Dutch Research on Tropical Rain Forests
An Overview and Analysis

DUTCH RESEARCH ON TROPICAL RAIN FORESTS
AN OVERVIEW AND ANALYSIS

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ACKNOWLEDGEMENTS

LIST OF ACRONYMS

aio	assistent in opleiding - *junior research staff at university*
BCRS	Netherlands Remote Sensing Board (the Netherlands)
CBS	Centraal bureau voor Schimmelcultures, KNAW - *Netherlands Research Institute on Fungi* (the Netherlands)
CERES	Research School for Resource Studies for Development (the Netherlands)
CIFOR	Centre for International Forestry Research (Indonesia)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CML	Centrum voor Milieustudies Leiden, Universiteit van Leiden - *Centre of Environmental Science, Leiden University* (the Netherlands)
CNRS	Centre National de Recherche Scientifique - *National Cnetre for Scientific Research* (French Guiana)
CTO-NIOO	Nederlands Instituur voor Oecologisch Onderzoek, Centrum voor Terrestrisch Onderzoek, KNAW - *Netherlands Institute Ecological Research, Centre for Terrestrial Ecology* (the Netherlands)
DGIS	Directoraat Generaal Internationale Samenwerking, Ministerie van Buitenlandse Zaken - *Directorate-General for International Cooperation, Ministry of Foreign Affairs* (the Netherlands)
DLO	Dienst Landbouwkundig Onderzoek, Ministerie van Landbouw, Natuurbeheer en Visserij - *Department of Agricultural Research, Ministry of Agriculture, Nature Management and Fisheries* (the Netherlands)
EC	European Commission
ECU	European Currency Unit
EIA	Environmental Impact Assessment
ETC	Educational Training Consultants (the Netherlands)
ETFRN	European Tropical Forest Research Network (the Netherlands)
ETI	Expert Center for Taxonomic Identification (University of Amsterdam, the Netherlands)
EU	European Union
EU-JRC	European Union - Joint Research Centre (Italy)
EZ	Ministerie van Economische Zaken - *Ministry of Economic Affairs* (the Netherlands)
FACE	Forest Absorbing Carbondioxide Emmission (the Netherlands)
FAO	The Food and Agricultural Organization of the United Nations (Italy)
FINNIDA	Ministry for Foreign Affairs, Department for International Development Cooperation (Finland)
fte	Full Time Equivalent
GO	Governmental Organization
GOA	Stichting Geologisch, Oceanografisch en Atmosferisch Onderzoek - Geological, Oceanographic and Atmospheric Research Foundation (NWO, the Netherlands)
IAC	Internationaal Agrarisch Centrum - *International Agricultural Centre* (the Netherlands)
IBN-DLO	Instituut voor Bos- en Natuur onderzoek - *Institute for Forestry and Nature Research* (the Netherlands)
ICG	Netherlands Centre for Geo-ecological Research (research school) (the Netherlands)
ICRAF	International Council for Research in Agroforestry (Kenya)
IDRC	International Development Research Centre (Canada)

IGBP   International Geosphere-Biosphere Programme (Sweden)
IHDP   International Human Dimension Programme (Germany)
IIED   International Institute for Environment and Development (United Kingdom)
IKC-N   Informatie en Kennis Centrum Natuurbeheer - *National Reference Centre for Nature Management* (the Netherlands)
INPE   Instituto Nacional de Pesquisas Espaciais (Brazil)
IPF   International Panel on Forests (USA)
ISRIC   International Soil Reference and Information Centre (the Netherlands)
ISS   Institute of Social Sciences (the Netherlands)
ITC   International Institute of Aerospace and Earth Sciences (the Netherlands)
ITTO   International Tropical Timber Organization (Japan)
IUCN   the World Conservation Union (Switzerland)
IUFRO   International Union of Forestry Research Organizations (Austria)
KNAW   Koninklijke Nederlandse Academie van Wetenschappen - *Royal Netherlands Academy of Science* (the Netherlands)
KUN   Katholieke Universiteit Nijmegen - *Catholic University Nijmegen* (the Netherlands)
LBA   Large scale Biosphere Atmosphere Experiment in Amazonia (the Netherlands, Brazil)
LNV   Ministerie van Landbouw, Natuurbeheer en Visserij - *Ministry of Agriculture, Nature Management and Fisheries* (the Netherlands)
NGO   Non-Governmental Organization
NLR   National Aerospace Laboratory (the Netherlands)
NNM   National Museum of Natural History (the Netherlands)
NOD   Nederlandse Onderzoek Databank - *Dutch Research Database* (KNAW, the Netherlands)
NRP-II   National Research Programme on Global Air Pollution and Climate Change - second phase (1995-2001) (the Netherlands)
NRSP-2   National Remote Sensing Programme - second phase (1995-2000) (the Netherlands)
NTFP   Non-Timber Forest Products
NUFFIC   Nederlandse organisatie voor internationale samenwerking in het hoger onderwijs - *Netherlands Organization for International Cooperation in Higher Education* (the Netherlands)
NWO   Nederlandse Organisatie voor Wetenschappelijk Onderzoek - *Netherlands Organization for Scientific Research* (the Netherlands)
NWO-biod   NWO Priority Programme 'Biodiversity in disturbed ecosystems' (the Netherlands)
OCW   Ministerie van Onderwijs, Cultuur en Wetenschappen - *Ministry of Education, Culture and Science* (the Netherlands)
ODA   Official Development Aid
ODI   Overseas Development Institute (United Kingdom)
oio   onderzoeker in opleiding - *junior research staff at university*
PIN   Programma Internationaal Natuurbeheer - *Programme on International Nature Management*
PROMAB   Programa Manejo de Bosques de la Amazonia Boliviana - *Research programme 'Sustainable use of forest products in the rain forest of Northern Bolivia'* (Utrecht University, the Netherlands)
PROSEA   Plant Resources in South-East Asia (the Netherlands)
RAWOO   Raad van Advies voor het Wetenschappelijk Onderzoek in het kader van Ontwikkelingssamenwerking - *Advisory Council for Scientific Research in Development Problems* (the Netherlands)

