogue between projects to discuss issues relating to data (data availability, database design & implementation) application of tools (individually by projects) and linkage of tools. This process has the added benefit of increasing dialogue between projects promoting the exchange of information, experience and knowledge far beyond that relevant to the tools alone. The process of dialogue between projects has been promoted by this consultancy and is further discussed in section Error! Reference source not found.**.** It is suggested that the IUFRO meeting on forest management in the neotropics, planned for early December 2000 would be an ideal opportunity for the main actors to assemble and discuss these issues.

7.1.3 The long-term sustainability of any tool being applied will depend on the development of a sense of local ownership of the process as well as the outcome. This means that local counterparts need to be involved at all stages of implementation. The requirement for suitably skilled staff may limit this process, particularly in the case of the GFC project. For this reason it would not be appropriate for the GFC project to develop an application of SYMFOR at present. Alternatives, are however available, and it is recommended that the process of dialogue that has commenced in the GFC related to growth and yield issues should continue to be supported and involve a wide range of stakeholders. This dialogue may well identify other potential partners that could develop local skills and applications, probably in conjunction with the Iwokrama and ECTF projects.

Recommendations

14. Linkages between tools and their applications should be driven by users. Project staff and their local counterparts from the GFC and *Dendrogene* projects should meet. The IUFRO meeting "*Integrated Management of Neotropical Rain Forests by Industries and Communities*" 4-8 Dec 2000, Belem, Brazil would be a suitable venue for such discussions. It would be appropriate for DFID to arrange a 1-2 day satellite meeting to discuss possible linkages between projects. It is likely that this combination would also be of interest to colleagues from the Indonesian MFP.
15. Local ownership of tools and their application is essential to the long-term sustainability and development impact. The lack of suitable staff in the GFC could be countered by strategic partnerships with other projects in Guyana.

7.2 Potential for enhanced links between projects and regions.

7.2.1 This report has identified several areas where there is great potential where strengthened linkages between projects could lead to enhanced development impact. One reason for this is that each project individually could be criticised for excluding one or more key stakeholders from its implementation. Whilst in many cases this criticism might be unfair, it is based on some element of truth. The terms of reference for this report (**8**) requested that areas of complimentarity be identified.

7.2.2 Improved communication between projects must be beneficial to all concerned. This should be encouraged as suggested between Brazil and Guyana, but there was evidence that added benefits could be obtained by extending the scope of the discussions. One example of this potential was the discussion of the results and financial benefits of thinning treatments. Results were presented using the Indonesian version of SYMFOR that were considered directly relevant to current forest management in Guyana (and also in Brazil). Forest managers were sceptical of potential benefits, but had been presented with research results suggesting that it might be beneficial. The presentation at the GFC showed how tools such as SYMFOR and CAFOGROM could be used to integrate these issues and present results simplistically in a way that is relevant to all stakeholders. It was noted that this analysis was directly relevant, without necessarily needing a local version of the software.

7.2.3 The sharing of information and tools should not be one-way, and it is noted that the Dendrobase system could be directly relevant to projects in SE Asia. Staff from both projects noted that DFID are unable to keep field staff well informed about potentially relevant activities in other projects (research and development projects). It is acknowledged that DFID circulates summaries of projects, but it appears that the effectiveness of this process could be enhanced. One option would be to collate project web pages (were available) with a link to the DFID home page. The time involved in generating effective web pages should not, however, be underestimated and for this reason this approach would only represent a partial solution. This seems to be an issue that needs to be addressed by DFID at regional and global levels. It is suggested that DFID national and regional programme officers need to be more pro-active in identifying the potential for linkages between projects.

7.2.4 The discussions leading to this report identified a number of areas where strengthened links would be beneficial. These are summarised below.

Recommendations

16. DFID national and regional programme offices should be more pro-active in identifying possible linkages between projects

Enhanced links between projects in Guyana

7.2.5 The GFC support project is focused on strengthening the institution of the Commission. There is clear evidence that this project is making significant progress towards achieving its main objectives. The impact of the GFC project would now be enhanced if the GFC was involved in encouraging better linkages between other stakeholders and projects. Potential linkages between the Iwokrama and ECTF/Barama projects with the GFC should be encouraged as should linkages to the NGO proposed by Tropenbos to take over responsibility for their plots and associated research activities. The proposed end-date for the GFC project (currently 2002) suggests that the Iwokrama project may also need to be proactive in this dialogue.

Enhanced links between projects in Brazil and Guyana

7.2.6 This report has identified areas where linkages between projects in Guyana and Brazil would be highly beneficial. Whilst the original purpose of the visit was to consider potential for links between the *Dendrogene* and GFC projects, it is clear that the dialogue should be more inclusive. In the context of collaboration with Guyana, it is clear that the Iwokrama project has considerable expertise to contribute (particularly in the social arena) and would itself benefit from such collaboration (particularly in the area of strategies for forest management). It has been suggested that the IUFRO meeting on forest management in the neotropics presents an excellent opportunity to consider possible areas for collaboration and sharing of information and resources.

Links to projects in other global regions

7.2.7 The SYMFOR tool (and associated process) was developed for application in Indonesia and SE Asia. This report has clearly identified the potential for this tool to be applied in the American region. It is also suggested that the tools being developed by the *Dendrogene* project might be of interest to activities in Asia. These comments demonstrate the general potential for improved linkages between regions, but it was apparent that such linkages are currently inhibited by a lack of information flow to relevant players.

