

1997

Annual Report



CIFOR
Research Forest








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Baringtonia flower, Sumatra
(photo: Alain Compost)



Chewing betel nut, Sumba
(photo: Alain Compost)

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Elophira alata (azobe)
(photo: Manuel Ruiz Pérez)

DIRECTOR GENERAL'S REPORT

1997 in Perspective

1997 may be remembered as the year in which international forestry initiatives finally turned from discussion to decisions and action. A feature of many of the year's events was a reduction in the polarisation and antagonism in the debate and the emergence of consensus and collaboration on many key issues. CIFOR was active in the international arena and we were able to contribute scientific knowledge on many important topics.

The Intergovernmental Panel on Forests met in New York in February. Interventions on virtually all topics highlighted the need for better information and analysis. This led the Governments of Brazil, USA, Indonesia and the representative of the European Union, among others, to make strong pleas for the final Co-chairmen's report to recommend 'that mechanisms be established to strengthen research and information dissemination on forests'. The final text of the Co-chairmen's report to the UNCSD in April gave CIFOR the responsibility for taking forward this process. Paragraph 94 of the Co-chairmen's report requested CIFOR:

'in collaboration with relevant organizations and in consultation with a group of internationally recognized experts, as well as in conjunction with national, regional, intergovernmental and non-governmental bodies, to develop as soon as possible mechanisms to:

guide the identification and definition as well as prioritization of global and eco-regional interdisciplinary research problems, taking into account national priorities and closely linked to practical and operational forest management issues;

promote consortia or networks to lead and organize global forest research and ensure that results are made available to all users;



Jeffrey A. Sayer,
Director General

build global capacity for forest research and develop new and innovative means to disseminate information and technologies;
mobilize resources to accomplish the above objectives.

CIFOR was thereby recognised at the highest level of the UNCSO as the focal point for further developing international mechanisms for strengthening forestry research. Subsequently, FAO Assistant Director General for Forestry, Dr David Harcharik, invited CIFOR to become a member of the Interagency Taskforce on Forests which is the official UN mechanism through which intergovernmental agencies provide technical support to international forest initiatives and policy deliberations, particularly the Intergovernmental Forum on Forests.

Further recognition of the importance of forests and the significance of CIFOR's role emerged through the debates of the Convention on Biological Diversity (CBD). A meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) for the CBD, focused on forest biodiversity conservation, recognised that the vast majority of the world's terrestrial biodiversity occurs in forests. But also, and more significantly for CIFOR, that a great deal of this biodiversity must be conserved in managed forests, and utilised for timber and other products. SBSTTA established priorities for the research and information needs for the conservation of forest biodiversity and thereby endorsed several activities already included in CIFOR's research programme. Understanding what happens to biodiversity in disturbed systems and developing mechanisms to assess and monitor biodiversity in forests were formally recognised as being major international research priorities.

In the latter part of the year the focus of the forestry community turned to the World Forestry Congress in Antalya, Turkey. CIFOR was well-represented and several CIFOR scientists presented papers in different sessions of the Congress. Recognition of CIFOR's role was also given by my own nomination as a Vice-President of the Congress.



*Wijma concession, Kribi
(photo: Manuel Ruiz Pérez)*



Burning forest, Indonesia
(photo: Alain Compost)




We felt that the conference deliberations and resolutions gave an international endorsement to CIFOR's priority research areas and that already, at this our first World Congress, we were fully accepted by the global forestry community. But as several thousand of the world's leading forestry specialists gathered in Antalya, elsewhere in the world devastating fires provoked by the El Niño phenomenon were occurring. These fires exposed the practical problems caused by poor management of forest lands.

For CIFOR, the fires in Southeast Asia towards the end of the year provided a sobering reminder of the immediate and devastating impacts of deficiencies in forest policy and forest management. Fires were occurring in logged-over areas where poor logging techniques had left behind excessive amounts of flammable material. But even greater problems were created by the burning of the vegetation in the course of land clearing. Industrial corporations took advantage of the dry conditions to expand areas of oil palm and industrial timber plantations. Superimposed on this was a great expansion of land clearing by smallholder farmers who also took advantage of the dry conditions to consolidate their claims to land and expand the areas they could cultivate. Clearly, these problems were greatly exacerbated by the El Niño but the fires were an inevitable consequence of policies that favoured non-forest use over forest use, and that failed to provide incentives for better quality logging.

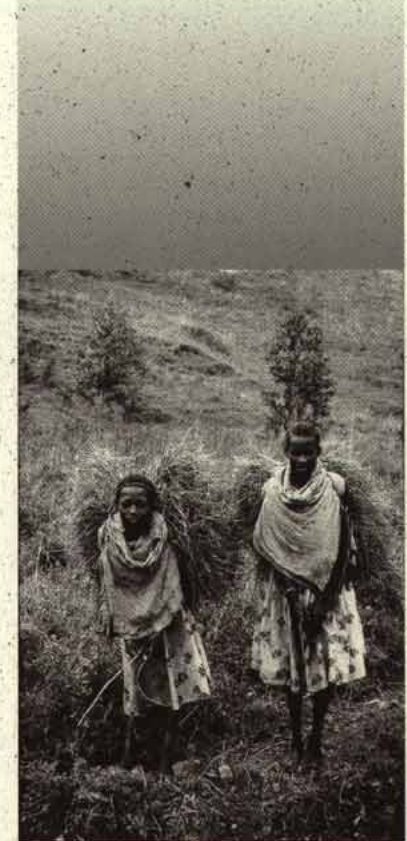
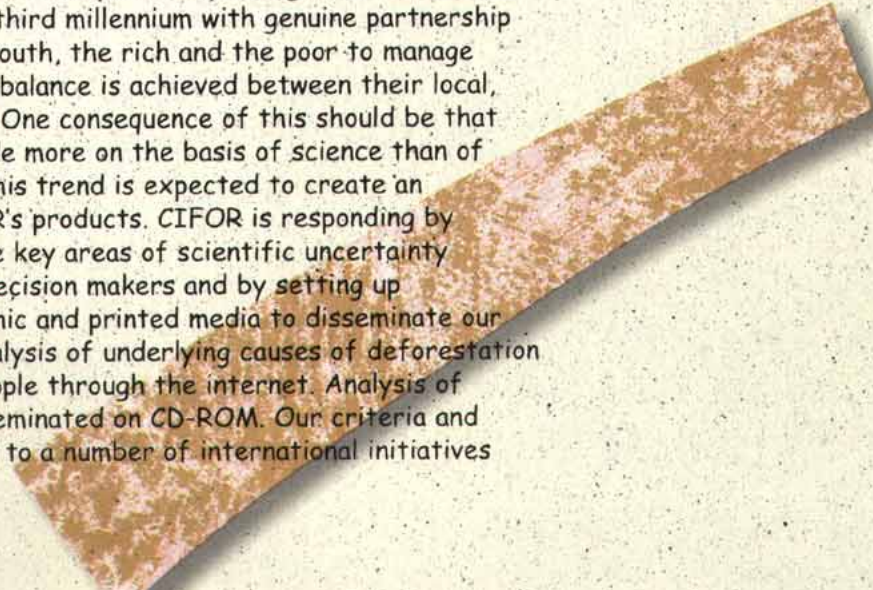
It became rapidly clear to CIFOR's scientists that the cost of these fires was borne mainly by rural people who depend upon the forest for their day-to-day existence. The fire problem reinforced our hypothesis that we must achieve balance in the allocation of land between agriculture, forestry and other users at the landscape level, and that management for timber must not compromise the environmental services provided by forests. The concept of forest ecosystem management that CIFOR has been advocating and researching are clearly part of the solution to the problems of fires in Southeast Asia.





The year closed with the meeting of the Framework Convention on Climate Change in Kyoto, Japan. World leaders were brought together to debate climate change at a time when the El Niño fires as well as extreme droughts and storms were jeopardising human welfare in many regions of the world. While the Kyoto conference was not primarily concerned with forests, it may have been the single most significant forestry event of 1997. The Kyoto Declaration implicitly recognised that all types of forests have to be managed in the context of national and global ecological considerations. Better conservation of forests alone cannot solve the problems of global warming. The critical issue is the excessive use of fossil fuels that ignores long-term environmental impacts. But what emerged from Kyoto was a clear international recognition that sustainable management of forests and expansions of forest cover is an integral part of the solution to the climate change problem. Significantly the need for international transfers of funds, to pay for the global environmental services of forests and to compensate for the development opportunities foregone by forest conservation, were accepted by the international community.

Over the past two decades, it sometimes seemed that progress in achieving acceptance of stewardship of all types of forests worldwide was painfully slow. The events of 1997 suggest that we are perhaps closer to achieving this than we had previously thought. It now seems likely that we will begin the third millennium with genuine partnership between the north and the south, the rich and the poor to manage forests in such a way that a balance is achieved between their local, regional and global benefits. One consequence of this should be that decisions will have to be made more on the basis of science than of special sectoral interests. This trend is expected to create an increased demand for CIFOR's products. CIFOR is responding by targeting its research to the key areas of scientific uncertainty identified by international decision makers and by setting up mechanisms through electronic and printed media to disseminate our results. For example, our analysis of underlying causes of deforestation reaches hundreds of key people through the internet. Analysis of forest resource data is disseminated on CD-ROM. Our criteria and indicators research is linked to a number of international initiatives

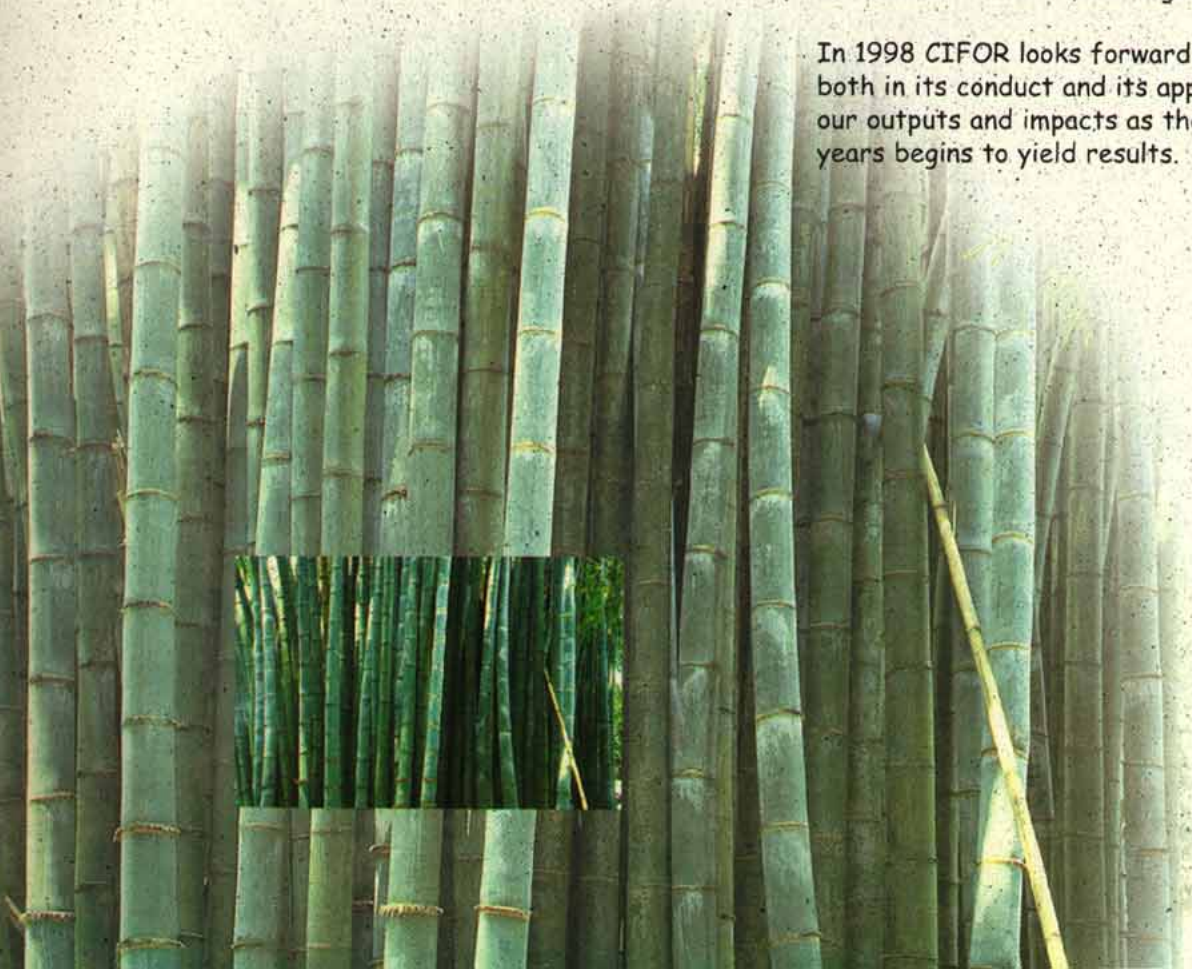


Fodder grass, Ethiopia
(photo: John Turnbull)

aimed at achieving sustainable forestry. Work on non-timber forest products and local institutions is providing new insights of value to numerous countries experimenting with devolution of management to local communities. Our biodiversity research is answering the questions posed by the Convention on Biological Diversity. New information on forestry options for low-potential sites is finding application in the vast areas of degraded lands in the tropics.

1997 was also the year in which CIFOR began to expand its presence in Africa and South America. We hope that one by-product of our greater physical presence in these areas will be increased involvement of scientists from these regions in international forestry issues.

In 1998 CIFOR looks forward to greater globalisation of our research, both in its conduct and its application, as well as to a rapid increase in our outputs and impacts as the research initiated in our first five years begins to yield results.



Dendrocalamus giganteus, Indonesia
(photo: Francis Ng)



Salacca borneensis, Kalimantan
(photo: Alain Compost)

FORESTS AND PEOPLE

The time when forests existed independently of humans is long gone. Hardly a square metre of the globe's forests can now be classified as 'pristine' - untouched by human hand or foot. Now, more than ever before, the actions of people have profound and often immediate effects on forests. People influence forests' productivity, their health, and their very existence.

CIFOR's interdisciplinary and intersectoral research shows clearly that many underlying causes of deforestation are fundamentally social. Researchers and policy makers have a broad understanding of the physical causes of deforestation, but there is little consensus on the social processes that underlie forest loss. Some causes, however, are widely recognised: human consumption and migration patterns, and government policies are clearly factors in the health of forests.

CIFOR recognises the intimate associations between people and forests, and each of its research themes includes social components. Of special interest to CIFOR are the communities that exist on the forest margins. Here, people are likely to make their livelihoods from or in the forest. They may cut timber from it, or harvest other products that grow in the forest, or depend on it for their fuelwood or construction materials. They also rely on the forest's ability to retain, filter and control water.

Deforestation and degradation

Humans have practised socially acceptable forms of forest use for millennia. They have cut down timber to construct the infrastructure of civilisations, they have taken wood from forests for fuel, and they have converted forested terrain to cropland. In many parts of the tropics, farmers traditionally have practised shifting cultivation. The method is also known as swidden or slash-and-burn agriculture. Farmers clear sections of forest, plant the land for a few years with



Peeling manioc tubers
(photo: WWF-Edward Parker)



annual or short-term perennial crops, and then allow the land to remain fallow for several years. The fallow is likely to last many years longer than the period of cultivation.

As traditionally practised, with the long fallow periods, shifting cultivation treats the land in a sustainable way. That is, it recycles nutrients, conserves soil and water, and encourages diversification of crops. But the traditional system is being rapidly replaced by shortened fallow periods in which the land has little or no chance to recover. The forest does not regenerate, fertility declines, weeds take over and the soil erodes. The forces behind this change are familiar: population growth, the arrival of migrants who do not follow sustainable land-use practices, the need to produce crop after crop in order to remain financially secure.

Agriculture is by no means the sole cause of deforestation. Unsustainable logging practices, livestock grazing and fire, manmade or caused by natural phenomena, all contribute to degradation and fragmentation of forest habitat.

The human role in the life of forests is reflected in all of CIFOR's work. Several activities, however, specifically address questions of inappropriate deforestation, degradation and biodiversity loss. CIFOR's research on 'Causes of Forest Deforestation, Forest Degradation and Changes in Human Welfare' specifically addresses questions of inappropriate deforestation. Research in 1997 has worked towards CIFOR's objectives, which include improving the scientific basis for balanced management of forest lands, developing policies and technologies for the sustainable use and management of forest goods and services, and strengthening national capacities for research on forests.

Project 1:
**Causes of Deforestation,
Forest Degradation
and Changes in
Human Welfare**

Objective:
Work to improve the capacity of policy makers and opinion leaders to make better-informed decisions, both by directly generating information and by increasing the capacity of national researchers in tropical countries to do so.

Main sites:
Bolivia, Cameroon,
Indonesia, Panama,
Zimbabwe:

Major partners:
CEDLA and BOLFOR
(Bolivia); Institut de
Recherche Agricole pour
le Développement and
Institut National de
Cartographie (Cameroon);
Agricultural Frontier
Program (Panama); Bogor
Agricultural University
(Indonesia); University of
Zimbabwe.



*Degraded land, Manaus, Brazil
(photo: Andy Gillison)*

In collaboration with national research organisations in Africa, Latin America, Asia and Central America, during 1997 CIFOR scientists participated in a number of studies designed to better understand why damage to forests occurs. A summary of the results of these studies was distributed among forestry policy makers, and an electronic mailing list was established so discussants could easily exchange their ideas.

Researchers also completed a review of some 150 economic models of deforestation. The review concludes that deforestation tends to be greater when: forested lands are more accessible; agricultural and timber prices are higher; rural wages are lower; and there are more opportunities for long distance trade. Population and migration both affect deforestation rates, but in a complex fashion that cannot simply be reduced to saying population growth promotes deforestation. Major doubts remain regarding the relationships between deforestation and productivity growth, input prices, land markets, land and forest tenure security, and household income (poverty) that can only be resolved through future research.