REPOSA	Research Programme on Sustainability in Agriculture (Wageningen Agricultral University, the Netherlands)
RIVM	Rijksinstituut voor Volksgezondheid en Milieu - *National Institute of Public Health and Environment* (the Netherlands)
RMNO	Advisory Council for Research on Nature and Environment (the Netherlands)
ROBO	Werkgroep Radar Bos - *Working group remote sensing research on forest* (the Netherlands)
RTR	Regeringsstandpu... Tropisch Regenwoud - *Dutch Government's Policy on tropical Rain forest*
RUG	Rijksuniversiteit Groningen - *Groningen University* (the Netherlands)
RUL	RijksUniversiteit Leiden - *Leiden University* (the Netherlands)
SBH	Stichting Bos en Hout - *Foundation for Forest and Forest Products* (the Netherlands)
SC-DLO	Staring Centrum, Instituut voor het Onderzoek van het Landelijk Gebied - *Staring Centre for Integrated Land, Soil and Water Research* (the Netherlands)
SHR	Stichting Hout Research - *Timber Research Foundation* (the Netherlands)
SLW	Stichting Levenswetenschappen (NWO, the Netherlands).
SPAAR	Special Programme on African Agricultural Research (World Bank, USA)
TFAP	Tropical Forestry Action Programme
TNO	Nederlands Toegepast Natuurwetenschappelijk Onderzoek - *Netherlands Organization for Applied Natural Science Research* (the Netherlands)
TRF	Tropical Rain Forest
TUT	Technische Universiteit Twente - *Technical University Twente* (the Netherlands)
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme (Switzerland)
UU	Universiteit van Utrecht - *Utrecht University* (the Netherlands)
UvA	Universiteit van Amsterdam - *University of Amsterdam* (the Netherlands)
VROM	Ministerie van Volkshuisversting, Ruimtelijke Ordening en Milieu - *Ministry of Housing, Spatial Planning and Environment* (the Netherlands)
VU	Vrije Universiteit - *Free University* (the Netherlands)
VWS	Ministerie van Verkeer en Waterstaat - *Ministry of Transport, Public Works and Water Management* (the Netherlands)
WAU	Landbouw Universiteit Wageningen - *Wageningen Agricultural University* (the Netherlands)
WCMC	World Conservation Monitoring Centre (United Kingdom)
WCRP	World Climate Research Programme
WCS	World Conservation Strategy
WNF	Wereld Natuur Fonds - *World Wide Fund for Nature* (the Netherlands)
WRI	World Resources Institute (USA)
WOTRO	Stichting voor Wetenschappelijk Onderzoek van de Tropen, NWO - *Netherlands Foundation for the Advancement of Tropical Research* (the Netherlands)
WWF	World Wide Fund for Nature (Switzerland)

SUMMARY

An overview/database of current Dutch research was made to serve as background documentation for the seminar 'Research in tropical rain forests: its challenge for the future'. The seminar to be held on November 25 and 26, 1997, is funded by the Dutch Directorate-General for International Cooperation (DGIS) and organized by the Tropenbos Foundation, a key institution to promote and coordinate Dutch research in tropical rain forests. The present study and report aims to provide insight into the ongoing Dutch Tropical Rain Forest (TRF) research programmes and projects, approximate participating research volume, themes of research, involved scientific disciplines, ways and approximate level of funding, and broad research achievements and impacts. The current research is reviewed in view of the Netherlands' policy, and set off against current issues in conservation and management on tropical rain forests.

The central objective of Dutch TRF policy is to encourage preservation of tropical rain forests through balanced and sustainable land and forest use. Strengthening of research is one of the strategies in this policy, and the main identified research themes are: sound land use (planning), conservation of ecosystems and biodiversity, sustainable forest management, and climate change, while strategic conditions include the strengthening of local research and stimulation of demand-driven and problem-oriented research, geared to local needs.

Information on research projects and institutions was compiled through (i) development, distribution and analysis of a data sheet; (ii) consultation of existing databases, project overviews, research plans and annual reports of relevant institutions; and (iii) consultation of persons involved in Dutch TRF research.

MAIN FINDINGS AND CONCLUSIONS

A total of 239 TRF research projects are recorded in the database, executed by some 60 Dutch institutions, including university institutions (research groups or faculties), research institutes, non-profit organizations and private consultancy firms. The majority of research is carried out by universities, and a relatively few number of institutions dominate Dutch TRF research, concentrated at the universities of Amsterdam (UvA), Leiden (RUL), Utrecht (UU) and Wageningen (WAU). Prominent research institutes include ministerial Departments of Agricultural Research (DLO), the International Institute of Aerospace and Earth Sciences (ITC), the National Museum of Natural History (NNM), and the National Institute of Public Health and Environment (RIVM).

Participation in research programmes
More than half of the projects are part of a programme. National strategic research programmes relevant to tropical rain forests include the Tropenbos Programme, the Netherlands Organization for Scientific Research (NWO) priority programme 'Biodiversity in disturbed ecosystems' and the National Research Programme on Global Air pollution and Climate change (NRP). Dutch TRF research also has linkages with international research programmes, notably the Centre for International Forestry Research (CIFOR) programme.

Geographic orientation

Most of the research is taking place in Latin America also involving the largest number of countries (18). Main countries are Guyana, Colombia, Costa Rica and Brazil. In Africa and Asia research is primarily concentrated in one country, Cameroon and Indonesia respectively.

