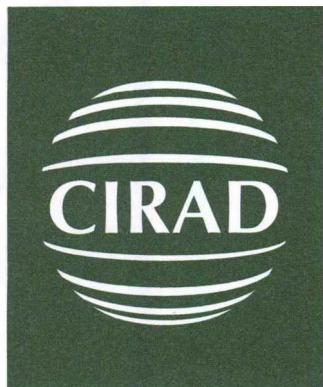


RAPPORT DE MISSION EN

AFRIQUE DU SUD



ET

MADAGASCAR

16 février-3 mars 1998

Ph. VIGNERON



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I. OBJECTIFS DE LA MISSION

1- Participer au deuxième atelier du réseau CIFOR “*Site management and productivity in tropical plantations, Impact on soils and options for management over successive rotations*”.

2- Présenter la candidature d’adhésion au réseau de Madagascar.

3- Présenter au CIFOR d’autres possibilités de collaboration avec le CIRAD/FOFIFA sur différents aspects de la filière Eucalyptus à Madagascar.

4- Organiser et animer la réflexion sur la filière Eucalyptus et initier des propositions à faire aux bailleurs de fonds.

II. PRÉAMBULE

Le CIRAD-Forêt, via l’URPPI, et le CIFOR collaborent dans le cadre d’une étude internationale sur la durabilité des plantations intitulée “Site management and productivity in tropical forest plantations”. Une importante expérimentation est en place au Congo.

Lors de la visite à Montpellier en août 1997 de MM Christian Cossalter et Jeff Sayer, respectivement responsable du programme CIFOR sur la réhabilitation des terrains dégradés et Directeur Général du CIFOR, il a été longuement discuté de ce projet “durabilité” et de l’intérêt qu’il pourrait y avoir à y intégrer une composante foresterie villageoise.

Le FOFIFA, à qui avait été présenté le projet, s’étant déclaré intéressé, il a été convenu d’une mission d’évaluation permettant de définir les thèmes potentiels de collaboration.

Cette mission CIFOR s’est déroulée en deux étapes :

- participation au deuxième atelier du réseau CIFOR à Pietermaritzburg (Afrique du Sud)
- mission CIRAD-CIFOR auprès du FOFIFA.

Suite à cette mission CIFOR, Ph. Vigneron est resté quelques jours de plus à Madagascar pour organiser la réflexion CIRAD-FOFIFA sur différents aspects de la filière Eucalyptus.

III. CALENDRIER

14 février	: départ de Montpellier puis Paris pour Johannesburg (Afrique du Sud)
15 février	: vol Johannesburg-Pietermaritzburg

16-20 février	: atelier CIFOR
21 février	: vol Durban-Johannesburg-Antananarivo Réunion CIFOR-CIRAD Forêts avec la direction générale du FOFIFA
22 février	: visite de terrain
23-24 février	: tournée terrain
25 février	: réunions CIRAD-FOFIFA-CIFOR
26 février	: réunion CIRAD-FOFIFA, point sur la documentation disponible et à trouver réunion avec le Directeur Général des Eaux et Forêts
27 février	: réunion CIRAD-FOFIFA, préparation de la réponse à l'appel d'offre "Projet Pilote Intégré de Mahajanga" réunion à l'Ecole Supérieure des Sciences Agronomiques-Forêt
28 février	: visite de terrain avec Mr Wachowiack, conseiller au FED
1 mars	: libre
2 mars	: réunion au FED avec Mr Wachowiack réunion CIRAD-FOFIFA réunion avec le Directeur Général de l'Office National de l'Environnement réunion avec le Directeur Adjoint de la Caisse Française de Développement départ pour Paris
3 mars	: arrivée à Montpellier

IV. FINANCEMENT DE LA MISSION

Le CIFOR a pris en charge les frais suivants :

Jean-Pierre Bouillet : intégralité des frais d'avion Pointe Noire-Pointe Noire
inscription et frais d'hôtel et restauration en Afrique du Sud

Jean de Dieu Nzila : idem

Alain Rasamindisa : intégralité des frais d'avion Antananarivo-Antananarivo
inscription et frais d'hôtel et restauration en Afrique du Sud

Laurent Schmitt : idem

Ph. Vigneron : intégralité des frais d'avion Montpellier-Montpellier
inscription et frais d'hôtel et restauration en Afrique du Sud

Seuls le séjour à Madagascar pour Ph. Vigneron est à la charge du CIRAD.

V. AFRIQUE DU SUD

Le second atelier du réseau CIFOR “**Site Management and Productivity in Tropical Forest Plantations**” était organisé localement par l’Institute for Commercial Forestry Research. ICFR est un organisme d’état réalisant des recherches dans le domaine de la sylviculture (régénération, nutrition, entretiens, protection des cultures, aménagement...) et de l’amélioration génétique des Eucalyptus résistants au froid (*E. globulus*, *E. nitens*, *E. grandis*...), de *Pinus patula* et d’*Acacia mearnsii*. De plus amples informations sur ICFR peuvent être obtenues sur le site internet “<http://www.icfrnet.unp.ac.za/>”.

1. Participants

Le séminaire regroupait 26 personnes représentant 11 pays et 19 organisations. La liste des participants est donnée en annexe.

La France et ses partenaires étaient représentés par : Jean-Pierre Bouillet (CIRAD-Forêt/URPPI, Congo), Georges Nizinski (ORSTOM Congo), Jean de Dieu Nzila (URPPI, Congo), Alain Rasamindisa (FOFIFA, Madagascar), Laurent Schmitt (CIRAD-FOFIFA, Madagascar) et Philippe Vigneron (CIRAD-Forêt, France).

Le CIFOR était représenté par Christian Cossalter, responsable du programme “réhabilitation des terrains dégradés”, et John Turnbull, chief scientist, qui s’étaient adjoints les experts suivants : E. K. S. Nambiar (CSIRO, Australie), Jacques Ranger (INRA, France) et Allan Tiarks (USDA Forest Service, USA).

2. Objet du réseau

Les plantations d’essences exotiques à courte révolution se développent rapidement en zone tropicale et subtropicale (plus de 30 millions d’hectares). Les rotations rapides et multiples induisent à la fois de fortes exportations minérales et des transformations parfois radicales des caractéristiques physiques et chimiques du sol. Alors que de nombreuses plantations entrent aujourd’hui dans leur seconde ou troisième rotation, le CIFOR coordonne un projet de recherche en partenariat poursuivant trois objectifs :

évaluer l’impact des pratiques sylvicoles (travail du sol, exploitation...) sur la productivité des plantations au cours de rotations successives,

développer des pratiques sylvicoles permettant le maintien ou l’accroissement de la productivité,

renforcer les institutions locales.

Les recherches coordonnées par le réseau sont focalisées sur le passage d’une rotation à l’autre et s’intéressent donc plus particulièrement à l’exploitation, la préparation du site et la croissance initiale du peuplement suivant. De mauvaises pratiques d’exploitation, de gestion

des rémanents et d'installation du nouveau peuplement peuvent avoir des effets désastreux sur la fertilité : perte de matière organique et d'éléments minéraux, compaction et érosion. La gestion de la matière organique, du fait des effets directs ou indirects qu'elle peut avoir sur la productivité (recyclage des éléments minéraux, température, teneur en eau et structure du sol) constitue le thème principal de l'étude.

3. L'expérimentation

L'expérimentation en cours est constituée de quatre traitements de base, communs à l'ensemble des sites retenus, ainsi que de traitements optionnels laissés à l'appréciation de chacun des membres du réseau. Les traitements communs sont les suivants :

BL0 : toute la biomasse aérienne est enlevée, y compris le sous-bois, les feuilles, les branches et la litière.

BL1 : seule la biomasse aérienne vivante est enlevée (écorces et houppiers compris), le sous-bois, la litière et les débris végétaux au sol sont intouchés.

BL2 : seul le bois commercialisable non écorcé est enlevé, le reste est laissé sur place.

BL3 : idem BL2 plus apport de toute la biomasse non commercialisable extraite de BL1.

Les traitements optionnels sont variés et peuvent prendre en compte différents types de travail du sol, de la fertilisation, des plantes de couverture ou des mélanges d'espèces (Acacia par exemple), le brûlis, du nouveau matériel végétal (alors que les traitements communs sont conduits en taillis ou replantés avec le matériel d'origine) etc. Les traitements optionnels mis en place par l'URPPI testent différents niveaux de travail du sol combinés à des brûlis.

Outre les mesures habituelles de croissance, différents paramètres sont mesurés et suivis au cours de la rotation : biomasse et minéralomasse des différents compartiments (bois de tronc, écorce, branches, feuilles, litière etc), composition floristique du sous-bois, chute et décomposition de la litière, caractéristiques chimiques et physiques du sol, profil hydrique, données climatiques (précipitations, températures, évaporation etc).

4. Les exposés

Les exposés ont présenté les travaux réalisés et en cours pour chacun des sites retenus :

- hybride *Pinus caribaea* x *elliottii* au Queensland (Australie),
- *Eucalyptus globulus* en Australie Occidentale,
- *Eucalyptus grandis* dans l'état de Sao Paulo (Brésil),
- *Cunninghamiana lanceolata* en Chine subtropicale,
- *Eucalyptus urophylla* en Chine tropicale,
- *Eucalyptus* hybride au Congo,
- *Acacia mangium* à Sumatra,
- *Eucalyptus grandis* et *Pinus patula* en Afrique du Sud,

ou ont fait état de propositions de travaux :

- *Eucalyptus grandis* et *E. tereticornis* au Kerala (Inde),
- *Eucalyptus robusta* à Madagascar,
- espèces diverses en Thaïlande et en Indonésie.

Les exposés suivants ont été présentés par le CIRAD-Forêt et ses partenaires :

Jean de Dieu Nzila et Jean-Pierre Bouillet : Site management and productivity of *Eucalyptus* commercial plantations in the Congo;

Jean de Dieu Nzila et Jean-Pierre Bouillet : Impact of litter and aerial biomass of the *Eucalyptus* growth on sandy soils in the Congo;

Georges Nizinski, Dominique Morand, Jean-Pierre Bouillet et Jean de Dieu Nzila : Effects of afforestation on soil water balance : *Eucalyptus* plantation in the Kouilou basin (Congo);

Laurent Schmitt et Alain Rasamindisa : Durabilité de la production de bois énergie des taillis d'*Eucalyptus robusta* à Madagascar;

Alain Rasamindisa : Résultats préliminaires sur l'étude de la croissance et de la gestion sylvicole des taillis d'*Eucalyptus robusta* (Hautes terres Est : Sambaina Manjakandriana).

