Research Abstracts 1999

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CIFOR

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Editor: Jennifer M. Turnbull

Center for International Forestry Research
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The 1999 Research Abstracts is a collection of in-house and external publications by CIFOR scientists and collaborators. Also included are abstracts of workshop and conference papers presented in 1999 but not published.

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1. Agricultural expansion and deforestation: Modelling the impact of population, market forces and property rights.

Angelsen, A.

This paper compares four different modelling approaches to agricultural expansion and deforestation, and explores the implications of assumptions about the household objectives, the labour market, and the property rights regime. A major distinction is made between population and market-based explanations. Many of the popular policy prescriptions are based on the population approach, assuming subsistence behaviour and limited market integration. Within a more realistic, particularly for the longterm effects, market approach, well intentioned policies such as agricultural intensification programmes may boost deforestation. Many forest frontier contexts are also characterised by forest clearing giving farmers land rights. Deforestation becomes an investment to the farmer and a title establishment strategy. Land titling and credit programmes may therefore increase deforestation.

Journal of Development Economics 58:185-218.

2. Why do farmers expand their land into forests? Theories and evidence from Tanzania.

Angelsen, A.

This paper examines the causes of agricultural land expansion and deforestation in Tanzania. In the theoretical section, two different, and partly contradicting, sets of hypotheses are outlined. These are based on a subsistence approach, emphasising the food or income requirements of farm households, and a market approach, focussing on the relative profitability of agriculture. The statistical analysis shows that increased agricultural output prices, in particular for annual crops, is a major factor behind agricultural expansion. An increase of one per cent in output prices leads to about a one per cent increase in agricultural area. Other factors such as input prices, technology and economic growth are tested and discussed, but the conclusions are less robust. The controversial role of population growth in explaining deforestation is addressed. Generally the results lend support to the market rather than the subsistence approach.

Environment and Development Economics 4:313-331.

3. Rethinking the causes of deforestation: Lessons from economic models.

Angelsen, A. and Kaimowitz, D.

This article, which synthesises the results of more than 140 economic models analysing the causes of tropical deforestation, raises significant doubts about many conventional hypotheses in the debate about deforestation. More roads, higher agricultural prices, lower wages, and a shortage of off-farm employment generally lead to more deforestation. How technical change, agricultural input prices, household income levels, and tenure security affect deforestation, if at all, is unknown. The role of macroeconomic factors such as population growth, poverty reduction, national income, economic growth, and foreign debt is also ambiguous. This review, however, finds that policy reforms included in current economic liberalisation and adjustment efforts may increase the pressure on forests. Although the boom in deforestation modelling has yielded new insights, weak methodology and poor-quality data make the results of many models questionable.

World Bank Research Observer 14:73-98.

4. Why do farmers expand their land into forests? Theories and evidence from Tanzania.

Angelsen, A., Shitindi, E.F.K. and Aarrestad, J.

This paper examines the causes of agricultural land expansion and deforestation in Tanzania. In the theoretical section, two different, and partly contradicting, sets of hypotheses are outlined. These are based on a subsistence approach, emphasising the food or income requirements of farm household, and a market approach, focussing on the relative profitability of agriculture. The statistical analysis shows that increased agricultural output prices, in particular for annual crops, is a major factor behind agricultural expansion. An increase of 1 per cent output prices leads to about 1 per cent increase in agricultural area. Other factors such as input prices, technology and economic growth are tested and discussed, but the conclusions are less robust. The controversial role of population growth in explaining deforestation is addressed. Generally the results lend support to the market rather than the subsistence approach.

Environment and Development Economics 4:313-331.
(Reprinted from Journal of Development Economics)

5. Chinandega. El manejo de una reserva natural en un mundo de agricultores.

Barahona, T. and Mendosa, R.

The municipality of Chinandega encompasses a variety of ecological regions. This territorial diversity offers a wide potential for the exploitation of natural resources. In pre-Columbian times, the exploitation of this ecological variety took advantage of the biological diversity. Presently, 60% of the land belongs to large estate owners, dedicated to growing oleaginous plants. Aiming to protect these remaining forests and the Maribios Range ecosystem a series of protected areas, among them the 'Chonco-Casita-San Cristobal volcanic system Natural Reserve', were established in 1983 and a number of management projects were set up. Presently, MARENA and INAFOR are only normative institutions. In Chinandega, an umbrella entity, Chinandega Municipal Commission for the Environment is coordinating both state and civil institutions related to natural resources and during the last four years, there has been an Environmental Section at the Mayor's Office. Since there are a number of conflicting interests regarding the use of the natural resources, there is an urgent need for an overall view of the territory in order to channel those individual interests towards a common goal of sustainable management.

El Papel de los Gobiernos Municipales en la Gestión de los Recursos Naturales. Nitalpán-UCA, CIFOR, PROTIERRA-Inifom. 95p.

6. Objectifs et méthodologies.

Bertault, J-G., Sist, P. and Nguyen-The, N.

STREK is an acronym of the 'Development of Silvicultural Techniques for the Regeneration of logged-over rain forests in East Kalimantan'. The objectives of this project were to develop management rules leading to sustained productivity of the forests in this area, which are the main suppliers of wood industry in Indonesia. This project was scheduled over a seven-year period (1989-1996). In the Berau PT. INHUTANI I concession, two sites of 1 000 ha each were selected. On the first site, logged in 1978-1979, six plots of 4 ha each were set up where two different silvicultural treatments were tested, with 2 control plots. On the second site, covered by primary forest until 1991, 12 plots of 4 ha each were set up. Three control plots were marked out and three logging treatments with three replications

were implemented: two Reduced-Impact Logging techniques (RIL) with two different diameter limits (>50 and >60 cm) and one called 'conventional'. In these plots, all trees with dbh > 10 cm were measured, numbered and mapped on a scale of 1:200. A database comprising about 40 000 trees was set up with botany, typology and pedology as well as silvicultural data, which is a prerequisite to carry out further growth and yield studies.

Bois et Forêts des Tropiques 259:7-15.
(Paper in French)

7. L'adaption de l'aménagement forestier a des situations diverses.

Bertrand, A., Babin, D. and Nasi, R.

Examples are used to illustrate the different present-day forms of forest management, based first and foremost on decision-making procedures governing management choices rather than on technical criteria governing the choice and implementation of programmes. These examples range from the Gabonese forest to Madagascar to the arid regions of the Sahel in Mali and Niger. They also involve different spatial scales ranging from the village forest to large forested areas, and thence to the nationwide dimension. Last of all, they incorporate various targets (timber production, raffia exports, biodiversity conservation) and take many different objectives into account (livestock raising, honey, etc.).

Bois et Forêts des Tropiques 261:39-48.
(Paper in French)

8. Les composantes de l'aménagement forestier et leurs incidences financières.

Bertrand, A., Babin, D. and Nasi, R.

The various factors common to forest management schemes are examined: sustained output, biodiversity conservation, and multiple uses. These factors are combined in different ways from case to case. Consideration of them in the management process includes specific kinds of financial impact for each factor. The diverse range of management situations must therefore lead to properly adapted financial set-ups. The planned generalisation of the implementation of forest management schemes will involve introducing economies of scale and reducing unit management costs. This represents a tremendous challenge for research. Likewise, the generalisation of

management schemes will entail a basic redefinition of the duties of forest administration agents.

Bois et Forêts des Tropiques 261:51-58.
(Paper in French)

9. Évolution et diversité du concept d'aménagement forestier.
Bertrand, A., Babin, D. and Nasi, R.

'Management means allocating and distributing limited resources to achieve clearly defined targets'. This definition helps towards a clear summary of the way ideas to do with forest management have been developing. Areas of concern have been gradually shifting from technical assignments (resource allocation and distribution) towards the issue of defining management goals (who? how?). This development leads from sustained timber production to the sustainable management of forest ecosystems against a backdrop of land planning. Considering the many people involved in forest management, and their concerns, which all carry the some kind of weight, it is necessary to single out the problem of decision-making procedures. Management must reconcile differing, not to say contradictory, goals in one and the same area. Managing a forest thus means, first and foremost, a successful negotiation.

Bois et Forêts des Tropiques 260:33-40.
(Paper in French)

10. *Eucalyptus* plantations in the equatorial zone, on the coastal plains of the Congo.
Bouillet, J.P., Nzila, J.D., Ranger, J., Laclau, J.P. and Nizinski, G.

Forty three thousand hectares of *eucalyptus* clonal plantations have been created around Pointe-Noire. Soils in the area are sandy and have limited nutrients, making them prone to degradation. Ensuring sustained productivity of these plantations without adverse impact on the soil is a research priority. Two trials of replanting and silviculture at the early stage of stand development are underway. Experiment 1 compares six kinds of treatments and their effects on the kind and amount of residue that remains after clear felling. Experiment 2 involves six blocks in which three litter treatments are crossed with three site preparation treatments. Accurate site and stand characterisation prior to clear felling has been carried out for both experiments. The results of Experiment 1 are not yet available. Initial results in Experiment 2 at 11 months after planting show improved tree

growth because of quicker release of nutrients into the soil when litter is burnt. Similarly, young trees respond better to subsoiling with three tines. However, in both cases these positive effects are no longer significant after 21 months.

In: Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.)

Site management and productivity in tropical plantation forests: Workshop proceedings 16-20 February 1998, Pietermaritzburg, South Africa, 23-30. CIFOR, Bogor. ISBN 979-8764-33-1

11. What futures for the people of the tropical forests?

Byron, R.N. and Arnold, M.

The importance of forest products to households living in or near forests has been increasingly recognised. Estimates of numbers of people who in some way rely on forests, for survival or livelihoods, vary widely. Yet numbers alone do not reveal the forests' importance to diverse users. A typology that recognises the varied relationships of people to forests and forest products permits assessment of the impacts of economic, cultural, and social changes. Understanding these relationships is crucial for institutions to adapt to changing patterns of demand, use, and supply, and to support both 'forest-dependent' and 'forest-related' peoples.

World Development 27:789-805.

12. Forest science research needs and priorities for sustainable forest management.

Byron, R.N. and Sayer, J.A.

The world is moving towards knowledge-based societies. Economies are globalising. The global public goods value of forests is being recognised at the same time that the traditional role of state forest agencies in production forestry is declining, in part being taken over by multi-national corporations. At the same time emerging technologies are greatly enhancing our ability to assess and monitor forest attributes, to process and disseminate information and to enhance forest production.

All of these changes will have an impact on how forest research is organised, what is done, who does it and who pays for it. It seems inevitable that much traditional forestry research concerned with sustainability and productivity enhancement at the stand-level will be taken over by the private sector. However, there is going to be a major challenge in finding resources for research in support of the public goods values of forests at local, national and global levels. There is a widely-held view that we are in the midst of a world forest crisis. It is

not a crisis of declining production but one of erosion of the 'public goods' or environmental values of forests. So far, we have not seen a concerted scientific response to this crisis, although the Inter-Governmental Panel on Forests (IPF) is seeking a new vision of forest science for the 21st century.

In: A.G. Brown (ed.) Sustainable Forest Management: Proceedings of the Hermon Slade International Workshop held at Melbourne, 30 November-4 December 1998, 1-8. Crawford Fund, Parkville, Victoria, Australia. ISBN 0 643 06316 1

13. Organising forestry research to meet the challenges of the information age.

Byron, R.N. and Sayer, J.A.

This paper examines the needs for forest science for the 21st century and ways of organising research to meet them. The world of the 21st century will be one of knowledge-based societies and globalised economies. The need for global stewardship of the environmental and social values of forests is finally being accepted. Yet pressures for economic efficiency and competitiveness are reducing the resources available to state forest agencies. Many countries are transferring management of production forestry to the private sector. Emerging technologies are greatly enhancing our ability to assess and monitor forest attributes, to process and disseminate information as well as to grow trees faster and to more narrow industrial specifications. Such changes will affect how forest science is organised, creating new demands for and new suppliers of, research. Funding responsibilities will be redistributed between the private and public sectors. The private sector can take over conventional forestry research on productivity enhancement, but it is unclear who will fund research supporting the public values of forests at the local, national and global levels.

International Forestry Review 1:4-10.

14. Moving to local control of woodland resources-can campfire go beyond the mega-fauna?

Campbell, B., Byron, N., Hobane, P., Madzudzo, E., Matose, F. and Wily, L.

Devolution of authority over natural resource management is now well advanced for the mega-fauna in Zimbabwe, through the CAMPFIRE programme. The authors ask whether models like CAMPFIRE can be applied to a broader spectrum of woodland resources. Problems in applying CAMPFIRE to woodland resources relate to: a legal and

policy framework which is not enabling to local management; weakened local institutional structures; a high degree of differentiation with respect to woodland resource use within communities; problems of defining resource user groups; and, the potentially low market value of woodland products. In identifying circumstances where CAMPFIRE may be applied successfully to woodland resources, economic, sociological and ecological circumstances must be considered.

Society and Natural Resources 12:501-509.

15. The CIFOR criteria and indicators generic template.

CIFOR C&I Team.

This manual provides a comprehensive set of criteria and indicators (C&I) for sustainable forest management based on CIFOR's research. This research was conducted by interdisciplinary teams of experts in large-scale natural forests managed for commercial timber production in Indonesia, Côte d'Ivoire, Brazil and Cameroon, with additional sites in Germany, Austria and USA. The use of the term 'generic template', for these C&I is intended to prevent them being confused with an ideal and universally applicable set of C&I. In term of the scope of applicability ('generic to what?'), it is envisaged that this template be used primarily for tropical natural forests managed for commercial purposes. Use of the term 'generic' also emphasises that the C&I in this set can be modified and customised to comply with local conditions. They could therefore be used both as a flexible set that is adaptable to all types of forest situations, and as an operational 'mother' set to be used by CIFOR's proposed CIMAT system (C&I Toolbox Series No.3). 'Generic' also implies that this C&I template can be employed by a variety of user groups, such as certification bodies, government officials, donors, forest managers, project managers, and scientists.

The Criteria & Indicators Toolbox Series No. 2
CIFOR, EU, GTZ and USAID. 53p.
ISBN 979-8764-29-3

16. World heritage forests: The World Heritage Convention as a mechanism for conserving tropical forest biodiversity.

CIFOR, UNESCO, UNESCO World Heritage Centre.

The future of the biodiversity of the world's tropical forests is intensely debated in a number of international processes. A broad consensus is emerging from these processes that the threat to forest biodiversity is one of the major environmental challenges the world faces and action

is required immediately to conserve vital forest areas, especially in the tropics. The Berastagi (Indonesia) policy dialogue brought together people interested in international programmes to conserve biodiversity to discuss how the World Heritage Convention might facilitate international efforts to conserve the world's most richly biodiverse forests. The World Heritage Convention has been ratified by over 160 countries, and 33 of the world's most biodiverse forests have already been inscribed on the World Heritage List. A number of broad objectives were established, and meeting participants agreed to work through their own organisations toward these goals. A tentative list of candidate World Heritage sites was developed from which additions to the present list might be drawn. Brief papers analysing the following issues were prepared during the meeting and are included in this volume: (1) how much human modification of forests is consistent with World Heritage status, especially to dispel the myth that conservation objectives are best met by excluding people; (2) how to reconcile the interests of local people with the maintenance of the global values of the sites; and (3) how to establish scientifically defensible methods for detecting changes in the biodiversity of tropical forest sites to provide indicators for triggering adaptive management responses. The meeting concluded that the World Heritage Convention is a potentially very valuable mechanism for achieving significant medium-term targets for the conservation of forest biodiversity.

CIFOR Ad Hoc Publication.
CIFOR, UNESCO, UNESCO WHC. Bogor. 54p.
ISBN 979-8764-23-4

17. *Pterocarpus macrocarpus*: Genetics, seed biology and nursery production.

Coles, J.F. and Boyle, T.

Pterocarpus macrocarpus Kurz is one of the most important commercial tree species of mainland Southeast Asia. It has historically ranked second only to teak in terms of value generated from logging of natural forests in Thailand, and is similarly important in neighbouring countries of the region. This is due to its fine quality wood, which is much sought after in the furniture industry. It is also an important plantation and agroforestry species which features in many reforestation programmes in the region. This publication summarises the state of knowledge of the genetics, seed biology and nursery of this important species.

CIFOR, Bogor. 123p.
ISBN 979-8764-31-5

18. Who counts most? Assessing human well-being in sustainable forest management.

Colfer, C.P.J., Prabhu, R., Günter, M., McDougall, C., Porro, N.M. and Porro, R.

Who counts cost? Assessing human well being in sustainable forest management presents a tool, 'the Who Counts Matrix', for differentiating 'forest actors', or people whose well-being and forest management are intimately intertwined, from other stakeholders. The authors argue for focusing formal attention on forest actors in efforts to develop sustainable forest management. They suggest seven dimensions by which forest actors can be differentiated from other stakeholders, and a simple scoring technique for use by formal managers in determining whose well being must form an integral part of sustainable forest management in a given locale. Building on the work carried out by the Center for International Forestry Research on criteria and indicators, they present three illustrative sets of stakeholders, from Indonesia, Côte d'Ivoire and the United States, and Who Counts Matrices from seven trials, in an appendix.