Generally, it is hard to find any clear-cut relationship between macroeconomic variables and policies and deforestation. A significant finding of this review is, however, that a number of the policy reforms included in current economic liberalisation and adjustment efforts may increase pressure on forests. The paper recommends some major shifts in future research. Research will probably be more productive if it concentrates on household and regional-level studies, instead of national and global studies. More attention should be paid to institutional issues and modelling of large-scale farmers/ranchers and logging companies.





Manoeuvring logs, Oaxaca, Mexico
(photo: WWF-Tony Rath)

CIFOR scientists studied the underlying causes of deforestation in three parts of the world: Bolivia, Cameroon and Indonesia. In Indonesia, for example, rural sociologist William D. Sunderlin and environmental and resource policy specialist Ida Aju Pradnja Resosudarmo found a lack of basic information about deforestation, including the scale at which it is happening and the reasons behind it. Although Indonesia possesses one-tenth of the world's remaining tropical rainforest, and it is well known that forest cover is declining, there is far less agreement on the major causes of the decline. Some sources say it is smallholder production, including shifting cultivation. Others identify the timber industry as the leading cause of deforestation in Indonesia.

There is little agreement even on the basic terminology of deforestation and degradation. Such terms as 'shifting cultivation' have different meanings for different people and institutions, and even 'deforestation' lacks a single, accepted definition (see BOX: 'What is deforestation?').

Similarly, few agree on the relative roles played by the accepted agents of deforestation in Indonesia. These include: smallholders who plant food crops (both those who practise shifting cultivation and those, known as 'forest pioneers', who come to establish permanent or semi-permanent farms); smallholders who clear land to grow tree crops; migrants who come from other Indonesian provinces, often to escape population pressures; logging and the timber industry; plantations and estates; and macroeconomic policies.

These questions must be faced if we are to manage and protect forests wisely. 'In order to adequately address the problems posed by inappropriate forest cover loss in Indonesia', write Sunderlin and Resosudarmo, 'it is necessary to know the rate of deforestation in Indonesia. . . . A clearer understanding of the situation is a necessary precondition for formulating new policies and adapting existing policies aimed at improving the welfare of forest communities and the conservation and management of Indonesia's forests'.

(photo: Paul Zborowski)





(photo: Paul Zborowski)

In Africa, CIFOR research on the causes of deforestation centres on the impacts of macroeconomic policies on household livelihood strategies in the miombo woodlands of Malawi, Tanzania, Zimbabwe and Mozambique. These miombo woodlands are composed of scattered trees that rise above a grassy understory. Community-level research will help determine which policies have the greatest impact on local communities and their management of woodland resources. Meetings with regional partners to assess data quality and quantity as well as analysis techniques were followed by a workshop to discuss the research results. Rapid rural appraisals (RRA) were conducted at each site to identify the key policy issues and baseline data were collected. The RRA laid the groundwork for the selected locations to become long-term 'laboratories' for studying different aspects of the impact of policies and local institutions on resource management and livelihoods.



Selling baobab, Zimbabwe
(photo: Manuel Ruiz Pérez)

What is 'deforestation'?

To the lay person, 'deforestation' may mean little more than the removal of trees from the forest. But according to CIFOR scientists William D. Sunderlin and Ida Aju Pradnja Resosudarmo it is more complex than that. In their survey of Rates and Causes of Deforestation in Indonesia: Towards a Resolution of the Ambiguities (CIFOR Occasional Paper 9), the researchers point out that a number of questions must be asked about the removal of forest cover in order for it to be termed 'deforestation.'

Is the removal permanent or temporary? If the definition includes forest cover removed for shifting cultivation, when the land returns as secondary forest will it still be 'deforested'? Does 'deforestation' refer to the loss of forest cover for all kinds of uses, or only for timber production? When a natural forest is turned into a plantation forest, is it deforested in the process? Does the term refer only to the removal of forest cover, or also to the loss of various forest attributes, such as structure, density and the composition of species? And is the 'agent of deforestation' the one who initially removes the forest cover or the one who later prevents the forest cover from re-growing (e.g., a small farmer who colonises the land after a timber company has moved on)?

Sunderlin and Resosudarmo argue that defining such terms is a necessary foundation for creating policies that adequately deal with issues of forest health and welfare.



The researchers in those laboratories will not all be CIFOR scientists. Collaborators from local universities and other participating institutions will be involved at every stage from research design, field work and data analysis to reporting of results. Ultimately this project should contribute to the development of a network of scientists dealing with policy analysis and socioeconomic issues as they relate to forestry in the miombo woodlands region. It is also expected that the active participation of four of the principal universities in the Southern African region should have an important indirect impact on the university training of foresters and social scientists. Further expansion of this collaborative work in the miombo areas of southern Africa was approved for funding by the EU late in the year.

Community-based forest management

One policy that has swept much of the developing world in recent years is devolution of management. In many nations, resources such as forests are no longer being managed by the national governments, but control has moved to state and local authorities. People at the provincial, municipal and community levels are making decisions about the fate of forests. At the same time, an effort is being mounted in many tropical countries to strengthen those forest management systems that are considered 'traditional'.

These changes affect hundreds of millions of people. Yet the institutions, policies and incentives necessary to reconcile their needs with other demands for use or conservation of forests remain unclear. Many questions remain unanswered. Do the policies of devolution contribute to increased equity, economic productivity and environmental sustainability? What factors influence people's incentives to protect or exploit a forest? Community control brings multiple and often competing interests into play; can they be accommodated in decision making about forests, especially when some of the players are less powerful than others?

CIFOR's work on 'Local Livelihoods, Community-based Management and Devolution' is attempting to answer these complex questions.



Project 7: Local Livelihoods, Community-based Management and Devolution

Objective:
Seek information to inform and improve understanding about the shifts to local control in ways that also have practical implications for improving people's well-being.

Main sites:
Indonesia, Madagascar, Tanzania, Zimbabwe.

Major partners:
World Wildlife Fund and University of Indonesia (Indonesia); CARE-Madagascar and the University of Atananarivo (Madagascar); Sokoine University (Tanzania); University of Zimbabwe.

Researchers seek information on the issues of local control that also have practical implications for improving the well-being of the forest's human neighbours as well as its inhabitants.

More resources during 1997 were devoted to studying policies and local institutions. Current field research in Madagascar, the miombo woodlands and Indonesia is being complemented by studies in China, India and the Philippines, thanks to a grant from the Rome-based International Fund for Agricultural Development. Linkages between CIFOR's work on policy and community-based management are recognised in studies on the effects of devolution of forest management in municipalities in Central America and Bolivia.

The Madagascar experience

Field research in Madagascar for the first phase of the Protected and Peripheral Area Management Systems project came to a close in 1997. The studies examine legal and institutional conditions that underlie the potential for community-based, cooperative management of renewable natural resources. They also report on preliminary efforts, in which the research team participated, to negotiate community-initiated agreements for the management and use of highly valued timber and non-timber forest resources. The conclusions are being widely circulated in Madagascar among policy makers, programme managers and researchers concerned with conservation and sustainable development issues in and around protected areas.

Findings from Phase I emphasise the importance of local institutions in anchoring community management systems, the various sources of conflict that arise among stakeholders as change in traditional patterns of relationship is anticipated, and the tenuous legal basis that local communities have for entering into contractual relationships.

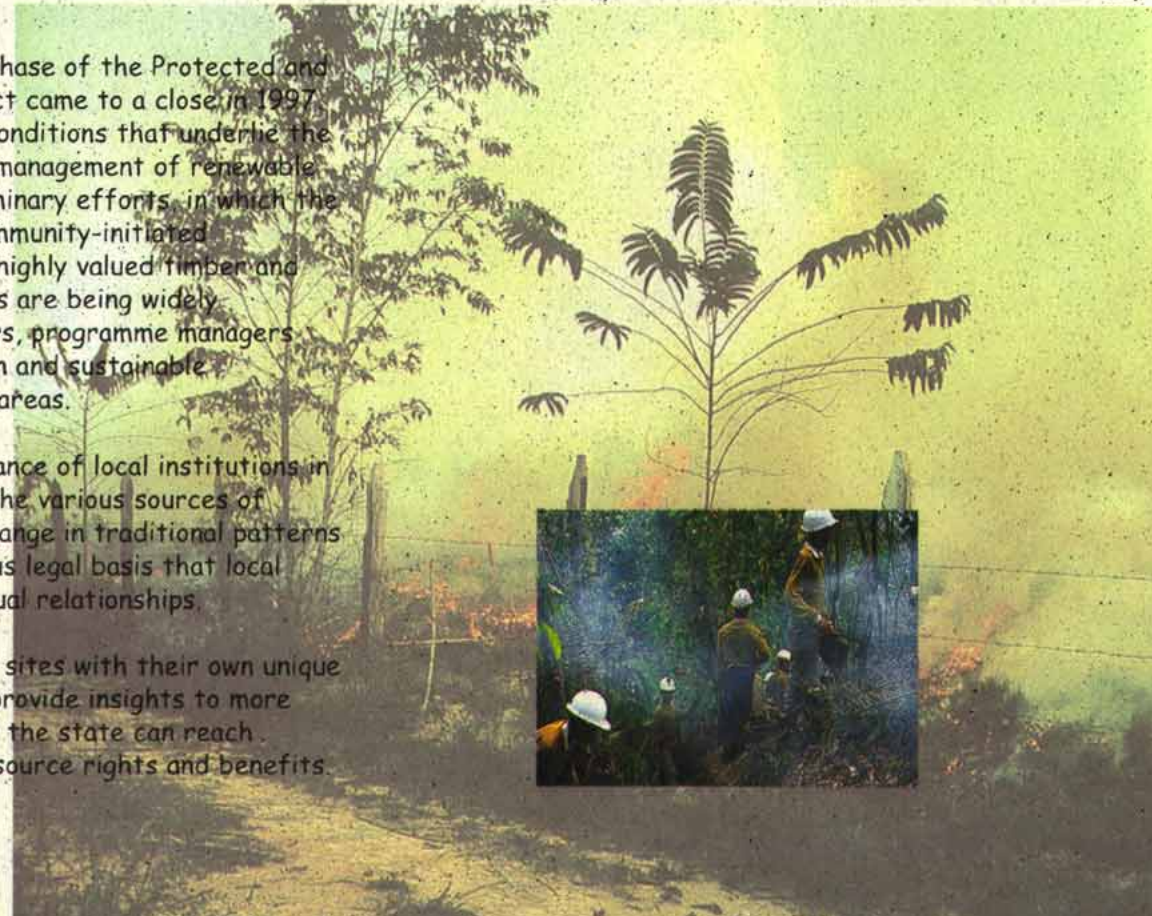
Although the investigation was conducted at sites with their own unique conditions, the conclusions of the research provide insights to more general concerns about how communities and the state can reach mutual agreement about the allocation of resource rights and benefits.



*Machiguenga Indian family, Peru
(photo: WWF-André Bartschi)*

Tavy fields, Madagascar (photo: Louise Buck)

Fire fighters, East Kalimantan (photo: Mark van Nieuwstadt)



The issue of legal recognition of local institutions and, conversely, community acceptance of formal arrangements often inhibits community-based management.

A proposed second phase of the research is designed to develop and test a methodology for establishing community-based, collaborative agreements for renewable natural resources management among key stakeholders as a strategy for implementing Madagascar's new devolution policy.

Life on the margins

Much the activity in forests happens on the forest margins. This is where the forest meets the rest of the world - especially that world's human constituents. People who live and farm at the forest margins can do so benignly, or they can do so destructively. Indigenous communities can live for centuries at the edge of forests without causing apparent harm; newly arrived colonists can and often do stake their claims at the margins, pushing the forest back as they place more land into cultivation or pasture, sometimes in an effort to compensate for plots they have degraded through unsustainable practices. CIFOR continued its efforts in 1997 to understand the complex exchanges that take place at the edges of the forest, and to identify, understand and encourage those that are beneficial and discourage those that are destructive.



Agroforestry, Tanzania
(photo: WWF-Wale Adeleke)

Project 8:

Sustainable Use and Development of Non-timber Products

Objective:

Direct attention to the individual and social costs and benefits of alternatives for forest land use. In particular studies how people respond to new opportunities that shift the relative costs of forest resources, land and labour, and to conditions that favour forest-based development, using non-timber forest products as a point of entry.

Main sites:

Bolivia, Brazil, China, Indonesia, Zimbabwe.

Major partners:

Chinese Academy of Forestry; University of São Paulo (Brazil); Mulawaran University (Indonesia); Programa Manejo de Bosques de la Amazonia Boliviana (Bolivia); University of Zimbabwe.

Life on the margins of forests is closely identified with life on another margin; that of economic security. Much of the poverty of the tropics can be found along the interface where humans meet forests. CIFOR seeks policy options that can both protect the values of the forest and improve the lives of the people living around them.

One way is through non-timber forest products (NTFPs). Millions of people rely on NTFPs to satisfy daily needs, or harvest them to earn cash. CIFOR's work on the 'Sustainable use and development of non-timber products', aims to improve understanding of how people interact with the forest with a focus on NTFPs.

Non-timber forest products

During 1997, CIFOR revised its research strategy on non-timber forest products to consolidate and focus field research activities. The new strategy places emphasis on individual and social costs and benefits of alternatives for forest/land use. In particular, it looks at how people respond to new opportunities that shift the relative costs of forest resources, land and labour, and at conditions that favour forest-based development, using NTFPs as a point of entry for studies.

The multiple use of forests and the conditions that favour forest-based development for local populations can be approached through a focus on NTFPs. CIFOR's work has found that successful multiple use is strongly linked with: positive state-sponsored regulations offering clear and well-known rights to people; a harvesting intensity and/or technique that does not put excessive pressure on the resource; and a transparent market, well organised gatherers and the existence of external support groups.

Further work will improve criteria to identify conditions with a high development potential, and tools to select appropriate actions.



Brazil nuts (*Bertholletia excelsa*)
(photo: WWF-Edward Parker)

In China, work conducted jointly with the Chinese Academy of Forestry has been reported in Chinese in *Forestry Economics* and in English. The study highlights the potential of bamboo for rural development, with its differentiated role based on income levels showing it to be relatively more important for middle income farmers. This contradicts the conventional view of bamboo as a poor man's timber, and offers interesting insights on the wider issue of NTFP development potential, especially for the poorest rural populations. Further studies clearly show the high potential of bamboo for income generation and rehabilitation of degraded lands.

In the western Amazon region field work is under way to identify the contribution of forest products (especially NTFPs) to regional development. A meeting was held in Bolivia to exchange experiences and to present the progress of the two main components of the German-funded project (with parallel work in Zimbabwe). Research was carried out in Peru to investigate the potential for NTFP production within secondary forest management. This work has significance for several of the major NTFP research issues already identified. A paper on the potential of Uña de gato (*Uncaria* spp.) prepared for the Instituto Nacional de Recursos Naturales, has had an important influence in the discussion on a proposed law to ban sale of unprocessed NTFP products from Peru, which would have significantly reduced income among some low-income collectors.



Medicine bottles, Amazon, Brazil
(photo: WWF)



Making bamboo baskets, China
(photo: Manuel Ruiz Pérez)

Uña de Gato

The plant named uña de gato (*Uncaria spp.*) is reputed to possess remarkable medicinal characteristics. Uña de gato is found in the rain forests of several Latin America countries as well as Peru, and it is being sold widely as a natural remedy in the developed world. Farmers collect the bark in the forest and augment their income by selling it to traders. Although much of the bark is collected from primary forests, uña de gato also grows well on disturbed land.

CIFOR is studying the implications of this NTFP and its future. Among the questions that are being asked are: Can the plant become a viable cultivated crop in secondary forests? Will farmers on the forest margin who place their futures in uña de gato be economically hurt when industry starts producing in bulk from plantations and bio-reactors? CIFOR's tentative conclusion is that two markets - one for drugs manufactured from uña de gato and another 'green' market for locally grown and produced derivatives - may offer farmers the best chance of success.



Acai palm tree fruit, Brazil
(photo: WWF-Juan Pratginestos)



Tapping rubber, Brazil
(photo: WWF-Juan Pratginestos)

A spatial analysis of data using Geographic Information Systems (GIS) in the Upper Juruá Extractive Reserve of Brazil shows increasing settlement along the main river banks while large areas of the interior are being abandoned due to low rubber prices and complete lack of infrastructure (schools, health posts). The Extractive Reserve is experiencing a major change in economic activities with implications for its conservation and sustainable development. By providing improved understanding of the causes of such changes, research can offer local populations new tools for making informed decisions on their future.

Ongoing research in the Humid Forest Zone of Cameroon has shown the importance of trade at a regional level and the high involvement of women, who represent more than 90 per cent of traders. Research output on market organisation and efficiency, transaction costs and traders have been used to debate the effects of a flat tax that was imposed on traders last year. This tax has pushed the poorest of the people, the women, to the brink of bankruptcy.





In Africa, preliminary data from research in Zimbabwe show the importance of the wood carving industry as an alternative source of income generation for rural populations there. The current economic adjustment and currency depreciation in the country has led people to look for alternative employment. With the increase in tourism, the demand for handicrafts based on forest products has increased, providing people with more employment opportunities. However, this also means increased pressure on forest resources.

A new activity in Indonesia began in August 1997 involving collaboration with an EU-supported project on NTFPs at the Center for Social Forestry at the University of Mulawarman. Three research sites have been selected for study, including a benzoin production system in North Sumatra, rattan and fruit garden systems in the middle Mahakam area of East Kalimantan, and NTFP extraction systems in the Bulungan research forest.

To complement hands-on research, CIFOR conducted a series of reviews and workshops on various aspects of NTFPs to make research results widely available. Florida International University is collaborating with CIFOR in an overview of the effects of moving from a subsistence to market economy in forest based activities, especially NTFP. This activity is being co-sponsored by CIFOR and FAO and has opened new avenues for collaboration between both institutions. CIFOR also supported a workshop of the Joint Forest Management Network in India on NTFPs. Review activities have focused on Central African NTFP trade in Francophone Europe, and NTFPs in Talamanca, Costa Rica.