Thematic orientation

A total of nine themes were distinguished in TRF research. Current Dutch TRF research is focussing on sustainable land use, conservation of ecosystems and biodiversity, sustainable forest management, and people-forest interactions. Themes which are somewhat under represented are forest rehabilitation, use of secondary forest, and policy, legal and institutional framework. There is a growing attention and efforts in research on Non-Timber Forest Products (NTFP). Research on conservation of ecosystems and biodiversity is primarily of a fundamental, scientific nature, with a large involvement of plant/animal taxonomy and biosystematics, and much research at a detailed level, i.e. species level, nutrient cycling. There is little attention paid to more strategic conservation issues and socio-economic aspects of ecosystem and biodiversity conservation, e.g. attitudes of local communities, property rights, are largely neglected in the ongoing research.

Dutch research volume (fte)

The total current Dutch research volume (fte) in TRF research is estimated at some 220 fte, two thirds of which is undertaken at universities. Findings indicate a dominant share of the natural sciences (including earth sciences) of about 85%. The contribution of social and societal sciences is still relatively marginal.

Ways and approximate level of funding

Funding of Dutch TRF research involves: (i) core funding by the Dutch Government of institutions (universities, research institutes) and programmes (Tropenbos, NRP),; (ii) funding by NWO of projects and programmes,; (iii) contract financing of projects, usually on a more short-term basis. The latter involves both Dutch and foreign funding agencies, i.e. the European Union (EU), the International Tropical Timber Organization (ITTO) and CIFOR. It was not possible to obtain a complete picture of the financial volume of Dutch TRF research. Based on financial details of nearly half of the projects, the current yearly expenses of all projects could be approximately Dfl 50 million. The yearly contribution by DGIS to Dutch TRF research is estimated at Dfl 5 million. Other main funding agencies include the Ministries of Education, Culture and Science (OCW), LNV and Housing, Spatial Planning and Environment (VROM) (mainly Global Change programme, NRP-II), and the EU.

Results, achievements and impacts

The scope and time limit of the present study did not allow a comprehensive analysis of achievements and impacts. Results can be assessed in four categories: (i) generated knowledge and insights; (ii) impact on policy; (iii) impact on forest management; and (iv) capacity building. Achievements of selected Dutch TRF research programmes are presented.

Recommendations

The present overview and database provides a good basis and reference for further in-depth analysis of Dutch TRF research. Some vital aspects of research could not be analysed satisfactorily in this study, and further studies are needed/recommended on the following issues:

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- development of research agendas, both in the TRF countries and in the Netherlands: mechanisms and procedures, priority setting etc.;
- coherence and collaboration in Dutch TRF research, also in relation to international research;
- participation/involvement of local institutions and other stakeholder groups in the TRF countries, both in formulation and execution of the research;
- achievements and impacts of the research, with emphasis on clients' views, target groups and beneficiaries in the TRF countries.

Finally: also through contributions of Dutch research we know more and more about tropical rain forests: their importance for sustaining the livelihoods of local people, how they function, how biologically diverse and rich they are, how fragile they are, how they could be managed in a more sustainable way, and how they disappear. A critical issue is how to incorporate and use new insights and knowledge in practical policy, planning and management. Perhaps more research is needed on this theme, in order to indicate mechanisms and conditions for this process, and to develop strategies for extension, communication and policy implementation.

1. INTRODUCTION

1.1 Background

Governments, the general public and the international community at large have manifested increasing uneasiness and concern over the clearing and degradation of forests all over the world. For instance, by devoting a significant part of its debate and decisions to issues of forest conservation and development, the United Nations Conference on Environment and Development (UNCED, Rio de Janeiro 1992) has amply reflected this concern about the world's forests.

Tropical rain forests require special attention because of their specific nature, their great importance and the fact that vast areas of forest are disappearing as a result of demands for new farmland and timber. They are among the most species-rich ecosystems in the world and provide a habitat for humans and wildlife and a source of livelihood for indigenous peoples and others. Fortunately, it is more and more realized that the process of deforestation must be controlled to prevent the irreversible loss of biological and natural resources and (inter)national action and strategies are aimed to achieve sustainable forest management and conservation.

However there cannot be sound decisions and action in the management of forests at any level, whether local or global, without essential information on status, nature and functioning of the forests and on interrelationships with people. The scientific community's role is to provide this information and to develop technologies appropriate for both long-term use and conservation of the forests.

The main goal of the Dutch government's policy on tropical rain forests is sustainable conservation and development of the forest which guarantees an optimum utilisation of the various goods, services and functions. In this policy, research executed by Dutch and international institutions/research programmes, is considered as an important supportive instrument to facilitate sound decision-making and sustainable forest management. As a consequence considerable Dutch funds and efforts have been and are being directed to execute research in tropical rain forests, and a broad Dutch expertise and capacity in this field is available. The Government considers the Tropenbos programme, a Dutch initiative set up in 1986, as a key institution to promote and coordinate Netherlands' research in tropical forests. Tropenbos is also the Dutch national node, and currently the host of the European Tropical Forest Research Network (EFTRN).

On November 25 and 26, 1997, the seminar 'Research in tropical rain forests: its challenge for the future' will be held, aiming to analyse and discuss research facilitated by The Netherlands. The seminar is funded by the Dutch Directorate-General for International Cooperation (DGIS) and is being organised by the Tropenbos Foundation. To facilitate the coordinating role of Tropenbos in general, and the seminar in particular, a comprehensive overview of Dutch research in tropical rain forests and Dutch research capacity is needed.

1.2 Scope and objectives of the study

The present study and report, which will serve as background documentation for the seminar, aims to provide an overview of ongoing Dutch research activities in tropical rain forests. The focus is on research coordinated and executed by Dutch institutions. The study should provide insight into the major ongoing research programmes, approximate participating Dutch research volume, themes of research, involved scientific discipline, ways and approximate level of funding, and broad research outputs. The resulting overview is evaluated in view of the Dutch government's policy on tropical rain forests, in particular the research policy, and is set off against major current issues in the conservation and management of tropical rain forests.