La liste des exposés est donnée en annexe. Les documents sont consultables au programme Arbres et Plantations.

5. Les résultats

Les divers résultats présentés jusqu'à présent concernent essentiellement l'état au démarrage de l'expérimentation : biomasse et minéralomasse des différents compartiments (jusqu'à 13 compartiments pour les pins du Queensland), matière organique, éléments minéraux, humidité, température et structure du sol sous les différents traitements, croissance initiale pour les essais les plus vieux... Les résultats les plus aboutis proviennent d'un essai *Eucalyptus* en Afrique du Sud. Ils montrent notamment que la compaction du sol engendrée par le passage répété des engins d'exploitation induit une baisse de production allant jusqu'à 20 % sur les sols les plus sensibles.

Le bilan des exportations minérales est en cours. L'importance de ces exportations est très variable et dépend notamment de l'espèce et du sol considérée, de la longueur des rotations, bien sûr des modalités d'exploitation (dont l'écorçage) et de très nombreux facteurs non encore mis en évidence (toxicité, compensation d'un élément par un autre, consommation de luxe etc). La comparaison des différentes situations semble montrer que les clones d'*Eucalyptus* plantés au Congo, à production équivalente, sont particulièrement frugaux en éléments minéraux et en eau.

6. Extension du réseau

La dernière session a été l'occasion de présenter les potentielles "candidatures" d'adhésion au réseau, dont celle de Madagascar.

Se voulant représentatif des différentes situations prévalant en zone tropicale, le réseau ne regroupe à ce jour que des plantations industrielles alors même que plus de la moitié des réalisations se font en milieu paysan. Ce "travers" est dû au mode de financement retenu : le CIFOR prend à sa charge les réunions annuelles, les missions des experts dont il s'est entouré, la diffusion des résultats... mais laisse aux membres le soin de mettre en place et de gérer l'expérimentation sur leur propre budget. La taille de l'expérimentation (plus de 4 hectares au Congo pour les seuls traitements de base) et son coût rendent ainsi difficile son implantation en milieu paysan. L'objectif du CIRAD-FOFIFA ne pouvait donc être la mise en place d'un tel essai mais plutôt de fournir des données partielles permettant de généraliser et de consolider tout ou partie des "modèles" en cours de développement. La proposition de Madagascar a été examinée rapidement, elle fait l'objet de la seconde partie de ce rapport.

VI. MADAGASCAR

L'atelier CIFOR de Pietermaritzburg a été suivi d'une visite à Madagascar les 21- 25 février. Participants à cette visite : Christian Cossalter, John Turnbull, Allan Tiarks et Sadanandan Nambiar.

1. Réunion de présentation

Une première réunion s'est tenue à la Direction Générale du FOFIFA le samedi 21 après-midi. Elle réunissait, pour le FOFIFA : François Rasolo, Directeur Général, Gervais Andrianirina, Directeur de l'appui technique, Lucille Ramisona, DAF, Honoré Randrianjafy, chef du DRFP, Alain Rasamindisa, DRFP, pour le CIFOR : les quatre missionnaires, enfin, pour le CIRAD-Forêt : Laurent Schmitt et Philippe Vigneron. Etaient excusés Yvonne Rabenatoandro, Directrice Scientifique du FOFIFA, Jean Louis Reboul, Délégué CIRAD, et Alain Bertrand, CIRAD. Elle a permis les présentations mutuelles des activités du FOFIFA et du CIFOR et de préciser l'objectif de la mission. Le Directeur Général du FOFIFA a exprimé son intérêt pour les collaborations avec les CGIAR et pour la constitution de réseaux internationaux. Il a confirmé que le FOFIFA, en partenariat avec le CIRAD-Forêt, étudierait toute proposition de collaboration portant sur la filière forestière.

Ces discussions se sont poursuivies lors d'un dîner pris en commun à l'invitation du FOFIFA, dîner auquel a pu se joindre Mme Yvonne Rabenantoandro.

2. Visite de terrain

La visite de terrain, les 23 et 4 février, a permis d'aborder différents aspects de la filière Eucalyptus. Y participaient, pour le CIFOR : Christian Cossalter, John Turnbull, Sadanandan Nambiar, Allan Tiarks, pour le FOFIFA : Honoré Randrianjafy, Alain Rasamindisa, Christine Rakotonirina, René Rakotomamonjy, pour le CIRAD-Forêt : Laurent Schmitt et Philippe Vigneron.

2.1. Description de la visite

Premier arrêt, route d'Anjozorobe : présentation générale du milieu, historique des reboisements, organisation des bassins versants et rôle de la couverture forestière sur le fonctionnement...

Deuxième arrêt, Ankazondandy : exploitation et premier rabaissement des souches, techniques de carbonisation,

Troisième arrêt, Soavinandrina-Anjepy : exploitation d'un taillis très productif après rabaissement des souches, conduite en taillis sous futaie, importance de la litière...

Quatrième arrêt, Sambaina-Manjakandrina : productivité et classes de fertilité.

Cinquième arrêt, Fanalamanga avec Mr Seth Ramakavelo (directeur) : fertilisation des pins, replantation en Eucalyptus robusta.

Sixième arrêt, Fanalamanga : les travaux en amélioration génétique des Eucalyptus, vergers à graines.

Septième arrêt, Sambaina : essais de rabaissement de souches, outils de coupe.

Huitième arrêt, Sambaina : gestion des brins et dépressage, prélèvement des litières (pour la fertilisation des rizières) et érosion...

Neuvième arrêt, Ambatovory (Angavokely annexe) : essai longueur de rotation, analyse chimique des sols, exportations minérales, gestion de la litière et des rémanents.

2.2. Résumé des discussions

Ces deux jours de visite ont été l'occasion de longues et intéressantes discussions.

Spécificité des taillis d'Eucalyptus robusta à Madagascar

La filière Eucalyptus robusta malgache est, à bien des égards, tout à fait originale dans le monde tropical. La complexité et la diversité des situations rencontrées en font cependant un terrain d'étude très complet et exemplaire.

L'importance du massif

Les plantations d'Eucalyptus robusta, traitées en taillis à courte rotation, fournissent l'essentiel du bois énergie consommé par Antananarivo. Les dernières données disponibles (1989, partiellement réactualisées en 1992) faisaient état d'une consommation annuelle estimée à 1,2 millions de mètres cubes de bois énergie. La consommation actuelle est probablement bien supérieure du fait de l'augmentation de la population (peut-être proche de 50 %) et devrait se situer aux alentours de 1,5 millions de mètres cubes auxquels il convient d'ajouter la consommation de perches et bois ronds (environ 0,2 millions de mètres cubes), de bois d'oeuvre (0,8 M mcube ?) et la consommation extra urbaine (la densité moyenne de population de la zone de production est supérieure à 100 habitants par km²) dont celle destinée à la cuisson de briques alimentant la ville. Même si la part prise par l'Eucalyptus dans cet approvisionnement est mal connue (80 % du bois de chauffe et du charbon, 20 à 30 % du bois d'oeuvre ?), c'est probablement plus de 1,5 millions de m³ grume que cette espèce représente. Si l'on considère que la productivité moyenne est de l'ordre de 15 m³/ha/an (avec une très forte variabilité) et que tout le massif est exploité (ce que confirme les visites de terrain), la surface totale occupée par cette espèce serait supérieure à 100 000 ha.

Son morcellement

Bien que couvrant de très grandes étendues sans discontinuité (jusqu'à 60 % de la surface totale de certaines communes) les études foncières ont révélé l'extrême morcellement du massif. La surface moyenne de la propriété peut varier considérablement d'une région à une autre. Pour certains, elle serait inférieure à 1 hectare par famille mais peut atteindre, très rarement il est vrai, plusieurs dizaines d'hectares.

L'âge du massif

Quelques études partielles et la simple visite de terrain montrent qu'il existe localement une certaine dynamique d'extension, sans qu'il soit pour autant possible d'en chiffrer l'importance. Les plus vieilles plantations sont maintenant centenaires et l'essentiel du massif est constitué de parcelles plus que cinquantenaires.

Sa productivité

Les inventaires de la ressource, localisés à la zone de Manjakandriana-Sambaina, conduisent à un accroissement moyen annuel de 10 à 30 m³/ha avec une moyenne d'environ 15 m³/ha/an à l'âge de 4-5 ans. Il semble cependant dangereux de généraliser à l'ensemble du massif vue la diversité des situations pédoclimatiques rencontrées.

Sa conduite

La sylviculture de ces plantations reste très sommaire et se limite aux interventions d'exploitation. Les peuplements sont conduits en taillis purs, beaucoup plus rarement en taillis sous futaie. L'ensouchemen moyen actuel est de l'ordre de 1100/ha. Après exploitation, la souche est laissée à elle même, il n'y a aucune intervention de dépressage. La longueur des rotations est très variable. De l'ordre de cinq ans dans les années 80, elle dépasse maintenant rarement 2-3 ans pour les peuplements les plus accessibles. A cet âge, l'accroissement moyen annuel n'est plus que de 12-13 m³/ha/an. L'origine de ce phénomène est à rechercher à la fois dans l'augmentation de la demande et dans l'appauvrissement des paysans producteurs (le bois est bien souvent la seule production commercialisée) à qui échappe le contrôle de la filière.

Modalités d'exploitation

L'exploitation est faite à blanc-étoc. Les rejets de souches sont coupés en laissant un moignon d'environ 10 cm. Ils sont laissés au sol durant 1 à 3 semaines afin de leur permettre de sécher. La parcelle est alors souvent brûlée afin d'éliminer l'importante masse de feuilles et de brindilles et de faciliter les travaux ultérieurs. Dans plus de 80 % des cas, le bois est transformé en charbon. Toutes les tiges, jusqu'au diamètre fin bout de 2 cm, sont alors découpées et carbonisées, écorce comprise, dans des meules traditionnelles. Les rémanents (entre 2 et 1 cm de diamètre) sont ensuite glanés. Ils assurent une partie de la consommation locale. Le charbon une fois extrait, la parcelle est abandonnée à son sort jusqu'à la prochaine coupe. La production de bois de chauffe, qui ne représente pas 20% du total, est plus "conservatrice". Le diamètre fin bout minimum de commercialisation est relevé et le bois est écorcé. Pour une rotation de deux ans, la production totale est de l'ordre de 20 à 24 m³/ha de bois de chauffe ou 1 à 1,5 tonnes de charbon.