The Criteria & Indicators Toolbox Series No. 8.
CIFOR, EU, GTZ and USAID. 62p.
ISBN 979-8764-26-9

19. Understanding local people's use of time: A pre-condition for good co-management.

Colfer C.J.P., Wadley, R.L. and Venkateswarlu, P.

Development of management plans collaboratively with local people (e.g. co-management) is now an important means of protected area conservation. Yet formal protected area managers often need more specific information about the local people with whom they want to co-manage resources. We propose wider use of a method, which we describe, for studying time allocation, as an early step in the co-management of conservation areas. Use of time allocation data in co-management is illustrated from a conservation project in Danau Sentarum Wildlife Reserve (DSWR) in West Kalimantan, Indonesia. Data from spot observations were analysed at three levels, namely those of 'macro-categories' (production, reproduction and leisure), an intermediate level (e.g. agriculture and food preparation), and that of individual activities (such as fishing, collection of forest foods and hunting). In the DSWR, the allocation of time differed according to gender, ethnicity and seasonality, throughout the year of the study. Our experience suggests that knowledge of such patterns of behaviour can help conservation area managers to understand local people's needs

and desires better, improve managers' rapport with local people, and make better cooperative plans with local people.

Environmental Conservation 26:41-52.

20. The BAG (Basic Assessment Guide for Human Well-Being).

Colfer, C.J.P., et al.

The BAG focuses on the social criteria and indicators for sustainable forest management, a topic that has been the subject of considerable controversy and uncertainty. It is designed for people interested in assessing sustainable forest management, but who do not have a high degree of expertise in social sciences. This manual describes six simple methods designed for use by biophysical scientists with a college education. These methods can also be used by assessors with higher levels of expertise in social sciences, but they are presented in a 'cookbook' format. 'The Scoring and Analysis Guide', to be used with 'the BAG', provides additional help in making assessments of human well being, including a specific scoring method. It also provides increasingly detailed levels of guidance in analysis.

The Criteria & Indicators Toolbox Series No. 5.
CIFOR, EU, GTZ and USAID. 79p.
ISBN 979-8764-21-82

21. The Grab Bag: Supplementary methods for assessing human well-being.

Colfer, C.J.P., et al.

'The Grab Bag' is designed to complement 'the BAG' and for use by social scientists who may find 'the BAG' overly prescriptive. The eight methods presented are either more difficult for non-social scientists to use or, in a couple of cases, can substitute for one or more method presented in 'the BAG'. 'The Scoring and Analysis Guide' provides the user with help in making an actual assessment of the social C&I, based on the results of these methods.

The Criteria & Indicators Toolbox Series No. 6.
CIFOR, EU, GTZ and USAID. 64p.

22. *Eucalyptus* d'Australie: Habitats naturels et dynamique d'évolution.

Cossalter, C., Vigneron, P. and Brooker, M.I.H.

This paper describes the main ecological and morphological attributes of the eucalypts and related genus *Corymbia* using Pryor and Johnson's

taxonomic classification (1971) and other recent works by Johnson (1976) and Hill and Johnson (1995) as guidelines. The main thrust is on what taxonomy can teach us on 'natural grouping' and 'evolution pathways' within the large and extremely diverse genus *Eucalyptus*. The description goes from the more primitive forms i.e. the bloodwoods (subgenus *Blakella*), to those natural groups which are better adapted to new environmental conditions i.e. the subgenus *Symphyomyrtus* (e.g. section *Transversaria*) and the stringybarks, blackbutts, ashes and peppermints (section *Renantheria*) of the *Monocalyptus* subgenus. Several examples show how the capacity of certain species to survive in a changing environment has been enhanced by the progressive transformation of key morphological attributes. Modern works on the systematics of eucalypts integrate the knowledge on ecology, chemistry, palaeontology, floral biology and genetics in addition to the more conventional studies on morphological traits and their adaptive values. The authors' conclusion is that more attention should be given to taxonomy when the purpose is to explore species' natural variation. Furthermore, it is the authors' opinion that the adaptive capacity of certain *Eucalyptus* species known for their good performances in plantations could have much to do with the geological history of their natural habitat. This is based on field observations. It seems that the best performing natural populations of several important tropical eucalypts, in terms of adaptation to new environments, are located in mountainous regions affected by the most recent geological events rather than in the geologically unchanged peneplains of northern Australia.

Le Flamboyant 49-mars 1999:15-20
(Paper in French)

23. Uña de gato: Fate and future of a Peruvian forest resource.
de Jong, W., Melnyk, M., Lozano, L. A., Rosales, M. and Garcia, M.

Uncaria tomentosa and *U. guianensis* have been important in traditional healing in many South American countries. These species contain some 60 active substances which are widely tested for possible medical treatments. *U. tomentosa* has been traded from Peru until it reached a peak export of 726 tonnes in 1996. Government agencies and private companies have dedicated considerable efforts in trying to enhance production and sales of these species. At the national level, there has been pressure put on the government to allow legislation to prohibit the sales of the raw material of these species to capture larger shares of benefits for the national economy. Initially false conservation arguments were used as there is sufficient evidence to argue that at

current harvesting levels there is no threat to the two species. Regional government agencies have promoted the production of the two species without having a clear picture of future demand, allowing the possibility that much of the future production will not have any demand. Both actions may possibly negatively affect the benefits that accrue to local collectors or producers.

Occasional Paper No. 22. CIFOR, Bogor. 15p.
ISSN 0854-9818

24. Community participation in developing and applying criteria and indicators of sustainable and equitable forest management.

de Oliveira, N.B.

Between March 1997 and February 1998 three tests of Criteria and Indicators (C&I) for assessing the sustainability of community-managed forests were conducted by the Center for International Forestry Research. The tests, each lasting approximately one month, were sited in humid forest in Central Province, Cameroon; Sanggau, West Kalimantan, Indonesia; and in the Arapiuns river basin, Para, Brazil. Each test was carried out by an interdisciplinary team composed of a social scientist or anthropologist, an ecologist and a forest management specialist, in consultation with the local community. This paper discusses some of the concepts and methodologies used in the tests. An overview is provided of the main results of community participation in the processes of developing and testing C&I. Two themes given prominence by the testing teams were participation in, and knowledge of, forest management and its social dimensions. Focus is on these interlinked themes, discussing how participatory processes of developing and applying C&I can be expanded to identify and realise learning potential on all sides. The popular and partnership educational/learning curricula are described as suitable mechanisms for introducing participatory C&I development processes. The document concludes by describing a range of research and extension activities suitable for participatory C&I development that can form part of the educational curricula discussed.

CIFOR, Bogor. 37p.

25. A review of forest fire projects in Indonesia (1982-1998).

Dennis, R.

Fire in the wet tropical climate of Indonesia is not a new phenomenon. The 'Great Fire of Borneo' in 1982-83 was one of the worst fire events in recent decades. Small holders clearing land for cultivation were

primarily blamed for starting fires that rapidly spread out of control. Subsequent fires linked to El Nino-Southern Oscillation occurred in 1987, 1991 1994 and most recently in 1997-98. The impact of the latest fire event is immense; estimates of the area burnt in 1997 vary between two and five million hectares (forest and non-forest), the number of people affected by smoke haze and fire at 75 million and the total economic costs in the region at as much as US\$4.5 billion. The 1982-83 fires brought the issue to world attention. After 1992 three long-term projects were initiated with the objectives of management and monitoring of fires. These were the EU-Forest Fire Prevention and Control Project in Southern Sumatra (1995-1998), GTZ's Integrated Forest Fire Management Project in East Kalimantan (1994-2000), and JICA's Forest Fire Prevention and Management Project in Bogor, Jambi and West Kalimantan (1996-2001). In addition, the Indonesia-UK Tropical Forest Management Programme started in 1992 and comprised a number of components related to fires as part of its overall improved forest management objective. After the 1997 fire event numerous short- and long-term fire projects were proposed and started. Others, such as the first phase of the WWF project (October 1997-September 1998) and the ADB's regional (RETA) (April 1997-April 1998) and national (ADTA) (July 1998-January 1999) projects, within a short time frame try to cover many aspects of fire problem such as socio-economic assessments, fire-fighting, area estimates, economic and policy assessments and ecological assessments. Representing a longer-term approach (October 1998-October 2001), CIFOR-ICRAF-UNESCO propose an in-depth study of the underlying causes and effects of fires. In addition to the international response Indonesia has several government agencies charged with the task of preventing, monitoring and controlling land and forest fires. Following the forest and land fires of 1994, the National Coordination Team for Land and Forest Fire Control was established in 1995. Interest in fire is only short-lived after a major fire event. Before the 1994 fires little attention was paid to the fire problem and missions mainly focussed on control and prevention of fires. Most of the new generation of fire projects established in 1997-98 address both issues.

CIFOR, Bogor. 105p.
ISBN 979-8764-30-7

26. Remote sensing and statistical analysis as tools to understand forest livelihood strategies.

Dewi, S., Fernandez, C.G., Ruiz-Pérez, M., Belcher, B., Angelsen, A., de Agarl, R.M., Loken, A. and Lutnaes, K.

In recognition of the importance of non-timber forest products in both social and forest resource management terms, one of CIFOR's major projects is 'Sustainable Use and Development of non-timber forest

products' which has sites in seven countries, including Indonesia. This paper reports on a study on the interaction between land-use changes and forest management strategies at the household level, and how this interaction is shaped by ecological, physical, socio-economic and other exogenous factors (e.g., policies). Field sites in Indonesia are at Pasir and Mahakam in East Kalimantan, and the west of Lake Toba in North Sumatra. The study combines various data collection and data analysis tools. Data collection tools include remote sensing, household surveys, ecological surveys, market studies, gender and diversity studies. Analytical tools include GIS, statistical analysis, spatial modeling, land-use decision modeling, and gender and diversity analysis. The general framework of the study covers three scales: landscape, local and household. At the landscape level, time series of satellite images classified on vegetation cover together with other data such as road, elevation, soil type, administrative boundaries and population are used to obtain a transition probability matrix (TPM). The area with major changes is taken as local scale. The overall model also allows for scenarios to predict or outline possible future changes. The impact of land-use change on biodiversity through the landscape diversity, complexity and heterogeneity is studied. The preliminary study started with the simplest TPM, namely Markov TPM. A temporal Markov TPH was obtained from post-classification images of two Landsat TH images of North Sumatra taken in 1993 and 1996. Projection using this temporal Markov TPH shows the tendency of decreasing primary forest area, and increasing other types of vegetation cover over time. More commonly a gradient between primary forest, secondary forest and other types of scrubs and crops is observed. Secondary forest's role as a pivotal state, both temporally and spatially, can clearly be seen in the TPM. The preliminary analysis of the household data in two villages in North Sumatra shows that land-use changes are associated with new economic opportunities.

In: Laumonier, Y., King, B., Legg C. and Rennolls K. (eds.)

Data management and modelling using remote sensing and GIS for tropical forest land inventory, 543-546. Rodeo, Jakarta. ISBN 979-95696-0-5.

**27. *Melaleuca quinquenervia* (Cav.) S.T. Blake.
Doran, J.C. and Turnbull, J.W.**

Melaleuca quinquenervia is a small to medium sized tree (8-12 m) that is native to the coastal region of eastern Australia, southern Papua New Guinea and New Caledonia between latitudes 8 and 34° S. It has been planted as an exotic in the tropical lowlands of several countries and has become a serious weed in Florida, USA. The leaves are a source

of the cineole-rich essential oil called niaouli oil or goman oil used in pharmaceutical preparations. It is often grown as a windbreak and as an ornamental. A strong flavoured honey is produced from the abundant flowers. The wood is an excellent fuel and makes good quality charcoal. It is suitable for pit props, fence posts, flooring and pulp. The paper-like bark may be used as mulch in potting mixes, for packaging and insulation. The paper describes the botanical features, aspects of its growth and development, its ecology, pests and diseases, harvesting and genetic resources. It concludes that the best prospects for the use of *Melaleuca quinquenervia* are on swampy sites, as more productive species are already available for better-drained habitats. It has a demonstrated ability to grow quite rapidly in areas of the humid and subhumid tropics that may be inundated for many months. Further research on this species and its close relatives is advocated and this should proceed with care in view of its potential to become a serious weed.

In: Oyen, L.P.A. and Nguyen, X.D. (eds.) Essential-oil plants, 131-135. Plant Resources of South-East Asia, No. 19. Backhuys, Leiden.

28. L'aménagement forestier au Gabon: Historique, bilan, perspectives.

Drouineau, S. and Nasi, R.

There is growing awareness of the need to sustainably manage forests in Central Africa. This paper reviews the current state in Gabon within the national context. Forests play a very important role in Gabon in view of their extensive area as well as their contribution to the national economy. There are three main forest regions: coastal sedimentary basin, North-East, and Central Gabon. Forest utilisation is largely controlled by foreign capital and includes few tree species, mainly Okoumé (75% in 1997), with comparatively low volumes extracted per hectare. Export of Okoumé and Ozigo was until recently a monopoly of SNBG, a state company now experiencing a deep crisis. The timber market is affected by the Asian crisis repercussions. Since the 50s the government, as owner, has tried to sustainably manage the forests. Pilot management schemes were undertaken and all forest concessions are required by law to have management plans. The main problem for the government is its capacity to enforce forest management, and for the concession holders the profitability of their investments. There are internal incentives (better forecast of harvest, rationalisation of forest road network, guarantee of access to managed forests), as well as international incentives, such as pressure for ecocertification and assistance to forest management. At national level the forest law reform will make sustainable management compulsory.

Such constraints and incentives are not fully identified, however there is clearly increasing involvement of logging companies: feasibility studies on management of timber concessions, forest management agreements between government and concession holders. The cost of sustainable forest management appears globally acceptable. The success of a forest management policy in Gabon will depend on the capacity of the government to incorporate management as a natural component of forest utilisation, and control implementation.

Serie FORAFRI, 19. CIRAD-Forêt, France. 64p.
(Paper in French)

29. **Eucalypt and pine plantations in South Africa.**

du Toit, B., Smith, C., Carlson, C., Esprey, L., Allen, R. and Little, K.

This paper describes some of the key constraints on productivity of plantation forests in the southern African context. The remainder is devoted to an experimental plan and a series of trials that had been proposed in 1998, to be carried out in collaboration with the CIFOR network project on 'site management and productivity in tropical plantations'. The principal focus of the trials is on nutrient cycling processes in young stands and how these are affected by various intensive silvicultural operations such as harvesting, fertilisation and slash management. Three potential trial sites are described in terms of location, physiographic, edaphic and climatic features. A detailed experimental plan is given for the first trial to be established (located in the Midlands in the Province of KwaZulu-Natal in South Africa). The plan covers details of the treatments to be imposed and proposed methods for implementation, and relevant measurements.

In: Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.)

Site management and productivity in tropical plantation forests: Workshop proceedings 16-20 February 1998, Pietermaritzburg, South Africa, 1-38.
CIFOR, Bogor ISBN 979-8764-33-1

30. **Gestion des écosystèmes forestiers denses d'Afrique tropicale humide. Références bibliographiques.**

Dupuy, B. and Nasi, R. (eds.)

This bibliography comprises 2500 annotated references, including grey literature, on sustainable forest management and related topics for: Cameroon, Central African Republic, Republic of Congo, Côte d'Ivoire, and Gabon. This was produced by a joint CIFOR/CIRAD-Forêt FORAFRI project.

CIFOR/CIRAD-Forêt FORAFRI. (CD-Rom)
(Bibliography in French)

31. Gestion des écosystèmes forestiers denses d'Afrique tropicale humide: 2. Congo.

Dupuy, B., Loumeto, J., Amsallem, I., Gerard, C. and Nasi, R.

This bibliography for the Republic of Congo is a sequel to the one on Gabon. It comprises 312 annotated references on thematic areas: fauna, flora, vegetation, ecology, conservation, silviculture, forest inventory, forest management, forest policy and economy, non-timber forest products, etc.; and a 20-page presentation of the country and its forests. This was produced by a joint CIFOR/CIRAD-Forêt FORAFRI project.

Les Bibliographies du CIRAD, No. 10. CIRAD-Forêt, Montpellier, France. 145p. (Bibliography in French)

32. Chinese fir plantation in Fujian Province, China.

Fan, S., et al.

A field experiment was established to study the impact of site management on productivity of multiple-generation plantations of Chinese fir. Five different logging residue levels were applied during the harvest of a Chinese fir plantation after which a second-generation plantation was established. Measurements after one year indicate that leaving the greatest amount of logging slash was the most favourable treatment for growth of Chinese fir and the most unfavourable for ground vegetation. Burning of the logging residue had no significant effect on the growth of one-year old Chinese fir, but reduced the biomass production of the ground vegetation. Tree growth on the complete removal treatment was intermediate; otherwise the growth increased as the amount of logging residue left on the site increased. The understorey vegetation dominated the site and accounted for 93% of the biomass production of Chinese fir stand after one year. About 50% of the harvest residue had decomposed at 16 months after harvesting. Regression analysis showed predicted complete decomposition of the harvest residue at 33 months.

In: Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.)