During 1997, field research on livelihoods and incentives for conservation looked at which conditions most favour successful use and development of NTFPs. The research was conducted with partners from the World Wide Fund for Nature-Indonesia Programme, the University of Indonesia and WATALA, an Indonesian NGO, with additional collaboration with ORSTOM-ICRAF, LATIN, the Ford Foundation and the Forest Research and Development Agency.



Training course, Oxford University
(photo: OFI)

As more forest products enter the market and forest products are seen as a means of enhancing the income of forest-dwellers, serious concerns have been raised about the impact of economic incentives on the long-term management of forests. A fear has been expressed that as forest products gain value, they are more likely to be exploited. Marketed products are seen as particularly vulnerable because of their more open-ended demand and the attraction of additional harvesters interested in capturing benefits. High levels of exploitation are expected to result in forest degradation and, sometimes, even extinction for sensitive or rare species.

An opposing view maintains that high value creates an incentive for conservation. Two distinct rationales are used to support this position. The first proposes that a resource must be valued if people are to invest in its long-term maintenance. People are more likely to protect a valuable resource than one that is not valuable. The second rationale maintains that some uses of the forest are more compatible with conservation than others. To the extent these conservation-compatible uses are more valuable, people will have more incentive to not engage in more destructive uses of the forest such as logging or conversion to agriculture. This position is the basis for the current popularity of valuation studies. According to this rationale the conserving or degrading nature of the use is therefore as important as its relative value.

What determines whether existence of a high value, marketed product will lead to increased exploitation of the forest or conservation and sustainable management? CIFOR research to answer this question in two regions of Indonesia - Krui, Sumatra, and Kayan Mentarang, Kalimantan - found that income alone is not an adequate predictor of people's management behaviour. Most previous analyses of economic incentives describe people's behaviour as a response to net income, especially expressed as the value of forest products or returns to labour or land. These studies do not take into account that net income may be valued differently among different people and in different settings or periods of time. A single forest product or forest-related



*Andean rainforest, Peru
(photo: WWF-André Bärtschi)*



Ginger flower, Sumatra
(photo: Plinio Sist)

(photo: Paul Zborowski)



income source may also be valued across several dimensions such as food security, monetary value or emergency source of cash. The forest landscape may be even more valued than a particular product and stream of income. Money itself may be valued differently in different settings. The value of an income will depend to a large extent on the economic strategy of the person or household concerned and the social context in which that strategy is carried out. Economic incentives are only part of the picture.

To complement field work, reviews of a range of NTFP valuation methods and analysis of their appropriateness for different circumstances have been initiated. The intent is to capture the diversity of methods in use and enable practitioners to determine for themselves which elements might work best for them. The reviews highlight the ways in which methods for NTFPs are distinctive and can be adapted from other fields. They also cover discussions of methods for analysis of marketing systems, profitability, assessment of microenterprise feasibility, project planning, measurement of household incomes, and monitoring and evaluation of impacts.

UNDERSTANDING FOREST ENVIRONMENTS

Forest environments are complex. They comprise biophysical, social and economic components. If efforts to increase the productivity of forests, conserve diversity, improve livelihoods and develop informed policies are to succeed, these environments must first be better understood.

CIFOR's project on the 'Conservation of Biodiversity and Genetic Resources' seeks to understand the diversity of plants and animals in the forest. People living in the tropics who are dependent on forests are the guardians of forest diversity, and they often possess intimate knowledge and sophisticated management systems for the resource on which they rely so heavily. CIFOR believes that conservation of forest biodiversity will be most efficient if local skills and knowledge are incorporated and if forest-dependent communities receive economic benefits from agricultural and pharmaceutical developments resulting from use of biodiversity, or their knowledge of it.

During 1997, research on genetic resources was extended to include broader issues of biodiversity. In tropical forests, reduced biodiversity causes losses in ecosystem stability and ultimately results in the destruction of tropical forest ecosystems. The consequences can be regional and global, affecting soil, hydrological cycles and climate, as well as limiting the opportunities for future breeding of forest stock.

The interactions of ecosystem processes are being studied at two levels. One is the landscape-scale losses that can reduce biological diversity. The other level comprises the micro-scale processes, such as inbreeding, pollination and seed predation. This research aims to assess the impacts of human disturbance, logging and fragmentation on the *in situ* conservation of forest biodiversity and genetic resources, and to develop tools for measuring and monitoring biodiversity. These tools include molecular markers, computer software and GIS and remote sensing applications.

Project 6:

Conservation of Biodiversity and Genetic Resources

Objective:

Use diverse means to produce ways to measure and assess biodiversity and genetic resources.

Main sites:

Costa Rica, India, Indonesia, Thailand.

Major partners:

CATIE (Costa Rica); University of Agricultural Sciences and TATA Forestry Research Institute, Bangalore (India); LIPI and IPB (Indonesia); Royal Forest Development and Mahidol University (Thailand); Universities of Alberta and British Columbia (Canada); Wageningen Agricultural University (the Netherlands)



Many genetic resources data collected in developing countries remain under-utilised because of limited accessibility to user-friendly analytical software. In 1994 CIFOR developed a Windows-driven user-friendly population genetics analysis package, in collaboration with the University of Alberta. During this past year, the package, called POPGENE, has become increasingly popular, and is now used in many institutions around the world for analysis of data on trees, agricultural crops, fish and wildlife. In 1997 the package was made available on the internet thereby greatly improving its accessibility.

Impacts of disturbance

In recent years, it has become increasingly apparent that conservation of tropical forests cannot rely solely on protected area networks. After a couple of decades of rapid expansion in tropical protected areas, further expansion is probably limited. This view is reflected in the World Resources Institute's Global Biodiversity Strategy, UNEP's Global Biodiversity Assessment, and the work of many other authors. A comprehensive approach to forest conservation must therefore incorporate the sustainable management of land outside protected areas, and this requires an understanding of how human activities impact on forest resources.

For the past three years, researchers from three countries - India, Thailand and Malaysia - have been working collaboratively under the auspices of CIFOR and IPGRI to investigate how human activities affect the genetic resources of forest plant species. This has been a multidisciplinary research project, involving not only research on genetic resources, but also on reproductive ecology and socioeconomic investigations of the communities living in and around the forest.



In August 1997, members of the research team met in Bangalore, India, to review results of their studies, to draw conclusions about the impact of human activities on forest genetic resources, and to begin a process of communicating the results to forest managers and policy makers.

The selection of sites within countries was made to cover as many different types of human activities as possible, while also allowing comparisons to be made amongst countries. Thus, in Malaysia, the main type of human activity was logging; in Thailand, as well as timber harvesting, the forests were also used for grazing and collection of NTFPs; and in India the main activities were grazing and NTFP collection.

Preliminary results provide some interesting insights concerning the interaction between people and forest genetic resources. For example, the socioeconomic research in India indicated that, in general, it is the poorer households that maintain a greater reliance on the collection of NTFPs. Members of the wealthier households often have access to salaried income, which not only provides potential for greater income, but is also more dependable than seasonal NTFP collection, yields of which can vary widely from year to year. With the incorporation of many NTFPs into a market economy, there is a marked tendency for unsustainable harvesting, even when the harvesting is undertaken by indigenous communities which have traditionally relied on these products for their livelihoods. Consequently, regeneration of certain species is almost completely absent in areas of highly intensive harvesting, and genetic diversity of these species is consequently eroded.

In contrast to NTFP collection, most other activities appear to have a much less obvious impact. Although the impacts of logging, based on the research done in Malaysia, were evident on all species sampled - not only on those which were harvested - the loss of genetic diversity did not exceed 24 per cent which was less than the percentage reduction in numbers of trees. Similarly, the harvesting of wood for construction and fuel in Thailand only had a significant impact at very high intensities of extraction.



*Milling lumber, Mexico
(photo: WWF- Tony Rath)*





The research in Thailand also clearly demonstrated that the intensity of impact is dependent on the reproductive ecology of the species. Those species which are pollinated by weakly flying insects show increased levels of inbreeding as the density of reproductive individuals declines, while species affected by more strongly flying insects are less affected. Depending on the behaviour of pollinators, and the degree of host-pollinator uniqueness, there may also be clear thresholds in the intensity of disturbance that affect the mating system and, consequently, genetic diversity.

Further comparative analyses across the three countries will indicate the degree to which these findings are generalisable. Similarly, the integration of research across all three disciplines involved will illustrate the processes which determine the consequences of people-forest interactions much more clearly than would be possible from examination of data from just one discipline.

Biodiversity

The need for accurate predictive information for forest management planning is vital. Detailed biodiversity surveying over more than a fraction of a forest management unit is impractical. A valuable management tool would be to predict species occurrence and habitat type from simple environmental information that can be obtained from GIS and remote sensing. In addition such predictions would assist in survey design for further biodiversity studies. Elevation is known to be an important factor in determining species composition, topography may also have significant influence on the ecological resources and biodiversity of an area. Including these parameters in biodiversity research will increase the relevance and applicability of results. CIFOR is conducting research in Central Kalimantan to assess the impact of logging operations on biodiversity in lowland dipterocarp forest and to identify the relationship between topographic variation and biodiversity.

This study focuses on several species of wildlife (small mammals, birds and primates) and the components of their habitat as represented by vegetation structure. These variables had been chosen as indicators of



*Pintas Sekajang, West Kalimantan
(photo: Carol J. Pierce Colfer)*



biodiversity to enable rapid assessment and to include a range of interrelated elements. Topographic variation was used to predict various environmental parameters and these were sampled in compartments with different logging histories. The study took place around Wanariset Sangai where there has been logging activity for several years.

CIFOR has also developed a predictive software package, DOMAIN. When linked to a GIS and a digital elevation model, DOMAIN can use climatic variables to predict and map plant distribution.

Impacts of fragmentation

Fragmentation occurs when a forest or habitat is broken up into unconnected parts by clearance for agriculture or settlement. It is believed that this will disrupt the reproduction abilities of species living in these areas.

Most of the research effort on fragmentation is in Costa Rica, where CIFOR and its partners are studying reproductive ecology and other aspects of invertebrate biodiversity. The research site in Costa Rica is in an area in the northwest of the country, where cattle ranching has historically cleared large areas of forest, leaving a pattern of riverine fragments. Detailed vegetation surveys have been undertaken in 22 of these fragments, and samples have been collected from four species. In late 1997 analyses were undertaken on these samples at the University of Alberta, Canada. Experimental controlled pollinations have been used to study the mechanisms controlling the degree to which species may be self-pollinated. Three major pollinators have been found: moths, small bees and large bees.

Impacts of logging

Studies of the impact of logging on genetic forest resources are rare. It has been assumed that logging activity will reduce the genetic quality of the remaining stands and regeneration. CIFOR is studying in Central Kalimantan whether selective logging practices will change the



*Bird of Paradise
(photo: Alain Compost)*



What is a carbon market?

Forests are the largest repositories of carbon on the terrestrial earth. The element, which is the key to the carbon cycle, is life's foundation, is stored in plants and trees of the forest, both above and below ground. Global interest is increasing in the idea of financial markets in carbon sequestration. Governments or corporations in places of great carbon use (such as Europe or USA) would balance their high emission rate by purchasing 'pollution rights' to lands elsewhere (such as in the tropics) and paying people to grow or re-grow forests on them, thereby conserving carbon and providing a planet-wide environmental service. Theoretically, one action would offset the other, and money could change hands in the transaction.

genetic diversity, or increase inbreeding, and if the magnitude of such changes can be related to the biological characteristics of some tree species.

Multiple resource management

CIFOR's research on 'Multiple Resource Management of Natural Forests' is focused on learning how the commodity and non-timber values of natural forests are affected by management decisions and operations.

In 1997, research on reduced-impact logging practices (RIL) aimed to demonstrate that timber can be produced without destroying the forests. CIFOR is producing guidelines and technologies that, if adopted, would have broad benefits for forest health. By the year 2000, if reduced-impact techniques are used in only 20 per cent of all tropical harvesting operations, the result could be a 10 per cent increase in carbon sequestration and a 5 per cent reduction in soil impacts caused by logging (see BOX: 'What is a carbon market?'). Ultimately, the gains would include protection for biological diversity, a significant decrease in deforestation, more stable incomes for households dependent on forests, and better utilisation of forests.



*Berbak Game Reserve, Jambi
(photo: Paul Sochaczewski)*



Project 3:

Multiple resource management of natural forests

Objective:

Contribute to better management of natural tropical forests including degraded (logged over) and secondary forests through sustainable production practices, policy, dialogue, increased national research capacity and information dissemination.

Main sites:

Bolivia, Brazil, Cameroon, Indonesia, Malaysia, Nicaragua, Peru, Tanzania, Zambia.

Major partners:

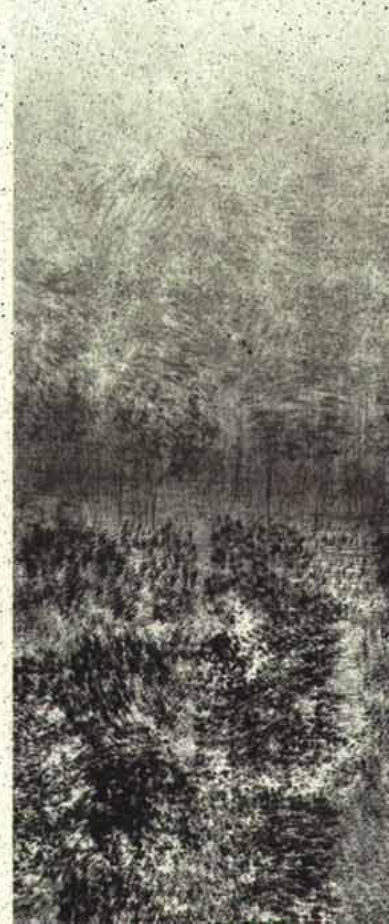
Universidad Agraria La Molina (Peru); EMBRAPA/CPATU (Brazil); Universidad Centroamericana en Managua (Nicaragua).

Implementation of RIL techniques and the assessment of the impact of logging techniques on forest ecology and socioeconomic conditions can be termed Improved Management of Production Forests. This research, originally limited to Malaysia, has now expanded to eight sites: Malaysia (carbon sequestration through reduced-impact logging); Indonesia (research at Bulungan to develop and assess policy incentives to promote adoption of reduced-impact logging by concessionaires); Brazil (two sites - research on economics and technologies for reduced impact logging on the Tapajós National Forest, and a separate study at Curua-Una, an experimental forest downstream from Santarem); Bolivia (a study on reduced-impact logging in drier forests); Cameroon (an overview of the logging industry and how it has been affected by devaluation of the local currency); Tanzania and Zambia (two coordinated field studies on reduced-impact logging which will contribute to the EU-funded project on sustainable management of miombo woodlands in East Africa). A global synthesis of reduced-impact logging research under way will facilitate a transfer of techniques and practices between national scientists.

A recent announcement by Assistant Minister to the Chief Minister of Sabah, states that new legislation has been proposed which, if enacted, will result in the adoption of CIFOR's reduced-impact logging guidelines throughout Sabah. Such enactment, if enforced, will result in reductions in fire hazard and environmental degradation.

Results of international studies on the management of secondary and logged-over forests in the humid tropics (Africa, Asia and Latin America) are being reviewed with a focus on silviculture. This annotated bibliography will be in the form of a CD-ROM. Small regional workshops are the chosen vehicles for presentation and discussion of papers contributed from collaborators. This synthesis work is *per se* a major task requiring close cooperation with other forestry research networks and organisations such as IUFRO, FORSPA, APAFRI, FORAFRI, CATIE, ETRN and CIRAD-Forêt. Support from the GTZ and IKCN will enable continued research and collaborative activities in this area.

(photo: Plinio Sist)





Using legumes to condition soils
(photo: WWF-Tony Rath)



What is multiple resource management?

The term 'multiple resource management' of natural forests is used to emphasise the multi-functional character of forest ecosystems, i.e., the long-term maintenance of their production, regulatory and recreational functions.

Sustainable forest management refers to the process of managing permanent forest land to achieve one or more clearly specified productive and/or ecological management objectives without undue reduction of its inherent values and future productivity, and without undesirable effects on the physical and social environments.

Natural forest management is defined as the management of primary or secondary forests for sustained production of timber and/or other products in which forest cover is maintained indefinitely.

Secondary forest is the woody vegetation which develops on land where primary forest has been cleared, usually for agricultural purposes.

In 1997, interdisciplinary research on small-scale farmers in the forest margins began. A dynamic conceptual framework was developed within which to study how the role of primary and secondary forest changes with frontier development. Diagnostic farm surveys were carried out in the Peruvian and Brazilian Amazon at sites selected to provide an international continuum in frontier development. The results show that substantial areas of secondary forest are likely to remain on small farms even in old frontiers.

At the frontier around Pucallpa, a Peruvian Amazon town on the Ucayali River, development has been rapid because the town lies at the end of a road across the Andes to Lima - a funnel for colonisation. CIFOR has found that in the intermediate stages of frontier development around Pucallpa, fallows do not appear to be declining as would be expected.



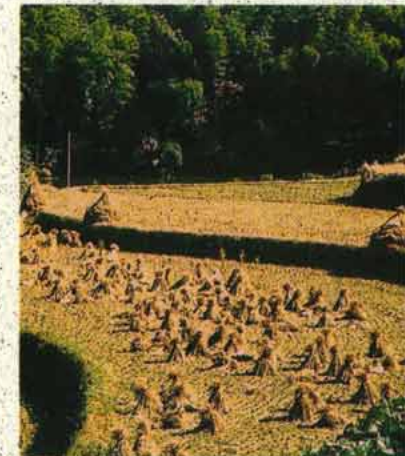
Harvesting manioc, Brazil
(photo: WWF-Edward Parker)

Regeneration of secondary forests seems to slow with frontier development (possibly because of a reduction of seed sources from the primary forest, of which little remains), and farmers are compensating by not reducing fallow periods.