Depuis quelques années, l'exploitation des rejets est complétée par celle des souches. Cette pratique, qui consiste à rabaisser à 10 ou 20 cm des souches souvent hautes d'un mètre et plus, est maintenant fréquente. Elle a été suscitée par des expérimentations/démonstrations, mises en place le long des principaux axes routiers. Ce rabaissement a un effet légèrement positif sur la croissance des futurs rejets. Il ne met donc pas en péril, contrairement à la croyance locale, la production future. La raison principale de son adoption est cependant plus liée à l'importance du volume de bois immédiatement mobilisable qu'à une volonté délibérée d'améliorer la production future. Le volume bois de souche commercialisable atteint en effet 60 à 100 m³/ha.

Les filières

Les enquêtes réalisées par l'ESSA-Forêt (B. Ramamonjisoa) révèlent la diversité des types d'organisation. Une typologie basée sur les acteurs de l'exploitation, du transport et de la distribution aboutie, pour le seul bois énergie, à pas moins de 9 filières ayant chacune leur spécificité. Ces filières informelles employaient en 1989 plus de 5000 personnes et généraient un chiffre d'affaire annuel de 13 milliards de fmg (15 millions de francs).

Les tendances actuelles et les problèmes rencontrés et attendus

Le raccourcissement généralisé des rotations a différents effets :

- un accroissement moyen annuel en baisse
- une proportion d'écorce à la hausse (riche en éléments minéraux)
- l'exploitation de bois juvénile, donc à très forte teneur en éléments minéraux
- une augmentation considérable du temps d'exposition directe du sol au soleil et aux pluies

qui aboutissent à une augmentation sans précédent des exportations minérales, à un ralentissement de la vie microbienne du sol et à une accélération de l'érosion.

Au delà donc d'une réelle interrogation sur l'avenir de la production, le raccourcissement des rotations peut avoir un effet négatif important sur la "fertilité" générale des bassins versants considérés (contrôle des débits hydriques, ensablement des rizières...).

Bien qu'importante, la bibliographie existante reste trop partielle et souvent contradictoire pour fournir une vision claire de la situation. De nombreux aspects de la filière restent dans l'ombre. La surface totale, la production moyenne, la dynamique d'extension ne sont connues que de façon très imprécise. Les impacts environnementaux du raccourcissement des rotations restent du domaine de la supposition. Les enquêtes de consommation sont anciennes et les données économiques sur les filières doivent être actualisées. La multiplicité des interactions entre facteurs sociologiques, biologiques et économiques ne permettent pas de formuler dès à présent des propositions pertinentes et cohérentes d'amélioration globale du système. Une synthèse générale accompagnée de l'acquisition ou de l'actualisation de certaines données est nécessaire.

3. Conclusions de la mission CIFOR

Une discussion générale regroupant l'ensemble des participants à la visite de terrain et reprenant l'ensemble des points évoqués plus haut s'est tenue le mercredi 25 au Département des Recherches Forestières et Piscicoles. Elle a été suivie l'après midi d'une réunion de restitution auprès de la Direction Scientifique du FOFIFA.

Le CIFOR a souligné l'originalité de la filière Eucalyptus robusta à Madagascar : son importance biologique, géographique, économique, le caractère plus ou moins spontané de son extension, son organisation sociale et économique, son rôle dans la gestion des bassins versants... Tout à fait originale dans le monde tropical, sa complexité, son importance et sa diversité en font une source de connaissances valorisables bien au delà de Madagascar.

Le risque que fait peser le raccourcissement des rotations sur la productivité à moyen terme des peuplements et, plus généralement, sur la fertilité du système semble réel. L'étude de la

dynamique du fonctionnement minéral et hydrique des plantations, commencée par le FOFIFA, est pleinement justifiée.

Parallèlement aux travaux portant sur la gestion du taillis à courte rotation, il conviendrait d'évaluer plus précisément les potentialités du massif et de définir, en fonction des sites et des situations, les principales contraintes biologiques, sociales et économiques de production.

L'adhésion formelle au réseau CIFOR "Site management and productivity" semble cependant actuellement impossible : les connaissances de base sont encore insuffisantes et bien inférieures à celles des autres membres, l'expérimentation centrale (traitements communs minimums) est trop lourde pour être mise en place et supportée par le CIRAD-FOFIFA dans le cadre des taillis d'eucalyptus, ou par la FANALAMANGA dans le cadre de la reconversion des peuplements de pins en eucalyptus.

Une connexion informelle avec le réseau est conseillée. Le FOFIFA sera destinataire des résultats et publications du réseau. Ce dernier facilitera, autant que faire se peut, les collaborations bi ou multipartites avec Madagascar.

Au delà des activités propres du réseau, le CIFOR souhaite développer une collaboration avec le FOFIFA-CIRAD portant sur divers aspects de la filière. Pour cela, il est prêt à soutenir auprès des bailleurs de fonds tout projet compatible avec son mandat, notamment dans le cadre de son programme "Plantation Forestry on Degraded or Low potential Sites" dont les objectifs peuvent se résumer à 1) identifier et analyser les principales contraintes d'une production forestière durable et 2) développer des outils techniques et économiques permettant d'améliorer durablement la productivité des petites plantations sur les sols dégradés ou à faible potentiel. Les documents CIFOR en annexe montrent la diversité des thèmes potentiels de collaboration.

La Direction du FOFIFA est prête à soutenir toute initiative DRFP-CIFOR-CIRAD et incite les chercheurs à travailler en ce sens.

4. Groupe de travail Eucalyptus

Les derniers jours de la mission ont été consacrés à l'organisation et à l'animation de la réflexion ainsi qu'à la promotion de nos activités auprès des bailleurs de fonds ou des administrations concernées.

4.1 Synthèse des connaissances.

Cette synthèse doit s'appuyer sur l'ensemble des travaux réalisés dans la région et portant sur le milieu physique et socio-économique, la connaissance de la ressource et de la consommation, les pratiques sylvicoles, la transformation, les filières de commercialisation, les politiques forestières... ceci afin d'avoir une vision aussi large que possible de la problématique. La documentation disponible au DRFP a été passée en revue. Elle est encore insuffisante. Des contacts ont pu être pris avec l'ESSA-Forêt (Bruno Ramamonjisoa) et le projet Terre-Tany (Leopold Gahamanyi). Il a été convenu de mettre en commun les

références disponibles. D'autres documents écrits ou cartographiques sont à rechercher auprès de l'Université, des organismes de recherche, des administrations et ONG concernées.

4.2 Visites aux bailleurs de fonds et administrations concernés.

Une tournée de terrain et quatre visites ont pu être effectuées avant le retour en France. Il s'agit là de prise de contact, contacts qui devront être poursuivis et intensifiés en vue de montages de projets recevables.

4.2.1 Jeudi 26 février. Visite au Directeur Général des Eaux et Forêts.

Etaient présents : Monsieur Hilarion Razafinandimby, Directeur Général, et trois de ses collaborateurs dont Madame Monique X, Directrice de la Planification et Madame la Coordinatrice du Projet Environnemental II (PEII), Messieurs Alain Bertrand, Laurent Schmitt et Philippe Vigneron.

Une présentation générale des problématiques liées à la filière Eucalyptus a été faite. La vision des problèmes apparaissait sous bien des aspects assez nouvelle à la DG.E&F. L'étude de la durabilité du système, l'inventaire des plantations, la filière bois d'oeuvre les ont particulièrement intéressés. Le Directeur Général a cependant souligné que la lutte contre l'exploitation illicite des formations naturelles constituait leur préoccupation majeure. La part des plantations dans l'approvisionnement en bois d'oeuvre est donc amenée à augmenter.

Cette brève réunion a permis de prendre contact avec le nouveau Directeur Général. Il convient de poursuivre notre action de sensibilisation auprès des différents responsables de la Direction Générale qui est prête à participer à notre réflexion.

4.2.2 Samedi 28. Tournée de terrain avec Monsieur Wachowiack, conseiller au FED.

Participaient à la tournée : Philippe Deleporte, Gilles Chaix, Honoré Randrianjafy, chef du DRFP, Laurent Schmitt et Philippe Vigneron.

Cette tournée de quatre heures a permis d'effectuer une rapide présentation de la filière Eucalyptus robusta et des diverses problématiques qui y sont liées.

4.2.3 Lundi 2 avril. Visite au FED.

Le réunion regroupait Mr Wachowiak, Deleporte, Chaix, Randrianjafy, Schmitt et Vigneron.

Un point rapide a été fait sur le projet "vergers à graines". Mr Wachowiack a assuré qu'il était toujours en attente de l'autorisation de mobiliser 80 000 écus pour prolonger les activités du projet. Par ailleurs, les propositions de réaménagement du budget actuel sont acceptées.

L'incertitude d'un financement pour une deuxième phase reste entière.

En ce qui concerne l'étude de la filière, Mr Wachowiack a précisé qu'un contrat de gré à gré avec le CIRAD était maintenant impossible (pression des pays partenaires européens) mais que certains arrangements pouvaient être trouvés au travers du FOFIFA. Le FED semble considérer le FOFIFA comme un partenaire sérieux, jouant pleinement la carte de la régionalisation. L'intégration d'un projet Eucalyptus dans un plus vaste projet régional Hautes Terres présenté par le FOFIFA pourrait recevoir l'appui de Mr Petit Pierre, Représentant du FED, pour un financement sur le huitième FED.

Mr Wachowiack pense que différents projets pourraient être financés sur la ligne "Action pour les forêts tropicales" (DG I et DG VIII) sur les thèmes bilan de fertilité, impacts environnementaux, connaissance de la ressource... Un travail de synthèse bibliographique complété par l'actualisation de certaines données (taille et productivité du massif, importance de la demande...) pourrait aussi être recevable.