Using the information gathered in this survey, Tropenbos intends to develop and maintain/update a database on Dutch tropical rain forest (TRF) research, to be integrated in the EFTRN database. The database (on diskette), together with the publication, will be distributed among the Dutch institutions involved in TRF research and other relevant, i.e. policy and advice, organisations. Use and consultation of the database could facilitate improved coordination and attuning of research activities.

2. METHODOLOGY

2.1 Definitions and delimitation

For selection of research projects to be included in the present overview, the following criteria are used:

a) **Definition of research projects**: research projects are defined as projects where research is the main component. More practical implementation projects (reforestatiqn, community forestry development, strengthening park management etc.), often having a small research component, are excluded. Also excluded are training projects/programmes, even when specifically aimed to strengthen research capacity.

   Research includes both field research, - surveys and - inventories, and desk studies such as policy evaluations, forest sector analysis, development and definition of criteria for timber certification. The overview involves both basic/fundamental -, strategic - and applied research.[1]

b) **Research themes/subjects**: in principle, all research taking place in tropical rain forests and research related to conservation and sustainable management and use of tropical rain forests is included, regardless of research discipline. For instance: agricultural research on shifting cultivation, sustainable crop systems or agroforestry in the direct surroundings of tropical rain forest is included; agricultural research in the wet tropics without any relation to forest conservation or management is excluded.

   Eight broad themes or areas of TRF research are distinguished (Appendix 2). The classification system roughly corresponds to the policy strategies of the Netherlands Government (LNV, 1992), the classification applied by Tropenbos and to the broad themes defined in the European Commission (EC) Guidelines for Forest Sector Development Co-operation (EC, 1996).

c) **Project execution and funding source**: all research coordinated and/or executed by Dutch (research) institutions is included, regardless of funding source. Funding sources may involve Dutch agencies Governmental Organizations (GOs), Non-Governmental Organizations (NGOs), other bilateral agencies and international agencies (e.g. EU, ITTO).

   Research funded by The Netherlands and executed by either international or local research organisations (in TRF countries) will be briefly referred to, and the latter will be included in the overview/database only when executed under the umbrella of a Dutch research programme (e.g. Tropenbos).

d) **Period, status**: all current (mid-1997) ongoing research projects are included. Also included are: (a) planned projects, for which funds are already committed, starting during 1997/98; and (b) projects completed during 1996/97.

2.2 Approach

Various approaches were used to gather the information:

1) Study of existing documentation, including policy documents, annual reports, research plans and evaluation reports of research institutions and research programmes, and existing databases such as Nederlandse Onderzoek Databank-Nederlands Bureau voor Onderzoek Informatie (NOD), Special Programme on African Agricultural Research (SPAAR), and EFTRN;
2) Development, distribution and analysis of a data sheet on institutions and projects (Appendix 3);
3) Consultation with various persons involved in Dutch TRF research (Appendix 2).[1]

Fundamental research	Scientific research for the purpose of advancing knowledge, without specific objectives for its application.
Strategic research	Research that is mission focused, fundamental in approach, however, seeking to understand those natural and human processes identified as important to the solution of a certain problem. Often in long-term research programmes.
Applied research	Research to solve a certain problem, with use/application of existing knowledge and to obtain direct relevant solutions/information.

3. DUTCH POLICY ON TROPICAL RAIN FORESTS AND RESEARCH

3.1 Current Dutch policy

The Netherlands' Government's policy on tropical rain forests is elaborated in a policy paper specifically on tropical rain forests (hereafter referred to as 'regeringsstandpunt tropisch regenwoud' (RTR) (LNV, 1992). Other Netherlands policy plans, generally with a broader scope, relevant to tropical rain forests include the DGIS policy document 'A world of difference' (DGIS, 1991) the National Forest Policy Plan (LNV, 1993), the National Environmental Policy Plan (VROM, 1993), the DGIS Biodiversity Policy paper (DGIS, 1994), the Programme on International Nature Management (PIN) 1996-2000 (LNV, 1995) and, most recently, the DGIS Sector and Policy Document on Forests and Forestry (DGIS, 1997b). The Government has adopted the following central policy objective on tropical rain forests (LNV, 1992):

> *to encourage the preservation of the tropical rain forest through balanced and sustainable land and forest use, with a view to halting the current rapid process of deforestation along with other environmental degradation.*

Nationally and internationally, the government aims to implement the policy by means of nine basic strategies. The first five are linked directly to the tropical rain forest and its restoration, and the last four are back-up strategies aimed at creating conditions conducive to implementation.

I   *Active protection of surviving rain forests*
II   *In principle, no collaboration with projects and developments that are harmful or potentially harmful to the rain forest*
III   *Encouraging planned land use and land management along with sustainable agriculture and forestry*
IV   *The tropical timber trade: controlled harvesting; encouraging the formulation and implementation of long-term planned timber production*
V   *National and international encouragement for afforestation and reforestation projects*
VI   *Strengthening institutions and legislation; empowering local populations*
VII   *Strengthening the political and social base in tropical nations*
VIII   *Improving economic relations and relieving the debt burden*
IX   *Increasing scope for national and international tropical rain forest policy by strengthening research and institutions.*

In its research strategy (IX) the Government seeks to ensure that a clearer line is followed in research relating to tropical rain forests so that the findings may contribute to the conservation of primary tropical rain forest and their sustainable use. Main aims are: an increase in basic knowledge of the significance of tropical rain forests, ecosystems, genetic diversity and effects on the climate; the development of methods to quantify the various functions of tropical rain forests and an increase in the understanding of the ecological and economic aspects of sustainable forest management geared to production of timber and other products. Other research to be supported includes: research in the area of land-use planning and land development, also to identify tropical rain forest conservation areas; studies that seek to establish criteria

for sustainable forest management in the tropics; research into environmentally friendly alternatives for tropical hardwood; inventories of endangered species and their protection under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and research into the effects of CO_2 increase in the atmosphere and into ways of limiting this increase.