Site management and productivity in tropical plantation forests: Workshop proceedings 16-20 February 1998, Pietermaritzburg, South Africa, 69-72.

CIFOR, Bogor ISBN 979-8764-33-1

33. Posoltega. La necesidad de articular esfuerzos y recursos en torno a la reforestación.

Fauné, A. and Kaimowitz, D.

Posoltega is one of Chinandega's smallest municipalities. Its general topography is flat, except at the foot of the Casita volcano, where it is

undulating and rough. Its soils are of volcanic origin with a large amount of fragmented material, prone to landslides. The intensive exploitation of soils and water resources without any management or control has resulted in severe hydrological erosion, degraded farming potential and pollution of the aquifer due to excessive use of chemicals. The municipality still has an area of 3100 ha of broad-leaf forest, part of the Chonco-San Cristobal-Casita Volcanic Complex Natural Reserve. The history of intense volcanic activity of the Marribios Range puts Posoltega among the 'risk areas for geological and volcanic disasters'. This condition was confirmed with the disaster caused by Hurricane Mitch (1998): the landslide from Casita volcano caused the destruction of several communities and thousands of deaths, plus massive loss of valuable agricultural land. This case study has focused on the urgencies arising from the new social and environmental situation and the relationship between the agricultural dynamics and the natural resources, amid a population that is demanding land to work and the recognition of their Agrarian Reform titles, a non-receptive Central Government and the lack of specialised studies on the destruction of the ecosystem.

El Papel de los Gobiernos Municipales en la Gestión
de los Recursos Naturales Ntitlapán-UCA,
CIFOR, PROTIERRA-Inform. 94p.

34. Achuapa. Capacidades locales para la gestión de recursos naturales.

Fauné, A. and Martines, T.

Achuapa is a small municipality located northeast of Leon, about 204 km from Managua. Its natural resources face severe degradation due to over-exploitation of the soils and indiscriminate felling of the dry tropical forest, resulting in massive desertification in several areas. The drying up of the river basins and the decreased water infiltration have desiccated the main water sources. Most of the rural population lives in 'extreme poverty' and there is a high level of migration in search of jobs. Hurricane Mitch (1998) swept away the cattle, crops and infrastructure, leaving the population in a very precarious and vulnerable situation. Nevertheless, there is a wealth of effort put together by the population, the municipal government and the local organisations for the issuing of the First Municipal Regulation for Environmental and Natural Resources Management. This initiative is oriented to redress the serious deterioration of the water, soils, forests and fauna resources, and highlights the political will of the municipal government and the local organisations to face the challenges together. The main weakness lies in the lack of definition of a strategy beyond

the conservation and protection of those resources and the little funds available at the Mayoralty to carry out the task.

El Papel de los Gobiernos Municipales en la Gestión de los Recursos Naturales. Nitalpán-UCA, CIFOR, PROTIERRA-Inifom. 79p.

35. Eucalypt plantations in the humid tropics: Sao Paulo, Brazil.

Gonçalves, J.L.M., Poggiani, F., Stape, J.L., Serrano, M.I.P., Mello, S.L.M., Mendes, K.C.F.S., Gava, J.L. and Benedetti, V.

This paper reports the effect of site management practices of minimum and intensive cultivation of the soil on the growth of a stand of *Eucalyptus grandis*, the chemical and physical characteristics of the soil, the nutrient cycling, and the configuration of the root system. The study site is a commercial plantation of *E. grandis* in Itatinga district, Sao Paulo State, Brazil. The natural vegetation of the area is cerrado, the climatic and soil conditions, which are representative of extensive blocks of homogenous forest on the Sao Paulo, plateau. The studies began in July 1995. In this paper some results are presented of the effect of the treatments on tree growth and on physical characteristics of the soil (moisture and temperature) as well as on nutrient uptake and cycling. These results show significant effects on a number of processes that are important for plantation productivity.

In: Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.)

Site management and productivity in tropical plantation forests: workshop proceedings 16-20 February 1998, Pietermaritzburg, South Africa, 5-12. CIFOR, Bogor. ISBN 979-8764-33-1

36. Early response of selected tree species to liberation thinning in a young secondary forest in Northeastern Costa Rica.

Guariguata, M.R.

Short-term growth responses in individuals of four commercial tree species (*Laetia procera*, *Simarouba anlara*, *Tapirira guianensis*, and *Vochysia ferruginea*) were evaluated one and two years after 'liberation thinning' in a young (4.5-year-old), dense, secondary forest stand located in an agricultural settlement in wet, north-eastern Costa Rica. Liberation thinning involved manual elimination (either by cutting or stem girdling) of the adjacent 'ring' of competitors in order to release future crop trees (median diameter: 8 cm dbh), selected on the basis of stem and crown form. The application of liberation thinning significantly increased diameter growth of future crop trees with respect to unmanipulated counterparts. Young stands in the region may be attractive systems for simple silvicultural manipulations due to rapid growth responsiveness, facilitated by manageable tree size.

Detailed observations on stand development and patterns of crown stratification in coexisting tree species in other dense secondary stands in the area seems warranted in order to refine silvicultural options aimed at increasing tree diameter growth.

Forest Ecology and Management 124:255-261.

37. Traditional wisdom meets Artificial Intelligence.

Hagith, M. and Colfer, C.J.P.

This is a description of an unlikely, but fruitful, collaboration between an anthropologist and an Artificial Intelligence researcher, the purpose of which was to build a model of how indigenous Dayak people in Kalimantan decide on their activities in the forest. The authors describe their approach and the result - a simple model which uses relations and logic to capture some of their decision-making processes. In building this model opportunities for giving and receiving favours were explored that might form an alternative to conventional methods of modelling choices between actions such as economic optimisation.

Agroforestry Forum 9:24-30.

38. CIFOR's Management Information System.

Ibach, M.O.

This study describes the concept of a management information system (MIS) developed for the Center for International Forestry Research. A definition of MIS and the institutional background are given, followed by a description of the organisational structure, definition of MIS requirements and the procedures and results of an information requirements survey. The core of the study is the design of the MIS which focuses on outputs, inputs, processing, storage and personnel as key elements of the system. Issues related to implementation and maintenance of the proposed system are discussed and key databases described. Emphasis is given to personnel, soft- and hardware requirements, system architecture, training and procedural aspects. The study concludes with a discussion of project management requirements, critical success factors, monitoring and evaluation procedures, and the potential generalisation of the concept.

CIFOR, Bogor. 80p.
ISBN 979-8764-28-5

39. Assessing forest canopies and understorey illumination: Canopy closure, canopy cover and other measures.

Jennings, S.B., Brown, N.D. and Sheil, D.

The forest canopy is one of the chief determinants of the microhabitat within the forest. It affects plant growth and survival, hence determining the nature of the vegetation, and wildlife habitat. A plethora of different techniques have been devised to measure the canopy. Evaluation of the literature reveals confusion over what is actually being measured. This paper distinguishes two basic types of measurement: canopy cover is the area of the ground covered by a vertical projection of the canopy, while canopy closure is the proportion of the sky hemisphere obscured by vegetation when viewed from a single point. The principal techniques used to measure canopy cover, canopy closure, and a number of related measures are described and discussed. The advantages and limitations are outlined and some sampling guidelines are provided. The authors hope to clarify the nature of the measurements and to provide foresters with sufficient information to select techniques suitable for their needs.

Forestry 72:59-73.

40. Policy options related to roads in tropical forests.

Kaimowitz, D.

Economic theory and empirical evidence suggest that building or improving roads near forests encourage forest clearing for land speculation, agriculture and other activities. Policies used to mitigate the dangers of forest road projects have failed in many countries. Practically all countries now require environmental impact assessments for large road projects near forests but these are often of poor quality and lead to a few protective measures. On the other hand, it is neither feasible nor desirable to prohibit all new road projects near tropical forests as for many rural people who live near forests improving their access to markets and services is among their greatest aspirations and highest priorities. The paper provides a possible set of appropriate policy recommendations related to roads in tropical forests. These are: (1) avoid road construction projects where costs do not justify the economic benefits; (2) include cost recovery provisions in road projects; (3) focus road investments in areas that already have substantial population and/or high quality soils; (4) establish performance bonds for forest concessions which companies will forfeit

if farmers encroach on concession lands; (5) respect the territorial rights of indigenous people; and (6) open project documents to public scrutiny.

In: Road infrastructures in tropical forests: Road to development or road to destruction?, 37-38. FAO, Rome.

41. Forests, policies, and people on the Central American agricultural frontier.

Kaimowitz, D. and Paupitz, J.

Forests cover between 17 and 19 million ha of the Central American isthmus. Most of this is broadleaved forest on the Atlantic side of the isthmus. The size and contribution of these forests vary greatly between the Central American countries, from Belize, with over 80% of its land in forests, to El Salvador, where little forest remains. The forests' main contribution to society comes from local uses and the environmental services they provide. Forest products, per se, contribute less to the region's economies but play key roles in the livelihood strategies of many poor families. Over the last 50 years, forest cover has declined rapidly in the region, caused mostly by the expansion of crops and livestock. This article traces the evolution of the agricultural frontier in Central America prior to and during the political-military conflict that engulfed the region until 1990. Then it looks at more recent changes in policies and forest cover, and concludes with recommendations regarding future management of frontier areas and forests. Although there is occasional reference to Belize and El Salvador, focus is mostly on Costa Rica, Guatemala, Honduras, Nicaragua and Panama.

*In: Palo, M. and Uusivuori, J. (eds.)
World Forests, Society and Environment, 247-253. Vol. 1.
Kluwer Academic, Dordrecht, Netherlands.*

42. The effects of structural adjustment on deforestation and forest degradation in lowland Bolivia.

Kaimowitz, D., Thiele, G. and Pacheco, P.

Bolivia's structural adjustment policies, initiated in 1985, increased poverty among certain groups but this did not lead to widespread migration to the agricultural frontier. Nor did adjustment greatly affect the average area planted in annual crops by small lowland farmers. Structural adjustment contributed to large-scale forest clearing for soybean production for export and, to a lesser extent, forest degradation by lumber companies. The economic benefits generated

by soybean and timber expansion may have outweighed the environmental costs but alternative policies might have reduced those costs and improved the distribution of the benefits.

World Development 27:505-520.

43. L'impact de la crise économique sur les populations, les migrations et le couvert forestier du Sud-Cameroun.

Kemajou, J.P.W. and Sunderlin, W.D.

This research was conducted in 1997-98 by CIFOR with the collaboration of Cameroonian institutions and researchers, and funded by the Department for International Development of the United Kingdom (DFID). The general objective was to understand the causes that might explain a much higher rate of deforestation in the period of the economic crisis (which began in 1986) compared to the decade prior to the crisis. The research project examined the effects of the economic crisis on human migration, agricultural cropping patterns, and the gender division of labor, and, through these effects, on forest cover. The research is based on a survey of 4,078 households in 38 villages located in the humid forest zone of the Center and South provinces in Cameroon. The survey is in part a replication of a migration survey done by André Franqueville, who studied the same 38 villages in 1974-75. There are three principal findings: (1) the rate of population growth in the study villages is far higher in the crisis period than in the decade prior to the crisis; (2) there has been a large-scale shift away from production of plantation crops and toward production of food crops in the crisis period; and (3) this increased production of food crops has been enabled in part by changes in the gender division of agricultural labour. The study concludes that macroeconomic phenomena can affect socioeconomic dynamics and the use of natural resources in unplanned, and in some cases, undesirable ways. Policymakers would do well to take this into account as they seek ways to improve the management of forest resources and the well being of people who live in forest communities.

Occasional Paper No. 25. CIFOR, Bogor. 23p.

ISSN 0854-9818 (Paper in French)

44. Development of silvicultural systems in flood plain forests in the upper Amazon valley.

Kvist, L.P., Vanclay, J.K., Gram, S. and Nebel, G.

-abstracts is not available-

Final Report on Project 104.Dan.8/620,
Department of Economics and Natural Resources, KVL, Denmark. 21p.

45. El Castillo. La colonización y las empresas madereras en una zona de amortiguamiento.

Larson, A. and Barahona, T.

The present forefront of the Nicaraguan southeast agricultural frontier is located in El Castillo municipality, department of Rio San Juan. In less than a decade, its population has doubled with the invasion of the rainforest by some 2,000 families. Although the government tried to organise the settlement, there are ownership conflicts in some demarcations and the influx of settlers continues without any further available land. In 1990, around 3000 km² were converted into the 'Indio-Maiz Great Biological Reserve', one quarter of which constitutes half of the El Castillo municipality. The town and immediate surroundings of El Castillo were declared as 'Fortaleza La Inmaculada Historic Monument' and the rest of the municipality became the 'Natural Reserve Buffer Area'. A number of projects and NGOs have established themselves in the Buffer Zone to assist in adapting the production practices to the ecology of the area and to restrain the further advance of the agricultural frontier, but meeting with little success. Timber logging by wood companies has increased, and the NGOs are concerned by the Mayor's Office dependency on this source of income. The Buffer Zone Sustainable Management Project, financed and advised by DANIDA, groups together the Mayoralty, the NGO Fundacion del Rio, the Ministry of the Environment and Natural Resources (MARENA) and the Agrarian Reform Institute (INRA). The Mayoralty could play a more decisive role in the transformation of the production systems and the follow up of the forest use in order to safeguard its future sustainability.

El Papel de los Gobiernos Municipales en la Gestión
de los Recursos Naturales.

Nitlapán-UCA, CIFOR, PROTIERRA-Inifom. 95p.

46. San Carlos ¿Una oportunidad despreciada?

Larson, A. and Barahona, T.

The municipality of San Carlos is the regional head of the Rio San Juan department. San Carlos town is the region's most important commercial hub, due to its privileged location at the junction of the Cocibolca Lake and the San Juan River. Despite the gradual loss of the forest, there are still important remnants: two protected areas and a forested strip located in the Buffer Zone of the Indo-Maiz Great Biological Reserve. The problem of forest resources is directly linked to the contradiction between production systems and the ecology of the region. There are numerous projects and NGOs geared to the

preservation and protection of the municipality's natural resources and their sustainable and rational use. A combination of factors prevents visible changes from happening: lack of the most effective methods to promote tree planting and regeneration; lack of full participation by the peasants; no effective coordination and clear leadership between the NGOs and the local authorities; a number of issues beyond the control of the projects, such as national economic and forestry policies; and to change the culture of production is a long process. The main concern has been the effective coordination of all participants. There are several good human and financial resources in San Carlos, and there is interest not only in the management of natural resources but also in having the Mayor's Office lead this effort.

El Papel de los Gobiernos Municipales en la Gestión
de los Recursos Naturales.
Nitlapán-UCA, CIFOR, PROTIERRA-Inifom. 106p.

- 47. Laporan survey kawasan desa di hulu DAS Malinau, kecamatan Malinau (19 Pebruari s/d 4 Maret 1999).**
Laway, P.S.S.T. and Bit, Y.

This report is the first of two survey reports. The survey was undertaken at Malinau Watershed area from 19 February 4 March 1999. Although this is not a full report, the information and its reviews are relevant for discussion and follow up. The objectives of the survey carried out by relevant institutions are to: (1) seek preliminary information on villages, their communities, history and *adat* forests along the Malinau watershed; (2) collect preliminary data on forest and natural forest management systems carried out by *adat* communities and their *adat* law; (3) have general picture of conflicts and potential conflicts in villages along the Malinau watershed and local institution readiness in solving the existing conflicts; (4) obtain preliminary information on communities' and local institutions' preparedness in mapping their *adat* forests; and (5) promote and encourage participatory mapping activities.

Tanjung Selor, WWF-Kayan Mentarang, CIFOR, PLASMA. 25p.
(Report in Indonesian)

- 48. Somotillo. Las gestión de cuencas una necesidad impostergable.**
Martinez, T. and Mendoza, R.

The municipality has a heterogeneous feature with very diverse agricultural and ecological conditions. On the flat land, cattle raising is the most important product, whereas agricultural activities prevail

among peasant families for food self-sufficiency. On the slopes, basic cereal production is the main economic activity, carried out on small-sized plots for food self-sufficiency. Somotillo has a number of potentialities: combined agricultural and forestry applications: cattle-raising for meat production; soils suitable for garden produce; a wide range of possibilities within the framework of the laws; varied organisational forms of civil society; and coordination of institutions aimed at the development of the region. But it also faces a number of problems to solve such as: lack of knowledge of laws and responsibilities for natural resources management; lack of a development strategic plan; lack of an environmental commission; poor inter-institutional coordination; an environment constantly affected by seasonal river floods; high risk of contamination in superficial and underground waters; degradation of water resources due to deforestation; and river basin problems not tackled. Little attention has been given to the preservation of local natural resources. However, the growing concern for energy supply, rural poverty, environmental degradation and food shortage has contributed to develop awareness of its importance. How to maintain and increase the local natural resources should be the priority of the municipality and the civil society of Somotillo.

El Papel de los Gobiernos Municipales en la Gestión
de los Recursos Naturales. Nitlapán-UCA,
CIFOR, PROTIERRA-Inifom. 62p.

49. El Sauce. La organización comunitaria como base para el desarrollo.

Martínez, T. and Rocha, J.L.