4.2.4 Lundi 2 mars. Visite à l'Office National de l'Environnement.

Etaient présents :Monsieur Alfred Rakotonjanahary, Directeur Général de l'ONE, Philippe Deleporte, Honoré Randrianjafy, Laurent Schmitt et Philippe Vigneron.

L'objet de la visite était de voir quel intérêt l'ONE pouvait porter à la filière Eucalyptus. Une présentation des différentes problématiques a donc été faite, en insistant sur les aspects environnementaux. L'ONE coordonne de nombreux travaux de recherche/développement relatifs à la gestion de l'environnement. Deux approches complémentaires sont favorisées. La première consiste à rechercher, avec les paysans, l'origine des problèmes écologiques auxquels ils sont confrontés puis d'étudier les diverses possibilités d'action localisée qui permettraient d'y remédier. La seconde consiste à proposer, initier et soutenir des modes de gestion des ressources naturelles (approche "GELOSE").

De l'avis du Directeur Général, le recours aux énergies renouvelables (biogesteurs, microcentrales hydrauliques) est le plus sûr moyen de réduire la pression d'exploitation sur le massif d'Eucalyptus. Nous ne partageons bien évidemment pas cette vision et le DG a admis un certain nombre de nos arguments : résidus d'exploitation et de récolte déjà employés (pour le bétail ou la fertilisation), microcentrales rurales inopérantes pour l'approvisionnement de la ville qui constitue le gros de la consommation (la population rurale de la zone considérée, bien que dense, ne représente guère plus du dixième de celle d'Antananarivo).

L'étude des impacts environnementaux du raccourcissement des rotations semble pouvoir entrer dans le cadre de la première approche développée par l'ONE. Il convient maintenant de préparer un papier présentant notre argumentation.

4.2.5 Lundi 2 mars. Visite à la Caisse Française de Développement

Etaient présents Mr André Meyer, Directeur Adjoint, et Mr Ullin, CSN chargé du

développement rural, pour la CFD, Mr Honoré Randrianjafy pour le FOFIFA, MM Philippe Deleporte, Laurent Schmitt et Philippe Vigneron pour le CIRAD.

Les activités de la Caisse à Madagascar reprennent après quatre années d'interruption. Elles sont pour l'instant engagées sur le court terme (2 ans), la Caisse se donnant ainsi la possibilité de se retirer si les conditions politiques l'y obligent (difficile recouvrement des prêts auprès des institutions). En matière de développement rural, les activités sont centrées sur : les petits pérимètres irrigués, la gestion de la fertilité (plantes de couverture, "zéro labour"), l'élevage, notamment laitier, et le micro crédit (cautions solidaires et caisses d'épargne mutualistes). Il s'agit d'appuyer la production agricole. Les zones principales d'intervention sont le Lac Alaotra, la région d'Antsirabe et Ambositra, celles de Morondava et Tulear.

L'appui aux plantations forestières à courte rotation pourrait être envisagé. La ligniculture bois énergie fait en effet partie intégrante du système de production, au même titre que la riziculture ou l'élevage laitier. Cette activité pourrait notamment bénéficier de la mise en place de micro crédits destinés à faciliter une gestion durable des parcelles (crédits relais pour attendre le terme optimal de la rotation).

Un appui dans le cadre de la filière bois d'oeuvre, pour aider les producteurs mais aussi les transformateurs, est susceptible d'intéresser la Caisse.

Cette visite semble avoir été très positive. L'existence d'une filière si importante était insoupçonnée à la CFD qui se demande pourquoi elle n'est pas inscrite dans les priorités des bailleurs de fonds. Les personnes rencontrées demandent un document de synthèse sur les problématiques qui nous paraissent importantes. Elles pensent que les différents fonds pour l'environnement sont potentiellement utilisables pour un tel sujet.

4.2.6 En conclusion de ces visites :

- la filière Eucalyptus est largement méconnue
- elle intéresse nos interlocuteurs
- tout en poursuivant notre réflexion, il convient de poursuivre notre action de sensibilisation, notamment en produisant des documents de synthèse et en invitant les bailleurs de fonds et les administrations à des tournées de terrain.

ANNEXES

SITE MANAGEMENT AND PRODUCTIVITY IN TROPICAL PLANTATIONS
Impact on soils and options for management over successive rotations

Second Workshop
 16-20 February 1998, South Africa

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SITE MANAGEMENT AND PRODUCTIVITY IN TROPICAL PLANTATIONS

Impact on soils and options for management over successive rotations

**Second Workshop
16-20 February 1998, Pietermaritzburg, South Africa**

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Conceptual framework

Project 5: Plantation Forestry on Degraded or Low-potential Sites

The Problem

Challenges that Production Forestry will face in the next century encompass: a worldwide increased demand for wood and wood-derived products; a significant shift in timber production from natural forests to plantations especially in the tropics; and a greater reliance on wood produced by small landholders. This will be driven by both ‘pushing’ and ‘pulling’ forces. Pushing forces will include the global environmental concern, social pressures and the rapidly diminishing resource of tropical forests. Some of the ‘pulling forces’ have already been apparent over recent years. They are closely linked to technological advances and related new needs of timber industries for raw material of a uniform quality and size, as a result of standardisation of quality and manufacturing processes. Plantations have clear comparative advantages over natural forests in terms of cost competitiveness and reliability of supply for this kind of raw material. Demand for the few specialty products that can be obtained only from natural forests may not increase greatly, and will probably be satisfied from ecologically sensitive logging operations in natural forests targeted for production. Those will probably represent only a fraction of the area which is being currently logged. Developing a man-made forest resource that will be biologically and economically sustainable, and socially acceptable, is one of the important challenges that many tropical countries will have to face in immediate future.

Degraded lands and plantation forestry: In the tropics there are vast areas of eroded and degraded lands. Physical and chemical degradation is manifested as soil compaction, sheet and gulley erosion, increased soil acidity and reduced availability of nutrients. Biological degradation includes declining soil organic matter, losses in beneficial soil micro-organisms and weed encroachment. In the humid tropics alone there is an estimated area of 250 million ha made up of degraded forest fallows, *Imperata cylindrica* grasslands and degraded pastures. In the densely populated countries of South and Southeast Asia nearly 20 per cent of farmland is unproductive due primarily to salinity, waterlogging and loss of top soil.

Table 1: Human-induced land degradation, 1945-1992

Region	Total Degraded Area (M ha)	Degraded Area as a percentage of Total Vegetated Land
Asia	746	20
Africa	494	22
South America	244	14
North & Central America	158	8
Oceania	103	13

Many forest plantations of the tropics are on soils that are low in nutrients and have physical properties that make them susceptible to degradation. In some cases, those sites can support reasonable wood production with suitable management. However forest plantations can also

further degrade a fragile site if the technology which is applied is inappropriate or if managed poorly.

Industrial plantations: Currently, competitive sources of industrial wood from intensively managed plantations are, to a very large extent, located in temperate countries. At the end of 1990, Southeast Asia and the Pacific region had about 12 million ha of industrial plantations, between 2-2.5 times less area than their temperate neighbours, namely southern Australia, northern China, Japan, Korea and New Zealand. Similarly, in the same period, tropical America and the Caribbean region had about 5 million ha, between 3.5-4 times less than Canada, USA and the non-tropical zones of Argentina, Brazil, Chile and Paraguay. Industrial forest plantations of the tropics are concentrated in only a few countries. At the end of 1990, Brazil had an area of tropical forest plantations equal to about 75 per cent of the entire resource of Latin America and the Caribbean region. For the same period, about 90 per cent of the industrial forest plantations of Southeast Asia and the tropical parts of the Pacific were located in southern China, Indonesia and Vietnam, while in South Asia, India had just over 90 per cent of the regional resource.

Non-industrial plantations: Since the late 1970s the notion of forestry as providing a broader range of products and services has become predominant in many countries' forest policies. Forestry subsidies are now frequently intended to ensure social, environmental and rural stability, as well as timber supplies. As a result of such changes in attitude, the area of plantations designed specifically for non-industrial products and services has greatly increased in proportion to other forms of plantation. Much still needs to be done to ensure that plantation forestry is sustainable, through incorporating ecological, economic, social and cultural needs. Today the areas of land suitable and available to forestry are decreasing and are often part of an intricate mosaic of land use and ownership. Commercial incentive is often the strongest stimulant for tree growing but frequently local markets for forest products are not well established and/or there is poor market information. Consequently there is little private, small-scale investment in commercial forestry. A great deal can be learned by studying institutions and markets in those few countries where small-scale forestry is flourishing.

Productivity and sustainability of plantations: Plantation forestry is new in many tropical areas and little is known about the potential capabilities for increasing productivity as well as potential problems that may limit yields. It is widely believed that growth rates are outstandingly high in the tropics, but this is only so on sites with good soils, good precipitation and favourable temperatures. High yields are absolutely dependent on the timely application of good management practices. Major challenges and issues facing tree growers and researchers are the biophysical problems that relate to nutrient management, tree improvement and control of pests and diseases. Of at least equal importance are socio-economic questions and development of policies and markets which will induce greater participation of the rural populations in tree growing.

The main factors controlling the productivity of plantations are soil water and nutrient availability, organic matter and effective rooting depth, as well as the genetic quality of seed and seedlings, elimination of weed competition and control of pests and diseases.

Where rainfall is sufficient to grow trees economically, it is likely to be nutrient deficiency which limits growth. Currently very many plantations have sub-optimal nutrition. In industrial plantations fertiliser application at establishment is cost-effective but, if fast-growing trees are

to be managed sustainably on degraded lands or soils of low nutrient status by smallholders, several questions concerning nutrition need to be answered. Many questions are related to our understanding of the dynamic interaction of trees and soil, particularly at the root-soil interface. What is the role of symbiotic micro-organisms and how can they be managed effectively? Management of soil organic matter through post-logging slash management, including reduced burning, will be important. The role of intercropping with herbaceous plants and polycultures with trees can also have effects on soil organic matter, and management prescriptions will need to be developed with sustainability as a goal.

There will have to be much more active nutrition management through site conservation and amelioration practices if sustainability is to be achieved in fast-growing, short-rotation plantations. From the point of view of small-scale growers it will be important to develop low-cost technologies and management options to improve tree productivity on soils of low nutrient status.