The Dutch Government intends to strengthen the basic disciplines relevant to research on tropical rain forests, for instance by encouraging research programmes and mechanisms that enable researchers to acquire the necessary know-how and experience. To ensure that available research capacities are used effectively, the Government will advocate coordination among the Tropenbos Programme, EC programmes and world programmes. Strengthening of the research capacity in the TRF countries is considered a key element.

Since the formulation of RTR in 1992, the UNCED policy strategies and guiding principles on sustainable forest management have been incorporated in the Dutch Government's (inter)national forest policy.

Other Dutch policy plans refer to and underline the RTR policy, however employing different accents and priorities. The Biodiversity policy paper emphasises that research should achieve direct applications for conservation and sustainable use of biodiversity and underscores the role of local research institutions. Increased TRF research efforts aimed at preservation of biodiversity is recommended.

In the DGIS sector policy document on forests and forestry (DGIS, 1997b) it is observed that knowledge and means to apply sustainable forest management are still inadequate. Access to existing knowledge and expertise is insufficient and in addition, forest research is too little geared to practical application of results for sustainable forest management. To implement the Netherlands' international forest policy, research programmes will be supported and strengthened, i.e. in the following areas: sustainable forest management; criteria and indicators for sustainable forest management; causes of degradation of primary forests; preservation of genetic diversity; and fragmentation and restoration of secondary forests. A better coordination and attunement among the research policies and programmes of the various (inter)national institutions, such as Tropenbos Foundation, CIFOR, the International Union of Forestry Research Organizations (IUFRO), the International Council for Research in Agroforestry (ICRAF) and the World Resources Institute (WRI) will be stimulated. At the national and local level in developing countries, research capacity will be strengthened, and support to research by national and local institutions, in cooperation with Dutch or international research institutions, will be continued. Research results have to be geared to support sustainable forest management at national and local level.

The PIN policy (LNV, 1995) stresses the need for maintaining an adequate Dutch research expertise and infrastructure in International Nature Conservation/Management. Strengthening alliances of expertise, both nationally and internationally, is recommended. With regard to the nature and type of research, a shift from fundamental, strategic research towards applied and short-term client research is observed, sometimes having a negative impact on existing Dutch expertise (for instance in taxonomic disciplines). Due to this shift, important functions of research, including development of new approaches, broadening of scope/visions and knowledge, are also under increasing pressure. The PIN policy calls for increased attention in the dissemination and application of research results. Thematically, research in the PIN framework will focus on concrete nature preservation and development, and an interdisciplinary approach is recommended.

The role and objectives of research in Netherlands development cooperation are elaborated in the policy paper 'Research and development cooperation' (DGIS, 1992). Among others, it contains policy guidelines and recommendations on the gearing of research to demands in the developing countries, to the needs of the poor, and it suggests instruments and mechanisms to strengthen local research capacities and to disseminate and apply research results. One of the recommended instruments in bilateral cooperation is the development of long-term thematic (e.g. environment) research programmes with the following objectives/characteristics:

development by the developing countries of their own research agendas;

multi-disciplinary approach;

involvement of policy makers, NGOs and other stakeholder groups in the developing countries in the formulation of the programmes, or development of demand driven programmes;

use/application of research results in Netherlands policy development;

incorporation of the programmes in international and national research networks;

preferably strengthening already existing research capacity;

ownership and responsibility of the programmes as much as possible with the countries concerned.

So called intermediate (Dutch) organisations, with partners in the developing countries, have to play a major role in the implementation of these programmes.

Table 1   Summary of main research themes/issues in Dutch TRF policy

Theme	Issues
Sound land use (planning)	Planning methodology; development of alternative land-use options; planning for conservation
Conservation of biodiversity	Ecosystem functioning; preservation of ecosystems and genetic diversity; protected area management
Sustainable forest management	Criteria and indicators for sustainable forest management; indigenous forest management; NTFP; development of operational systems for sustainable timber production; environmentally friendly alternatives for tropical hardwood
Reforestation, restoration of secondary forest	Causes of forest degradation
Climate change	Effects of the of CO_2 increase in the atmosphere and ways of limiting this increase

Strategic conditions/issues

Strengthening local research capacity
Demand driven and problem oriented, geared to local needs
Integrated, multi- and interdisciplinary approaches
Long-term strategic programmes, containing both fundamental and applied research elements
National- and international coordination and streamlining
Attention for gender issues

3.2 Relation of Dutch policy to international conventions, strategies and research programmes

International policy frameworks, strategies and conventions relevant to tropical rain forests and supported by the Dutch Government, include the World Conservation Strategy (WCS), the UNCED resolutions, the International Panel on Forests (IPF) action programme, the Tropical Forestry Action Programme (TFAP), the Biodiversity convention, and the Climate convention. The Netherlands' Government adheres to the implementation of these conventions and strategies, among others through partnerships with international organizations such as the Food and Agricultural Organization (FAO), the United Nations Environment Programme (UNEP), the World Bank, ITTO, the World Conservation Union (IUCN), and the World Wide Fund for Nature (WWF).

The WCS, published in 1980 by IUCN, with the support of UNEP and WWF, pinpointed the vital role that tropical rain forests play. Their importance as a reservoir of biological diversity, coupled with the protective services that they provide - particularly their role in the maintenance of global climate, has raised tropical rain forests as a priority on the list of world environmental problems. The WCS proposes increased and more management oriented research.