7.3 Support issues.

7.3.1 Staff from the GFC project expressed concern about the provision of technical support for forest management tools. It was noted that many very useful tools had been developed with support from DFID, but that there was no apparent policy within the organisation to promote uptake by projects or to ensure continuity of support. It was noted that most technical support could be considered strategic, in that it would be relevant to more than one country. The example of conversion of TREMA into the Windows environment was cited as an example.

7.3.2 DFID staff from the GFC project stated that there was an illusion of implied DFID support for some software tools such as TREMA and BRAHMS which have been applied in a number of DFID funded projects. The reality was that any support needed to be funded on the basis of individual consultancies. It was felt that this was not necessarily the most efficient approach and that it has led to a situation where software and tools tended to evolve by chance rather than design. It is clear also that this approach inhibits the potential for sharing tools and information between projects.

7.3.3 It was suggested that it would be helpful if DFID collated a package of "supported" tools available to support development projects in the forestry sector. The exercise should also consider appropriate means of funding the strategic component of technical support for the tools (bug fixes and new features). It is suggested that such an approach is also likely to increase or extend the developmental impact of outputs from DFID funded research projects. These issues are not unique to forestry and a similar approach would be beneficial in other areas of activity.

7.3.4 It can be argued that the low uptake of results from some DFID funded research projects is the failure to link with potential immediate beneficiaries. Better linkage between NRRS programmes (such as the FRP) and regional or country programmes would greatly assist uptake. DFID's relatively small NRRS budget cannot, nor should fund the uptake pathway linking research to application in country. There is, however, a strategic component of the process in adapting research outputs to application. Individual projects are reluctant to invest in activities that are not specific to their own project outputs. It is apparent that there is a

funding gap in DFID linked to making selected, relevant, research results available for application in more than one region.

7.3.5 This report has identified that improved linkages between DFID projects has the potential of significant benefits and enhance their impact on development targets. Project staff were enthusiastic at the potential of a more integrated approach to develop tools supporting the management of tropical forests. It was however noted that such an approach would be associated with significant initial costs and that it was unlikely that these could be met from existing budgets. There will need to be a dialogue on potential sources of funding for such activities if DFID management agree that they are desirable.

Recommendations

17. DFID's forestry advisors should consider collating a group of "supported" tools for forestry projects. This activity should be linked to discussions on suitable methods to fund the technical support for these tools, where such support is likely to benefit more than a single project.
18. There needs to be more dialogue within DFID on the desirability of improved linkages between projects to develop a more integrated approach to (and common tools supporting) sustainable management of tropical forests. Additional sources of funding are likely to be required to support these activities.

8 Terms of Reference

8.1 Title:

Forest management software linkages.

8.2 Objective:

To introduce Symfor to DFID partners in Brazil and Guyana and discuss future strategies for software development.

8.3 Strategy:

Dr Paul Van Gardingen will present Symfor at the Symposium on Modelling and experimental research on genetic processes in tropical and temperate Forests from 18-22 September in Kourou, French Guiana. Representatives of the DFID supported *Dendrogene* project will be present. During the event the future development strategies for forest management software within *Dendrogene* will be discussed and the potential for complementarity with Symfor examined. Development of an integrated decision support system will be considered. Dr Van Gardingen will then present Symfor and discuss development plans with the Forest Commission in Guyana and DFID support project members.

8.4 Outputs:

Visit report identifying complementarity of the different software and discussing possible development strategies in the context of Brazilian and Guyanan priority needs.

8.5 Financial support:

On approval of the visit report DFID, Brasilia will make reimbursement against invoice and receipts up to five thousand pounds sterling to cover fees and expenses associated with this visit, including items such as travel costs, allowances, symposium fees.

9 Organisations and Individuals visited

9.1.1 The consultant met with staff from a number of projects in Korou (French Guiana), Georgetown (Guyana) and Barbados. The following individuals contributed to the discussions leading to this report.

9.2 *Dendrogene* project

Ian Thompson	DFID	Belem, Brazil	Ian@cpatu.embrapa.br
Milton Kanashiro	Embrapa	Belem, Brazil	Milton@cpatu.embrapa.br
Bernd Degen	INRA	Korou, French Guiana	Degen.b@kourou.cirad.fr

9.3 GFC, Guyana

James Singh	GFC	Commissioner of Forests	
Godfrey Marshall	GFC	Deputy Commissioner of Forests	
Neil Bird	DFID	Georgetown, Guyana	neil.bird@solutions2000.net
Chris Turnbull	DFID	Georgetown, Guyana	Turnbull@networksgy.com
Denis Alder	DFID	Short-term consultant	Denis@bio-met.co.uk
Gary Clarke	DFID	Georgetown, Guyana	Garyc@solutions2000.net
Gavin Nicol	DFID	Georgetown, Guyana	Gavin.nicol@solutions2000.net

9.4 Iwokrama, Guyana

David Hughell	Iwokrama	GIS Specialist	Dhughell@solutions2000.net
Vijay Datadin	Iwokrama	GIS	Vdatadin@solutions2000.net
Simone Mangal	Iwokrama	Social forestry	Smangal@aya.yale.edu

9.5 Other Organisations

Graham Chaplin	DFID	NR Advisor, Barbados	g-chaplin@dfid.gtnet.gov.uk
Dejan Lewis	ECTF/ Barama	Guyana	Lewisd@solutions2000.net
Chris Inglis	LTSI/ ECTF	Director, LTS International Edinburgh	C-Inglis@ltsi.co.uk
Peter van der Hout	Tropenbos	Georgetown, Guyana	Marissa_peter@hotmail.com

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