There has been rapid development in plant biotechnology in recent years and powerful tools are becoming available which can enhance plantation production and utilisation. However, it is unlikely that many of the products from biotechnology or even from more traditional tree breeding will flow through to tree growers using a range of species on a small scale as the research investment costs will be difficult to justify if the extent of application is limited. It will be important to develop methodologies to ensure that the genetic material used by small landholders is improved to the extent possible at very low cost.

Forest managers and farmers often express concern about the potential impact of pests and diseases which reduce productivity and can threaten the economic viability of plantations. As plantation areas increase, there will be a need to be especially vigilant to ensure that new pests are not introduced and, if they are, small scale plantings with a diversity of species will require integrated pest management techniques to be applied. The potential for severe damage by pests and diseases is magnified when species are planted 'off-site'. Choosing species well-adapted to environmental conditions can be of equal importance to selecting species to give the desired wood products.

The main benefits from integrating trees and other land uses appear to be in the less-productive marginal uplands where ecological benefits are eventually translated into economic advantages, i.e., higher productivity on a sustained basis. The perceived ecological benefits are nutrient and soil conservation in fragile and hilly lands, and restoration of productive capacity of degraded lands through soil biological processes controlling the decomposition of plant residues. The application of social forestry to issues of increasing agricultural productivity, soil conservation and the provision of wood products has two elements, i.e., local participation and the sustainable increase of productivity on a fixed area of land. Local participation will occur only if farmers have the ability to take up new technologies and a range of incentives may be necessary as a stimulus. Government commitment to promoting new technologies through legislation, technical support, market development and financial support may be a key factor. Overall there must be economic gain as conservation without discernible economic benefits is difficult to promote.

One of the reasons for the increasing interest in tree plantations in the tropics is their rapid growth. However, almost all available growth data come from first rotation stands. The question is, will later rotations yield as much wood as the first? Can degraded rainforest sites,

grassland or savanna, be permanently turned into highly productive tree plantations or is the large initial gain unsustainable without major inputs of fertiliser, etc.? These questions of long-term productivity are important because it is the spectacular short-term productivity in the tropics that encourages development of many industrial plantations as well as influencing decision making in small-scale social forestry activities.

Forest plantations and people: Forest plantations and societies interact. At their best, forest plantations foster local socio-economic development. They provide employment, raw materials, infrastructure, and environmental and recreational services for local people. At their worst, plantations can take land out of food production in areas of acute food shortage, increase the number of landless farmers and destroy culturally important species, habitats and landscapes. Ultimately many plantations may come to suffer financially from the social problems they cause. Where plantations form a major part of the land use system, and where competition for land is strong, the social and cultural implications and feedbacks can be significant.

In this context it is expected that there will be increased needs for new tools/approaches to foster stakeholder participation in decisions, costs and benefits, and to ensure effective procedures to resolve conflicts. This remains an important challenge, especially in densely populated countries of Asia where an increasing proportion of forest products is expected to be produced closer to their point of consumption.

The Objectives

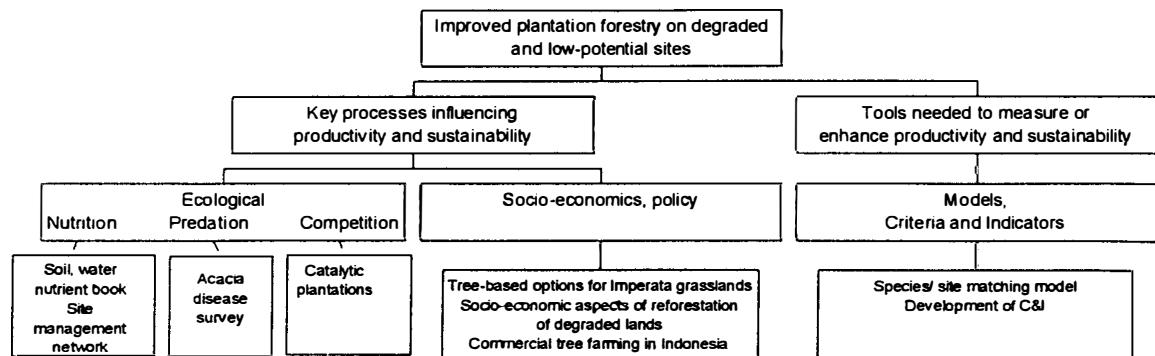
CIFOR research on plantation forestry will:

- identify and analyse priority problems which constrain sustainable and productive tree planting; and
- develop technological and incentive options to enhance the sustainability and productivity of small-scale plantations on degraded and low-potential sites in the tropics.

The Approach

Industrial forestry has made great progress by using single-species plantations and applying intensive management with high inputs to provide high productivity and uniform products. These plantations are confined to a relatively small area and, while economically viable, offer limited social and environmental benefits. They are mainly the concern of large companies in the private sector or government corporations. However, as large areas of land not subject to tenurial problems become increasingly difficult to locate, the outlook for greater development of a more complex system of wood production involving smallholders will become more feasible and attractive. Prospects appear good for a complementary, more complex model of plantation forestry in which trees are grown in smaller blocks, are more integrated with other land uses, have more direct involvement of local people and provide a more diverse range of products and services. In some parts of the world smallholders grow trees for charcoal or pulpwood for industries while at the same time producing honey and other non-industrial products.

Figure 1: Diagrammatic representation of CIFOR's research programme to develop technologies and incentives for improved forestry options on degraded and low-potential sites.



Complex plantation forestry requires an interdisciplinary approach to define the appropriate economic, social and environmental contexts as there are likely to be biophysical, socio-economic and policy constraints to be overcome. CIFOR will use a series of comparative case studies, involving interdisciplinary teams where appropriate, to conduct strategic and applied research to determine key processes influencing productivity and socio-economic and environmental sustainability. Such an approach would be very difficult for an individual national forestry organisation but in partnership with CIFOR national research organisations could be part of a co-ordinated interdisciplinary effort.

Outputs and Impact

Technologies and models derived from this research will provide silvicultural management and policy options to support the introduction and development of an effective and more complex model of tropical plantation forestry involving smallholders. It will enable the application in plantations of management options which are both environmentally sustainable and economically viable. By improving the rate of success of small-scale plantations, rural and urban dwellers will be able to obtain essential forest products and environmental services. Through increasing incomes of smallholders, the rural economy will be improved which will ultimately impact positively on livelihoods of the rural poor. The successful integration of trees into the landscape in developing countries is expected to promote more sustainable agriculture and may reduce pressures on natural forests.

Expected Gains

- (a) Where improved management practices are identified and adopted in fast-growing plantations it is estimated that increased growth rates of 10-40 per cent in the second and subsequent rotations will be achieved; and
- (b) improved economics of small-scale plantations compared to other land use-alternatives should result in a reduction of the pressure on natural forests and increased opportunities for households and communities to generate income from forest products.

Users

Industrial and community forest managers and smallholders; forestry research institutes; universities and forestry technical institutes; policy makers; extension forestry specialists; NGOs involved in community forestry policy and management; regional and international forestry and environment projects.

Impact Pathways

Improved policy: The development of forest plantations is strongly influenced by government policy. Therefore, Project 5 work will:

1. raise awareness among policy makers of the current and changing importance and potential of forest plantations on local and regional economic systems;
2. analyse the influence of policy in forest plantation development trends; and
3. recommend necessary changes in forest plantation-based policies.

The Project will achieve impact by working with research partners who have potential policy influence and utilising a variety of media intended to inform and engage policy makers, including policy seminars and policy briefs.

More effective forest plantation projects: There is currently a high level of investment in the sector, much of it without adequate basis. Our work will:

1. improve understanding of how forest plantations can be better managed for increasing and sustaining production in tropical regions with due care for the environment and due concern for people needs; and
2. provide analyses to assist with priority setting and with the design and use of appropriate technologies.

Impact will be achieved by collaborating with forest plantation projects in research and strategic evaluations.

Better informed forest stakeholders: New emphasis on non-industrial/smallholder forest plantations in government and donor programmes is providing expanded opportunities for development agencies and other support groups to influence the agenda. Our work will:

1. provide new tools for people to understand their own situation and take better informed decisions (scenario models, market studies, etc.).

Impact will be achieved by collaborating with and providing information to national partners (universities, government agencies, NGOs) and international donors and NGOs that have extension and participatory development mandates.

System Linkages

Increasing Productivity in Trees (60%), Policy (32%), Biodiversity (6%), Training (2%).

Plantation Forestry on Degraded or Low Potential Sites

1997 Highlights

Project Team leader: Christian Cossalter

Improving smallholder farming systems in Imperata grassland of Southeast Asia

Budget code: 105000

Activity started in 1995

Task leader: John Turnbull

This activity involves 18 outside collaborators

Uplands are important geographical components of south east Asian agriculture, particularly in the Philippines and Indonesia. Large areas of the forest uplands in both countries have been severely degraded due to logging and shifting cultivation and are now converted into grasslands colonized with *Imperata cylindrica*. Although *Imperata* has some uses, these are of relatively low economic value and *Imperata* areas are inhabited by people with low incomes (Garrity et al. 1993, Menz et al. 1995, Sabarnurdin et al 1991). The purpose of this project is to use bio-economic computer modeling for testing the impact of improvements in technologies and policies over a range of socioeconomic settings. Models, by definition, are abstraction from reality. The aim is to present a range of models, broadly representative of large parts of *Imperata*-dominated south east Asian uplands. The models are being constructed to enable them to be used for extension and training purposes as well as for technological and policy research and for investment decisions.

The following reports were prepared and published by the project staff. These will form the basis of future journal articles.

1. Napier Grass Strips and Livestock : A. Bio-economic Approach
 2. Multipurpose Trees as Improved Fallow : An Economic Assessment
 3. Alley Cropping Farming Systems in Indonesia (A Review)
 4. A Cost-Benefit Analysis of a *Gmelina* Hedgerow Improved Fallow System in Claveria, Northern Mindanao, Philippines
 5. Multipurpose Trees as an Improved Fallow :Modelling the Role of Cattle
 6. Fire as an Economic Disincentive to Smallholder Rubber Planting in imperata Areas of Indonesia
 7. Biophysical and Economic Evaluation of Hedgerow Intercropping using SCUAF in Lampung, Indonesia.
-

Alternative socio-economic approaches to reclaiming degraded lands, China

Budget code: 105010

Activity started in 1995

Task leaders: John Turnbull and Neil Byron

This activity involves 33 outside collaborators

With market driven economy taking gradually more importance in China there is a clear awareness at all levels of the State and provincial authorities on the need to experiment new forms of people participation. There is a specific need to encourage productive use of degraded lands. Various models are already taking place. These range from new rights and a certain responsibility on the land given to State farms' employees to free enterprise on the land re-allocated to farmers. Degraded lands in mountainous and hilly areas account for over 60% of China's total land area. Tree planting by small farmers can offer solutions to this problem. However, there is widespread local and national concern about the sustainability of tree planting on such lands.