The United Nations Conference on Environment and Development (UNCED, Rio de Janeiro 1992) devoted a significant part of its debate and decisions to issues of forest conservation and development. The unbinding Forest Principles were formulated, together with recommendations to combat deforestation (Agenda 11, chapter 11), also including recommendations for research related to its four programme areas:

A. Sustaining the multiple roles and functions of forests.
B. Enhancing the protection, sustainable management and conservation of forests, and the greening of degraded areas, through forest rehabilitation, afforestation, and reforestation.
C. Promoting efficient utilization and assessment to recover the full valuation of the goods and services provided by forests.
D. Establishing and/or strengthening capacities for the planning, assessments and systematic observations of forests and related programmes, projects and activities, including commercial trade and processes.

As part of the implementation of its policy on international forest research, the Dutch Government supports the Centre for International Forest Research. CIFOR devotes a significant part of its research to tropical rain forests and has developed 10 programmes/projects, indicating the scope of CIFOR's research policy and activities:

1. Underlying causes of deforestation, forest degradation and poverty in forest margins.
2. Forest ecosystem management.
3. Multiple resource management of natural forests.
4. Assessing the sustainability of forest management: testing criteria and indicators.
5. Plantation forestry on degraded or low potential sites.
6. Conservation of biodiversity and genetic resources.
7. Local livelihoods, community-based management and devolution.
8. Sustainable use and development of non-timber forest products.
9. Research impact, information and capacity building.
10. Policies, technologies and global changes.

3.3 Policy development and advice

The Dutch policy on tropical rain forests has been jointly developed by four Ministries: DGIS, LNV, VROM and Economic Affairs (EZ), with inputs and advice from various organisations including environmental NGOs (IUCN-Netherlands, Wereld Natuur Fonds (WNF), Advisory Councils, and (ad hoc) Committees such as the 'Stortenbeker Committee' (criteria and indicators for sustainable forest management).

Advisory Councils relevant to thematic and strategic orientation of TRF research are the Advisory Council for Scientific Research in Development Problems (RAWOO) and the Advisory Council for Research on Nature and Environment (RMNO). The mission of the RAWOO is to advise the government on matters of policy related research in the area of development problems, and to keep the government informed of developments in this area. One of its advisory reports, 'A medium-term perspective on research for development' (RAWOO, 1995) presents a number of proposals for the elaboration and specification of certain research themes, based on a survey and analysis of the supply (available Dutch research capacity) and demand side (priorities/requirements on the Southern research agenda). Taking the aims of sustainable development as its departure point, and building upon the priorities contained in international (i.e. UNCED) and Southern research agendas, RAWOO distinguishes five major directions/clusters for future research, one being research directed towards the conservation, restoration and sustainable management of the resource base. The four focal themes in this cluster are: (i) sustainable agriculture; (ii) use and management of renewable natural resources; (iii) climatic change and the management of coastal areas; and (iv) biodiversity. Besides the specification of thematic research themes, organizational and methodological recommendations are put forward. RAWOO strongly endorses the development of long-term strategic research programmes. It considers the programmatic method highly suited to a problem and demand oriented approach, keyed to the needs in developing countries, as well as to multi- and interdisciplinary cooperation, participation by users and a combination of research and capacity building.

The Advisory Council for Research on Nature and Environment (RMNO) advises the Government on medium and long-term research on nature and environment. The council also gives recommendations with a view to promoting coordination and stimulation of research. Both the natural and gamma sciences, including economics, social and political sciences, are included in the RMNO activities. RMNO contributed to the aforementioned RAWOO publication. In addition, it has produced a considerable number of publications, including overviews of (inter)national research and strategic views on long-term research, among others on ecological and biodiversity research.

3.4 Implementation of Dutch TRF research

Within The Netherlands' Government the following Ministries are involved in the steering and funding of tropical rain forest research:
- Ministry of Foreign Affairs, Directorate-General for International Cooperation (DGIS).
- Ministry of Agriculture, Nature Management & Fisheries (LNV).
- Ministry of Education, Culture and Science (OCW).
- Ministry of Housing, Spatial Planning and Environment (VROM).
- Ministry of Economic Affairs (EZ).

Research is implemented in four ways, according to the funding and executing institution:

1) research coordinated and/or executed by Dutch institutions, and largely financed by the Dutch Government;

2) international research institutions (i.e. CIFOR), supported by financial contributions from the Netherlands' Government, notably through 'core' funding;

3) research funded by The Netherlands and executed by national institutions in the TRF countries;

4) research (primarily) financed by international or foreign funding agencies and executed by Dutch institutions.

The first channel involves structural core funding of universities, research institutes and core funding of research programmes, a.o. NWO-research programmes, the Tropenbos Programme, the National Remote Sensing Programme (NRSP-2) and NRP-II.

4. OVERVIEW OF DUTCH TROPICAL RAIN FOREST RESEARCH

4.1 Development of the database

A database on institutions and projects was developed by compilation of the replies on the data sheet, in combination with a more active approach to the key institutions involved in TRF research. A selection of institutions was made, aided by information and knowledge at the Tropenbos office and 'A guide to Dutch organizations on tropical forest and nature management' (BOS Foundation, 1996). In the selection and compilation of project information, existing project databases (EFTRN, NOD, SPAAR) and overviews of the Netherlands Centre for Geo-ecological Research (ICG), the Centre for Resource Studies and Human Development (CERES), Sense, NRP and NRSP were screened, in addition to annual reports and research plans.

These combined efforts resulted in a total of 58 institutions and 239 TRF projects included in the database. The database, in Microsoft Access (Appendix 6), has two parts: one on institutions and one on projects. Institution in this sense means the department or research group of a university, one of the DLO research institutions, or a non-profit organization. The project database has two levels of aggregation, the individual project and the programme level. Consistency in this system also depends on the way project information is being aggregated and reported by the institutions concerned.

The following description of the on-going Dutch research in tropical rain forests is based on analysis of the various sources of information. Not all elements of the data sheet have been used for a quantitative analysis due to gaps and inconsistencies in the information. For instance, results and impact of research is treated in a more qualitative way at programme level, while the total funding and budget can only be roughly indicated.