The municipality of El Sauce is located in the northwest of Nicaragua, and is characterised by small-scale land ownership. Small and medium farmers produce basic grains with very low yields. Cattle raising, the predominant activity which generates the highest income, is in the hands of large-scale farmers. The main problem faced by the El Sauce municipality is the decentralisation process since they lack experience, knowledge and adequate financial resources. Other problems are the lack of compliance and application of existing local legislation, and little awareness of the legal framework as a whole. The lax control of the local natural resources is mainly a result of the lack of coordination among the various parties in the municipality and the poor contribution of the local environmental groups. Forests along riverbanks and small creeks are among the most damaged natural resources in the municipality. Finally, it is important to highlight that citizens' participation is a crucial factor in the development of the municipality.

This means coordination of the different parties and identification of common interests for joint action.

El Papel de los Gobiernos Municipales en la Gestión de los Recursos Naturales. Nitlapán-UCA, CIFOR, PROTIERRA-Inifom. 49p.

50. The CIFOR criteria and indicators resource book database (CD-ROM + user manual).

McDougall, C., Isbadi, I.R., Santoso, L., Corless, M. and Purnomo, H. (eds.)

The CIFOR Criteria and Indicators Resource Book Database is a source of information on some key items in the generic template. It offers information on attributes; definitions, relevance, method for assessment, how to go about measuring a particular indicator, how to design a sample plot etc. The Resource Book Database is a work in progress at CIFOR and subject to further improvements.

The Criteria & Indicators Toolbox Series No. 4.
CIFOR, EU, GTZ and USAID.

51. Guidelines for applying multi-criteria analysis to the assessment of criteria and indicators.

Mendoza, G.A., Macoun, P., Prabhu, R., Sukadri, D., Purnomo, H. and Hartanto, H.

Multi-Criteria Analysis (MCA) is a decision-making tool developed for complex problems. In a situation where multiple criteria are involved confusion can arise if a logical, well-structured decision-making process is not followed. Another difficulty in decision-making is that reaching a general consensus in a multidisciplinary team can be very difficult to achieve. By using MCA members do not have to agree on the relative importance of the criteria or the rankings of the alternatives. Each member enters his or her own judgements, and makes a distinct, identifiable contribution to a jointly reached conclusion. This manual is written for an audience that needs a clear, easy to follow manual that can be used in the field to implement MCA. The information is structured so that the reader is first introduced to the general concepts involved before delving into the more specific applications of MCA. The manual reviews the conceptual framework of C&I and introduces the theoretical basis of MCA, and methods such as ranking, rating and pairwise comparisons in the Analytic Hierarchy Process. It provides an example of how MCA can be applied to C&I in

a Forest Certification context both from a 'top-down' perspective as well as in a more 'bottom-up' context.

The Criteria & Indicators Toolbox Series No. 9.
CIFOR, EU, GTZ and USAID. 84p.
ISBN 979-8764-27-7

52. León. Dilemas en la gestión del bosque seco y del area manglar.

Mendoza, R. and Artola, N.

The Municipality of Leon encompasses an abundance of natural, human, social and economical resources. Although it is one of the better-off municipalities enjoying good access to markets, social services and international support, it faces high degradation of its natural resources. Leon boasts one of the better-organised mayoralties in the country with development focused more on the urban than on the rural areas. There is a master plan with considerable stress on natural resources, but with an urban-oriented territorial planning. Single crop farming, a deep social gap, shrimp farming and rural fires are the main problems affecting the municipality and threatening the natural resources. The same can be said of the following issues: lack of rural development services such as technical and financial assistance; lack of financial resources for the decentralisation process; and predominance of 'blind' application of the law and control policies. This study has developed programme proposals that aim to reduce the social gap, boost the dynamics of the local economy, increase the local human capabilities and stress the role of the Mayoralty and the Municipal Environmental Commission for better management of the natural resources.

El Papel de los Gobiernos Municipales en la Gestión
de los Recursos Naturales. Nitalapán-UCA,
CIFOR, PROTIERRA-Inifom. 118p.

53. Plantas Amazonicas de uso medicinal: Diagnóstico de un sector económico con un potencial de realización.

Navarte, W., de Jong, W. and Domingues, G.

This is a report on the trade of medicinal plants in Peru, the manufacturing industry that relies on these plants, the research on promotion of their use, and on the legal instruments that govern their use, trade and transformation.

In Peru medicinal plants have been used for centuries. However, since 1994 the trade of these plants has boomed. Local collectors gather the fresh material which they trade in markets in the principal

cities throughout Peru. They engage in medicinal plant trade as an activity complementary to their agricultural activities. The larger commercial collections have occurred since 1994 to meet the international demand for *Uncaria tomentosa* and *U. guianensis*.

Collection is still the dominant form of procurement of medicinal plants in Peru. It is the initial step of a production chain of activities, including pharmaceutical companies that prepare a number of derivatives traded as food additives nationally and to some extent internationally. These companies are mostly located in Lima and they buy their raw material from intermediaries with whom they have mostly informal agreements. In some cases these agreements are with members of indigenous villages. Such companies have inadequate market information systems that could improve their planning. The USA is the largest buyer of medicinal plants from Peru. These plants are, after processing, sold to other destinations. Peru has so far had little access to international markets because of limited dominance of the required technology and high processing costs. The added value of the export of medicinal plants is therefore quite low. Control of this forest resource is insufficient. It is extracted from non-managed forests from areas of unknown extension. Current legislation does not guarantee the sustainable extraction. The state charges fees when extraction occurs, but has little opportunity to control actual levels and it does not engage in any kind of the ground control, management, or restoration of natural populations. There is insufficient knowledge for the production of medicines that can meet strict standards imposed by law. Consequently many companies are considering abandoning the manufacture of medicinal plant derivatives. There is a need for adequate research, legal instruments and policy to enable greater benefits to the Peruvian economy and people from this forest resource.

Center for International Forestry Research and Universidad Nacional Agraria La Molina. Lima, Peru. 102p.
(Report in Spanish)

54. Site management and productivity in tropical plantation forests: Workshop proceedings 16-20 February 1998, Pietermaritzburg, South Africa.

Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.)

These proceedings describe the experimental basis and preliminary results of the CIFOR project 'Site management and Productivity in Tropical Plantations'. The papers were presented at the second workshop off project partners held in Pietermaritzburg, South Africa, in February 1998. The research, which is underway at 17 sites in seven countries and involves scientists from 16 institutions, focuses on inter-

rotation management. This phase between tree harvesting and replanting for the next rotation is a window of considerable risks as well as opportunities. It holds the potential for physical and chemical soil degradation, but also offers a chance to remedy past mistakes and introduce sound technology for improved long-term management of plantation soils. Although the species and the soil problems vary according to local conditions, all the experiments have been designed to provide knowledge that will benefit both the specific sites and our understanding of underlying processes of tree productivity.

CIFOR, Bogor. ISBN 979-8764-33-1
(Paper in Spanish)

55. Commerce transfrontalier et integration regionale en Afrique Centrale : Cas de produits forestiers non-ligneux.

Ndoye, O. and Ruiz-Pérez, M.

In Central Africa, non-timber forest products (NTFP) are traded between Cameroon and neighbouring countries. kola nut (*Cola acuminata*) is traded between Cameroon, Nigeria and the Central African Republic. Wild mango (*Irvingia gabonensis*) is traded between Cameroon, Gabon and Equatorial Guinea. Okok (*Gnetum africanum*) is traded between Cameroon and Nigeria. As for bush butter tree (*Dacryodes edulis*), there is some trade between Cameroon, Gabon and Congo. Transborder trade of NTFP is based on linguistic, cultural, environmental and monetary complementarities of the countries involved. This survey shows that the quantity of NTFP sold on export markets in the wet tropical forest zone of Cameroon is quite significant, and their value is assessed at 3.099 million French francs in 1995 and 5.033 million in 1996. This gives an indication of the importance of transborder trade between Cameroon and its neighbour countries, and the need to better assess the role of NTFP in diversification of exports. Profit margins of traders are higher for bush butter than for other NTFP. Main markets for bush butter fruit are New-Bell (Douala) and Mfoundi (Yaounde), where traders' margins are higher than the SMIG (guaranteed minimum wage). In addition, the survey shows that the merchants selling wild mango kernels in Abang-Minko border market (Gabon border) in 1995 and 1996 and in Kye-Ossi border market (Equatorial Guinea border) in 1996 also earned margins higher than the SMIG. Transportation is the highest cost in NTFP marketing, especially for markets close to borders. A better harmonisation of economic policies and improvement of infrastructure could increase mobility of goods and people, and foster regional integration in Central Africa.

Arbres, Forêts et Communautés Rurales. Bulletin FTTP 17:4-12.
(Paper in French)

56. Non-wood forest product markets and potential degradation of the forest resource in Central Africa: The role of research in finding a balance between welfare improvement and forest conservation.

Ndoye, O., Ruiz-Pérez, M. and Eyebe, A.

This paper investigates the importance of income generated from marketing selected Non-timber Forest Products (NTFP) in Central Africa. The focus is mainly on local markets in the Humid Forest Zone of Cameroon and markets at the borders with the Central African Republic, Equatorial Guinea and Gabon. The main NTFP species considered are *Irvingia spp.* (bush mango nut), *Cola acuminata* (kola nut), *Garcinia lucida* (essock) and *Garcinia kola* (onie). Emphasis is on the marketing of the kernel and fruit of *Irvingia spp.* and *C. acuminata*, and the bark for *G. lucida* and *G. kola*. The study found that the value of the NTFP marketed was US\$753 000 in the first half of 1995 and US\$499 000 in the same period of 1996. Of these amounts, the value of bark marketed (for both *G. lucida* and *G. kola*) represented US\$30 000 and US\$ 23 500 in 1995 and 1996, respectively. The decline in the significance of NTFP marketed, as a result of lower supply, shows the weakness of NTFP markets resulting from their dynamic and unpredictable nature, which changes the role of markets in assembling and distributing NTFP from year to year. The study also found that traders' weekly marketing margins from bark are comparable to and may even be higher than those from kernels (*Irvingia spp.*) and fruits (*C. acuminata*). The harvesting of bark is not always carried out in a sustainable manner. However, the markets provide revenues for both traders and rural dwellers. This reveals the potential role of NTFP markets in forest resource degradation and underlines the difficulty in achieving a balance between improving the livelihoods of forest-dependent people and conserving the forest resource. Future research should focus on determining the rate of bark harvest that would enable forest dwellers to sustainably derive part of their livelihoods from *Garcinia lucida* and *Garcinia kola* while preserving these trees.

In: Sunderland, T.C.H., Clark, L.E. and Vantomme, P. (eds.) Non-wood forest products of Central Africa: current research issues and prospects for conservation and development, 183-206. Rome: FAO.

57. Les approches participatives dans la gestion des écosystèmes forestiers d'Afrique Centrale: Revue des initiatives existantes.
Nguinguiri, J.C.

Developments in the international institutional context and in the capacity of governments to ensure sustainable forest management in

Central Africa lead to new approaches to participatory management being explored. The author reviews current initiatives in this field in Congo Brazzaville, Gabon, Cameroon, Central African Republic and Equatorial Guinea. Such initiatives are still in an experimental stage and aim at answering issues linked with conventional forest management as well as meeting prerequisites imposed by international organisations for granting aid to development. These new approaches apply to four main areas: (1) Planning in the form of Forest Action Plans (TFAP/NFAP) and Environmental Management or Action Plans (EMP/EAP). Only those being in a development process take into account the participatory approach. (2) Protected areas. The current trend, especially at regional level (ECOFAC), is to substitute involvement of local populations in sustainable resource management for protection of forest islands. (3) Community forests. Cameroon has changed its legislation and is in an experimental stage. Congo and Gabon are engaged in reforming their laws. And (4) Management for timber production. Participation of local people is recommended, however the mode of implementation is not clearly defined. Research is involved at different levels: function of advice and analysis, definition of operational modes of implementation, and social experimentation. The author describes analysis patterns (theory of land control, modes of appropriation), and the main research focuses. Most important is communication, using approaches such as GRAAP (Research Group in Support to Self-Promotion) and MARP (Active Method of Participatory Research). Objectives are listening, informing and awareness-raising. The economic alternatives approach, based on a combination of incentives and disincentives, is increasingly used, as well as institutional alternatives approach. The success of a co-management process is dependent on taking into account all categories of actors involved in decision-making.

Occasional Paper No. 23. CIFOR, Bogor. 24p.

ISSN 0854-9818

(Paper in French)

58. Dynamique de la forêt mixte à diptérocaroacées de basse altitude avant et après traitement sylvicole.

Nguyen-The, N., Favrichon, V., Sist, P., Houde, L. and Fauvet, N.

As part of the STREK project, forest dynamics were analysed to assess the impact of logging, especially relatively environment-friendly techniques, and the potential benefits of silvicultural regimes that favour the growth of commercial species. The study was mainly focused on growth and mortality rates, especially concerning species of the *Dipterocarpaceae* family, which represents 25% of the trees in

the stand and literally all of the commercial species. Productivity of the primary forest was found to be lower than 1 m³/ha/year. Dipterocarpaceae species had the highest growth rates. Growth and mortality rates were dependent on the stand density, tree diameter, the size and shape of the canopy, which is an indicator of between tree-competition. The conditions were most detrimental to small-diameter trees. Two years after logging, productivity in the logged plot was as low as in the primary forest. The reforestation process is not yet under way. However, forest degradation to the benefit of *Dipterocarpaceae* species prompted a productivity gain of 3 - 5 m³/ha/year.

Bois et Forêts des Tropiques 259:25-44.

(Paper in French)

59. Eucalypt plantations in south-western Australia.

O'Connell, A.M. and Grove, T.S.

Hardwood plantation forestry is a new and expanding industry in south-western Australia where *Eucalyptus globulus* plantations are established on agricultural land. First-rotation growth rates are high, partly because of previous use of fertilisers and annual leguminous pasture species by farmers. A series of inter-rotation experiments has been established at two sites with contrasting soils to investigate options for plantation management that will maintain soil fertility and stand productivity in subsequent rotations. These experiments include alternatives for managing harvest residues, use of inter-row legumes and nutrient application rate trials. After harvest, about one-quarter of the N and half of the Pand Ca in the trees was exported from the sites in logs. Most of the exported N and P was in the wood, whereas most Ca was in the bark. Where burning was used to remove harvest residues and prepare the site for planting, more than 500 kg ha⁻¹ of N was lost from the more fertile site. Retention of harvest residue tended to increase soil moisture, moderate diurnal temperature fluctuations and enhance the pool of potentially available N. Soil organic matter content declined in the first two years following harvest, largely due to a reduction in the labile pool of soil carbon. There are indications of a reversal in this trend in the third year after harvesting, probably due to inputs of plant residue from turnover of roots. Early growth rates of trees were enhanced by retention of harvest residues, but longer-term measurements are needed to confirm this trend.

In: Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.) Site management and productivity in tropical plantation forests: Workshop proceedings 16-20 February 1998, Pietermaritzburg, South Africa, 53-59. CIFOR, Bogor ISBN 979-8764-33-1

60. Self-governance and forest resources.*Ostrom, E.*

Forest resources share attributes with many other resource systems that make difficult their governance and management in a sustainable, efficient and equitable manner. Destruction or degradation of forest resources is most likely to occur in open-access forests where effective governance has not been established. Conventional theories applied to forest resources presumed that forest users themselves were incapable of overcoming the temptations to overharvest. Extensive empirical research, however, has challenged this theory and illustrated the many ways that forest users themselves have devised rules that regulate harvesting patterns so as to ensure the sustainability of forest resources over time. A growing consensus exists in the literature concerning the attributes of common-pool resources and of resource users that enhance the probability that self-organisation will occur. Many of these attributes also help predict when forest users will self-organise. Forest users are more likely to devise their own rules when they use a forest that is starting to deteriorate but has not substantially disappeared, when some forest products provide early warning concerning forest conditions, when forest products are predictably available, and when the forest is sufficiently small that users can develop accurate knowledge of conditions. Self-organisation is more likely to occur when forest resources are highly salient to users, when users have a common understanding of the problems they face, when users have a low discount rate, when users trust one another, when users have autonomy to make some of their own rules, and when users have prior organisational experience. These attributes of forests and of the user community affect the benefits and costs of organising to protect and enhance forest resources. The growing consensus on the attributes of users and resources has been applied in the design of policies intended to enhance the participation of local users in the governance and management of common-pool resources, including many forests.