The project on *Alternative socio-economic approaches to reclaiming degraded lands* is using new research approaches and methods to address the problem of land degradation. Previous research by the Chinese Academy of Forestry (CAF) have produced several technological solutions to the problem of degraded lands. The question which is now being addressed in degraded land use is how to efficiently achieve the application of the technologies on a wide scale and integrate individual technologies into appropriate socio-economic-technological packages for selected areas. Therefore, beside further work on technology development, the socioeconomic dimension of the problem is given high attention in this new research.

The project staff prepared a revised work plan based on a review of the previous year's activities. An attempt was made to reduce the large number of activities in the project. A meeting was held in Hunan in November 1997 to review the results of the year's research.

Generating community income through rehabilitation of degraded lands: production of *Vitex pubescens* on *Imperata* grassland

Budget code: 105001

Activity started in 1996

Task leader: Wil de Jong

This activity involves 9 outside collaborators

The Indonesian province of West Kalimantan, where the research is being conducted, is inhabited by a large number of farmers who practice shifting cultivation in forest margins and, by doing so, contribute to the expansion of *Imperata* grasslands. The region counts large areas of land which used to be cultivated but were abandoned after invasion by *Imperata* grass. Shifting cultivators will not come back to these areas unless exploiting these lands become economically attractive again. One option is to cultivate crops which would withstand low-input farming practices, in terms of fertilization and tending. *Vitex pubescens* presents certain advantages in this respect. The aim of this project is to test to what extend *Vitex pubescens* can tolerate low-input cultivation practices and what economic returns can be expected, under these circumstances, with barbecue charcoal being the production objective.

Because of its nature as an *Imperata* land pioneer species *Vitex pubescens* can be expected to grow in plantations. However, cultivation methods and growth capacity of the species are still largely unknown and therefore on-site silvicultural experiments are needed. Although the technology that is expected to be developed in this research has good likelihood to meet the requirements that usually make tree plantation acceptable to small holders, it can be hypothesized that there are other factors, especially in farmers household economy, and current agricultural strategies that play a decisive role in whether farmers will accept such a new technology or not. The case of *Vitex pubescens* production allows for investigating what these factors are.

CIFOR's collaborators for this activity are Yayasan Dian Tama (YDT) and Tanjungpura University. YDT has formed two different teams, one responsible for the technical research, and one responsible for the socioeconomic research. Mr. Setia Budhi, a forest ecologist from Tanjungpura University has

been hired by YDT to support the project activities. Mr. Setia Budhi has visited two of the four research sites, to study taxonomic diversity of *Vitex pubescens*, and define the final research design.

In Rengas and Toho agreements have been reached with local owner for conducting the research on their land. In these two site experimental plots have been laid out and planted with *Vitex pubescens* seedlings. Negotiations are underway with the People Resources and Conservation Foundation (PRC) to coordinate the research in Sintang. PRC has long term experience in the Sintang region, has much baseline data on local farmers economies, and is planning to establish a farmers training center. PRC could take care of the extension of the *Vitex* production, once it has become a viable technology for swidden agriculturists.

Two studies conducted by Tanjungpura University ` students have been completed

Site management and productivity in tropical forest plantations

Budget code: 105030

Activity started in 1995

Task leader: Christian Cossalter

This activity involves 19 outside collaborators

If plantations as a technology are to continue to be vigorously promoted, it is essential to understand better their long-term impact on site productivity factors. Do the changes in soil characteristics induced by intensive forms of plantation management lead necessarily to site degradation as it is currently assumed? How can changes in soil characteristics be influenced by silvicultural and harvesting practices? Can successive and equally productive crops of trees be harvested from a site in perpetuity? The project aim is to increase our understanding of the processes controlling productivity of plantations in the long-term and to measure the impact of selected management practices on productivity. These will be the basis for more sustainable management options. The project is conducted in partnership with research organizations which are committed to implement jointly agreed research protocols in their own site and a team of scientists invited by CIFOR to provide scientific support as needed. Research sites are located in Australia, Brazil, Congo, China, India, Indonesia and South Africa. The scientists who provide the required scientific expertise belong to research organisations such as CSIRO, IBSRAM, INRA and USDA Forest service. Most of these scientists are engaged in similar activities in temperate forests.

During 1997, experimental plots were laid out in Congo and China, research sites were selected and research protocols finalised in Brazil and Indonesia. During this process Indonesia and Brazil received strong scientific support from CIFOR. The two countries were visited respectively in February 97 (C. Cossalter, Dr. S. Nambiar and Dr. A. Tiarks) and June (Dr. A. Tiarks and Dr. S. Kobayashi). Potential partners have been identified and approached in Madagascar, and Malaysia. Preparation has also been made for holding a second workshop of the network in February 1998 with venue in South Africa.

Rehabilitation of Degraded Tropical Forest Ecosystems

Budget code : 105041

Activity started in 1996

Task leader : Shigeo Kobayashi

This activity involves 15 outside collaborators

Tropical forests are decreasing at the rate of 17 million hectares per year due mainly to clearing for agriculture. Moreover, timber harvesting results, every year, in more than 5 million hectares of tropical forest becoming secondary forests. The decrease and degradation of tropical forests affect not only the production of timber but also global environment. It is, therefore, an urgent matter to rehabilitate these degraded forests along with sound management practices. The main question of rehabilitation is how to create appropriate growing conditions for each species, especially light condition, from the juvenile to the matured stage. Where short-rotation plantations are being established there will be changes in nutrient storage and cycling processes due to the harvest of large quantity of wood, change in organic matter quality, fertilisation, erosion, leaching etc. All of these factors will impact on storage and supply of soil nutrients for tree growth and consequently on sustainability of the entire plantation system. Opportunities exist to manipulate soil organic matter

through silvicultural practices. The challenge for researchers is to provide the scientific information that will enable to devise silvicultural systems which will ensure that the trend in plantation productivity is non-declining or positive, over successive rotations and harvests while enhancing the quality of the soil resource base and with due care for environmental values.

The following research topics have been included in this activity : 1. Evaluation of forest harvesting impacts on the forest ecosystems (collaborator: UNMUL, FCFUM), 2. Development of methods to rehabilitate logged-over forests and degraded forest lands (collaborator: FRIPNG, INIA, UPM), 3. Site management and productivity in fast-growing tropical forest plantations (collaborator: KUFF, EMBRAPA).

Research planning was completed by May, 1997. Contractual agreements/MOU between CIFOR and all partners were finalized at the end of November, 1997. Site selection and establishment of experimental plots were carried out at the end of November, 1997.

The catalytic effect of tree planting on the rehabilitation of native forest biodiversity on degraded tropical lands

Budget code : 105101

Activity started in 1995

Task leader: Christian Cossalter

This activity involves 8 outside collaborators.

There is a growing recognition that native forest regeneration within plantations can add value in many ways to tree planting programs including, in certain cases, increased economical returns. During a first phase of two years (1995/1996) vegetation, fauna and microfauna studies have been conducted in Congo and South Africa to check under which circumstances (historical and current land use practices, proximity to natural forest, degree of site degradation, plant management intensity and plantation species selection) and to what extend establishment of tree plantations on degraded lands can enhance biodiversity of indigenous and naturalized plant species and restore faunal biodiversity, relative to comparably degraded, unplanted but protected sites. Research results obtained during this first phase have been published in 1997 in a special issue of **Forest Ecology and Management**.

During the first part of 1997, CIFOR and the research partners of phase one have discussed and designed a project extension. A second phase will start during the last quarter of 1997 with the same team of scientists from Congo, France and South Africa as for phase one. The scientific team will work in close collaboration with the management team of Unité d'Afforestation Industrielle du Congo (UAIC) where the research experiments will be located. Research focus will be on understanding reasons for change in soil biological fertility when converting savanna to eucalyptus plantations and through successive rotations of eucalypts plantations. Research hypothesis are: 1/ Quality of litter and soil organic matter generated by plantations are the main factors controlling biological changes in plantations established in savanna environment; 2/ The poor quality of eucalypts litter can be improved by allowing the establishment of an understorey (which will produce better quality litter and will increase overall litter decomposition through enhanced soil microfauna biodiversity/activity and soil microbial activity); 3/ Decomposition of litter differs from clone to clone and therefore pattern of soil organic matter accumulation varies according to clonal composition of plantations; 4/ Changes in soil biological fertility continue to evolve through successive rotations.

Fungal pathogens as a potential threat to tropical acacias

Budget code : 105070 & 105111

Activity started in 1995

Task leader: Christian Cossalter

This activity involves 17 outside collaborators

Tropical acacias are of considerable social and industrial importance for reforestation in South and South East Asia where over one million hectares have been already planted. Recent reports from Malaysia, Indonesia, Thailand and northern Australia suggest that the future productivity of some important species may be affected by fungal pathogens including leaf spots, shoot blights, stem cankers, heart rot and gall rusts. During 1995/1996 a series of disease surveys was undertaken by

forest pathologists in native Australian stands and in trials, social forestry planting and large-scale industrial plantations in India, Indonesia, Malaysia and Thailand to assess the potential of fungal pathogens as limiting factors to tree growth and productivity and to assess the relative importance of individual fungal pathogens. Results of these surveys have been published in 1997 in a CIFOR Special Publication.

During the first part of 1997, CIFOR and the research partners of phase one have discussed and designed a project extension. A second phase has been started during the last quarter of 1997 with the same team of scientists as for phase one. Focus will be put on further training of pathologists of counterpart organisations (especially from Indonesia) This training will be of value both to plantation managers who are relying on relatively untrained staff to monitor plantation for disease outbreaks, and to more experienced scientists in exposure to methodologies.