This work also implies significant changes in the secondary forest research agenda. Among these is the need to broaden secondary forest management, which previously had focused on timber production on abandoned land, to include management for short-duration NTFPs during fallow periods. The linkages between forests and other aspects of the production system were also highlighted in the survey, with implications for policy and technology development. The challenge in future years will be to implement these changes in research agenda.

In Pucallpa, CIFOR's research is now beginning to be integrated with the work of CIAT and ICRAF. In November 1997, the Directors General of the three CGIAR Centers met to develop a strategy through which each institution contributes to a common vision, based on its own comparative advantage. This is expected to strengthen the prospects for making an impact, given the interactions between forests and other aspects of production systems, particularly on small farms.

A new strategic thrust within CIFOR's research on multiple resource management is to build on opportunities arising from global developments. The project is investigating whether global markets in environmental services can be used to compensate farmers and loggers who switch to more sustainable practices. An example is the recent Kyoto Protocol on climate change which permits trade in carbon sequestration services. Research could facilitate the emergence of these markets by identifying the conditions under which markets would be feasible and by quantifying the value of the commodities to be traded. International agricultural research centres may have a comparative advantage in research of this nature, which requires an understanding of both global and local issues, and provides opportunities for introducing scientific input into global debates.



Taojiang Bamboo Park, China
(photo: Manuel Ruiz Pérez)



Managing forest ecosystems

Ecosystems have been defined as functional systems made up of communities of interacting organisms such as plants and animals and the environment that affects them and is in turn affected by them. Forest Ecosystem Management (FEM) requires an understanding of ecosystem function, especially the response to perturbations (e.g., removal of nutrients, genotypes, structures), its dependence on critical components (e.g., pivotal species), and the existence of thresholds and other situations where decisions may be irreversible. FEM is concerned with ecosystem function at the *landscape* scale; how landscape patterns and ecosystem functions interact, and how they may be modified to satisfy various objectives. Landscape scale may be interpreted as the view seen from a good vantage point on a clear day. It may approach that of a sub-catchment or small catchment, but is not necessarily delimited by watersheds.

It is unlikely that 'business as usual' will continue to improve the quality of life on earth. A better understanding of the environment, and better tools to predict consequences of policy and management initiatives, will enable people, planners and policy makers to enhance the quality of life. To advance the management of tropical forest ecosystems, we need to gain new knowledge, develop new techniques and promote existing knowledge. The complexity of these issues requires a holistic approach integrating social, economic and ecological aspects. An effective way to synthesise information and identify gaps in existing knowledge is to compile clear models, and test them systematically to reveal strengths, weaknesses and sensitivities. This will highlight areas for further research as well as feasible management options. Two key elements of this work are conflict resolution and valuation of diverse goods and services.

Project 2:

Forest Ecosystem Management

Objective:

Provide the insight and tools required for policy makers and planners to explore implications and impacts of various alternatives on land use and rural livelihoods.

Main sites:

Bolivia; Cameroon, Indonesia, Peru.

Major partners:

CIAT (Colombia); ICRAF/TSBF (Kenya); University of Gadjah Mada and BIOTROP (Indonesia); University of Edinburgh (United Kingdom); CIRAD (France).



CIFOR's research on FEM contributes towards the better management of natural resources by offering an improved understanding of alternatives, their potential impacts and limitations and consequences of current practices. This will help to maintain ecosystem function and, in turn, lead to improved food security, conservation of biodiversity and indirectly to alleviation of poverty. A number of useful tools are being developed for those who generate policy and make decisions to accommodate the increasing pressures that societies place on forests. These techniques include the Tree Growth and Permanent Plot Information System (TROPIS) database, and an ecosystem modelling program currently under construction called FLORES, for Forest Land Oriented Resource Envisioning System.

FLORES is a model designed to assist understanding of land-use patterns in time and space, especially in forested landscapes, and to facilitate quantitative analyses of policy options to change these patterns. The program exists now in prototype. It is planned to make it available as a graphical depiction of a selected forest and all the human interventions that affect it. Jerry Vanclay, CIFOR's systems modeller, hopes that the ultimate version of FLORES 'may have many clients spanning natural resource managers, conservation advocates, indigenous people's organisations, political advisors, and school children'. Potential partners in the University of Edinburgh, CIRAD, CIAT and ILRI have demonstrated interest in applying the model. The technical feasibility has been demonstrated by constructing a simple prototype with the Agroforestry Modelling Environment being developed in Edinburgh. Currently work concentrates on surveying existing data holdings to establish a suitable site for an initial calibration of the model.



Teak in Java (photo: Francis Ng)





Tree nursery, Uganda
(photo: WWF-Rick Weyerhaeuser)

The final version will resemble the popular educational computer program, SimCity, in which users construct and manage a graphical simulation of a city. Users of FLORES would make 'what-if' decisions involving the management of forests. As they enter different ecological and sociological variables into the model, they receive factual and visual information on the consequences of their 'actions.' The resulting decision-support system will allow managers and others to investigate alternatives in almost endless combinations.

TROPIS is concerned primarily with information about permanent plots and tree growth in both planted and natural forests throughout the world. During 1997, it gained increasing acceptance and a steady inflow of new contributions as well as search requests. An index of people or institutions holding plot data is maintained as well as links to valuable tools. Data can be used from comparable sites to develop models or estimates of growth for sites without empirical data.

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. It now contains 12 200 plots of varying size and age, and 2900 species, and 75 search requests have been serviced. TROPIS has also been adopted as the official organ of Diversitas International - Western Pacific and Asia (DIWPA). 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 per cent of the plots are in natural forests, while the other 40 per cent 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). A companion system for organising inventory data from plantations, known as MIRA, has gained increasing acceptance. It is now bilingual (Spanish-English), is used widely in Latin America, and is beginning to be used elsewhere (e.g., Africa).



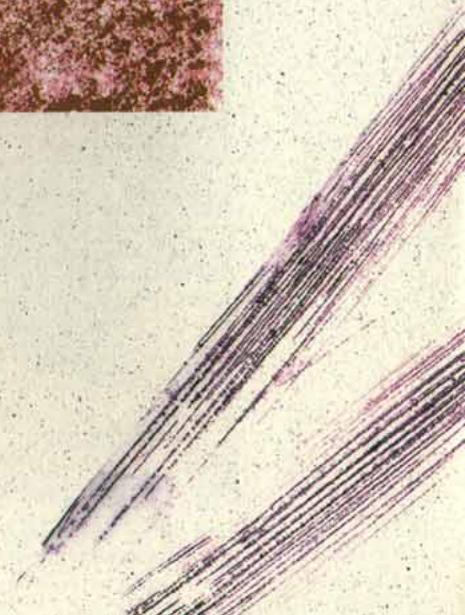


Collecting medicinal plants,
East Kalimantan (photo: Alain Compost)

Plant Functional Attributes (PFAs) are being currently assessed as possible indicators of site capabilities and specific growth habits. CIFOR has developed a pioneering method of characterising plants according to a set of PFAs that reflect adaptation to environment, such as leaf size class, leaf inclination and life form. New measures of plant functional diversity and complexity have been developed that complement the traditional measures based solely on species. PFAs provide a cost-efficient, uniform way of evaluating species response to land use, as well as assessing the impact of resource use on biodiversity and productivity for human needs. A strong relationship has been found between the number of unique PFA combinations (or modi) and the number of species in a given plot. In very complex plots, the existence of PFA combinations can be used to estimate plant species richness with a high degree of confidence. This technique is useful and practical for many developing country sites. Using this method, surveys across land use types in each of CIFOR's ecoregional benchmark sites revealed unexpectedly high variation in the biodiversity of fallow systems, with some systems exhibiting levels of richness in excess of those in nearby rainforest.

CIFOR heads the above-ground biodiversity working group of the CGIAR Systemwide Programme on Alternatives to Slash and Burn which is using PFA analysis. The below-ground biodiversity group of this programme, headed by the Tropical Soil Biology and Fertility Programme, also uses functional groups for analysis. Contrary to initial expectations, data collected across a wide range of land use types showed only small effects on the number of broad functional groups. However, there were substantial shifts in species composition and density. Results from both above- and below-ground surveys will be combined to provide a holistic basis for modelling the impact of land use on biodiversity and related productivity. As study sites are developed in each of the ecoregional benchmarks, they will become increasingly important for modelling impacts of global change.

In 1997, a groundbreaking paper on PFAs entitled 'A plant functional attribute set and grammar for dynamic vegetation description and analysis' appeared in *Functional Ecology* and was well received.



The Economic Crisis and Indonesia's Forests

In 1997, with the onset of the Asian economic crisis, CIFOR's policy scientists began studying the impacts of this crisis on forests with specific reference to Indonesia. Below is a synopsis of CIFOR's analysis. The full text is can be read on CIFOR's Homepage.

The economic crisis affecting Indonesia, and much of Asia, over the past year has increased threats to the country's forests, and consequently to the people who depend on the flora and fauna within them. These threats are intensified by the devastating drought and uncontrolled fires that have occurred at the same time. Policies implemented in response to the requirements of the International Monetary Fund's assistance package have both direct and indirect impacts on the Indonesian forestry sector.


It is imperative to understand the combined implications for the forest sector of all policies within an economy. By knowing where the greatest threats to the forest are likely to be felt, concerned groups - both government and non-governmental - can act to minimise negative impacts and counter measures where possible. Indonesia's disastrous year of 1997-98 reinforces the need for research on policy implementation and its effects on forests. The IMF programme focuses on poverty alleviation, employment generation, health care and currency stabilisation. Policies enacted to address these issues in key sectors, especially agriculture, will have major implications for the forests. In addition, reforms within the sector will have a direct effect on the health of the forests and their ability to provide services - both economic and non-economic - into the future. The strongest effect to date appears to be as a direct result of the devaluation of the Indonesian currency and the more competitive position of the country's commodities on the international market.

The expansion of agriculture to facilitate economic recovery is likely to occur at the expense of forest cover. The most important commodity in respect to this development is oil palm. Since costs are mainly in local currency while export income is in dollars - a much needed commodity to service the country's huge foreign debt - the pressure to expand the production of oil palm is thus great. Forest-dependent people are also under threat of being relocated to make way for agriculture. Increasing international prices of cocoa and coffee also have stimulated interest in plantations of these commodities.

Other factors which will affect Indonesia's forests are: directed resettlement to support agricultural development and agro-industries, migration by the urban unemployed to rural areas, and the growing attractiveness of mineral exports as a source of foreign exchange.

(See page 44 for a report on CIFOR's policy research)





IMPROVING FOREST PRODUCTIVITY

Increasing amounts of wood are now being produced in smallholder plantations, especially in areas where population density is high. The sites available for these plantations are frequently degraded and of low fertility and there is a question about whether they can sustain a high level of productivity without large inputs of fertiliser and weedicides. It may not be feasible for smallholders to provide these inputs.

During the year, CIFOR continued its work to identify and analyse the problems which constrain sustainable tree planting, and to develop technological and other options to maximise the sustainability of smallholder plantations on degraded tropical sites. The project on 'Plantation Forestry on Degraded or Low-potential Sites' seeks to develop site management and policy options which improve the choices and chance of success for smallholder involvement in plantation forestry, and technologies which improve production and sustainability of fast-growing plantations on low-potential sites. Improvement of soil and water management in tropical tree plantations, dipterocarp silviculture and research needs, and fungal pathogens in tropical acacias have been addressed in this work.

In 1997, CIFOR conducted research on using computer modelling to test the impacts of technologies and policies in Southeast Asian uplands; on applying new techniques to degraded lands in mountainous areas of China; on generating community income and restoring degraded lands in West Kalimantan, Indonesia, and through production of *Vitex pubescens* for barbecue charcoal.

Project 5:

Plantation Forestry on Degraded or Low-potential Sites

Objective:

Identify problems that constrain the sustainable and productive planting of trees, and develop techniques to increase the sustainability and productivity of small-scale plantations.

Main sites:

Brazil, China, Congo, India, Indonesia.

Major partners:

EMBRAPA (Brazil); Chinese Academy of Forestry; Unité de Recherche sur la Productivité des Plantations Industrielles (Congo); Kerala Forest Research Institute (India); IPB (Indonesia).



Imperata grasslands of Southeast Asia

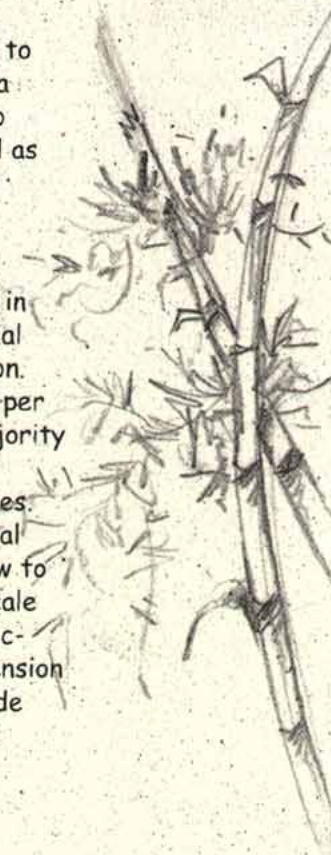
Uplands are important geographical components of Southeast Asian agriculture, particularly in the Philippines and Indonesia. Large areas of the forest uplands in both countries have been severely degraded due to logging and shifting cultivation and are now grasslands colonised by *Imperata cylindrica*. Although *Imperata* has some uses, these are of relatively low economic value and *Imperata* areas are inhabited by people with low incomes. Bioeconomic computer modelling was used to test the impact of improvements in technologies and policies over a range of socioeconomic settings. The models can be constructed to enable them to be used for extension and training purposes as well as for technological and policy research and investment decisions.

Reclaiming degraded lands in China

With a market-driven economy becoming gradually more important in China, there is a clear awareness at all levels of State and provincial authorities of the need to adopt new forms of people's participation. Degraded lands in mountainous and hilly areas account for over 60 per cent of China's total land area and it is in these areas that the majority of very poor people live. Tree planting by small farmers can offer solutions to the problems of land degradation and increasing incomes. Research by the Chinese Academy of Forestry has produced several technological solutions but the question now being addressed is how to efficiently achieve the application of the technologies on a wide scale and integrate individual technologies into appropriate socioeconomic-technological packages for selected areas. The socioeconomic dimension of the problem is given high attention in this new research alongside technological development with test sites located in villages in the provinces of Zhejiang, Hunan, Guangxi and Yunnan.



Burnt forest, Thailand
(photo: Thomas Enters)





Amazon timber species, Peru
(photo: WWF-Sandra Mbanefa)

Site management and productivity in tropical forest plantations

If plantations as a technology are to continue to be vigorously promoted, it is essential to better understand 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? CIFOR's research aims to increase 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 past year has brought closer collaboration at research sites in India, Indonesia and Brazil, with plots also established in Congo and China.

Rehabilitation of degraded tropical forest ecosystems

Tropical forests are decreasing at the rate of 17 million ha per year, due mainly to clearing for agriculture. Moreover, timber harvesting results in more than 5 million ha of tropical forest becoming secondary forest. 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. The main question of rehabilitation is how to create appropriate growing conditions for each species from the juvenile to the mature stage. Where short-rotation plantations are being established there will be changes in nutrient storage and cycling processes due to the harvest of large quantities of wood, changes in organic matter quality, fertilisation, erosion, leaching, etc. All of these factors will affect storage and supply of soil nutrients for tree growth and consequently sustainability of the entire plantation system. Opportunities exist to regulate soil organic matter through silvicultural practices. The challenge for researchers is to develop silvicultural systems to ensure plantation productivity does not decline or is improved over successive rotations. They should also aim to improve soil quality and

Logging road, Bulungan, East Kalimantan
(photo: WCS-Robert Fimbel)



other environmental values. In 1997 continuing financial support from Japan enabled links with partners to be formalised and experimental plots established in tropical Asia and South America.

The effect of tree planting on biodiversity in degraded tropical lands

There is a growing recognition that native forest regeneration within plantations can add value in many ways to tree planting programmes including, in certain cases, increased economic returns. During 1995-96 vegetation, fauna and microfauna studies were conducted in Congo and South Africa. The purpose was 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 the extent to which establishment of tree plantations on degraded lands can enhance biodiversity of indigenous and naturalised plant species and restore faunal biodiversity. Research results obtained during this first phase have been published in 1997 in a special issue of *Forest Ecology and Management*.

Extension of the work began during the last quarter of 1997 with the same collaborators from Congo, France and South Africa. The research focus will be on understanding reasons for changes in soil biological fertility when converting savanna to eucalyptus plantations and through successive rotations of eucalypt plantations.

Criteria and indicators

CIFOR's research on 'Assessing the Sustainability of Forest Management: Developing Criteria and Indicators' looks at ways to distinguish between sustainable and unsustainable management practices in tropical forests. The results will be incorporated into a system of 'Criteria and Indicators' or standards by which a forest unit and its management are assessed. The system would be objective, relevant and cost-effective (see BOX: 'What are C&I?'). Policy makers and managers must understand the biological and human history, environmental conditions, productivity, and dynamics of the places they



*Euphorbiaceae, East Kalimantan
(photo: Plinio Sist)*



are managing in order to evaluate sustainability. The managers and planners must also understand the possible future directions their forests may take and the future results of present-day actions.

CIFOR research has highlighted the fact that there is too much variation for any one set of C&I to be valid across the globe. A large number of locally relevant initiatives have been developed in several countries. To be useful, CIFOR's efforts had to be directed towards enabling these locally relevant initiatives to develop C&I sets that are also scientifically sound and internationally compatible. To satisfy very diverse needs means providing the basic tools necessary for C&I development.