Occasional Paper No. 20. CIFOR, Bogor. 15p.
ISSN 0854-9818

61. A Sustainable forest future.*Pearce, D., Putz, F.E. and Vanclay, J.K.*

Available literature is reviewed to determine the type of forest management best suited to slowing the rate of loss of the world's forests and biodiversity. The traditional argument that sustainable forestry is the most preferred option has recently come under criticism

from those who argue that it is neither profitable nor necessarily environmentally preferable to conventional logging. The paper proceeds from comparing financial rates of return to differing forest management systems, through to economic rates of return, and from there to wider rate of return concepts that include non-market values, eg. biodiversity conservation and carbon storage. While sustainable systems appear capable of earning returns in excess of some modest discount rates, eg. 5-10 percent, they do not compete financially with other systems. No other factors appear to give sustainable timber management any edge over conventional systems. If the focus is on sustainable and unsustainable forest systems in developing countries, then high discount rates reinforce the initial preference for conventional systems based on the rapid liquidation of the timber and other resources without regard for future harvests or other impacts. Studies suggest non-market benefits of sustainable systems are significant. Timber yields are less on a comparative basis but non-timber values more than offset the relatively lower yield. The role of carbon is highlighted because carbon values dominate the non-market values overall. An analysis made in the context of a modified forest model, developed by Hyde, suggests the prospect for sustainable forest management is low in the early stages of development, and increases as the values attached to the forest and the services rise over time. Extended to include carbon and biodiversity values, it is arguable that the potential for sustainable forestry is far greater, even in the early stages of development, than might be thought.

CSERGE Working Paper GEC 99-15. ISSN 0967-5690. 64p.

62. CIFOR - a newcomer to CGIAR.

Persson, R.

The process by which CIFOR became the 16th and newest research centre of the Consultative Group on Agricultural Research (CGIAR) in 1993 is described. CIFOR is located at Bogor in Indonesia and employs about 40 internationally recruited scientists including foresters, social scientists and economists. Multi-disciplinary and inter-disciplinary research is a hallmark of CIFOR's program. Its mission and research agenda are described. There are 6 core research projects: (1) causes of deforestation, forest degradation and changes in human welfare; (2) multiple resource management of natural resources; (3) plantation forestry on degraded or low potential sites; (4) conservation of biodiversity and genetic resources; (5) sustainable use and development of forest products by forest-dependent communities; and (6) local people, devolution and adaptive co-management of forests.

Currently a major problem with forestry research in general is that the results are often not being used. Much of the research may be too 'academic' and research must become more problem-orientated. Another problem is priority setting and funding in forestry research. Donors have often invested heavily in the latest crisis or panacea and many assumptions behind these were wrong or at least only partially true. CIFOR needs to question the conventional wisdom, despite the difficulty in getting project funding for such an outcome. Forestry research will have an important role to play if there is a commitment to using the results. There must also be a strong commitment to do something to reduce poverty, as it is often difficult to improve the forests if the well being of humans who depend on them is not improved. Setting priorities, using results, building capacity, involving stakeholders and so on indicates major changes occurring in forestry and forestry research. We appear to be in the middle of a paradigm shift in both forestry and forest research and CIFOR must be in the forefront of the new and challenging work arising from this shift.

Currents 19/20:31-35.

63. Ecological characterization of tree species for guiding forest management decision in seasonally dry forests in Lomerío, Bolivia.

Pinard, M.A., Putz, F.E., Rumíz, D., Guzman, R. and Jardim, A.

When the goal of natural forest management is to maintain the biodiversity and ecological integrity of the forest while harvesting timber, the silvicultural systems employed must promote timber production and reduce negative impacts on whole timber resources. To foster development of such a system in a seasonally dry tropical forest in Lomerío, Bolivia, the authors classified tree species according to their relative timber value, importance as food for vertebrate frugivores and vulnerability to population declines when subjected to logging. They used this classification to identify a management system appropriate for the commercial species and to evaluate the compatibility of the system with the regeneration requirements of tree species that produce important food for mammalian wildlife. About half of the tree species in the site are commercially valuable for their timber and a similar proportion are considered of value as food for wildlife. A tree species rating for vulnerability to disturbance appeared to be independent of both timber and wildlife values. A silvicultural system that includes even-aged groups of trees within an uneven-aged matrix appears more suitable to the multiple goals of management in this forest than either an even-aged or uneven-aged (single tree selection) management system.

Forest Ecology and Management 113:201-213.

64. Criteria and indicators for sustainable forest management: A global overview.

Prabhu, R.

Criteria and indicators (C&I) can help to develop equitable and self-improving systems of forest management to ensure sustainability by providing information that is timely and involves a cross-section of the many stakeholders involved in forest management, ensuring that the information needs meets the important pre-conditions of relevance and equity. They can also help close the feedback loop to the policy development and reform process. From 1990-1994 national and international groups developed many C&I in an uncoordinated way. Since 1994, efforts have been made to consolidate and harmonise initiatives to develop principles and C&I. The paper describes the pioneering work of ITTO, and ongoing global initiatives of the Intergovernmental Panel on Forests and FAO. Groups including the Montreal, Pan-European ('Helsinki') and Tarapoto processes attempted to define C&I at national and supra-national levels. They all incorporate seven fundamental elements: (1) extent of forest resources; (2) biological diversity; (3) forest health and vitality; (4) productive functions of forests; (5) protective functions of forests; (6) socio-economic benefits and needs; and (7) legal, policy and institutional framework. At the sub-national level many organisations such as Rainforest Alliance, The Soil Association, World, Wide Fund for Nature and Greenpeace have defined C&I. CIFOR has been testing C&I for sustainable management of forests at the Forest Management Unit (FMU) level with partners in industrial and developing countries since 1994. Although there has been considerable success in developing C&I, there is little experience with their implementation, particularly at the FMU level. The information gap between the levels of local FMU, policy formulation and implementation needs to be effectively closed. Ultimately sustainability will only be achieved if there is action on the information and continuous improvement. This requires both political will and commitment at all levels. If this occurs there is no reason why the model of adaptive management sustainability should remain the elusive goal it currently represents.

In: Prasad, R., Raghavan, S., Phukan, B.R. and Bharti Joshi (eds.) Proceedings of the National Technical Workshop (under Bhopal-India Process of SFM) on Evolving Criteria and Indicators for Sustainable Forest Management in India, 21-22 January, 1999, Bhopal, India, 6-19. Indian Institute of Forest Management, Bhopal, India

65. Guidelines for developing, testing and selecting criteria and indicators for sustainable forest management.

Prabhu, R., Colfer, C.J.P. and Dudley, R.G.

This manual provides methods for the development and evaluation of criteria and indicators (C&I) which can then be used to assess the sustainability of forest management. The manual is written primarily for researchers, people or groups interested in evaluating C&I for assessments of forests in new areas, or as a reference for readers wanting to know how CIFOR's Generic Template was produced. The methods presented are aimed at the development of sets of C&I for natural forest at the forest management unit level, especially in the tropics. Following an introductory chapter focusing on the overall purpose, specific objectives, and the C&I development process, three chapters explain how to prepare for C&I testing, how to conduct a test, and how to analyse the results. Subsequent chapters explain the conceptual basis of C&I development, with three case studies offered as examples, and suggested additional reading materials. Specific forms and tools that have been used in the course of CIFOR's testing are also presented, with examples of ways to present the results. The final chapter provides possible baseline sets of C&I, available to users for evaluation and testing in their own contexts.

The Criteria & Indicators Toolbox Series No. 1.
CIFOR, EU, GTZ and USAID. 186p.
ISBN 979-8764-24-2

66. CIMAT (Criteria and Indicators Modification and Adaptation Tool) (CD-ROM + user manual).

Prabhu, R., Haggith, M., Purnomo, H., Rizal, A., Sukadri, D., Taylor, J. and Yasmi, Y.

CIMAT is a computer software package designed to help users modify, customise and adapt the CIFOR C&I generic template to meet local conditions and expectations. CIMAT will guide its users through all the basic steps in creating a new C&I set, navigating the current C&I knowledge base, and in its present version introduce the topic of an on-site assessment. In later versions CIMAT will provide more substantial support for assessment and monitoring of C&I. CIMAT can also be treated as a 'learning tool' for those who are merely interested in exploring the C&I knowledge stored in it.

The Criteria & Indicators Toolbox Series No. 3.
CIFOR, EU, GTZ and USAID.

67. Puerto Morazán. La camaronicultura: ¿un espejismo en tierra salada?

Rocha, J.L. and Barahona, T.

Puerto Morazan, a municipality famous for its shrimp farms and ancient port, was hit by Hurricane Mitch in October 1998, with a devastating effect on its most important industry, shrimp production. The Estero Real waters swept away the total shrimp production. The losses in the whole area have been calculated at about US\$30 million, which could increase by US\$10 million if timely financial support for redevelopment does not arrive. The producers are grouped in cooperatives and their technical level has created a demand for capital investment they cannot afford, thus being forced to contract heavy debts with the marketing companies, which results in low returns due to low prices. Before Mitch, the cooperatives were already in debt and now they must borrow again. In this situation, only 20% are rehabilitating. The villages in the interior of the Municipality bore the impact of Mitch to a lesser extent. The future of the municipality is closely linked to shrimp production, with its ecological consequences and complex limitations. Shrimp farming can still play a decisive role in the development of the Municipality of Puerto Morazan; however, its economical benefits have been based on the destruction of the ecological system and the abject poverty of the people. Shrimp culture can be either an oasis or an illusion.

El Papel de los Gobiernos Municipales en la
Gestión de los Recursos Naturales.
Nitlapán-UCA, CIFOR, PROTIERRA-Inifom. 99p.

68. A methodology to analyse divergent case studies of non-timber forest products and their development potential.

Ruiz-Pérez, M. and Byron, R.N.

Debate currently rages over the development potential of Non-Timber Forest Products (NTFP) in tropical forests. Proponents of particular 'solutions' can refer to evidence (case studies, data) which tend to support their interpretation of events and relationships. Recommendations thus frequently depend on how data are classified and interpreted. Inaccurate or incomplete classification leads to defective subsequent theories, models, and recommendations. The authors present a method for classifying very divergent case-study data, and some initial results as a basis for general understanding of key factors that influence a given result. Crucial issues determining outcomes of NTFP development include the nature of government involvement, distribution of property rights, the ability of local people

to claim and enforce such rights, market transparency, and pressure on the resource. This paper concludes with suggestions for further testing and development of the methodology.

Forest Science 45:1-14.

69. **La situación de los bosques tropicales.**

Ruiz-Pérez, M. and Byron, R.N.

Tropical forest constitutes the largest forest biome on Earth, hosting a large part of its biodiversity and contributing to global water and carbon cycles. The chapter analyses the pressures on these forests, their causes and differentiated results in each of the main tropical continents. Some strategies proposed to conserve tropical forest are discussed. The chapter concludes asking what would be the role of the professionals interested in management and conservation of tropical forest.

In: Homenaje a don ángel Ramos Fernández (1926-1998).

Tomo I, 245-252. Real Academia de Ciencias Exactas,

Físicas y Naturales; Academia de Ingeniería; Escuela Técnica Superior de Ingenieros de Montes, UPM. Madrid

(Paper in Spanish)

70. **Marketing of non-wood forest products in the humid forest zone of Cameroon.**

Ruiz-Pérez, M., Ndoye, O. and Eyebe, A.

Cameroon's humid forest zone contains very diverse ecosystems and provides many non-wood forest products (NWFPs) to local populations. Like many tropical countries, Cameroon has experienced major deforestation and forest degradation resulting from a combination of factors related to agricultural expansion, population increase and general development activities. This has reduced the supply of many forest products. Concurrently, the predominantly traditional subsistence land use has given way to increased commercialisation as a result of urbanisation and development. Consequently, markets selling NWFPs have been expanding throughout the humid forest zone. The NWFP trade is an important contribution to Cameroon's overall economy. The markets offer income opportunities for large-scale, specialised traders and also for many poor traders who rely on them for their small cash income. Many traders are women although the study found that the largest traders were men. Rural dwellers and traders trade simultaneously in NWFPs and agricultural commodities and, because of their seasonal nature, NWFPs complement agricultural commodities. The NWFP markets are very dynamic and form a widespread network around local,

provincial and national nodes. The products are traded throughout West and Central Africa, with some reaching migrant communities in Europe. The absence of a market infrastructure is an important feature common to the NWFP trade across the region. Improved market conditions and management systems to guarantee stable supply are key priorities of the traders, while the need to improve the credit system is less strongly felt. A number of products are under increasing pressure as a result of the reduction of forests and increasing demand, a problem for which a plantation approach may offer solutions. Reconciliation of the potential for income generation and local development with forest conservation is one of the urgent tasks for Cameroon. Policymakers need to be aware of the value of NWFPs and include them in official statistics.

Unasylva 198:12-19.

71. The role of bamboo plantations in rural development: The case of Anji County, Zhejiang, China.

Ruiz-Pérez, M., Zhong, M., Belcher, B., Xie, C., Fu, M. and Xie, J.

Bamboos have often been viewed as inferior products, labelled as the 'poor man's timber'. Development groups have proposed bamboo production as an opportunity for increasing the wealth of the low-income groups. This paper is a study of the household economy of 200 bamboo farmers in eight township of Anji County in China. The authors describe the process of transformation of rural China from communes to the household responsibility system, the differentiated rate of development among farmers and the role of bamboo in that change. A multiple regression analysis was carried out to study the factors that influence farmers' incomes and their evolution. A warning is sounded against using bamboo production to target low-income groups, as well as relying solely on aggregated data when drawing conclusions on income disparities in China.

World Development 27:101-114.

72. Scoring and analysis guide.

Salim, A., Colfer, C.J.P. and McDougall, C.

This is designed to supplement 'the BAG' and 'the Grab Bag'. It provides a scoring method that can be used with the two manuals, to come to a decision about particular criteria and indicators in particular forest and human settings. Following the section on scoring is a section on analysis. It begins very simply, leading the user through the steps of making a spreadsheet, and concluding with more complex

statistical analyses that may be desirable in some circumstances. Different teams have different requirements for quantitative and statistical sophistication in their analyses. This manual responds to these differing needs.

The Criteria & Indicators Toolbox Series No. 7.
CIFOR, EU, GTZ and USAID. 140p.
ISBN 979-8764-25-0

73. Globalisation, localisation and protected areas.

Sayer, J.A.

Processes of economic integration and growing economic influence of corporations are leading to greater efforts among people in all countries to protect the life styles and habitats that they value. For conservation organisations, the first challenge is clearly defining objectives and priorities on what to conserve, followed by mobilising the best available science and emerging techniques of working with local human communities to determine the most efficient way of achieving the agreed conservation goals at the least social cost. Greater transparency, objectivity and fairness must be essential elements in the process of allocating land for various purposes. For conservationists, the critical task is to determine the optimal extent, location and management of areas needed to achieve an acceptable balance between the development needs of local people and global biodiversity conservation needs. The inevitable trade-offs between biodiversity conservation and other uses of natural areas are more likely to be widely accepted if they are made in transparent manner with the full participation of all people concerned, with related economic costs and benefits allocated in an equitable manner. IUCN and WWF need to play a leadership role in helping people protect their land against global pressures and enable them to be fairly compensated for any costs they may incur when they live in areas whose biodiversity values are primarily global and not local.

In: McNeely, J.A. (ed.) IUCN's 50th anniversary celebration; results of imagine tomorrow's world: Symposium workshop, 125-136. IUCN. (Also published: In: Stolton, S. and Dudley, N. (eds.) Partnerships for protection: new strategies for planning and management for protected areas, 29-38. Earthscan Publications, London.

74. The state of the world's forest biodiversity.

Sayer, J. A. and Iremonger, S.

The term of biodiversity was first used in specialised conservation circles in the mid-1980s. In the decade that has elapsed it has moved

to centre-stage on the international agenda. The Convention on Biological Diversity (CBD), adopted at the Rio Summit in 1992 and now ratified by 169 countries, has had a major impact on biodiversity becoming a global concern. A major landmark was the publication of the Global Biodiversity Assessment, which provided a comprehensive account of the status of the world's biodiversity and of the issues confronting its conservation. Subsequently, in 1996 the Subsidiary Body for Scientific, Technical and Technological Advice, established by the Parties to the CBD, recognised the extreme importance of forests for biodiversity and established priorities for conservation. It recognised the inadequacy of existing systems of protected areas, the potential for improved conservation in managed forests and the need for more research and assessment to underpin forest biodiversity conservation programs. However, concern at a political level is not being matched by practical conservation achievement on the ground. Fewer new protected areas are being established and many existing ones are poorly managed. The possibility of conserving significant biodiversity in extensively managed multiple use areas has still to be proven in practice. The purpose of this article is to attempt to assess the progress that has been made, to identify some of the key problems, and to identify those actions which would yield the greatest benefits for forest biodiversity conservation.

In: Palo, M. and Uusivuori, J. (eds.)

World forests, society and environment, 129-134.
Kluwer Academic, Dordrecht, Netherlands.

75. The World Heritage Convention as a mechanism for tropical forest conservation.

Sayer, J.A., Iremonger, S., Ishwaran, N. and Thorsell, J.

This paper makes a plea for greater use to be made of the World Heritage Convention in conserving the world's forests. Whilst we fully endorse the current international processes and the eventual aim to bring all forests under sustainable management, we believe that the international conservation community may be fiddling while Rome burns. Significant action is urgent within the next decade to ensure that the building blocks for sustainable forest management in the future are still available to our descendants. The World Heritage Convention provides an existing mechanism that has international legitimacy and that could rapidly be geared-up to intervene operationally on the ground. It is unique amongst the existing forest conservation initiatives in that results of investments in the system could be measured. A monitoring system could quite easily be put into place. A small operations centre would be required with a capacity to maintain

updated scientific information on each site. A fund would be needed to intervene in support of urgent action in threatened sites. It is likely that technical and operational support would be required to confront the problems of some sites. This support could come from the personnel of other sites in the network. Thus, the network of World Heritage forest sites might be supported globally with those sites where management capacity is strongest supporting those where it is weaker. A global support programme with a relatively modest budget could maintain the integrity of 50 sites strategically located in the tropical forests of the world. This would provide the most cost-effective option to conserve a large proportion of the world's tropical forest biodiversity.