4.2 Structure and organization of Dutch TRF research

In commencing a compilation and analysis of research activities, one initially seems to be confronted with a Gordian knot. For instance, the same project may be listed under various programmes or institutions, and can easily lead to double counting. The reason for this is that projects are often both co-executed and co-funded. Therefore a first step was to distinguish the broad national research programmes, with their principal executing institutions and the funding agencies. Appendix 4 gives an overview of these programmes and of the main university research programmes relevant to tropical rain forests. The various links and participation of institutions in research programmes are shown in Table 2.

Of these broad multi-institutional programmes, the Tropenbos Programme is exclusively aimed at tropical rain forests. The NWO priority programme 'Biodiversity in disturbed ecosystems' (NWO-biod) has most of its ongoing research located in tropical rain forests, while other programmes and the research schools have only part of their research related to tropical rain forests. The national programme on global change (NRP-II) has a worldwide character, with location specific case studies in tropical rain forest regions.

The national research programmes have a coherent research agenda and programme. Research schools, established at the beginning of the nineties as part of a new organizational structure within Dutch

universities, are institutions where related research groups or institutions collaborate in the same field of research. The coherence of the research programmes and effective cooperation among institutions varies considerably per school. A number of the projects presented under the research schools' project overviews are part of PROMAB (research programme 'Sustainable use of forest products in the rain forest of Northern Bolivia), Tropenbos and other programmes.

Table 2   **Participation of Dutch institutions in national research programmes and research schools**

	National research programme				Research school		
	NRP-II	NRSP-2	NWO-biod	Tropenbos	Biodiversity	CERES	ICG
Universities							
RUG			O	O			
RUL	O		O	●	●		
UU				●	●	●	O
UvA			●	●	●	O	●
VU						O	O
WAU	O	●	O	●		●	
Research Institutes							
DLO		O		●			
RIVM	●						
ITC		O		O			
NNM			O	O	●		
ISS						O	
CBS			O	O	O		
CTO-NIOO			O				

●   > 3 fte involvement in TRF research
O   < 3 fte involvement in TRF research

There are also linkages among the programmes, for instance between NRSP-2 and Tropenbos, and NWO-biod and Tropenbos. Finally, several Dutch institutions and national programmes are involved in international research activities, i.e. in:

- CIFOR research programme (Tropenbos, PROMAB, WAU, UU)
- the International Geosphere-Biosphere Programme (NRP-II, RIVM)
- the LBA-programme: Large scale Biosphere Atmosphere Experiment in Amazonia (the Winand Staring Centre (SC-DLO), the Free University (VU), the State University Groningen (RUG), and RIVM).
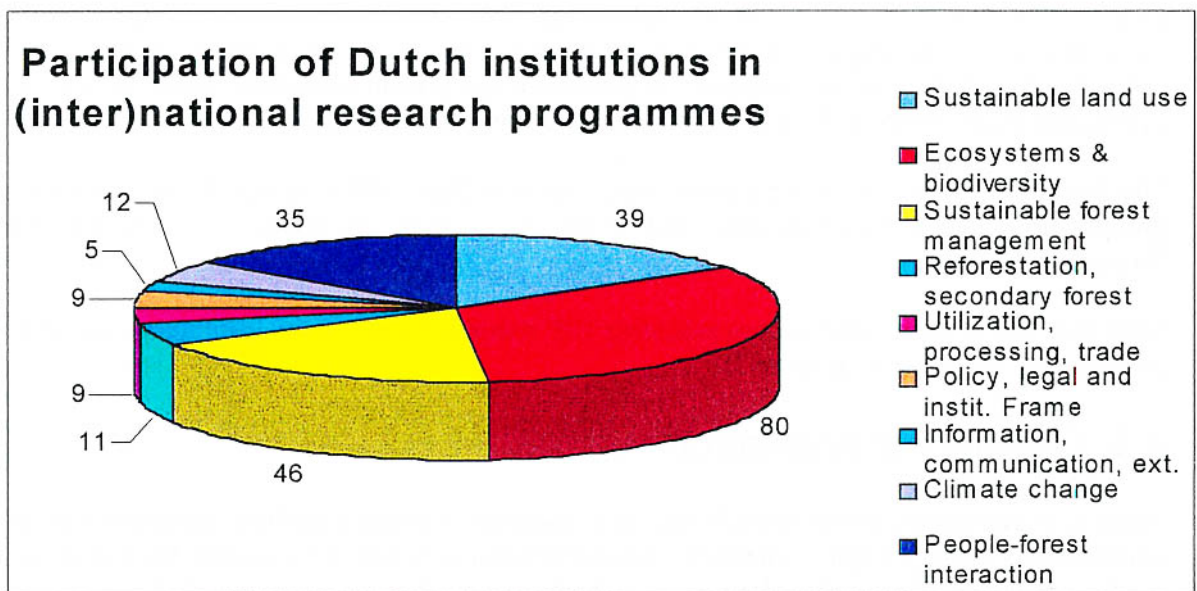
Figure 1   Participation of Dutch institutions in (inter)national research programmes
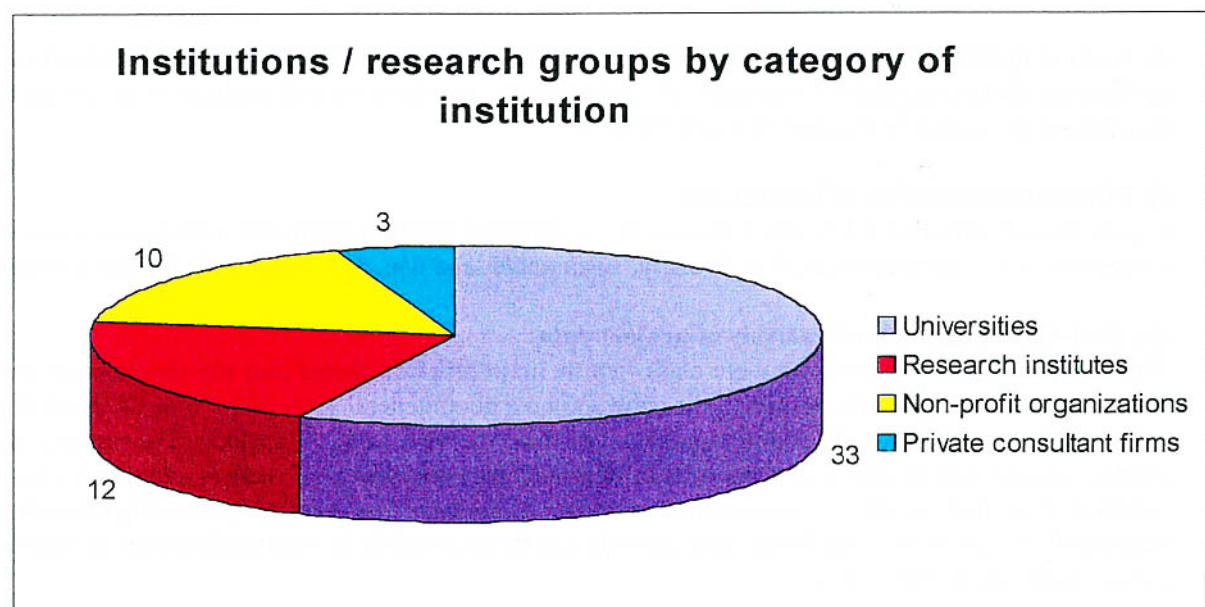