Working with some 30 partners in all continents, CIFOR has coordinated the evaluation of numerous sets of criteria and indicators. Interdisciplinary groups have worked in forest sites in Austria, Brazil, Cameroon, Côte d'Ivoire, Germany, Indonesia and India, using methodology that ensures the involvement of all local stakeholders.

Much of the C&I work addresses two main categories of forest life: biological diversity and social sustainability. In the case of biodiversity, CIFOR recognises that adequate information could never be assembled on all the species, from tree to soil microbe, that inhabit a forest ecosystem - let alone the genetic diversity within each of those species. But a set of criteria and indicators *can* be developed that allows a rapid assessment of key components of the forest. They can include birds, which can serve as surrogates for the variety of organisms that comprise their habitat, and frogs, or components of water quality, or any number of other indicators.

In developing measures of social sustainability, CIFOR hopes to determine the threshold levels at which human activities move from being benign to causing harm to the forest. Closely related to this is the level of well-being of the people who live in and around the forest. C&I here relate to questions of whether people have access to the forest's resources; have secure tenure and rights to use the forest; receive their fair share of forest benefits; and are able to participate



Harvesting Brazil nuts, Amazonia
(photo: WWF-Mark Plotkin)



Project 4:

**Assessing
the Sustainability of
Forest Management:
Developing Criteria and
Indicators**

Objective:

Help develop and evaluate techniques to determine objectively whether forests are being managed on a sustainable basis.

Main sites:

Brazil, Cameroon, Côte d'Ivoire, Indonesia.

Major partners:

Instituto de Pesquisas e Estudos Florestais (Brazil); Office National de Développement des Forêts (Cameroon); Société de Développement des Forêts (Côte d'Ivoire); Ministry of Forestry and Lembaga Ekolabel Indonesia.

in forest management and in making important decisions that affect both the forest and their own livelihoods.

During 1997, the project continued to assemble a 'toolbox of techniques' for the development of C&I. Such a collection of near-generic tools are seen as devices to assist national initiatives to develop criteria and indicators that would be useful locally, but that would also be compatible and comparable with C&I in use elsewhere. CIFOR envisages the toolbox as initially containing all the tools necessary for C&I development. At later stages it could also be expanded to contain the tools necessary for C&I application. The toolbox will comprise, among other things, components to assess impacts on biodiversity; calculate the degree of intergenerational access to forest resources and participation in decisions about them; and provide indications of health of a planted forest.

Appropriate C&I can assist in assessing the feasibility of forest certification programmes. In many countries, forest managers, traders and national governments recognise the benefits of managing forests sustainably and advertising that fact. This can be done by certification programmes, also sometimes referred to as 'ecolabelling.' Communities that participate in certification programmes gain leverage in their dealings with governments and financial institutions, since sustainable forestry can translate into lower risk for an investor. This can then result in better local access to credit, grants and tenure security. But what should the standards of such a programme be? CIFOR has led a global effort to evaluate the criteria and indicators that are most useful in setting up such standards.

C&I can indicate the level of security of forest users' tenure and use rights by determining if rights are well-defined; if forest people share in the economic benefits of forest use; and if there are opportunities for local people and others dependent on the forest to find employment and training with forest companies.



A valuable end result of CIFOR's work on criteria and indicators will be the creation of a knowledge-based system, based on C&I, to aid in decision making by forest managers. And the most important gain from the project is to be able to discern clearly between sustainable and unsustainable forest management practices and so reduce uncertainty about environmental and social costs of logging and other kinds of forest use.

Guidelines are being prepared for developing and testing criteria and indicators for sustainable forest management based on CIFOR's field research methods. Widespread dissemination through channels that include the internet will enable testing of the C&I in forests managed by local communities and for planted forests. Feedback to CIFOR will be incorporated into the final set of criteria and indicators proposed. The guidelines will be a product of 1998. The methods presented so far are directed to natural forests at the forest management unit level, especially in the tropics. This manual is expected to be used by those interested in developing tools for on-site assessment of the quality and performance of forest management systems such as certification bodies, government officials, funding agencies, forest managers, project managers and scientists.

A 'C&I Resource Book' is currently being compiled that contains a 'generic C&I template'. The Resource Book will provide a short profile on relevant and practicable principles, criteria and indicators considered as a minimum necessary to assess sustainable forest management. It is intended for use in conjunction with the guidelines and as a stand alone reference. It is important to note that the C&I Resource Book will not replace the need to develop regional or locally adapted C&I. It is a tool to facilitate this process.



Reforestation program, Ecuador
(photo: WWF-Juan Pratginestos)



To be useful a C&I set must have a defined validity and scope. CIFOR's current work in natural forests, forests managed by local communities and plantation forests should allow this 'generic template' to expand to include these other forms of forest management in the humid tropics. In so doing, scientists should be in a position to identify the factors that delimit the scope of a particular indicator or verifier.

This work should broaden the common platform for sustainable forest management. Research results from CIFOR's research on reduced-impact logging will provide the C&I related to more conventional aspects of forestry.

Criteria and indicators for sustainable management of plantation forests

Controversy on the environmental effects and social impacts of tree planting in the tropics is primarily due to industrial plantations, especially those comprising single, short-rotation species. Risks for the environment include impacts on soil water, soil nutrients, soil erosion and biodiversity. In addition, a potential source of social conflict arises where land acquisition for forest plantations is in direct competition with agriculture.

Plantation forests, on the other hand, have avoided major confrontations on environmental issues. Concerns of the international community are directed primarily at the loss and degradation of tropical natural forests due to human activities. The recent international initiatives taken for natural forests 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 labelling of the resulting timber. Active in the discussion of criteria and indicators at the forest management unit level have been international and regional NGOs and, increasingly, the timber industry and governments.



With support from the ACIAR, CIFOR has started testing and developing criteria and indicators (C&I) for sustainable management of plantation forests. Whereas several international efforts have concentrated on developing C&I at the national or global levels, this project is the only international effort directed at the forest management unit level.

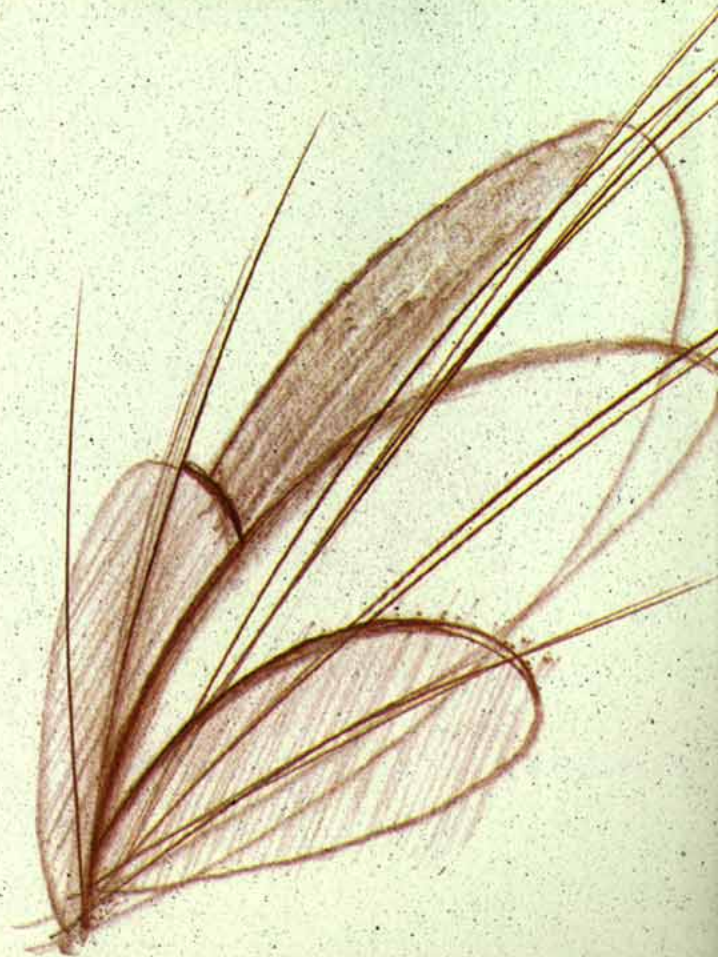
Social and biodiversity criteria and indicators

Field tests have consistently shown that criteria and indicators for biodiversity and social sustainability are particularly weak. Many of those suggested were either substitutes (surrogates) for more direct measures, or were not very precise. Special attention was given to developing these C&I during 1997.

In the case of biodiversity C&I, a novel approach was followed which looked at the health of the ecological processes that serve to shape and maintain biodiversity rather than inventorying species.

Most reliable methods of assessing social C&I are too time consuming; and the quick ones were too 'dirty'. CIFOR concluded that a focused effort was needed to develop and test relevant social science methods which would be simple, quick and reliable. Testing methods centred on locations about which a great deal was known (by CIFOR or its collaborators) so that the proposed methods could be evaluated in the context of fuller knowledge from long-term research. Cameroon and East Kalimantan were selected as initial sites.

Three topics were identified as priorities: definition of relevant stakeholders in forest management; intergenerational access to resources; and participation in forest management. The focus here was to develop methods that would allow criteria on intergenerational access to resources and participation/co-management to be meaningfully adapted to local site conditions. This research also contributes to improving the overall 'generic template'. A 'social sustainability assessment kit' is planned to provide an improved selection of indicators and more precise verifiers for social issues.



The development of the 'kit' has involved tests of 12 social science methods in Cameroon and Indonesia. In 1998, a test in Brazil is planned to further revise the 'kit'. At present, the question of suitable C&I for assessing economic impacts of forest management is under discussion with a workshop planned in early 1998.



(photo: Alain Compost)

Plucking manioc leaves, Brazil
(photo: WWF-Edward Parker)



What are C&I?

Forests and their uses are diverse, and the management of forests is not possible with a single set of guiding principles. As CIFOR silviculturist and researcher Ravi Prabhu wrote in 'ETFRN News' in September 1997, 'Perhaps one of the most important lessons learnt in trying to achieve sustainable forest management in tropical forests has been the recognition that there is no such thing as a universal management prescription, even in a regional context. Our perception of what constitutes sustainable forest management has changed over the course of the century, expanding it now to encompass both social sustainability and the maintenance of biodiversity... We are thus faced with a moving target'. To create a management policy that allows for the persistence, change, and unpredictability of forest environments, CIFOR has developed (and continues to build) what it calls 'C&I' - Criteria and Indicators. These are tools that can be applied in a variety of situations to organise, analyse and use the numerous bits of information that go into successful forest management. CIFOR's C&I research represents a collaboration with 30 partners on all the world's continents.

FORESTS AND POLICIES

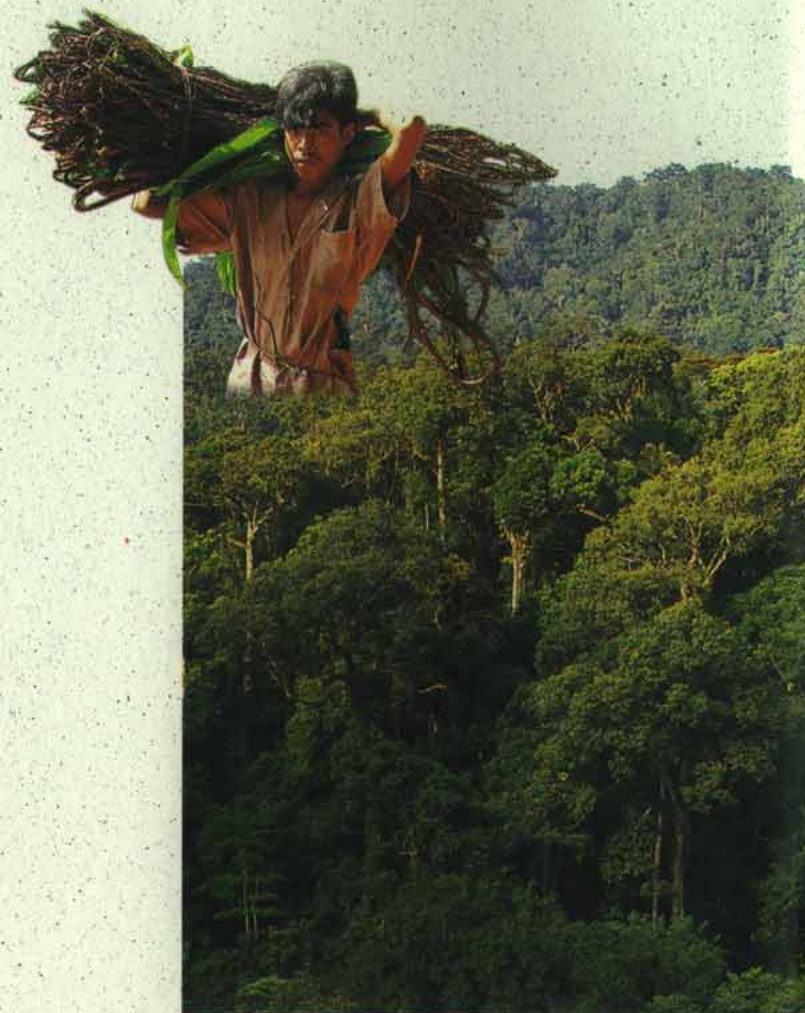
The people who make decisions about forests - government ministry officials, leaders of national programmes, leaders of forest communities and forest managers at all levels - need the highest-quality information possible. They need to know how their decisions are likely to affect the health and sustainability of the forest itself, as well as that of people who depend on the forest. Their need for knowledge extends well past the forest boundaries. They must know, too, about social trends such as population growth and shift, technical change, and fluctuations in the market (all the more important in the present era of global trade). Without such basic information, the makers of policy are not well equipped to evaluate and, if necessary, change present policies that may have unintended negative effects on forests and their people.

One of CIFOR's main objectives is to provide independent analysis, information and advice to assist in making policy decisions about forests and land use. Each of CIFOR's research areas contributes toward this goal.

The Center is ideally situated to serve as a resource and clearing house for information that is useful to decision makers. As an independent, international research institute, it has a comparative advantage in seeking out forest information, analysing it, and making it available to those who form policy, both nationally and internationally.

Local management of forests

At the national level, for example, policies that encourage local management of forests are one means of ensuring more sustainable, longer-term benefits for future generations. In 1997 research on the effects of decentralisation of control to several lowland communities in Bolivia found that some communities had established municipal forestry units and that local governments had become involved in a wide variety



Forest roots for weaving, Sumba
(photo: Alain Compost)



of activities related to forest management and agroforestry, protected areas and land-use planning. Because it is not yet known whether the local units will have the technical capacities necessary to maintain their involvement, CIFOR's research can help to identify policies and programmes that can develop this infrastructure.

Decentralisation in Bolivia has opened up new possibilities for poor rural people in heavily forested municipalities to achieve greater access to forests and their resources, to engage in land-use planning, and to resist encroachment by large timber companies and ranchers. A CIFOR study found many obstacles as well: difficulties inherent in identifying appropriate public forests; a generally weak technical capacity of municipal governments; limited support from provincial and national governments; organisational problems among small-scale loggers who might benefit from the changes; and the loggers' limited managerial skills and access to capital.

A particularly delicate issue in devolution in Bolivia concerns protected areas which, by definition, restrict users' access. But in some municipalities, support for such protected areas has grown as a result of interests in ecotourism, a desire to keep outside loggers away, and genuine concerns for resource conservation.

CIFOR concluded that local governments that take on the tasks of managing forests sustainably will need substantial external assistance as well as an overall policy context favourable to local initiatives. They will also need clear mechanisms for exercising their legal rights and carrying out their responsibilities. So far, the assistance offered by external projects and NGOs has not been sufficient to consolidate their capacity to manage forest resources.



*Birdwing butterfly, Irian Jaya
(photo: Alain Compost)*



*Nutmeg, West Java
(photo: Alain Compost)*

An overriding question raised by devolution to community control is: Will decentralisation lead to greater conservation of natural habitat and reduce the threats to biodiversity? The answer is still unclear. 'Most local groups are still more concerned with their access to existing resources and immediate incomes than with long-term sustainable development', notes CIFOR agricultural economist David Kaimowitz. 'Compared to the powerful forces that favour increased forest clearing and degradation in the Bolivian lowlands, the efforts to reverse these trends have yet to go much beyond the level of good intentions and symbolic actions.'

Global scenarios for tropical forests

At the global level, CIFOR's analyses have led to a number of likely scenarios for the future of forests. Timber harvesting pressures on natural forests are expected to decline, but timber production from plantations will grow. The costs of taking trees from natural forests have been rising, while at the same time the ability to produce timber at low cost and in strategic locations on plantations has been expanding.

The pressures to convert forests to agriculture will be greatest in Asia. They will be considerably less in South America, and minimal in Africa. The demand for tropical forest products in the future will be from the newly industrialised nations of the South, including China, India and the emerging economies of the Pacific Rim. South-South trade will be more important than South-North trade in setting the patterns of forest use.

As the world's population grows, it will depend heavily on biomass, or matter of biological origin, from tropical forests and plantations for meeting its energy and industrial raw material needs. The nature of the evolution of the supply and demand for these products will have a major influence on pressures on forest lands in the 21st century. Poor people will continue to depend on tropical forests. Industrial economies will develop, and much of the South's population will become urban, but the reliance on forests will continue. Understanding the dynamics of these changes represents a major scientific challenge.



Moss forest, West Java (photo: Alain Compost)



Project 10:

Policies, Technologies and Global Changes

Objective:

Maintain comprehensive overview of the world's tropical forests and of international organisations addressing their development and conservation; analyse major global trends involving forest supply and demand.

Main sites:

Global

Major partners:

European Forest Institute; Food and Agriculture Organization of the United Nations; World Bank; World Conservation and Monitoring Centre (UK); World Resources Institute (US).