In: Thulstrup, H.D. (ed.).

World natural heritage and the local community, 33-45.
UNESCO World Heritage.

76. Developing tests of successional hypotheses with size-structured populations, and an assessment using long-term data from an Ugandan rain forest.

Sheil, D.

In 1947, W. J. Eggeling published an account of forest succession at Budongo, Uganda. This interpretation was based on a large-scale comparative plot study, performed in the 1930s and 1940s. This account, with its implication that species richness declines in late succession, endures as a controversial corner stone in theories and disputes about community diversity. Data have now been collected over six decades from five of Eggeling's original plots. This paper evaluates Eggeling's successional interpretation of the Budongo vegetation. The first set of analyses assesses the consistency of the original data with the predictions of compositional progression and convergence implicit in his model. The second analyses do the same for the time-series observations. A logical approach shows how temporal information may be derived from both between plot, and within plot, evaluations using size-structured data. A Detrended-Correspondence-Analysis (DCA) of canopy-tree composition, from the original data, ranks the plots in perfect correspondence to Eggeling's successional sequence. A 'development-scoring' procedure is developed using passive-ordination against this sequence; this is then applied to composition by plot and stemsizes class. Eggeling's original data are consistent with each prediction assessed. The analyses show compositional progression and apparent convergence across the plot series. And also progression and convergence within each plot. A monodominant-Cynometra forest is the natural end-point of this

progression. The time-series results, though in apparent agreement for one early successional plot, do not generally accord with Egge's ideas. The analyses illustrate a general means for evaluating explicit and implicit compositional trends in communities with structured populations.

Plant Ecology 140:117-127.

77. A simple graphical method for the comparisons of mortality, recruitment and other count defined 'event-rates'.

Sheil, D.

Researchers frequently compare rates of change based on counts (e.g. mortality, germination, infection, recruitment). The estimation of mortality and recruitment rates from tree census data have been discussed elsewhere. However, rather than estimating absolute rates, researchers may often need to determine whether two rates are significantly different. Most biometric texts and computer packages are not very helpful on this question, and guidance is not readily sifted out of the more technical literature. This note is intended to address three related issues: 1) to inform researchers who are not familiar with the appropriate tests, 2) to present an approach that avoids analytical complexity, and 3) to provide some feel for the power of the tests. This third point should assist in experimental design by providing guidance on the sample-sizes and differences required for significance to be detected. The simple and accurate graphical models provided will be of use to biologists who work with count-based changes. The number of observations required to detect significant rate differences may surprise some researchers.

Journal of Tropical Forest Science 11:323-325.

78. Tropical forest diversity, environmental change and species augmentation: After the intermediate disturbance hypothesis.

Sheil, D.

It is not simple to predict how environmental changes may impact tropical forest species diversity. Published hypotheses are almost invariably too incomplete, too poorly specified and too dependent upon unrealistic assumptions to be useful. Ecologists have sought theoretical simplicity, and while this has provided many elegant abstract concepts, it has hindered the attainment of more practical goals. The problem is not how to judge the individual hypotheses and arguments, but rather how to build upon and combine the many hard-won facts and principles into an integrated science. Controversy is

inevitable when the assumptions, definitions and applications of a given hypothesis are unclear. Elegance, as an end in itself, has too often been used to justify abstract simplification and a lack of operational definition. Clarifying and combining hypotheses while avoiding assumptions provides a potentially more useful, if less elegant, standpoint. An appraisal of Connell's intermediate disturbance hypothesis, and its application to long-term observations from a Ugandan forest illustrates these concerns. Current emphases encourage ecologists to exclude consideration of environmental instability and non-pristine ecosystems. In reality, many environmental changes and ecological processes contribute to both the accumulation and erosion of diversity, at all spatial and temporal scales. Site histories, contexts, long-term processes, species-pool dynamics, and the role of people require greater emphasis. These considerations reveal that many environmental changes, even those associated with degradation, can lead to a transient rise in species densities. Drawing on related studies, such as forest yield prediction, suggests that the formulation and calibration of simulation models provides the most tractable means to address the complexity of real vegetation. Simulation-based approaches will become increasingly useful both in unifying the study of vegetation dynamics and in providing improved predictive capacity. Quantification of the processes, scales and sensitivities of the dynamics of tropical forest communities remains a major challenge.

Journal of Vegetation Science 10:851-860.

79. Pine plantations on the coastal lowlands of subtropical Queensland, Australia.

Simpson, J.A., Osborne, D.O. and Xu, Z.H.

Queensland Department of Primary Industry Forestry manages extensive pine plantations consisting mainly of slash pine, Honduras Caribbean pine and a hybrid of these two taxa. Most of these plantations are located on the infertile coastal lowlands of south-east Queensland. They are managed intensively and there is concern about the maintenance of long-term productivity. One of the major opportunities for influencing sustainability is the period between harvesting and establishment of the succeeding crop. Removal of nutrients in logging and the use of fire to prepare second-rotation sites results in significant loss of nutrients from the site and large changes in the availability of nutrients. Ecologically sound harvesting combined with other desirable management practices are needed to ensure sustainable production. These practices need to be underpinned by a sound scientific basis. Estimates of biomass and nutrient

distribution in the biomass were made to provide a basis for interpreting changes in nutrient dynamics and tree response to residue management practices. An experiment testing a range of clearfell residue manipulation treatments was established on a typical second-rotation slash pine site at Toolara in south-east Queensland. Growth of F1 hybrid pines on this site is being monitored. Retention of litter and logging residues has not affected survival but has improved height growth by 11-24% at age 17 months. The site is to be used as a reference site in further investigations of key soil processes. The direction of future research required to interpret these findings and to provide a scientific basis for the best forest management practices is discussed.

In: Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.) Site management and productivity in tropical plantation forests: workshop proceedings 16-20 February 1998, Pietermaritzburg, South Africa, 61-67. CIFOR, Bogor. ISBN 979-8764-33-1

80. *Acacia mangium* plantations in PT Musi Hutan Persada, South Sumatera, Indonesia.

Siregar, S.T.H., Hardiyanto, E.B. and Gales, K.

PTMusi Hutan Persada, a forestry company growing wood for pulp in South Sumatra manages about 200 000 ha of forest plantations, 90% of which consists of *Acacia mangium*. Most of the plantations are in an area with high rainfall and on red-yellow podzolic soil with inherently poor fertility and low pH. Inter-rotation site productivity and management have been identified by the company as one of the crucial issues for sustaining the long-term productivity of its plantations. This paper describes the study plan for inter-rotation site productivity and management of *A. mangium* plantations in PT Musi Hutan Persada. The experiment tests the on-site effect of different treatments of organic matter or aboveground biomass management. Information from earlier work indicates that most *A. mangium* biomass and three major nutrients (N, P and K) is in the wood, and harvesting will remove around 200 kg N, 45 kg P and 240 kg K per hectare. Litter production of an 8-year old stand was about 13 t ha⁻¹ and about 70% of its mass will be lost in one year.

In: Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.) Site management and productivity in tropical plantation forests: Workshop proceedings 16-20. February 1998, Pietermaritzburg, South Africa, 39-44. CIFOR, Bogor ISBN 979-8764-33-1

81. Structure et floristique de la forêt primaire à diptérocarpacées de l'Est-Kalimantan.

Sist, P. and Saridan, A.

Forest inventories conducted in Indonesia (Berau, East Kalimantan) highlighted the main features of the Dipterocarpaceae primary forest. Dipterocarpaceae species accounted for 25% of the stand (diameter >10 cm), 50% of the basal area and 60% of the standing volume. In three primary forest control plots (total area 12 ha), 538 taxa were inventoried, with a mean of 182 different tree species per hectare. The Berau forest, in terms of stand density, basal area and standing volume, resembled Borneo forests, and especially Sabah forest. However, it had a much higher proportion of Dipterocarpaceae species, which could be due to the absence of major climatic variations in this region. Although floristic variability within the stand has been explained by edaphic factors in previous studies, the present results indicated that forest dynamics are critical in determining the species composition of the forest.

Bois et Forêts des Tropiques 259:16-24.
(Paper in French)

82. Pedoman pembalakan berdampak rendah untuk hutan dipterocarpa lahan rendah dan bukit di Indonesia.

Sist, P., Dykstra, D. and Fimbel, R.

These guidelines form the basis for defining the initial set of activities to be classified as Reduced-Impact Logging (RIL). They have been adapted to and will be tested in the local conditions that occur in the lowland and hill dipterocarp forest of the Bulungan Model Forest project in East Kalimantan, Indonesia. It is anticipated that through the implementation and supervision of the RIL practices described in this document, the timber concession operators (INHUTANI II) can expect to: reduce disturbances to soil and residual vegetation by at least 50% in comparison to conventional logging operations where these guidelines are not applied; limit overall direct impacts to the forest <25%; conserve wildlife and other forest resources, including non-timber forest products, threatened and endangered species, keystone plant resources, and water; diminish direct logging costs by at least 15%; and protect the long-term integrity and value of the permanent forest estate.

Bulungan Research Report Series No. 1b, August 1999, 15p.

This paper is translated from Reduced-impact logging guidelines for lowland and hill dipterocarp forests in Indonesia, Bulungan Research Series No. 1, September 1998/CIFOR Occasional Paper No. 15.

83. Management of secondary and logged-over forests in Indonesia.

Sist, P., Sabogal, C. and Byron, Y. (eds.)

Secondary and logged-over tropical forests cover more than 600 million hectares. An international workshop held in Bogor (Indonesia) in November 1997 provided a forum of discussion on the research priorities for the sustainable management of secondary forests in Indonesia and more generally in South East Asia. Secondary forests were defined as: "woody vegetation regrowing on land whose previous forest cover was destroyed by at least 90 % by human activities or natural disaster". In these proceedings five papers focus on the use and manipulation of secondary forests as part of smallholders' resource management strategies, six papers refer to management aspects of logged-over forests for timber production, mainly focusing on the application of silviculture (e.g. conditions for natural regeneration and enrichment techniques).

There is also an analysis of the socio-economic consequences of forest changes in relation to the future economic development of two Indonesian provinces. The workshop concluded that secondary and logged-over forests are complex ecosystems providing a large range of timber and forest products and environmental values but a clear typology of these very different forests is not yet defined. Secondary forests are quite different from logged-over forests in both structure and species composition and there is a need to develop new silvicultural concepts for their management and silvicultural interventions favouring non-timber forest products. Indonesian forest policy and regulations and their implications for logged-over forests were debated. Socio-economic aspects were also recognised as an important feature, which should retain more attention in forest regulations than in the past. The potential of the Indonesian Selective Logging System (TPTI) in achieving and promoting forest management is now questionable. New rules based on research results from various research and development projects must be defined within TPTI regulations which, with adequate enforcement, have potential to attain many of the criteria associated with sustainable forest management. Logged-over forests will be the main suppliers of the timber industry for the next felling cycle (35 years) so achievement of sustainable forest management in the remaining production forests is both an environmental concern and an important economic issue for Indonesia.

Selected Proceedings of an International Workshop
17-19 November 1997. CIFOR, Bogor. 114p.
ISBN 979-8764-34-X

84. Tree trade: Liberalization of international commerce in forest products: Risks and opportunities.

Sizer, N., Downes, D. and Kaimowitz, D.

Unless countries that export forest products improve forest protection, policies, laws and practices, further trade liberalisation poses a significant threat to efforts to conserve and sustainably manage forests. The acceleration of tariff elimination is unlikely to have a large impact on net global trade because most tariffs are already quite low. However, eliminating tariffs could have a significant impact on some products and some markets. Removal of some non-tariff barriers could have far greater negative consequences. There are major concerns about weakening phytosanitary standards, threats to efforts to label forest products, and proposals to outlaw measures that some local and national governments have taken to reduce the negative environmental and social impacts on forests of consumption of forest products within their territories. Trade liberalisation that could threaten forests or interfere with their protection should not go forward until mechanisms are put in place to ensure parallel progress on forest protection. The authors highlight five recommendations, many of which should be implemented independently of the trade policy debate because they make economic and environmental sense in their own right.

Forest Notes, November 1999. World Resources Institute. 23p.

85. Land use change in soybean production systems in the Brazilian savanna: "The role of policy and market conditions".

Smith, J., Cadavid, J.V., Ayarza, M., de Aguiar, J.L.P. and Rosa, R.

This paper analyses land use change in the Brazilian savanna and draws out policy implications about the adoption of resource management technologies. Resource management technologies are more likely to be adopted in areas experiencing a long-term deterioration in market conditions. Adoption occurs primarily to increase long-term economic viability. Thus adoption may coexist with adverse environmental and social impacts. Past opportunities for asset accumulation appear to be a pre-condition for adoption, indicating the importance of building up the resilience of farmers (particularly the resource-poor) during good times. Partnerships with the private sector can contribute significantly to technology diffusion.

Journal of Sustainable Agriculture 15:95-117.

- 86. Dynamics of secondary forests in slash-and-burn farming: Interactions among land use types in the Peruvian Amazon.**
Smith, J., Van de Kop, P., Reategui, K., Lombardi, I., Sabogal, C. and Diaz, A.

The regeneration of secondary forests (SF) on previously cleared land in the Amazon is a promising development within the generally pessimistic scenario about tropical deforestation. This has stimulated efforts to augment the value of SF to farmers to induce them to increase the area in SF. The objective of this paper was to document the regeneration of SF in slash-and-burn agriculture and to develop policy and technological recommendations for conserving forest cover on small farms and to improve farmer welfare. The dynamics of SF in slash-and-burn farming were studied by investigating changes in the role of SF with frontier development. Farm survey data from a colonist settlement area in the Peruvian Amazon were analysed by using a recursive econometric model. Results confirmed that substantial areas of SF exist on slash-and-burn farms during the first few decades after settlement. As a result, over a third of the farm area is under forest cover. This implies that deforestation in slash-and-burn farming may be less than previously believed. Soil recuperation is the most important reason for the existence of SF in slash-and-burn agriculture.

During the relatively early stages of frontier development studied in this paper, fallow periods increased over time as site productivity declined, giving rise to secondary forests. Pastures lowered forested areas on farms and appear to impede the regeneration of SF. Commercial exploitation of SF products was minimal and declines with frontier development. The conclusions show that improved short-rotation fallows may recuperate the soil at the expense of forest cover, particularly in areas where most of the forest cover consists of SF. This conflict could be resolved by technologies that enrich SF and reinforce its multiple functions, including soil recuperation. Reduction of extensive cattle ranching may be a more effective way to conserve forest cover in slash-and-burn farming than technologies for shortening fallow periods. A 'quantum leap' in the benefits of forested land will be required if increases in forest cover are to be compatible with farmer welfare. This is likely to require innovative approaches, such as commercialisation of the environmental services of forests. The results of this research could potentially shift efforts to control deforestation away from slash-and-burn farmers, thus reducing the perceived conflict between forest conservation and the livelihood of poor people.

Agriculture, Ecosystems and Environment 76:85-98.

87. Capacity for forestry research in selected countries of West and Central Africa.

Spilsbury, M.J., Kowero, G.S. and Tchala-Abina, F.

In 1997/98 a survey of nine forestry institutions in the West and Central African countries of Nigeria, Ghana, Côte d'Ivoire, Cameroon, Gabon and Benin was conducted. The survey methodology utilises ten indicators of research capacity that facilitate comparisons across the survey sample. General trends relating to research capacity in the region are highlighted and include: insufficient collaborative research; poor linkages between research, education and development; inadequate flow of information and access to scientific literature; and a low level of sustainability for research programme support. While there is still a considerable need to invest in the development of human resources and physical infrastructure at the institutional level, governments and development assistance agencies should pay more attention to promoting efficiency and effectiveness of the 'supply' side of research systems (national and regional). There have been few consistent attempts to develop mechanisms to match research 'supply' to the real 'demands' in terms of providing solutions to the most pressing problems.

Occasional Paper No. 24.
CIFOR, Bogor. ISSN 0854-9818

88. Between danger and opportunity: Indonesian and forests in an era of economic crisis and political change.

Sunderlin, W.D.

Policy aiming to improve the conservation and management of tropical forests are often based on the assumption of political economic stability. Yet some of the most important changes in conditions affecting tropical forests can occur when the political and economic climate changes in abrupt, unpredicted, and largely uncontrolled manner. This fact is illustrated through preliminary, largely media-based documentation of changes underway in Indonesia. It is unclear, as yet, whether the effects of the sudden transformation on the forest sector in this country will be largely positive or negative.

Social and Natural Resources 12:559-570.

89. Crise économique et changements politiques en Indonésie premiers effets sur le secteur forestier.

Sunderlin, W.D.