An overview of the state of knowledge on Dipterocarps and identification of priorities for future research

Budget code: 105100

Activity started in 1994

Task leader: Christian Cossalter

This activity involves 13 outside collaborators

Dipterocarps form the most important family of tropical trees in Asia. Research on dipterocarps started about a century ago but apart from some classical work on their taxonomy and silviculture most of the knowledge remain fragmented and therefore the potential benefits of this family have not been fully recognised. The book which is being prepared with 11 leading scientists is an attempt to describe the current knowledge on this family and identify the main questions which remain to be answered. The scientific editing of the 10 chapters of the book has been completed during 1997. The English editing is underway. The book will be published in 1998.

Development of Tropis

Budget code: 105090 and 105091

Activity started in 1995

Task leader: Jerry Vanclay

TROPIS, the Tree Growth and Permanent Plot Information System, attempts to promote more effective use of existing data and knowledge about tree growth. Several recent reviews report a paucity of long-term studies in terrestrial ecology (e.g., Strayer *et al.* 1986, Tilman 1989); this presumably relates more to the availability of data from long term permanent plots, rather than the existence of such studies. TROPIS attempts to redress this situation by drawing attention to existing studies. TROPIS is concerned primarily with information about permanent plots and tree growth in both planted and natural forests throughout the world.

TROPIS, comprises 4 components: the TROPIS Index of Plots, the twice-a-year newsletter TROPIS-Update, the data management system MIRA, and the expert system Plantgro.

The TROPIS index currently contains 10936 plots with 2090 species in 61 countries. The "top ten" countries are currently Indonesia, Fiji, Brazil, Kenya, Uganda, Malaysia, Thailand, Australia, Bangladesh, and Honduras (ranked by number of plots included). Approximately 60% of the plots are in natural forests, while the other 40% are in plantations. The information on these plots has been contributed by 100 people in 38 countries. The plots references span the small (0.01 ha) and the large (500 ha), the new and the old (established 63 years with 17 remeasurements).

Some 69 searches of the TROPIS index have been made at the request of 58 clients in 29 countries. Only 4 of these requests could not be satisfied; the others were put in touch with a total of 155 contacts who possessed data matching the search criteria. Of the 58 clients, 22 used academic addresses, 13 were from research institutes, 7 from commercial organizations, 5 from NGOs (but note that some academic requests appeared NGO-related), 4 from development assistance agencies, 2 from government forest services, and 5 remain unknown (private addresses).

TROPIS-Update currently goes to 254 subscribers by email, and to a further 197 subscribers by post.

Management of soil, water and nutrients in tropical forest plantations

Editors: Alan Brown and Sadanandan Nambiar

Activity started in 1995

Reliance on plantation forests as a source of wood is rapidly increasing throughout the world.

Although there are examples in which well-managed plantations offer prospects of both augmenting wood supplies and improving the environment, most experience is from temperate climates. The sub-tropics and tropics often pose special problems for sustained production for reasons that include soil and other environment stresses, and social and management factors. The multi-authored book which has been produced under this activity provides a multidisciplinary synthesis of genetic, biophysical, soil and silvicultural factors relevant to sustained productivity of tropical plantations. The target audience is post-graduate students and new researchers. Two CIFOR's scientists have contributed to chapters 1 (Plantations in the Tropics - Their Role, Extent and Nature by *Brown, A. G., Nambiar, E.K.S. and Cossalter, C*) and chapter 2 (Genetic resources for plantation forestry by *Boyle, T.J.B., C. Cossalter and R. Griffin*). The book is published by ACIAR in collaboration with CSIRO and CIFOR. It is already available.

Adaptation of the PLANTGRO and World models

Budget code : 105110

Activity started in 1997

Task leader: Jerry Vanclay

This activity involves 3 outside collaborators

Plantgro is a (cheap) commercial package, but is useful for predicting tree growth when empirical data are not available. CIFOR involvement has been to test and promote the system. A paper on the first test will appear in Ecological Modeling soon, and a more thorough test has been initiated. As a result of interest generated through TROPIS, Plantgro has been enhanced (by its owner, Plant Soft Services), and a new Windows-based version will be released soon.

Plantgro provides the framework for predicting tree growth from informal knowledge, but requires that knowledge to be consolidated in a "plant-file". INFER is an expert system to help construct plant-files, and is made available freely on request through TROPIS (a gentleman's agreement not yet formalized in a MOU or contract). The TROPIS Web page also provides access to plant-files for 33 tropical tree species, and users are encouraged to contribute their own plant-files for inclusion in this "library".

Forest Resource Information studies

Budget code: 105130

Activity started in 1997

Task leader: Christian Cossalter

This activity involves 16 outside collaborators

Information available on forest resource is of uneven quality and in many instances scattered. A common feature of many countries, especially in the sub-tropics and the tropics is that forest statistics cover wood and timber resources from public land only. In many cases forest statistics reported from the field are either rarely checked or difficult to check. Furthermore, methods used may leave the way to inexact or subjective analyses and interpretations. In this context, it is difficult to undertake prospective analysis on a solid ground.

CIFOR is conducting a study with key institutions in China and Indonesia to jointly study the current systems for collecting, synthesising, analysing and using forestry resources information and statistics, with a view toward identifying strengths and weaknesses and improving future work in this important area

Mr. Liu Dachang, a Chinese national, has joined CIFOR in June 1997 and since then has been working full time on documents obtained from the Forestry Statistics Department and Forest Resource Department of the Chinese Ministry of Forestry; Ministry of Agriculture (MoA) and State Statistical

Bureau. We have now a fairly good idea on the type of data on forest resources and forestry sector available in China and how this data is structured. Mr Liu visited MOF in September 1997 with the purpose of identifying key partners from within the organization and conduct further survey of the Chinese forestry statistic system.

In the case of Indonesia most of the raw/primary information will be provided by key colleagues from: DG Forest Utilization (PH), DG Forest Inventory (INTAG), DG Reforestation and Land Rehabilitation (RRL), and Bureau of Planning, Secretary General through small author contracts. So far a study outline has been developed and discussed with our Indonesian collaborators. Dr. Aulia Aruan, a CIFOR scientist, is also providing very valuable inputs to this study. Dr. Chun K. Lai, a consultant, will coordinate the inputs, review the first drafts of study sections submitted by MoF colleagues, provide suggestions for improvement, and synthesize all contributions into a review manuscript. Dr. Chun will also assist to organize a short workshop with our Indonesian partners (Key MoF staff) to review and improve the manuscript. Based on feedback from the workshop, Dr. Chun will prepare the final study manuscript.

Testing and developing criteria and indicators for sustainable management of plantation forests

Budget code: 105120 & 105121

Activity started in 1997

Task leader: Christian Cossalter

This activity involves 19 outside collaborators

Controversial aspects of the environmental effects and social impacts of tree planting in the tropics is primarily due to industrial plantations, especially those made of single, short rotations species. Risks for the environment include impacts on soil water, soil nutrients, soil erosion and biodiversity. On the other hand potential source of social conflicts arise where land acquisition for forest plantations is in direct competition with agriculture.

However, so far, plantation forests have avoided major confrontations on environmental issues. Concerns of the international community goes primarily to the loss and degradation of tropical natural forests due to human activities. The recent international initiatives taken for natural forest suggest that a logical step in this process will be the need for scientifically sound criteria and indicators of the real environmental and social impacts and sustainability of plantation forestry. For natural forests this process has been driven largely by efforts to introduce independent third party certification of sustainably managed forests and labeling of the resulting timber. The actors in the discussion of criteria and indicators at the forest management unit (FMU) level have been international and regional non-governmental organizations and increasingly the timber industry and governments

Thanks to ACIAR support (two year-duration from January 1997) CIFOR is conducting a research project aiming at testing and developing criteria and indicators for sustainable management of plantation forests. Whereas several international efforts have concentrated on developing C&I at the national or global levels, CIFOR's research project is, as yet, the only international effort to evaluate and develop C&I at the forest or management unit level.

CIFOR's project started in May 1997 with an international workshop which discussed the following issues:

- Does the development of C&I for Sustainable Management of Tropical Forest Plantations fill a need? Is such an initiative appropriate? Is it a timely undertaking?
- What sets of C&I already exist for tropical forest plantations? How suitable, realistic, cost efficient, acceptable are there?
- What are the main problems in developing C&I for forest management?
- What advise can the workshop provide on appropriate approaches and methodologies to develop C&I for forest plantations?

A position paper was produced at the end of the meeting and will be published latter this year as a CIFOR Working Paper. Dr. S. Sankar of the Kerala Forest Research Institute and Dr. Punadjaja of the Bogor Agricultural University have been appointed to serve as national focal points respectively for

India and Indonesia. Their role is to organize and coordinate a series of missions by multidisciplinary teams in their countries. One mission is scheduled in each country during the last quarter of 1997.

105140: Testing the feasibility of tree farming for industries in Indonesia

Budget code: 105140'

Activity started in 1997

Task leader: Aulia Aruan

This activity involves 3 outside collaborators

Experience has shown that farm forestry (defined here as *small farmers planting trees on their own land* for profit) is market driven - a response by small farmers planting to a profit making opportunity. However, experience also shows that external initiatives can direct and enhance the movement.

In industrialized as well as developing countries, most farm forester - industry relationships is related to short rotation pulpwood. Indonesia has the ambition and the potential to be one of the world's largest pulp producers. Licenses have been granted by the Indonesian government to raise national pulp capacity from a current 2.2 million tons a year to 6.1 million tons a year by year 2005. About 1.5 million hectares of plantations will be required to sustain this level of production. Less than a third of plantation area which will be required is already in place.

It is already apparent that future expansion of pulpwood plantations cannot continue to rely heavily on clearing of natural forests. Therefore already cleared lands currently used by agriculture and largely occupied by small farmers are going to have an increasing importance and will play a key role in the sustainability of the Indonesian pulpwood production.

So far there have been only limited attempts by the Indonesian pulpwood industries to involve local farmers in the production of the raw material they require. In other developing countries there are examples of successful partnerships which provide farm foresters with on-going income security and forest industries with resource supply security. A more concerted effort will be required among other things. The challenge is to check farmers' motivation and economical benefits related to this new activity.