The conservation of biodiversity can co-exist with forest production. After an era in which environmentalists and many policy makers argued that biodiversity cannot be conserved without an end to deforestation, CIFOR finds an emerging pragmatism which is based on a more express weighting of the values of different components of biodiversity. Research in coming years is likely to demonstrate that biodiversity conservation needs can be met through the allocation of smaller areas of forest to total protection, and through the adaptation of management regimes for other forest areas to optimise the combined benefits of biodiversity and production.

None of this research can have an impact, however, unless policy makers and opinion leaders receive and use the results. With this in mind, CIFOR has begun to examine what type of information and sources policy makers used in the past to make their decisions, beginning with a study of the role of policy research in the formulation of new forestry laws in Bolivia, Cameroon, Costa Rica and Indonesia.

To disseminate research results, CIFOR has also created two electronic mailing lists. The first is a general list for forest policy experts (POLEX), that currently reaches some 600 key decision makers and opinion leaders concerned with policy affecting forests. The second is exclusively on Bolivian forestry issues and reaches some 200 people concerned with forest issues in that country.

A special workshop was held in Yaoundé, Cameroon, where research results were presented to the Cameroon forestry community, and future research priorities were discussed.



Dayak woman, East Kalimantan
(photo: Alain Compost)



Forest fire, Thailand
(photo: Tim Boyle)

CIFOR's research on 'Policies, Technologies and Global Changes' gathers and maintains a comprehensive overview of knowledge about the world's tropical forests, including their current state, as well as information on the international organisations that deal with those forests.

With that information, scientists analyse global trends in the patterns and structure of international supply and demand. This is not limited to logs and timber, but includes all the goods and services that societies draw from tropical forests. CIFOR is actively represented in international gatherings on the subject of forests, and contributes to analyses and policy recommendations.

In 1997, CIFOR collaborated with FAO in a survey of the outlook for the Asian Pacific forestry sector; co-authored studies of an outlook for non-timber forest products and of prospects for conservation, and participated in the production of a CD-ROM containing data and analysis for the *World Forests Review*, in collaboration with FAO, the European Forestry Institute and the Finnish Forest Research Institute. Other efforts included a study of the future of dwellers of tropical forests; an examination of innovative institutional arrangements for the management of forests around the world; a study of the economic valuation of forests; and continuing contributions to international fora including the 1997 World Forestry Congress in Turkey.

As an illustration of the rapidly changing environment in which CIFOR functions, the Center became heavily involved during the last half of 1997 with the planning of research on an unanticipated global forest policy issue: the fires that ravaged Southeast Asian forests. CIFOR issued a position statement on 'Fires in Indonesia in 1997' which was heavily quoted by the media and others (see page 54 for extracts from this statement).



Jackfruit, West Java
(photo: Alain Compost)





Tree ferns, West Java. (Photo: Alain Compost)

ASSESSING CIFOR'S RESEARCH IMPACTS AND SETTING PRIORITIES

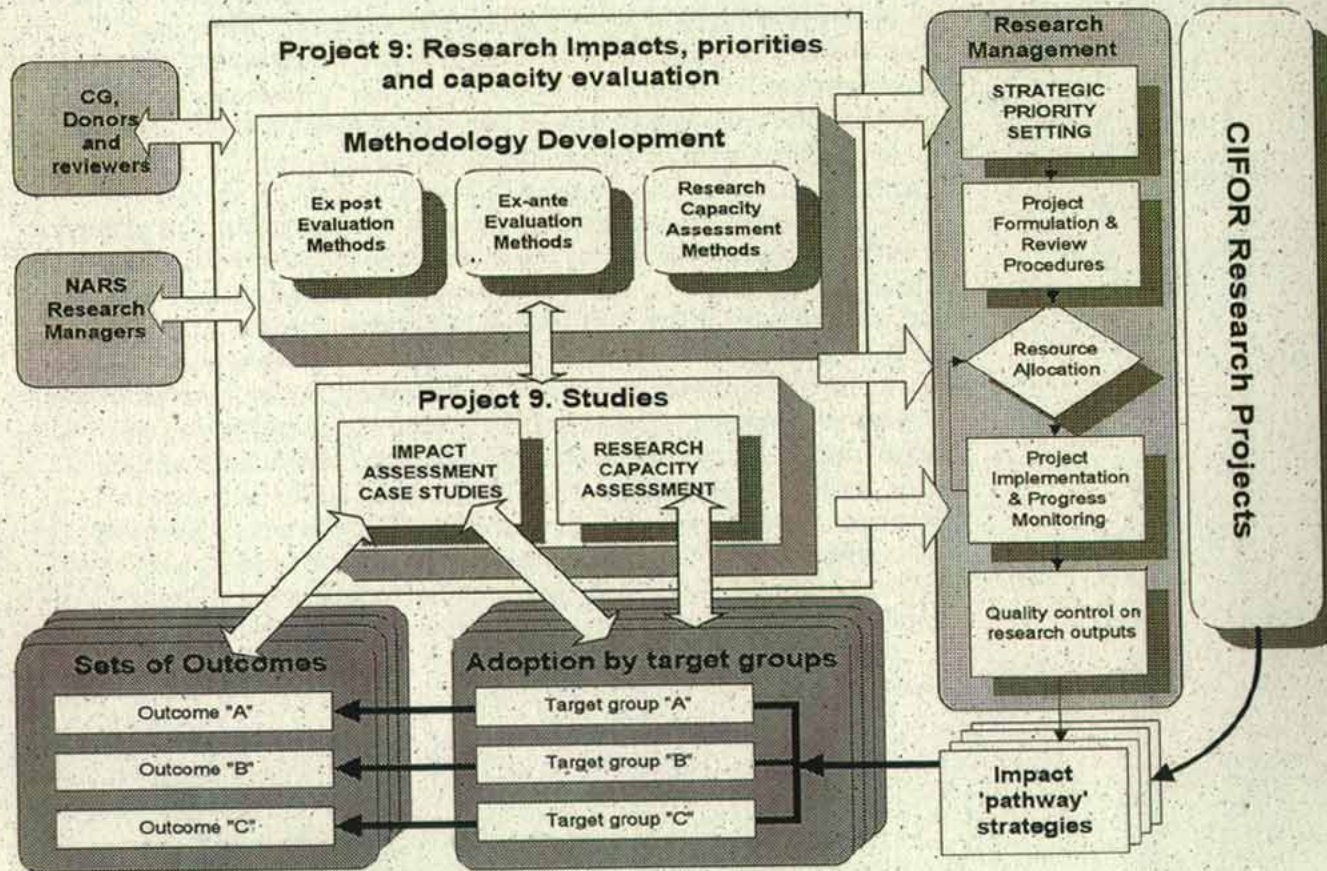
The Intergovernmental Panel on Forests specifically requested CIFOR in collaboration with others to:

*'guide the identification and definition as well as the prioritisation of global and eco-regional interdisciplinary research problems'; and
'..extend on-site research and enhance its prioritisation and the application of its results, with the involvement of all interested parties in the planning implementation, monitoring and evaluation of research, so as to enhance its relevance and impact'...*

CIFOR has a challenging research mandate that requires it to address strategic forestry-related research issues of global significance encompassing, social, economic and ecological factors. In addressing such issues the aim is to generate significant positive impacts for the benefit of large numbers of poor people in many different parts of the world. CIFOR operates primarily through research partnerships with collaborators and associates located in an array of highly diverse organisations around the world. CIFOR is therefore accountable to a wide range of stakeholders; the CGIAR, donor agencies, research partners, government agencies and NGOs. There is a corresponding diversity of demands for research-related evaluation and a variety of differing perspectives on appropriate research priorities. The challenges facing research managers in this context are considerable.



CIFOR's work on 'Research Impacts, Priorities and Capacity Evaluation' consists of two main themes, methodology development for priority setting/impact evaluation and impact assessment case studies. Specific activities include strategic priority setting, project screening and *ex ante* evaluation, project monitoring, impact assessment and research capacity assessments (see diagram below). Responsibility for many aspects of research evaluation are, however, shared among several CIFOR management and staff members.





*Moss forest, West Java
(photo: Alain Compost)*

In the short-to-medium term, efforts will concentrate on developing methodologies both for impact assessment and for priority setting. Such methods are not well developed in the natural resources research context. The term 'natural resources research' covers a highly diverse array of activities with an even wider range of possible research outcomes. In contrast, the details relating to any particular research activity and its resulting outcomes are highly specific. Methods to assess actual research impact are very likely to be case specific rather than generic. In priority setting, by comparison, there is greater scope for the development of generic methods.

The 'impact pathway' concept

Gone are the days when scientists and institutions engaged in strategic research can afford to ignore the issues of dissemination, uptake and impact. There must be a coherent plan both for producing outputs and delivering them to the specified target groups that maximises the potential for impact. CIFOR has conceptualised and is actively promoting the concept of 'impact pathways' in response to this need. Focusing on 'impact pathways' does not imply that CIFOR will allocate a significant proportion of its budget to 'extension and public awareness activities' because the guiding principles of 'comparative advantage' are always applied. In most instances national organisations are best placed to adapt and extend new technologies and policies. However, a research impact strategy demands that the 'pathways' by which research outputs are most likely to yield impact (positive or negative) be clearly identified and re-evaluated throughout the planning and implementation of the research effort.

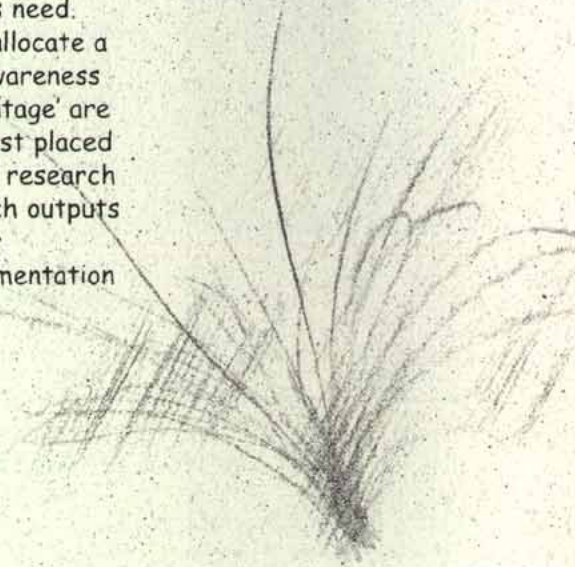


Fig tree, East Java
(photo: Alain Compost)



Assessing impact

For most of CIFOR's research portfolio the outputs and impacts still lie in the future. Case studies to evaluate and quantify impact are at an early phase of development and definition. A key issue is the extent and detail to which CIFOR's research can be subjected to rigorous *ex post* evaluation. CIFOR is still a relatively young institution and much of its research has yet to reach the adoption/impact phase of the research cycle. Since adoption, or the use of, research outputs is a necessary prerequisite for impact, this work seeks to improve understanding of the process. Two impact assessment evaluations were started in 1997 that will contribute to this objective. Both cases also have a strong emphasis on methodology development. They are:

- impact of policy writings on the policy debate at national and international levels; and
- assessing the impact of the Criteria and Indicators (C&I) for sustainable forest management.

The policy case study focuses on an *ex post* analysis of 'influential' policy writings. It does not examine CIFOR impact, but will serve to reveal important factors that determine whether policy research writings are destined to influence policy decisions or whether they are merely destined for the library bookshelf.

The C&I initiative has the potential to make a difference at the forest management level and is 'high profile', therefore there will be considerable interest in evaluation of the impact. The C&I case study is attempting to quantify impact, but also highlighting factors that influence the adoption of research findings. There are wide variety of potential user groups, many of which are common to other CIFOR research. The C&I project represents what is probably an unusual case. If the findings show that research outputs were adopted by accreditation or certification agencies (for sustainable forest management) there is a regulatory link (certification schemes) between the C&I research and on the ground management in the certified forests.



Extracting gaharu, East Kalimantan
(photo: Alain Compost)

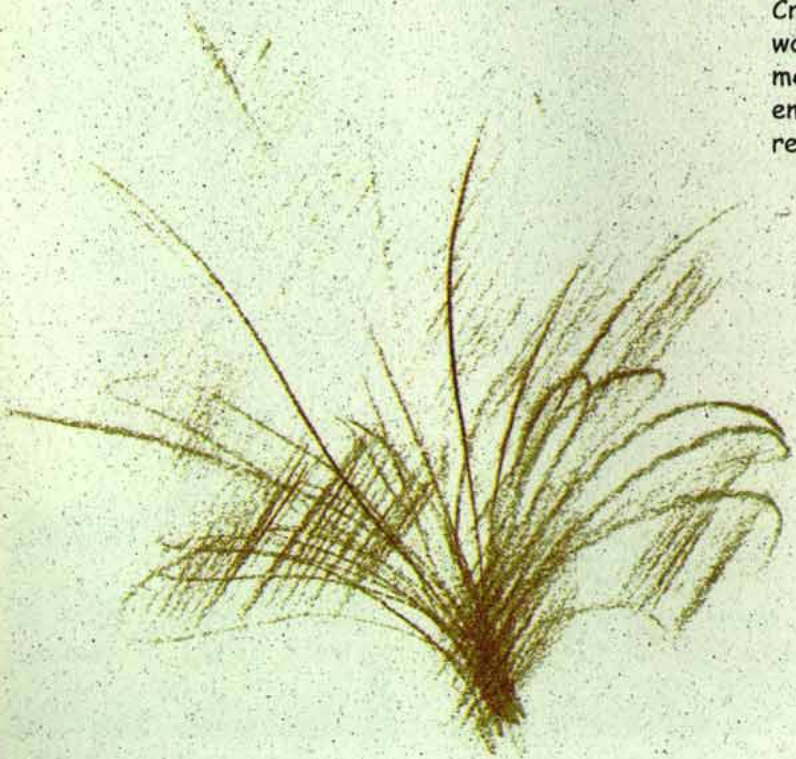




Another aspect of research evaluation is the assessment of research capacity of national research systems in areas where CIFOR is focusing its research efforts. The aim is to gather baseline information that will later serve to highlight changes in capacity, and to supply CIFOR, donors and national agricultural research services/systems (NARS) themselves with accurate comparative information relating to current institutional research capacities. Opportunities for collaboration between institutes and CIFOR can also be framed in the context of the research capacity available. Methodologies have been developed, a study in eastern and southern Africa has been completed and a report published in the *Journal of World Resource Management*. One is under way in West Africa and one is planned for 1998.

Priority setting

Criteria for setting research priorities in CIFOR have been defined but would benefit from regular, structured, re-examination. Priority setting methodologies are under development and will require integration into emerging management procedures for the allocation of research resources among projects and activities.



Fires in Indonesia in 1997

In October 1997, CIFOR issued a position statement on the forest fire situation in Indonesia. Below is an extract from the statement which is available in full on CIFOR's Homepage.

The Center for International Forestry Research is deeply concerned at the extent and severity of fires in forested areas of Indonesia, especially Sumatra and Kalimantan, in the latter part of the 1997 dry season. We believe these fires are a symptom of deficiencies in forest management systems and in policies and regulations on the clearance of forest land for agriculture.

The government has licensed and stimulated many companies to develop new industrial plantations of rubber, oil-palm and pulpwood, as well as transmigration sites. These activities require the clearing of hundreds of thousands of hectares of land, and fires are their cheapest option. The traditional method of claiming forested land, as in many parts of the world, has been to burn and then plant. It seems likely that migrants, particularly in areas near cities, as well as large government-sponsored agricultural or forestry development programmes, are clearing forest to establish land claims.

Finally, local people may also be clearing slightly larger areas for ricefields (as a risk-aversion strategy in a drought year). This year, such fires are of course also more prone to get out of control than they would be under normal circumstances. This effect is exacerbated where logging activities have dried out nearby forests.

The impacts of the fires are much greater in areas where forests and agriculture overlie deposits of peat. Burning peat contributes to the build-up of greenhouse gases in the atmosphere and also releases particulate matter and sulphur and nitrous oxides, which make the 'haze' a greater threat to human health.

CIFOR supports recent efforts to control the fires; measures mobilising people and equipment into action to prevent further damage, especially to public health, the environment, the economy, and to neighbouring countries, is appropriate. Yet CIFOR also wishes to emphasise that short term 'solutions' to the problems of these fires will be insufficient. Extinguishing fires will be costly and inefficient. The real solution is to adopt better long-term policies and regulations to improve general land stewardship standards, to resolve unclear or contested land tenure, and to reinforce a fire management system to ensure that similar fires do not recur when the next El Niño event produces another drought early in the 21st century.



Durian (photo: Alain Compost)

INFORMATION AND COMMUNICATIONS

In 1997, CIFOR's former Research Support Division was restructured with the establishment of two closely linked but separate units: the Information Services Group and the Communications Unit. The Information Group is located within the Research Division and contains CIFOR's library, GIS service, computer services, multimedia and Management Information System. The Communications Unit is responsible for the Center's publications and public affairs activities.

Information Services Group

Information Services continued to receive excellent support from management and user demands increased. In the library, one highlight was the visit in March by a consultant from the School of Library and Information Science of the University of Stuttgart who provided very useful recommendations for library development. These included establishing an information desk, a selective dissemination service, and providing computer network access to the CIFOR library catalogue. The implementation of these ideas has begun. A partner-targetted activity in the library focuses on the establishment of a transmission system to allow documents to be sent electronically to NARS and CGIAR partners and outposted CIFOR scientists.



*Root strings for weaving, Indonesia
(photo: Alain Compost)*

There was a considerable increase in the demand for Geographic Information System (GIS) services in 1997. Work was conducted mainly on projects related to forest ecosystem management (Sumatra), extrasectoral influences on forests (Bolivia) and impacts of logging (Kalimantan). Research projects on multiple resource management, criteria and indicators and non-timber forest products have indicated further demand for GIS services in 1998. A compilation of spatially referenced material on the Bulungan Research Forest was initiated.

The Computer Services Unit faced a major challenge in maintaining services during the move of office to the new headquarters building. At the new premises, the infrastructure for full access to the CGIAR Integrated Voice and Data Network (IVDN) was developed. Besides the provision of services for internal users, the Unit developed plans to provide services for an increasing number of outposted staff and partners. These include remote access to our local area network and CD-ROM database collection over the internet. A draft structure for electronic archiving of documents was developed.