Indonesia's economy receded in 1998, and the national currency has lost more than 70% of its value. Expansion of agriculture is one of the

main ways to overcome the crisis: 1) relatively independent of the dollar economy; 2) provision of basic needs commodities; 3) reduction of unemployment; 4) reduction of costly food imports; 5) Indonesian commodities cheaper in the export market - costs in rupiahs, earnings in US\$. Another means is access to loans from IMF. The author reviews the likely effects on the forest sector. (1) Decreased demand for Indonesian plywood from main importers (Japan, South Korea and Taiwan) is largely compensated by increased demand from other countries and Malaysia's decision to restrict its wood product exports. (2) Expansion of agriculture will occur partly at the expense of forest cover: spontaneous clearing by farmers, and large scale clearings for agro-industry plantations, mainly oil palm, then cocoa, coffee, rubber trees, pepper, as well as shrimp ponds in mangroves. (3) Transmigration will probably not slow down, foreign aid compensating for the decline of State aid. (4) Unemployed people in the urban sector migrate to rural areas, and young people in the rural areas remain there which may increase pressure on forests for three reasons: a) incentives to expand plantations for export; b) incentives to produce food crops locally (rice, maize, soya) to reduce imports; c) shortage of capital for inputs, that may encourage extensive agriculture. (5) Expansion of mining in forest areas (coal, iron, and nickel) may lead to degradation of important protection forests. (6) The likely slowdown of major road programmes will reduce their direct and indirect impacts on forests. (7) Policy changes as a prerequisite to IMF loans will have negative effects on forest conservation when they encourage plantations for export (oil palms). (8) President Habibie has launched a wave of policy reforms to remedy former abuses in granting timber concessions, and the resulting forest deterioration. In addition, new laws should promote community-based forest management. In conclusion, the economic crisis appears a threat to Indonesia's forests, in view of the trend to increase foreign exchange earnings through the export of forest and agricultural products.

Bois et Forêts des Tropiques 260:79-82.
(Paper in French)

90. Development of the forest sector in Indonesia. *Sunderlin, W.D.*

Indonesia is among the world's leading wood products exporters, and is the leading plywood exporter. The forest sector has grown rapidly in the last three decades to 487 concessions occupying 56 million hectares. A notable change in recent years has been the rapid growth of the pulp and paper industry. The extraction of timber from concessions is over 40 million cubic metres per year whereas the government-

determined threshold for sustainable production is 22 million cubic metres per year. Non-wood forest products account for 1-5% of forest sector export income. Rattan production, like that of timber, has been subject to dramatic transformation through the implementation of value-added policies and Indonesia has become the world's leading supplier of rattan furniture.

The main environmental concerns related to the forest sector are: (1) deforestation and forest degradation resulting from the farming practices of agricultural smallholders; (2) deforestation and forest degradation from land use practices of large enterprises such as timber concessions, tree crop and industrial timber plantations, and pulp and paper mills; and (3) the use of fire for clearing land. The Indonesian forest industry sector is facing greater upheaval and challenges than at any point in the past 30 years. On the positive side, there may be a temporary reprieve from pressure on natural timber supplies in the short-term resulting from the decline in demand for plywood. There is no indication that current policies will provide incentives for sustainable management of natural forests. The drastic currency depreciation may lead to high demand for Indonesian forest products and the resumption of high pressures from within the forest sector. Moreover, the economic crisis has increased pressures from outside the forest sector on remaining forest resources by agriculture, mining and transmigration. Overall, the rate of exploitation of Indonesia's natural forests for industrial purposes is unsustainable.

In: Palo, M. and Uusivuori, J. (eds.)

World forests, society and environment, 214-221.

Kluwer Academic, Dordrecht, London, Boston.

91. The effect of population and migration on forest cover in Indonesia.

Sunderlin, W.D. and Resosudarmo, I.A.P.

The massive loss of quantity and quality of natural forest cover in Indonesia threatens an important source of foreign exchange and employment. Several studies and government policies indicate that population growth, particularly among small landholders, is the principal cause of deforestation. Although there is an element of truth to these studies and policies, they greatly oversimplify and distort the issue of Indonesian deforestation. This article evaluates 'population-entered' (neo-Malthusian) explanations of forest cover change in Indonesia in the light of non-population-centered (non-Malthusian) evidence. The conclusion is that although population growth is an important part of the explanation of Indonesian deforestation, it should be seen as an intermediate variable, and not as an independent

variable. The policy implication is that nonpopulation factors should receive greater attention in policy measures directed at controlling inappropriate deforestation.

Journal of Environment and Development 8: 152-169.

92. Le marché des produits forestiers non ligneux de l'Afrique Centrale en France et en Belgique: Produits, acteurs, circuits de distribution et débouchés actuels.

Tabuna, H.

In France and Belgium, there has been a trade of non-timber forest products from Central Africa for nearly 30 years. Traded products come chiefly, by order of importance, from Cameroon and the Democratic Republic of Congo. There are many (45 in total, of which 13 come from native species), but the more regularly imported are saka-saka or cassava leaves (*Manihot esculenta*), ndolé (*Vernonia sp.*), fumbua or koko (*Gnetum africanum* and *G. buchholzianum*), safou or bush butter (*Dacryodes edulis*), many spices and condiments such as njansan (*Ricinodendron heudelotii*), wild mango (*Irvingia gabonensis*), pèbè (*Monodora myristica*), and two stimulants: kola nut (*Cola acuminata* and *C. nitida*) and bitter kola (*Garcinia kola*). These products are imported mainly by air, and are largely intended for nationals of Central African countries living in Paris, Brussels, several other French and Belgian cities, and recently in England, Germany and Switzerland.

Others, often in small quantities, go to African restaurants and the market of 'bio' products. Initiated by the first students and trainees from Central Africa in France and Belgium, this trade was originally carried out exclusively by European grocers specialising in general food products. European, North African, Central African and Asian grocers now carry it out. They all run shops specialising in the sale of products to African and West Indian customers. They charge prices sometimes eightfold the prices prevailing in Central African markets, which paradoxically does not slow down the demand for ethnical and biological products, and health or dietetic foods among young French, Belgian and European consumers. This paper describes the organisation and operation of the non-timber forest products market (selling points, actors, distribution networks, prices, bottlenecks, etc.) and its potential for development. It also formulates recommendations to release constraints to its dynamics, and suggests access paths for use by actors in Central Africa.

Occasional Paper, No. 19. CIFOR, Bogor. 32p.

ISSN 0854-9818

93. Produits Forestiers Autres que le Bois d'oeuvre (PFAB): Place dans l'aménagement durable des forêts humides d'Afrique Centrale.

Tchatat, M., Ndoye, O. and Nasi, R.

Non-timber forest products (NTFP) are very important for people of Central African countries, however they are not adequately taken into account in economic calculation and forest management. The author reviews the current state of knowledge on NTFP, their socio-economic role, their modes of utilisation and related problems, and outlines suggestions to improve their management. There is an extreme diversity of NTFP, in relation to the high biodiversity and complexity of ecosystems in the wet tropical forests of Central Africa, hence the need to treat forest management in a holistic manner instead of considering the sole aspect of timber production. Local people have a deep understanding of NTFP, and their utilisation gives rise to a special social organisation and customary rights of access, often in conflict with formal laws.

There are two threats to NTFP: overexploitation, due to their importance in household incomes, and destructive harvesting practices; and timber extraction, in view of the impact of current practices on the ecosystem, and outsiders' access to the forest. Silvicultural operations (thinnings) should be adapted in order to reduce their negative impact on NTFP. There is a need to take into account the interests of all actors, as well as requirements for ecosystem conservation by: (1) Taking NTFP into account in forest management, which implies better knowledge of the resource. NTFP management will aim at either their protection or improvement of their resources. and (2) Reducing impact of logging, through better localisation of resources and optimisation of forest road network, and low-impact techniques. Indirect impacts in connection with logging (e.g. poaching) should be curbed. Practices of logging companies and local populations should be reconciled in order to avoid conflicts.

Serie FORAFRI, 18. CIRAD-Forêt, France. 95p.

94. Eucalypt plantations.

Turnbull, J.W.

This paper reviews the historical development of the use of the eucalypt over 200 years, from its curiosity status in the botanical gardens of Europe to its extensive use as a fuelwood for the wood-burning locomotives of the national railway systems, and then to its more recent use as a major source of biomass for paper pulp, fibreboard, industrial charcoal, and fuelwood. Ecological and

biological aspects of the genus *Eucalyptus* have made it successful as an exotic in industrial monocultures and as a multipurpose tree of benefit to small landholders. Social, policy, and economic aspects of growing *Eucalyptus* are examined, as are prospects for using the eucalypt in the twenty-first century as an industrial plantation tree and as a component of farming systems in the rural landscape.

New Forests 17:37-52.

[Also published: In: Boyle, J.R., Winjum, J.K., Kavanagh, K. and Jensen, E.C. (eds.) *Planted forests: Contributions to the quest for sustainable societies*, 37-52. Forest series Vol. 56. Kluwer Academic, Dordrecht, Boston, London.]

95. Codes of forest practice and related research needs.

Turnbull, J.W. and Vanclay, J.K.

This paper aims to set codes of forest practice in the framework of the evolving debate on sustainable forest management. Codes of forest practice are sets of regulations or guidelines developed by governments or other organisations to assist forest managers select practices to be followed when carrying out forest management and utilisation operations. These practices, when correctly applied, should meet standards for sustainable forest management. A code of practice is also a form of forest policy typically used to promote certain environmental benefits and the codes are regarded as important measures in moving towards sustainable forest management. They are based on the best knowledge available to ensure forests are well managed. In many countries the pressures from environmental activists to improve forest management practices began in the 1970s.

In Australia, CSIRO published environmental guidelines for forest harvesting in 1979 and throughout the 1980s most Australian States developed codes of forest practices, principally directed at logging or harvesting forests. In the United States many forestry authorities published guidelines and best management practices from 1988 onwards, but Oregon developed the first comprehensive forestry practices Act in 1971. In the tropics, buoyant world timber markets and weak forest regulatory authorities led to deteriorating standards of timber harvesting and utilisation, and the gap, is widening between the principles of sustainable forest management and forest management practices. ITTO produced general guidelines for management of natural forests, planted forests and conservation of biological diversity

in tropical forests. Regional codes of practice for the South Pacific and Asia-Pacific have and are being developed. The paper concludes that sustainability continues to be the single most important principle to guide forest management and management will need to continuously challenge and evaluate its own codes of forest practices.

In: Brown, A.G. (ed.) Sustainable Forest Management: proceedings of the Hermon Slade International Workshop held at Melbourne, 30 November-4 December 1998, 21-28. Crawford Fund, Parkville, Victoria, Australia. ISBN 0 643 06316 1

96. Income generation through rehabilitation of imperata grasslands: Production of *Vitex pubescens* as a source of charcoal.

Utama, R., Rantan, D., de Jong, W. and Budhi, S.

A tree-planting technology using *Vitex pubescens*, a native tree species from Southeast Asia, is presented. It may allow reclaiming *Imperata cylindrica* grasslands that are difficult to use for other purposes and at the same time increase incomes for local swidden agriculturists in West Kalimantan. *V. pubescens* is grown as a raw material for charcoal production. It has a wood density of 0.8–0.95 kg/Land produces a high quality charcoal that is comparable and competitive with mangrove charcoal in international markets. It is expected that this technology may have wider application, beyond the location where the technology is being developed. The development of this technology allowed general conclusions on the domestication of tree species. Domestication of a tree species should be mostly concerned with providing the technology that allows the tree planting agents to successfully cultivate the tree species, meaning that the tree species can be reproduced successfully and lead to achieving an economic profit. Developing the technology has many facets. What these facets are depends on both on the characteristics of the tree species and the opportunities and constraints of the tree planting agent. Selection of certain genetic strains may be a facet of domestication but it is not always a necessary requirement.

In: Roshetko, J.M. and Evans, D.O. (eds.) Domestication of agroforestry trees in Southeast Asia: Proceedings of a Regional Workshop,

Yogyakarta, Indonesia, November 4-7, 1997, 175-184.

[Also published as: Forest, Farm, and Community Tree Research Reports, Special Issue, 1999. Winrock International and ICRAF, Morrilton, USA.]

97. Management Advice from tree measurements.*Vanclay, J.K.*

-abstracts is not available-

In: Gideon, O. and Oavika, F. (eds) Permanent sample plots and growth models for natural forest management in PNG.
 Proceedings of Workshop, PNG Forest Research Institute, Lae,
 0-13 November 1998, 93-102.

98. TROPIS - networking research with permanent plots.*Vanclay, J.K.*

-abstracts is not available-

In: Gideon, O. and Oavika, F. (eds). Permanent sample plots and growth models for natural forest management in PNG.
 Proceedings of Workshop, PNG Forest Research Institute, Lae,
 10-13 November 1998, 103-111.

99. Spatially explicit model of deforestation in Bolivia.*Vanclay, J.K., Kaimowitz, D., Puntodewo, A. and Mendez, P.*

A GIS compiled by the Departmental Government of Santa Cruz, Bolivia offers data that may help to resolve some competing theories of tropical deforestation. The GIS contains many attributes relating to land use at two points in time, 1989 and 1994, which allow questions to be addressed, such as: what has been the impact of past road construction on deforestation and land use?; what impacts might be expected from future road construction?; what impact do zoning policies such as forest concessions and protected areas have?; and what influence do cultural factors have on forest clearing and fragmentation? The methodology is discussed and interim results given. The authors seek to provoke discussion on appropriate statistical procedures for such analyses.

In: Laumonier, Y., King, B., Legg, C. and Rennolls, K. (eds.).
 Data management and modelling using remote sensing and
 GIS for tropical forest land inventory, 371-382. Rodeo, Jakarta.
 ISBN 979-95696-0-5

100. Promoting forest conservation through ecotourism income?*Wunder, S.*

A principal criterion for classifying a tourism operation as 'ecotourism' is that local residents at the site should receive substantial

economic benefits, which serve both to raise local living standards and as enhanced incentives for nature conservation. This paper sets out a methodological framework for analysis of the alleged participation-income-conservation link, and applies it to the Cuyabeno Wildlife Reserve in the Ecuadorian Amazon region. Three Cuyabeno ethnic groups involved in tourism, the Quichuas, Siona-Secoyas and Cofans, are characterised by different tourism participation models, ranging from autonomous operations to pure salary employment. Results do not support the frequently held belief that autonomous operations are 'better off' by yielding higher local benefits; rather, income size is determined by the site-specific degree of tourism specialisation, which largely depends on the tourist appeal and level of conservation of the natural site. Annual tourism cash flows are found to be much higher than previously estimated (from US\$ 15 000-50 000 per village), which represents a significant rise in local purchasing power.

In terms of conservation incentives, this study confirmed that income from tourism tends to change local attitudes and behaviour, such as reducing overexploitation, creating 'untouchable' zones and user quotas. The more autonomous the operation, the more incentive exists to rationalise resource use. Also, the mere fact that labour time is invested in tourism leaves less opportunity for hunting and other activities that may have been practised unsustainably in the past. Further, tourism income helps to protect the Cuyabeno Reserve against important external threats, such as oil drilling and squatter colonisation. Recommendations include proposals for gradually augmenting local participation, strengthening both incentives and tourist operations in the fields of food production, handicrafts and the training of local tourist guides. Even with these safeguards, the nexus of social-economic-environmental change will often come in clusters that make it impossible to distinguish between 'desirable' and 'undesirable' impacts, in the unambiguous manner suggested by the axioms of ecotourism.

A case study from the Ecuadorian Amazon region.
Occasional Paper, No. 21. CIFOR, Bogor. 24p. ISSN 0854-9818

101. **Plantation of *Eucalyptus urophylla* S.T. Blake in Guandong Province, China.**

Xu, D.P., Yang, Z.J., Chen, Q.D. and Chen, M.H.

The productivity of eucalypt plantations in southern China is low and may decline over successive rotations this study focuses on the effects of harvest residue management, intercropping, fertilisation and regeneration on productivity of a second rotation plantation of *Eucalyptus urophylla* S.T. Blake. The first rotation produced 44 t ha⁻¹

of aboveground tree biomass in seven years. Of this, 87% was in the bark and stemwood removed at harvest. An additional 5.8 t ha⁻¹ of biomass was in the understorey and litter. Retention of residue at the site (from 1.4 to 17.5 t ha⁻¹) increased tree height from 2.5 to 3.3 m at age 15 months. Applications of fertiliser increased the height at 15 months from 1.2 m (without fertiliser) to 4.1 m at the highest rate. Retaining litter alone without fertiliser had little effect on growth of planted trees. Fertiliser application to coppice trees also had little effect on growth.

In: Nambiar, E.K.S., Cossalter, C. and Tiarks, A. (eds.)

Site management and productivity in tropical plantation forests: workshop proceedings 16-20 February 1998, Pietermaritzburg, South Africa, 31-38.

CIFOR, Bogor ISBN 979-8764-33-1

PUBLISHED IN 1998

102. Constraints and opportunities in rattan production-to-consumption systems in Asia.

Belcher, B.