For the first five months main focus were to assemble and analyze quantitative and qualitative information on reasons for success and failure in joint ventures schemes between industries and small farmers in developing countries. Field and key-person visits have been done to Philippines (PICOP, C. Alcantara & sons, Inc and Cagayan Woodworks MFG Corporation), Australia (Nursery and plantation at Holbrook, Wagga Wagga Plantation CSIRO Project, Egaline Nursery and Plantation at Tumbarumba), New Zealand (Canterbury farm and plantation), and Indonesia (PT. Finanntara Intiga in West Kalimantan and Perum Perhutani in West Java).

Two preliminary documents are still being processed: (a) annotated bibliography on small holder arrangements in forestry and non forestry. This activity is conducted by Levania Santoso who is doing this activity for about 3 months, and (b) preliminary checklist for farm forestry. Several CIFOR's scientific staff have already shared their valuable critics and suggestions for this document.

CIFOR's collaborators for this activity are:

- Ministry of Forestry (Directorate General Reforestation and Soil Rehabilitation). A scientific meeting would be held in early 1998 between CIFOR, Ministry of Forestry and state-owned forest enterprises (Inhutani I-V). The propose of this meeting is (a) to explain CIFOR's research for social forestry aspects; (b) Director General of General Reforestation and Soil Rehabilitation from Ministry of Forestry will inform policies and regulations regarding these social forestry activities; and (c) Inhutani I-V will respond for their research needs to be supported.
- 6 industrial forest plantation companies (or HTI). Two HTIs are in the Memorandum of Understanding drafts to be finalised, i.e. PT. Tanjung Redeb Hutan and PT. Menara Hutan Buana.
- 4 state-owned forest enterprises (Inhutani I, II, III and Perum Perhutani).

- 2 individual contacts (Mr. Rudolf Heering-Just from Promitra Ministry of Cooperative Jakarta and Mr. Machmud Simpoha from ODA).
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Research collaborators of CIFOR's project on plantations
Project 5
(on-going activities as per December 1997)

105000: Improving smallholder farming systems in Imperata grassland of Southeast Asia
Task leader: John Turnbull Activity started in 1995

Project Personnel	Institutions	Level of involvement / Links with CIFOR
Project leader Dr. Ken Menz	The Australian National University, Centre for Resource and Environmental Studies. Canberra, Australia	++ 2
Principal Researchers Peter Grist, Katie Ellis		
Project leader, Dr. Damasa Magcale-Macandog	The SEAMEO Regional Center for Graduate Study and Research in Agriculture. College Laguna Philippines	++ 1
Project Advisory Group Dr. Percy Sajise, Dr. Gil Saguiguit, Dr. Art Gomez, Mr. Paulo Pascolan, Ms Alice Perez, Dr. Arsenio Calub, Dr. Roberto Rañola, Dr. Nards Florece, Canesio Predo, Patrick Rocamora		
Project leader Dr. Achmad Suryana	Center for Agro-Socioeconomic Research (CASER). Bogor	++ 1
Principal Researchers Dr. I Wayan Rusastra, Sri Hery Susilawati, Gelar Satya Budhi	Indonesia	

105010: Alternative socio-economic approaches to reclaiming degraded lands, China
Task leader: John Turnbull and Neil Byron Activity started in 1995

Project Personnel	Institutions	Level of involvement / Links with CIFOR
Steering Committee Dr. John Graham	IDRC, Singapore	+
Prof. Sheng Weitong, Prof. Wu Bingyi	Chinese Academy of Forestry, Research Institute of Forestry. Beijing	0
Mr. Qi Hong	Ministry of Forestry, Policy and Stipulation Department. Beijing	+
Prof. Zhong Maogong	Ministry of Forestry, China National Forestry and Economy Development Research Center. Beijing	0
Prof. Zhu Zhaohua	Chinese Academy of Forestry, International Farm Forestry Training Center. Beijing	+

105001: Generating community income through rehabilitation of degraded lands: production of *Vitex pubescens* on Imperata grassland

Task leader: Wil de Jong

Activity started in 1996

Project Personnel	Institutions	Level of involvement / Links with CIFOR
Mr. Rudijanta Utama	Yayasan Dian Tama, Pontianak	++ 2
Mr. Doatur Rantan	"	++ 0
Mr. Benjamin Wilson	"	++ 0
Mr. Sabinus Melano	"	++ 0
Ms. Jenny McVoy	"	++ 0
Mr. Irawan Sihombing	"	++ 0
Ms. Fitri Sriwardani	"	++ 0
Ms. Supia Kusuning	"	++ 0
Mr. Setya Budhi	Indonesia Tanjungpura University, Pontianak Indonesia	++ 1

105011: Gains and losses of different tree planting schemes in Indonesia

Task leader: Wil de Jong

Activity started in 1997

Project Personnel	Institutions	Level of involvement / Links with CIFOR
Mr. Peter Hart	Luminis Pty. Ltd., Australia	2
Dr. Lesley Potter	University of Adelaide, Australia	++ 0
Mr. Justin Lee	University of Adelaide, Australia	++ 0

105030: Site management and productivity in tropical forest plantations

Task leader: Christian Cossalter

Activity started in 1995

Project Personnel	Institutions	Level of involvement / Links with CIFOR
<u>Project Advisory Group</u>		
Dr. E. K. S. Nambiar	CSIRO Division of Forestry and Forest Products, Canberra, Australia	++ 2
Dr. Allan Tiarks	USDA Forest Service, Southern Forest Experiment Station, Pineville, USA	++ 2

Principal researchers		
Andrew Assman, Pearson Taupai		++ 0
Project leader		
Mr. Auberto Riese		++ 2
Principal reserchers		
Ing. Sara Yale, P.L. Woomer	Instituto Nacional de Investigacion Agraria, Peru	++ 0
Dr. Julio Alegre, Ing. Carmen Sotelo	ICRAF Peru	
Project leader		
Dr. Bunvong Thaiutsa	Faculty of Forestry Kasetsart University, Thailand	++ 2
Principal researchers		
Chanchai Yarwudhi, Ladawan Paungjit Chief of the FIO Thong Pha Phume		++ 0
Project leader		
Dr. Francisco J. Bellote	Empresa Brasileira de Pesquisa Agropecuaria, Brazil	++ 2
Principal researchers		
Helton Damin da Silva, Renato A. Dedecek		++ 0

105101: The catalytic effect of tree planting on the rehabilitation of native forest biodiversity on degraded tropical lands

Task leader: Christian Cossalter

Activity started in 1995

Project Personnel	Institutions	Level of involvement / Links with CIFOR
Project leader		
Dr. France Bernhard-Reversat	ORSTOM. Bondy France	++ 2
Principal Researchers		
Dr. Charles Huttel	ORSTOM/Université Paul Sabatier. Toulouse France	++ 2
Dr. Jean Joël Loumeto	University of Brazzaville Congo	++ 1
Dr. Alain Brosset	CNRS. Brunoy France	++ 1
Dr. Pierre Michel Loubana	DGRST/ORSTOM. Pointe-Noire Congo	++ 1
Dr. Irène Mboukou	ORSTOM. Bondy France	++ 2
Dr. Daniel Diangana	CNRF. Pointe-Noire Congo	++ 1
Mrs. Patricia Esmard	ORSTOM. Pointe-Noire Congo	++ 1

Dr Paul Tomsett	Royal Botanic Garden Kew UK	++ 2
Dr. G Maury-Lechon, Dr. L. Curtet	CNRS/University of Claude Bernard. Lyon France	++ 2
Prof. K.S Bawa	University of Massachussets. Boston USA	++ 2
Dr. Mark S. Ashton	Yale University USA	++ 2
Dr. Claire Elouard	French Institute of Pondicherry India	++ 2
Dr. M.P. Shiva	Centre of Minor Forest Products India	++ 2

105081: Adaptation of PLANTGRO to Amazonian conditions

Task leader: Christian Cossalter

Activity started in 1996

Project Personnel	Institutions	Level of involvement / Links with CIFOR
Dr. Antonio Higa	EMBRAPA. Curitiba Brazil	++ 2
Dr Clive Hackett	Plant Soft Service. Canberra Australia	++ 2
15 Brazilian collaborators	several organizations involved in research in the Amazonian region	++ (training) 0

105090 & 105091: Development of TROPIS

Task leader: Jerry Vanclay

Activity started in 1995

Project Personnel	Institutions	Level of involvement / Links with CIFOR
340 scientists are associated with TROPIS		++ 0
98 of them are primary contacts [(i) have contributed data; and (ii) are nominated as contact point for direct supply of information/data to users upon request)	Of the 98, 22 have contributed information on >100 plots. Contributors come from 61 different countries. Data on plots is distributed as follows: Asia: 43% of plots; Africa: 25%; Latin America and the Caribbean: 17%; Australia-Pacific: 14%; Europe: 1%	
242 are secondary contacts [(ii) only]		

Dr. David Brand	Forest Service of New South Wales Australia	++
Dr. Nigel Dudley	Equilibrium. Bristol UK	2
Dr. S. Sankar	KERALA Forest Research Institute. Peechi India	being processed
Mr. Cahyono Agus Dwi Koranto	Faculty of Forestry UGM	++
Ms. Sri Rahayu	"	2
Dr. Haryono Supriyo	"	++
Dr. SM Widystuti	"	2
Dr. Purnadjaja	Faculty of Forestry IPB	++
Mr. Muhamad Buce Saleh Wirakartakusumah	"	2
Mr. Simon Taka Nuhamara	"	++
Dr. E.G. Togu Manurung	"	2
Mr. Suwarno Sutarahardja	"	++
Mr. Satria Astana; M.Sc.	Forestry Research and Development Agency Ministry of Forestry	2
Mr. Sabar TH Siregar	PT Musi Hutan Persada (Barito Group)	++
Mr. Edi Purwanto	"	0
Mr. Sigit Herdiyanto	"	
Dr. Kenneth Gales	"	
Mr. Makinuddin, MA	Yayasan PLASMA Indonesia	++

105140: Testing the feasibility of tree farming for industries in Indonesia

Task leader: Aulia Aruan

Activity starting in 1997

Project Personnel	Institutions	Level of involvement / Links with CIFOR
Mr. H. Djauhari	PT Menara Hutan Buana Indonesia	2
Mr. Soebardjo	PT Arara Abadi/ Indah Kiat Indonesia	in process
Mr. Anwar Abidin	PT Tanjung Redeb Hutani Indonesia	in process