1997 was the most critical year for the development of CIFOR's Management Information System (MIS). After its conceptualisation in 1996, the challenge was to implement and test the system, develop data input procedures and provide basic training both for end-users and application developers. These targets were met and a fully operational system is now in existence.

The multimedia work of the Information Services Group was concentrated on the development of computer-based presentations. Feedback received on these presentations was very positive and encouraging. A project to create a CD-ROM-based archive of all CIFOR publications from 1993 to 1997 was initiated. The product is expected to be ready by mid-1998.

Swallowtail butterfly, West Java
(photo: Alain Compost)



On a more conceptual level, efforts continued to present information services to internal and external users in a more integrated framework. This initiative will increase user awareness about the variety and depth of services available, concentrating on the rapidly growing potential for electronic services. The establishment of an information desk will be one highly visible result of this effort. The ultimate goal is to improve services to scientists thus contributing to improved research.

Communications Unit

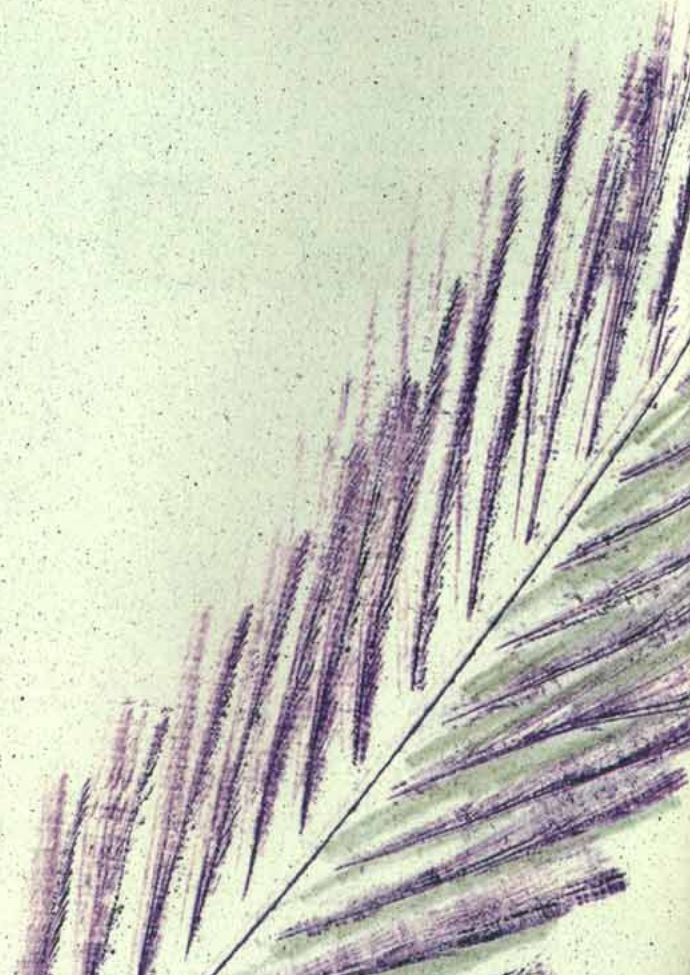
In May 1997, CIFOR's Communications Unit was established within the Director General's Office. A Communications Strategy was finalised and approved later in the year. In the area of publications, a total of 20 in-house publications and 62 publications by CIFOR staff and collaborators in external journals were produced in 1997 (see Appendix 1). The quarterly CIFOR News was distributed to 4346 individuals and institutions in three languages - English, French and Spanish. The 1996 CIFOR Annual Report was also published in those three languages. New corporate publications in 1997 included a compilation of CIFOR Research Abstracts, and a Research and Management Staff Directory. Two monographs were reprinted in response to high demand, as well as other *ad hoc* publications. An analysis of the publications process including options for improved tracking systems was initiated in 1997. All CIFOR Occasional Papers, CIFOR News, research project updates and governance documents (e.g., CIFOR Strategy, Medium Term Plan), are available on the Center's webpage. Work was begun to restructure and redesign the webpage in late 1997.



In terms of international public awareness activities, CIFOR participated with two other CGIAR Centers (ICRAF and IPGRI) in an exhibition at the World Forestry Congress in Turkey in October 1997. CIFOR was also represented at CGIAR-sponsored displays in Japan and China on international agricultural research. Targetted public awareness materials about CIFOR were created for these events.



(photo: Alain Compost)





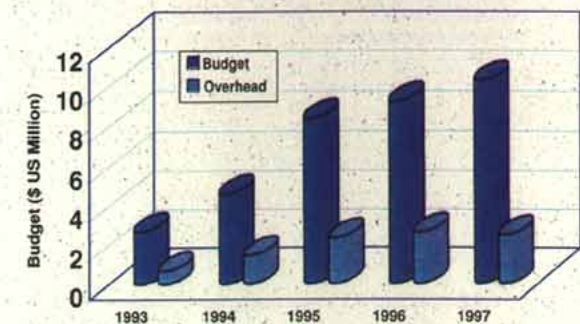
Passion fruit (Marquisa), West Sumatra (photo: Alain Compost)

STATEMENTS OF FINANCIAL POSITION

As at 31 December 1997 and 1996
(US \$000)

	<u>1997</u>	<u>1996</u>
ASSETS		
Current Assets		
Cash on hand and in banks	4 640	6 936
Accounts receivable:		
Donors	3 553	2 418
Employees	176	94
Others	389	384
Prepaid expenses	522	376
Total current assets	<u>9 280</u>	<u>10 208</u>
Fixed Assets		
Property, plant and equipment	3 170	1 969
Less: Accumulated depreciation	(1 322)	(877)
Total fixed assets - net	<u>1 848</u>	<u>1 092</u>
TOTAL ASSETS	<u>11 128</u>	<u>11 300</u>
LIABILITIES AND NET ASSETS		
Current Liabilities		
Accounts payable:		
Donors	1 440	1 815
Others	61	53
Accruals and provisions	1 988	1 802
Funds in trust	9	115
Total current liabilities	<u>3 498</u>	<u>3 785</u>
Net Assets		
Capital invested in fixed assets	1 848	1 092
Capital fund	1 155	1 911
Operating fund	4 627	4 512
Total net assets	<u>7 630</u>	<u>7 515</u>
TOTAL LIABILITIES AND NET ASSETS	<u>11 128</u>	<u>11 300</u>

Growth in Budget 1993-1997

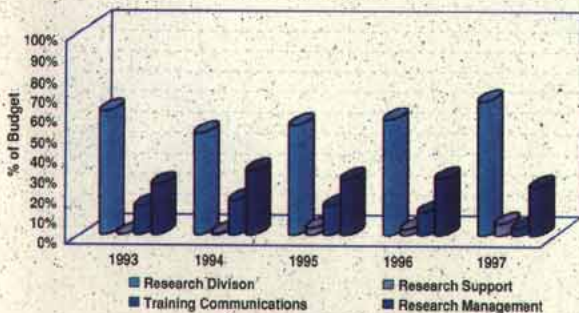


SCHEDULE OF GRANT REVENUE

For the years ended 31 December 1997 and 1996
(US \$000)

<u>Donors</u>	<u>1997</u>	<u>1996</u>
Agreed Research Agenda		
Unrestricted		
Australia	348	334
Austria	80	80
Canada	226	240
Denmark	231	135
European Union	750	750
Finland	401	377
France	84	134
Germany	284	332
Indonesia	500	500
Japan	1 445	1 624
Netherlands	512	592
Norway	204	216
Philippines	23	26
Spain	50	30
Sweden	191	370
Switzerland	270	255
USA	500	400
World Bank	900	600
Sub-total	6 999	6 995

Budget Allocation 1993-1997





Donors

1997

1996

Agreed Research Agenda

Restricted

Australia (ACIAR)	97	0
Brazil (EMBRAPA)	30	20
European Union	208	254
Food and Agriculture Organization	5	0
Ford Foundation	82	0
Germany (GTZ/BMZ)	376	408
Inter-American Development Bank	141	0
Japan	567	165
Netherlands	(29)	213
Norway	70	0
Rockefeller Foundation	27	0
Spain	75	0
Sweden	87	0
Switzerland	107	0
USA	838	382
United Kingdom	427	275

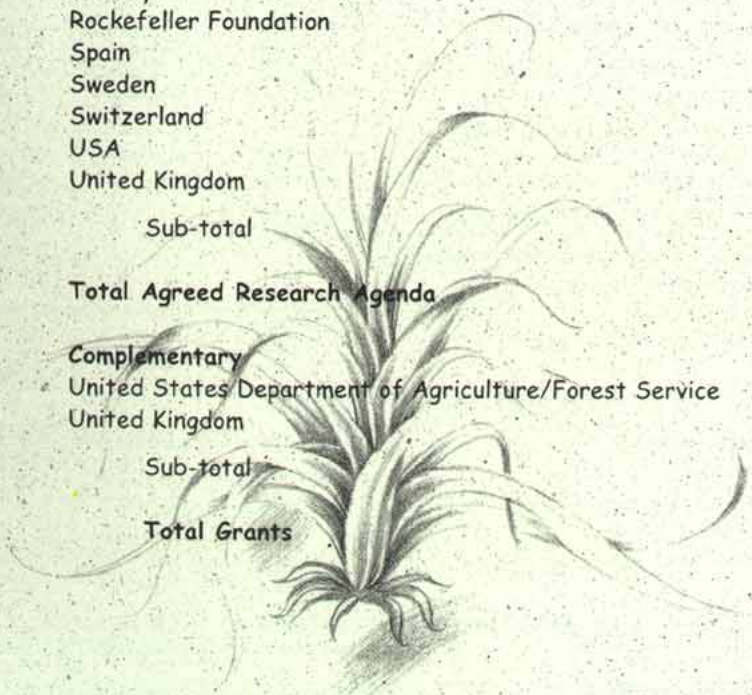
Sub-total 3 108 1 717

Total Agreed Research Agenda 10 107 8 712

Complementary

United States Department of Agriculture/Forest Service	0	37
United Kingdom	64	236
Sub-total	<u>64</u>	<u>273</u>

Total Grants 10 171 8 985

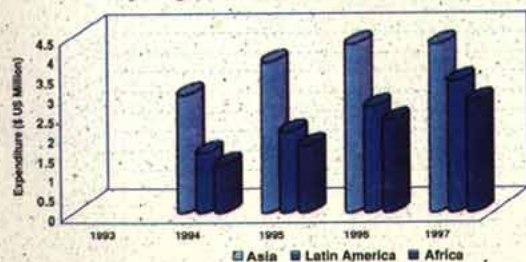


STATEMENTS OF ACTIVITIES AND OPERATING FUND

For the years ended 31 December 1997 and 1996
(US \$000)

	1997			Total	1996
	Agreed Research Agenda				
	Unrestricted	Restricted	Complementary		
Revenue					
Grants	6 999	3 108	64	10 171	8 985
Other revenues	376	—	—	376	409
Total revenue	7 375	3 108	64	10 547	9 394
Operating expenses					
Research programmes	3 775	3 108	—	6 883	5 437
Research support	990	—	64	1 054	1 510
General administration	2 495	—	—	2 495	2 627
Total operating expenses	7 260	3 108	64	10 432	9 574
Excess of expenditure over revenue	115	—	—	115	(180)
Operating fund - beginning	4 512	—	—	4 512	4 692
Excess of (expenditure)/revenue over (revenue)/expenditure	115	—	—	115	(180)
Operating fund - ending	4 627	—	—	4 627	4 512
Operating expenses represent:					
Personnel costs	3 433	1 009	—	4 442	4 055
Supplies and services	1 890	120	—	2 010	2 316
Collaborative activities	1 005	1 847	64	2 916	2 177
Operational travel	469	132	—	601	611
Depreciation of fixed assets	463	—	—	463	415
Total operating expenses	7 260	3 108	64	10 432	9 574

Distribution of Expenditure by Regions 1993-1997



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Orange orchid, Sumatra
(photo: Alain Compost)



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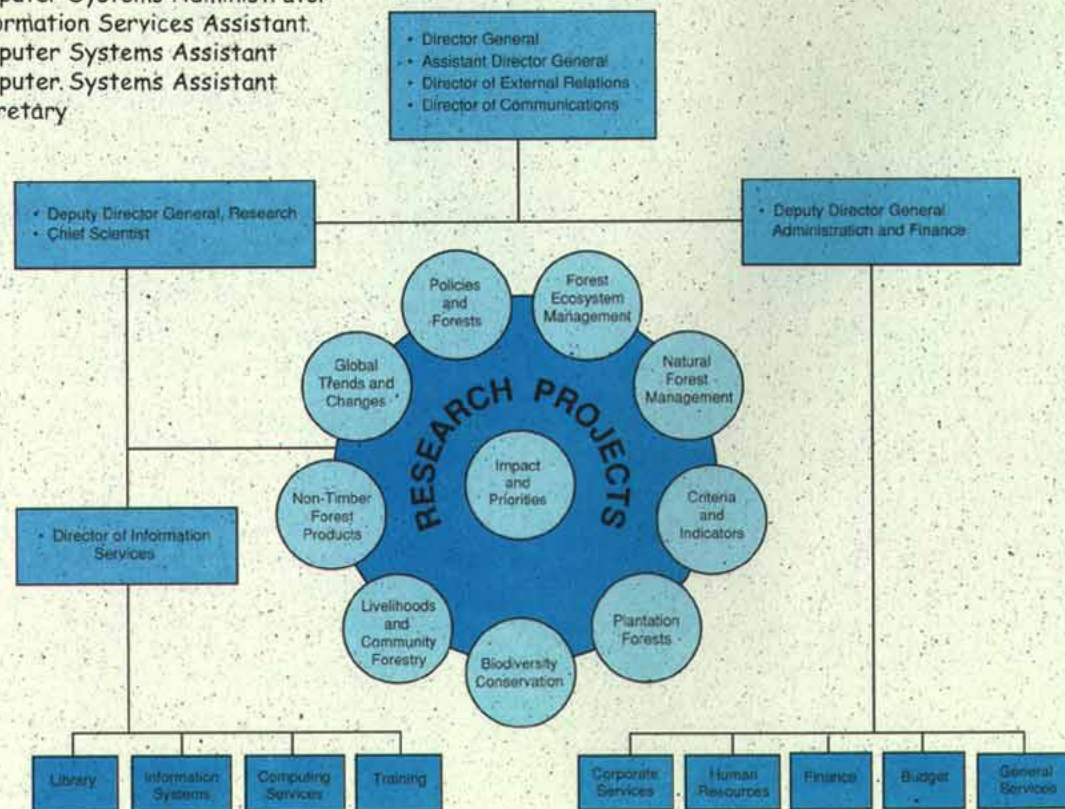
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 Ecologist
 Economist
 Social Scientist

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 Computer Systems Assistant
 Secretary

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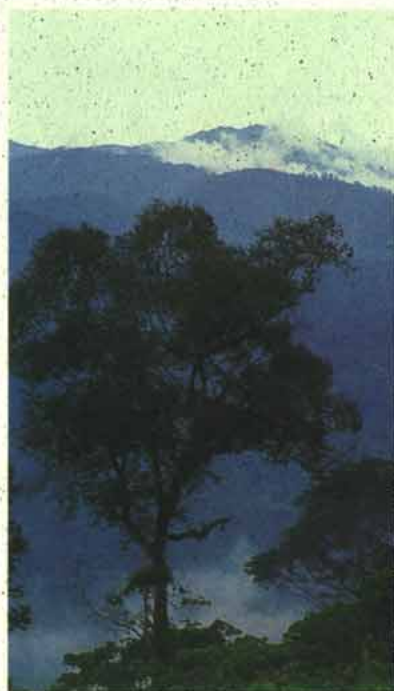


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 Travel/Conference Coordinator
 Human Resources Assistant
 Administrative Assistant
 Accounts Assistant
 Cashier
 Administrative Support
 Receptionist
 Receptionist

*Sunrise, Sumatra
 (photo: Alain Compost)*



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 Tonny Syafei
 Suratman
 Tatang Hasan
 Ata Sukanta
 Iie Suwarna
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 Komar
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 Kusnadi

* Indonesian nationality



APPENDIX 1: CIFOR PUBLICATIONS DURING 1997

CIFOR News (in English, French, Spanish).
Numbers 14 (March), 15 (June), 16 (September), 17 (December)

CIFOR Annual Report 1996

Monographs

- Timothy J.B. Boyle and Boonchoob Boontawee (eds.) *Measuring and Monitoring Biodiversity in Tropical and Temperate Forests*. 2nd printing.
- Manuel Ruiz Pérez and J.E. Michael Arnold (eds.) *Current Issues in Non-timber Forest Products Research*. Proceedings of the workshop 'Research on NTFP'. Hot Springs, Zimbabwe, 28 August - 2 September 1995. 2nd printing.

Occasional Paper Series

- No. 9 (I), William D. Sunderlin dan Ida Aju Pradnja Resosudarmo. Laju dan Penyebab Deforestasi di Indonesia: Penelaahan Kerancuan dan Penyelesaiannya.
- No. 10, Michael Ibach and Yvonne Byron (eds.) Discussion Forum on Information Services in the Asia Pacific and AGRIS/CARIS in the 21st Century an Asia-Pacific Regional Consultation.
- No. 11, G.S. Kowero, M.J. Spilsbury. Capacity for Forestry Research in the Southern African Development Community
- No. 12, J.A. Sayer, J.K. Vanclay and N. Byron. Technologies for Sustainable Forest Management: Challenges for the 21st Century. Commonwealth Forestry Congress, Victoria Falls, Zimbabwe, May 1997.
- No. 13, Joyotee Smith, César Sabogal, Wil de Jong and David Kaimowitz. Bosques Secundarios Como Recurso Para el Desarrollo Rural y la Conservación Ambiental en los Trópicos de América Latina.