Six systems of rattan production, processing and marketing from four Asian countries are compared using a production-to-consumption systems approach. Cases were selected to represent a range of management and capital intensity at different stages. Strong similarities among the cases are explained by characteristics of the material and similar policy treatments among the four countries. There is a tendency toward increasing intensity and scale in the manufacturing sector, but this has not translated into incentives for improved management in raw material production. The industry in most countries is still based mainly on the unsustainable exploitation of wild rattan, although there are technically feasible systems for intensifying production. Raw material shortages are already being experienced in the industry. The situation represents a good opportunity for investment. The paper concludes by identifying key areas for attention.

In: Bacilieri, R. and Appanah, S.

Rattan cultivation: Achievements, problems and prospects.

An International Consultation of Experts for the Project: Conservation, Genetic Improvement, and Silviculture of Rattans in South-East Asia, 12-14 May 1998, Kuala Lumpur, Malaysia, 116-138.

CIRAD-Forêt and FRIM, Kuala Lumpur.

103. Improving smallholder farming systems in *Imperata* areas of Southeast Asia: Alternatives to shifting cultivation.

Menz, K., Magcale-Macandog, D. and Rusatra, I.W. (eds.)

This a report of a collaborative research project, 'Improving smallholder farming systems in *Imperata* areas of Southeast Asia: a bioeconomic modelling approach' sponsored by the Center for International Forestry Research and the Australian Centre for International Research. The nature of the *Imperata* problem and the methodology is outlined. *Imperata* is essentially restricted to upland areas, since it does not coexist with lowland rice farming. There is a section on bioeconomic analysis of traditional smallholder 'shifting cultivation' farming systems where the fallow is *Imperata* and another contains a series of case study descriptions of successful tree growing by smallholders on *Imperata* grasslands. The core modelling work of the project is reported. Various tree-based interventions are modelled with and without an animal component. Some of these modelled farming systems are already in place in farmers' fields. In these cases, possible management or policy interventions analysed with the models can point the way to productive and economic improvements.

In other cases, the farming systems modelled are 'experimental' in nature. *Imperata* grows on uplands of various slopes, but some special attention is given to *Imperata* on steeply sloping land where soil erosion is a particular problem. Finally, two key issues in relation to tree growing on *Imperata* grassland, fire control and carbon sequestration, are addressed. These are viewed both from the viewpoints of the individual smallholder and of the broader society. This is an overview and compilation of studies, many of which were previously reported in a series of project papers published by Centre for Resource and Environmental Studies, Australian National University between 1995 and 1998.

ACIAR Monograph No. 52.

Australian Centre for International Agricultural Research, Canberra.

ISBN 1-86320-223-4

104. Les effets de la crise économique et la dévaluation sur l'utilisation des plantes médicinales au Cameroun. Implications pour la gestion durable des forêts.

Ndoye, O., Ruiz-Pérez, M., Desire, M.A. and Ngono, D.A.

-abstracts is not available-

Papier présenté à l'Atelier International FORAFRI (CIRAD-Forêt/CIFOR)
sur la gestion durable des Forêts denses humides Africaines aujourd'hui,
Libreville, Gabon, 12-16 Octobre 1998. 15p
(Paper in French)

105. Criteria and indicators for sustainable forest management: New findings from CIFOR's forest management unit level research.

Prabhu, R., Colfer, C.J.P. and Shepherd, G.

This paper traces the growing interest in the development of Criteria and Indicators (C&I) for sustainable forests since the declaration of the 'Forest Principles' at the Rio Conference 1992. Several processes are underway in different regions of the world to define sets of C&I that can be used to assess the social, economic, and ecological sustainability of forest management. Some have focused more at national level, while others have emphasised information needs at the forest management unit level. In an attempt to produce a generic 'master set', the Center for International Forestry Research (CIFOR) has carried out several tests to compare the different sets of C&I in existence. At the forest level, ecological criteria are much easier to apply than social ones as the latter often require an in-depth understanding of areas beyond the intermediate boundaries of the forest management unit. To help people in different areas adapt the generic hierarchy of C&I to their own conditions, CIFOR is developing a computer programme (CIMAT) which allows the addition of local knowledge and iterative development of locally-specific C&I. Further work is needed but the importance of defining a comprehensive but practical set of C&I is that such a measurable and comparable methodology would build public confidence in forest sustainability.

Rural Development Forestry Network Paper/ODI, 23a, Summer 1998. 20p. Also published: Criterios e indicadores para la ordenación forestal sostenible: nuevos hallazgos de la investigación realizada por CIFOR al nivel de la unidad de manejo forestal. Red Forestal para el Desarrollo Rural No. 23a. (in Spanish)
Critères et Indicateurs d'une gestion forestière durable: Nouveaux résultats des recherches du CIFOR au niveau de l'unité de gestion forestière. Réseau de foresterie pour le développement rural no. 23a. (in French)

Appendix: Workshop and Conference Papers in 1999 (unpublished)

This section includes papers presented at conferences, seminars and workshops whose proceedings have not yet been published, contributions to newsletters and unbrefereed documents appearing on the World Wide Web.

106. Technological change in agriculture and tropical deforestation: Definitions, theories and hypotheses.

Angelsen, A., Kaimowitz, D., Holden, S., Smith, J., and Vosti, S.

The paper introduces the debate on the opposing views of how technological change in agriculture relates to tropical deforestation. The authors hypothesise that the effect on deforestation depends on several factors: type of technology, farmer characteristics, market conditions, property regime, and agro-ecological conditions. The paper first provides a discussion of some concepts and definitions, and argues that changes in factor intensities (e.g., labour per hectare) are key factors in the analysis. Next, theories and theoretical arguments are reviewed, starting with the simple perfect market case, and then extending the analysis by including market imperfections (capital and labour constraints), several productions systems, and general equilibrium effects. Based on these theories, several hypotheses about possible effects of technological change on deforestation are outlined.

Paper presented at the CIFOR Workshop on Technical Change in Agriculture and Deforestation, CATIE, Turrialba, Costa Rica, 11-13 March 1999.

107. Forest operations and multiple resource management.

Dykstra, D.P.

The contribution of non-timber forest products to the global economy is significant, though probably less than that of timber products. In addition, non-timber resources provide substantial environment benefits that are difficult or impossible to measure in an economic sense but are nevertheless highly valued by society. In all parts of the world and at all levels of economic development, societies increasingly demand that forest managers consider the value of non-timber goods and services in making harvesting and silvicultural decisions. While this is not easy, methodologies are becoming available that at least are beginning to make the task feasible. Technologies that offer promise for incorporating non-timber values into harvesting and silvicultural decisions include the use of

comprehensive multiple-resource models to develop plans and to negotiate with interested parties, and the modification of forest practices in an effort to enhance non-timber values through the operations themselves. Operating technologies that reduce damage to residual vegetation, decrease soil disturbance, and improve timber recovery will benefit management while at the same time increasing substantially the value of the non-timber goods and services provided by forests.

Keynote presentation to the International Mountain Logging and 10th Pacific Northwest Skyline Symposium, 'New Technologies for Harvesting Systems, People, and the Environment in Mountainous Terrain', March 28-April 1, 1999, Oregon State University, Corvallis, Oregon, USA, 11p.

108. L'importance des produits forestiers non-ligneux pour les communautés rurales et urbaines du Cameroun.

Eyebe, A., Ndoye, O. and Ruiz-Perez, M.

Non-timber forest products (NTFP) are of critical importance for urban and rural communities. Their contribution (income, medicines, food) is essential for households involved in their harvesting. In rural areas, sustainable harvesting of NTFP can strengthen the management of community forests. In urban and semi-urban areas, NTFP generate high incomes for those who are involved in their trade. The various actors of the sector (peasants, traders, carriers, local governments) should establish closer relationships and develop more positive interaction. In addition, it is essential that research be more involved in the sector of NTFP, where there remains much to be done to improve the well-being of rural populations and the poorest urban populations. Lastly, the governments should give a real push to NTFP, while reconciling development and forest protection objectives.

Papier présenté à la Troisième Réunion du Réseau de la Foresterie Communautaire. Yaoundé, 4-5 Mai 1999

109. Spatial regression analysis of deforestation in Santa Cruz, Bolivia.

Kaimowitz, D., Mendez, P., Puntodewo, A. and Vanclay, J.K.

This paper applies a spatial economic regression model to analyse the relationship between deforestation in the period from 1989 to 1994 and access to roads and markets, ecological conditions, land tenure, and zoning policies in Santa Cruz, Bolivia. The data comes from a Geographic Information System database compiled by the Natural Resources Department of the Santa Cruz Government. Locations that are closer to roads and the City of Santa Cruz and that have more

fertile soils have a greater probability of being deforested. The same applies to colonisation areas. National parks and forest concessions seem to protect forests. Areas with rainfall levels optimal for soybeans have higher deforestation than drier or wetter areas.

Paper presented to Conference on Patterns and Processes of Land Use and Forest Change in the Amazon, 23-26 March 1999, Gainesville, Florida. 21p.

110. Diversified management of natural forests: Changing roles of tropical silviculture.

Sayer, J.A.

Current issues confronting those concerned with the conservation and management of tropical forests are explored. A critical issue is the balance between the goods and services provided through conventional forest management and those provided by other forms of forest management, and how this balance can be achieved in the broader landscape. This is the fundamental challenge of the ecosystem approach to forest management. This approach has the following characteristics: (1) the forest is managed for a wide range of potential products and services rather than for maximisation of a single product; (2) decisions about how the forest is to be used are made cooperatively with all the stakeholders who have legitimate interests in the forests and its use; (3) management of the forest is conducted on large spatial scales, with forestry and agricultural land uses integrated and complementary; and (4) management of the forest is adaptive and uses output measures to provide feedback and guide modifications to achieve desirable outcomes. This assumes that all components of the ecosystem have to be managed. Issues of connectivity permeate the problem.

This connectivity is relevant at two dimensions: first, in understanding the vertical linkages between upstream policies and downstream actions, and horizontally in understanding people's uses of different components of the landscape. These linkages are illustrated by reference to recent research papers from CIFOR on topics such as deforestation and forest degradation, biodiversity in managed forests, and understanding people's decision making. In an attempt to understand complex human interactions with forests and their diverse resources CIFOR has begun to develop generalisable models of decision-making by various forest stakeholders in a model called FLORES. It is concluded that there is a huge body of knowledge on tropical silviculture to support tropical forest management but achievement of diversified management of natural forests poses a

whole set of new scientific challenges that go far beyond the confines of traditional silvicultural research.

Paper presented at the 26th Anniversary and Inauguration of the Chair of Tropical Forest Management, CATIE, Turrialba, Costa Rica, 18 March 1999. 7p.

111. **Ecosystems, timber and biodiversity.**

Sayer, J.A.

Forestry evolved in an era when most management was aimed at meeting local needs and when the rate of change of the external environment was relatively slow. The challenge of modern natural resource management is one of managing non-bounded, non-linear systems and of dealing with high levels of unpredictability. Implications of applying the concepts embodied in ecosystem management (broadly defined) to implementation of programmes under the Convention on Biodiversity (CDB) are examined. The CBD has limited comparative advantage in bringing about large numbers of locality-specific 'solutions' favourable for biodiversity, but has a valuable role in developing concepts, promoting an appropriate policy environment and fostering the underlying science needed for optimal local outcomes.

To succeed, it must confront the intractable problem that meeting many global biodiversity objectives will involve opportunity costs in terms of foregone local development options and will require financial transfers from those who benefit from biodiversity conservation to those who incur the costs. New technologies can assist forest ecosystem management, but this is not primarily a technical problem, and the biggest challenge is to achieve a fundamental change in the culture and structure of forestry institutions. Their relationships with the users of forest lands must be redefined. Command and control management will have to be abandoned and be replaced by negotiation and arbitration. The need for ecosystem management of forests parallels a move toward different approaches to managing other enterprises confronted with highly dynamic environments. The difficult transition for forestry institutions will be to accept the need to substitute their prescriptions of a rigid solution with an informed choice from amongst a range of options identified in consultation with a broad base of stakeholders.

Paper presented to Session 8, Ecosystem Approaches in Forest Resource Use, at the Conference on Ecosystem Approaches to Biodiversity Conservation, September 1999, Trondheim, Norway.

112. Forest protected areas.*Sayer, J.A.*

An ecosystem approach to the management of forests for environmental values is advocated. Forest ecosystem management is defined as management: (1) to achieve an optimal balance of forest uses at a large, landscape scale; (2) to achieve an optimal balance of the various goods and services produced by the forests; (3) based on negotiations with all legitimate interested parties; and (4) based on feedback mechanisms that enable adaptation to achieve desired outcomes. A major challenge lies in the area of defining conservation objectives and achieving a balance between global conservation objectives and the local utilitarian objectives. A summary analysis of the extent to which the forests of the world are allocated to those categories defined by IUCN is provided, and some comparisons are drawn between the extent of such coverage in different countries and in different forest types. Information on the ways in which such coverage has changed in recent years is presented. Such global analysis is useful and more resources should be devoted to it, at the same time, more attention should be given to defining categories and other ways in which the conservation values of multiple use forests can be captured in statistics. Adaptive, locally appropriate management strategies must be found, and institutions built that are capable of operating in a decentralised way to achieve conservation objectives. Efforts to categorise and classify at a national or global level should follow this agenda but not drive it. Inevitably, most of the conservation values of forests will be achieved through multiple-use systems and by trees that exist throughout the broader agricultural and urban landscapes. Viewing the main objective of conservation as one of segregating a fixed percentage of forests into a totally inviolate reserve system may be dysfunctional in achieving real conservation needs.

Paper presented at the Intergovernmental Forum on Forests,
Brazil-United States of America Initiative,
San Juan, Puerto Rico, 15-19 March 1999. 8p.

113. The effects of economic crisis and political change on Indonesia's forest sector, 1997-99.*Sunderlin, W.D.*

An economic crisis and political changes that have occurred in Indonesia since 1997 have presented grave dangers but also important opportunities for the country. On the one hand, the depreciation of the rupiah against the dollar is part of a drastic economic downturn, but on the other hand, it represents an opportunity for increased

competitiveness of Indonesian exports and for increased prosperity for those involved in the export economy. The changeover of regimes from Suharto to B.J. Habibie led to much political instability, which compounded economic problems, but at the same time it has offered the potential for fundamental policy changes. This article assesses the consequences of these changes, both negative and positive, on people living in forested areas, on commercial activity within the forest sector and on the extent of forest itself. Among the findings are that: (1) two-thirds of the people in forested areas have become worse off during the crisis compared with their situation in the year before the crisis; (2) small farmers are increasingly interested in clearing forests for perennial tree crops rather than raising food crops in shifting cultivation systems; (3) pulp and paper have replaced plywood as the mainstay source of export revenue in the forest sector, although the origins of this transformation pre-date the crisis and the change cannot be solely explained by the crisis; (4) illegal logging has boomed during the crisis, but also cannot be entirely explained by the crisis; (5) oil palm development has slowed in the crisis period but is poised for future growth; and (6) positive forest policy changes have been introduced but in general fall short of the expectations of the reform community in Indonesia.

<http://www.cgiar.org/cifor/research/projects/effect-crisis.html>
(15 November 1999)

114. Agricultural intensification, deforestation and the environment: Assessing tradeoffs in Sumatra, Indonesia.

Tomich, T.P., Van Noordwijk, M., Budidarsono, S., Gillison, A., Kusumanto, T., Murdiyarso, D., Stolle, F. and Fagi, A.M.

The key hypothesis underlying Alternatives to Slash and Burn (ASB) research in Indonesia has been: intensifying land use as an alternative to slash and burn can reduce deforestation and poverty. Poverty reduction in most of the tropics depends on finding ways to raise productivity of labour and land through intensification of smallholder production systems without degrading forest functions. Estimates of returns to land and labour presented in this paper indicate that, from a purely private perspective, returns to forests conversion are high in Sumatra's peatlands. Because all derived land uses are inferior to natural forest regarding global environmental concerns e.g. carbon stocks and biodiversity conservation, ASB research has shown that land use change involves trade-offs between global environmental concerns and the objectives of poverty alleviation and national development. It also provides evidence that land use alternatives differ significantly in their ability to substitute for global environmental

services of natural forests. So although forest conversion has the biggest negative effect on these environmental services, the resulting land uses also matter.

To obtain estimates of regional or global impact directly from measures such as biodiversity, employment, household food security, and institutional and policy issues, it is necessary to assume independence, and hence additivity, across space. This assumption is reasonable for some measures but only a rough approximation for others. One of the key challenges of future ASB research is to be able to assess these phenomena at the landscape level. Ultimately, instead of the single land use system or technology, the most attractive way to achieve the various objectives is likely to come from combinations of complementary land use practices within a varied landscape. This landscape level analysis is not feasible now. The land use-specific analysis presented in this paper is a necessary precursor to that work.

Paper presented at AAEEAConference on Agriculture Intensification, Economic Development, and the Environment, Salt Lake City, Utah, USA, August 1998. 34p.

115. On yield regulation for sustainable forestry, with examples from Queensland.

Vanclay, J.K..

-abstracts is not available-

Paper to Workshop on Growth and Yield Regulation with Minimal Data, CATIE, Turrialba, Costa Rica, 5-9 July 1999. 5p.

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