Working Paper Series

- No. 15, M. Ruiz Pérez, A.J. Broekhoven, J.W.R. Aluma, S. Iddi, J.D. Lowore, S.M. Mutemwa and J.A. Odera. Research on Non-timber Forest Products in Selected Countries in Southern and East Africa: Themes, Research Issues, Priorities and Constraints.
- No. 16, Andrew P. Vayda. Managing Forests and Improving the Livelihoods of Forest-Dependent People: Reflections on CIFOR's Social Science Research in Relation to its Mandate for Generalisable Strategic Research.





No. 17, N.E. Stork, T.J.B. Boyle, V. Dale, H. Eeley, B. Finegan, M. Lawes, N. Manokaran, R. Prabhu and J. Soberon. *Criteria and Indicators for Assessing the Sustainability of Forest Management: Conservation of Biodiversity.*

No. 18, Carol J. Pierce Colfer, R.L. Wadley, E. Harwell and R. Prabhu. *Inter-generational Access to Resources: Developing Criteria and Indicators.*

No. 19, Neil Byron and Michael Arnold. *What Futures for the People of the Tropical Forests?*

No. 20, Zulkifli Lubis. *Repong Damar: Kajian tentang Pengambilan Keputusan dalam Pengelolaan Lahan Hutan di Pesisir Krui, Lampung Barat.*

CIFOR Special Publications

K.M. Old, Lee Su See and J.K. Sharma (eds.) *Diseases of Tropical Acacias. Proceedings of an international workshop held at Subanjeriji, (South Sumatra) 28 April - 3 May 1996.*

FAO, IUFRO and CIFOR. *New Arrangements for Forest Science. A discussion paper prepared for the Intergovernmental Panel on Forests. Fourth session, New York, February 1997.*

N.C. Saxena. *The Saga of Participatory Forest Management in India.*

Liz Wily. *Finding the Right Institutional and Legal Framework for Community-Based Natural Forest Management: The Tanzanian Case.*

APPENDIX 2: PUBLICATIONS BY CIFOR STAFF IN 1997

- Bertault, J.G. and Sist, P. An experimental comparison of different harvesting intensities with reduced-impact and conventional logging in East Kalimantan. *Forest Ecology and Management*. 94: 209-18.
- Boyle, T.J.B., Cossalter, C.C. and Griffin, A.R. Genetic resources for plantation forestry. *In: Nambiar, E.K.S. and Brown, A.G. (eds.) Management of soil, nutrients and water in tropical plantation forests*, 25-63. ACIAR Monograph No. 43. ACIAR with CSIRO and CIFOR, Canberra, Australia.
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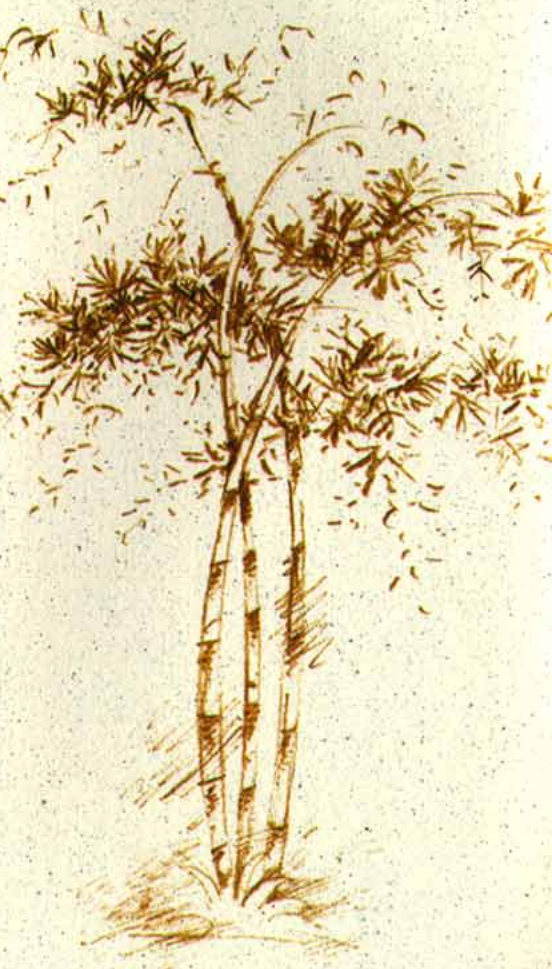
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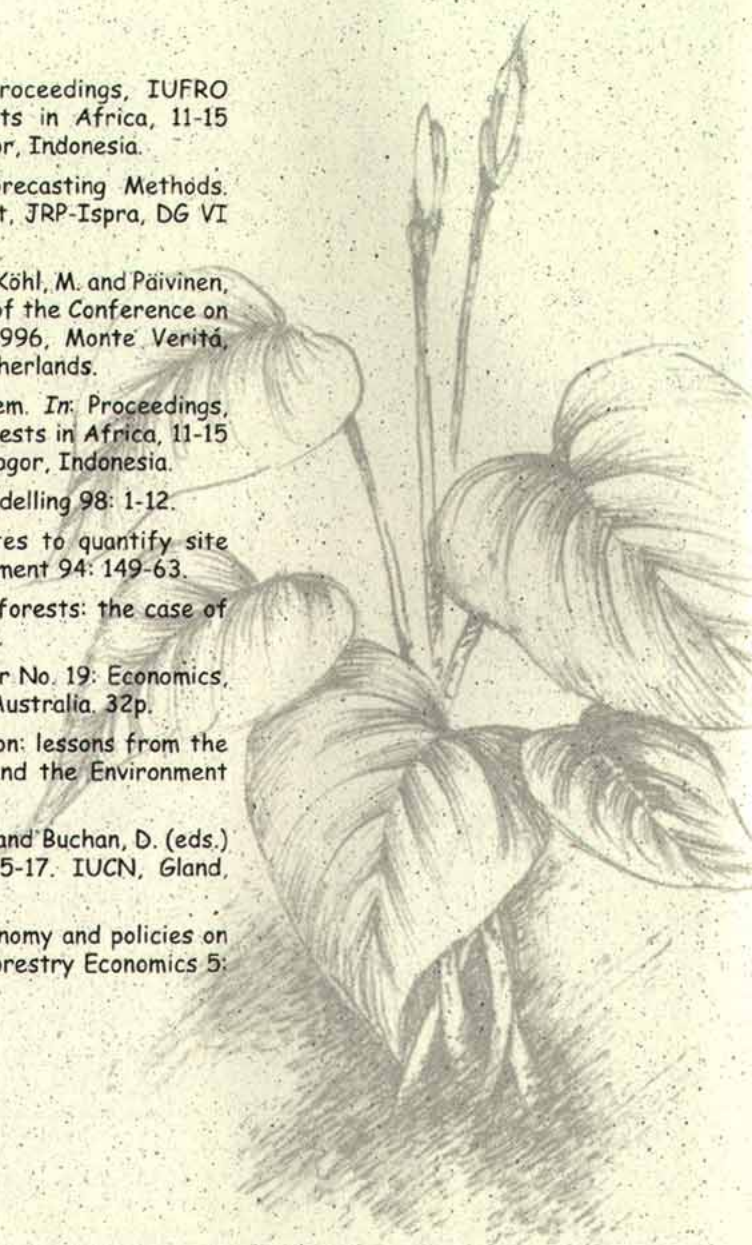
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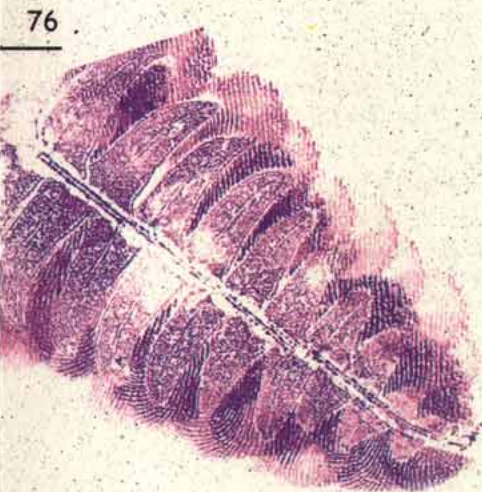
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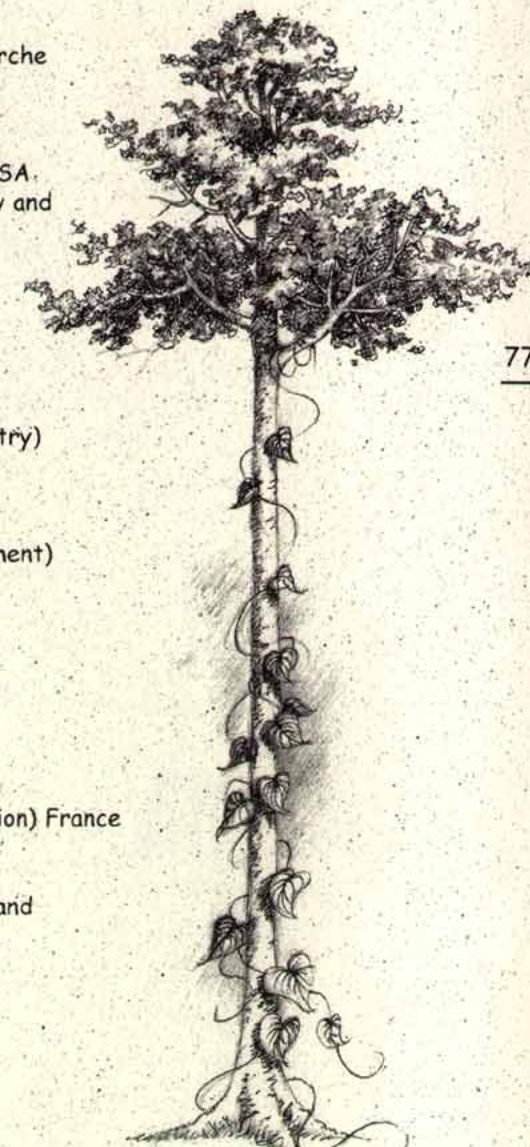
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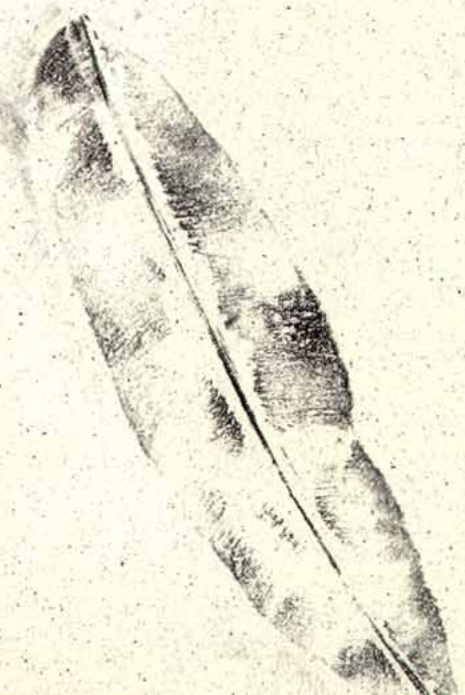



APPENDIX 3: MEMORANDA OF UNDERSTANDING WITH PARTNERS

ANU-DGeo (Australian National University, Department of Geography) Australia
CATIE (Tropical Agriculture Research and Higher Education Center) Costa Rica
CIIFAD (Cornell International Institute for Food, Agriculture and Development) USA
CIRAD-Forêt (Forestry Department of the Centre de Coopération Internationale en Recherche Agronomique pour le Développement) France
EFI (European Forest Institute) Finland
EMBRAPA (Empresa Brasileira de Pesquisa Agropecuária) Brazil
ESF (The State University of New York, College of Environmental Science and Forestry) USA
FFPRI (Forestry and Forest Products Research Institute; Ministry of Agriculture, Forestry and Fisheries) Japan
FOFGMU (Faculty of Forestry, University of Gajah Mada) Indonesia
Government of Denmark
IIAP (Peruvian Research Institute for the Amazon) Peru
IICA (Inter-American Institute for Cooperation on Agriculture) Costa Rica
IITA (International Institute of Tropical Agriculture) Nigeria
INIA (Instituto Nacional de Investigación Agraria) Peru
INTAG (Directorate General of Forest Inventory and Land Use Planning, Ministry of Forestry) Indonesia
IPB (Bogor Agricultural University) Indonesia
IPEF (Instituto de Pesquisas e Estudos Florestais) Brazil
IWOKRAMA (IWOKRAMA International Centre for Rain Forest Conservation and Development) Guyana
JOFCA (Japan Overseas Forestry Consultants Association) Japan
Kayu Mas & BPK Samarinda Indonesia
KFRI (Kerala Forest Research Institute) India
KUFF (Faculty of Forestry, Kasetsart University) Thailand
MHB (PT Menara Hutan Buana) Indonesia
MOF (Ministry of Forestry) Indonesia
DfID (Department for International Development) formerly ODA, UK
ORSTOM (Institut Français de Recherche Scientifique pour le Développement en Coopération) France
Papua New Guinea Forest Authority Papua New Guinea
PBC (Prince Bernhard Centre) The Netherlands
PCARRD (The Philippine Council for Agriculture, Forestry and Natural Resources Research and Development) The Philippines
PFA (Central American Agricultural Frontier Program) Panama




PREFECT (The Government of the Department of Santa Cruz) and BOLFOR (Sustainable Forestry Management Project) Bolivia
SACCAR (Southern African Centre for Cooperation in Agricultural and Natural Resources Research and Training) Botswana
SADC FSTCU (Southern African Dev. Community Forestry Sector Technical Coordination Unit) Botswana
SEAMEO BIOTROP (Southeast Asian Regional Centre for Tropical Biology) Indonesia
SUA (Sokoine University of Agriculture) Tanzania
TAFORI (Tanzania Forestry Research Institute) Tanzania
TRH (PT Tanjung Redeb Hutani) Indonesia
TROPENBOS (Tropenbos Foundation) The Netherlands
UNMULFOF (Faculty of Forestry, Mulawarman University) Indonesia
UPM (Universiti Putra Malaysia) Malaysia
UZIM (University of Zimbabwe) Zimbabwe
WWF-IP (World Wide Fund for Nature - Indonesia Program) Indonesia
WWF (World Wide Fund for Nature, International) Switzerland





APPENDIX 4: ACRONYMS AND ABBREVIATIONS



ACIAR	Australian Centre for International Agricultural Research, Australia
AGRIS	Agricultural Research Information Service (FAO), Italy
APAFRI	Asia Pacific Association of Forestry Research Institutes, Thailand
BIOTROP	SEAMEO Regional Centre for Tropical Biology, Indonesia
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit, Germany
BOLFOR	Proyecto de Manejo Forestal Sostenible, Bolivia
C&I	Criteria and Indicators
CARE	Cooperative for American Relief Everywhere
CARIS	Current Agricultural Research Information Service (FAO), Italy
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza, Costa Rica
CBD	Convention on Biological Diversity
CD-ROM	Compact Disk - Read Only Memory
CEDLA	Centrum voor Documentatie Latijns Amerika (Documentation Centre for Latin America), Netherlands
CGIAR	Consultative Group on International Agricultural Research, Washington DC
CIAT	Centro Internacional de Agricultural Tropical, Colombia
CIFOR	Center for International Forestry Research, Indonesia
CIRAD-Forêt	Forestry division of Centre de Coopération Internationale en Recherche Agronomique pour le Développement, France
CSIRO	Commonwealth Scientific and Industrial Research Organization, Australia
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuaria, Brazil
ETFRN	European Tropical Forest Research Network
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FEM	Forest Ecosystem Management
FLORES	Forest Land Oriented Resource Envisioning System
FORSPA	Forestry Research Support Programme for Asian and the Pacific, Thailand
GIS	Geographic Information System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit, Germany
ICRAF	International Centre for Research in Agroforestry, Kenya
ILRI	International Livestock Research Institute, Kenya
INIA	Instituto Nacional de Investigaciones Agropecuarias, Chile
IPB	Institute Pertanian Bogor (Bogor Agricultural Institute), Indonesia



IPGRI	International Plant Genetic Resources Institute, Italy
IUCN	The World Conservation Union, Switzerland
IUFRO	International Union of Forest Research Organizations, Austria
LATIN	Lembaga Alam Tropika Indonesia, Indonesia
LIPI	Lembaga Ilmu Pengetahuan Indonesia (Indonesian Institute of Science)
MIRA	Manejo de Información sobre Recursos Arboresos (CATIE), Costa Rica
NARS	National Agricultural Research Service/System(s)
NGO	Non-Governmental Organisation
NTFP	Non-timber Forest Product
ODI	Overseas Development Institute, UK
ORSTOM	Office de la Recherche Scientifique et Technique Outre-Mer, France
PFA	Plant Functional Attributes
RIL	Reduced-Impact Logging
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
TROPIS	Tree Growth and Permanent Plot Information System
UNCSD	United Nations World Commission on Sustainable Development
UNEP	United Nations Environment Programme
USDA	United States Department of Agriculture
WATALA	Keluarga Pencinta Alam dan Lingkungan Hidup (Friends of Nature), Indonesia

Acknowledgements:

Design by Patrick Virolle
Reflet Artwork for Business
Switzerland

Printed by SMT Grafika Desa Putera

SMT Grafika Desa Putera is a graphic training centre established by the Budi Mulia Foundation, Jakarta. The original Desa Putera work began in 1947 in the aftermath of World War II. An elementary school was established by Catholic Brothers to care for and educate orphans and those in need. Desa Putera, literally meaning "boys town", has since developed to incorporate a secondary school and a health centre, as well as the graphic training centre.

The facilities of SMT Grafika are among the most advanced of such training schools in Indonesia and provide an excellent environment for training students in the printing industry. There are approximately 240 students who receive both theory and practical training. Income from the printing activities supports the graphic school and other social activities of the Budi Mulia Foundation.

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