Figure 2   Institutions / research groups by category of institution

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Results of the data sheet indicate that about 50% of the institutions involved in TRF research participate in (inter)national research programmes (Figure 1), and 100 out of the 239 ongoing projects are individual and 139 part of a programme. Non-profit organizations and private consultancy firms are less involved in research programmes, and are predominantly executing individual projects.

The Tropenbos Programme holds a prominent position in Dutch TRF research. Sixteen Dutch research groups participate in the programme, and 73 out of a total of 239 projects are executed under the Tropenbos umbrella.

More than half of the research groups executing TRF research are university institutions, predominantly departments 'vakgroepen' (Figure 2).

4.3 Geographic orientation

Analysis of geographic orientation of research is based on the project database, calculating the number of projects per country. Figure 3 shows the geographic focus of Dutch TRF research. Most of the research is taking place in Latin America also involving the largest number of countries (18). Main countries are Guyana, Colombia, Costa Rica and Brazil. In Africa and Asia research is primarily concentrated in one country, Cameroon and Indonesia respectively. There is an obvious correlation between the geographic concentration of Dutch research, expressed in number of projects, and the location of the Tropenbos research sites: Indonesia (23 Tropenbos projects out of a total of 59), Cameroon (16 on a total of 31), Guyana (24 on a total of 39) and Colombia (8 on a total of 28).

4.4 Thematic orientation

Analysis of thematic orientation of research was made in two ways: (i) based on results of the institutional profile data sheet (Appendix 3, question 10), and (ii) post-classification and analysis of the project data. Results are presented in Figures 4a-c and Table 3.

(i) Thematic orientation of institutions
Figure 4a indicates that all research themes are covered by Dutch institutions, with a concentration on conservation of ecosystems and biodiversity, sustainable land use, and sustainable forest management.

(ii) Post-classification and analysis of project data
The 239 projects in the database were classified by main research theme and sub-themes according to Table 3, which also gives the results of the analysis and a good general view of the type of research being executed. Figure 4b shows the results aggregated by main theme for all 239 projects. The research themes climate change and people-forest interaction were added to the original 7 themes and themes 1-4 were subdivided to allow a better research characterization. number of projects are addressing more than one research theme, however they have been classified as far as possible by one single theme or sub-theme, reflecting its main orientation.
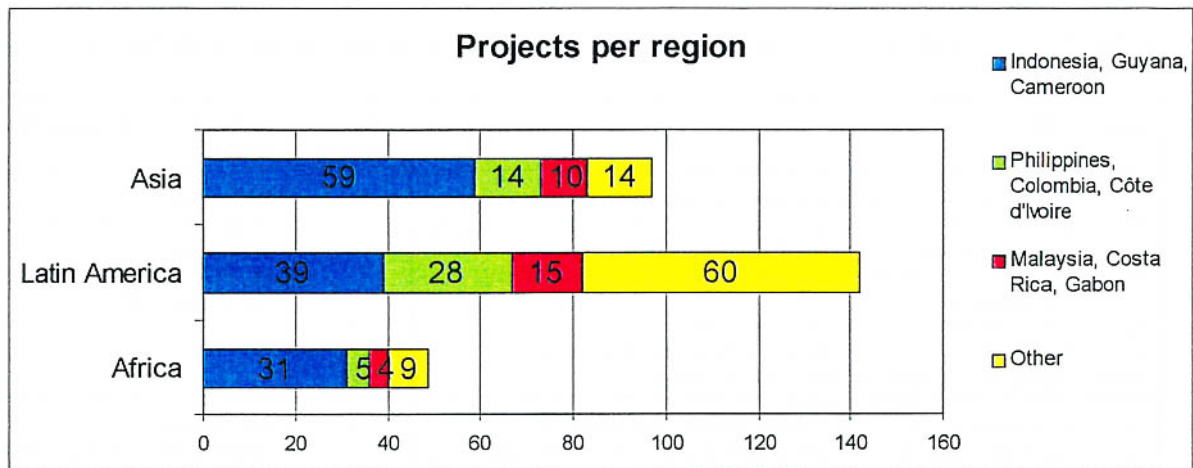
Figure 3a   Geographic orientation of Dutch TRF research
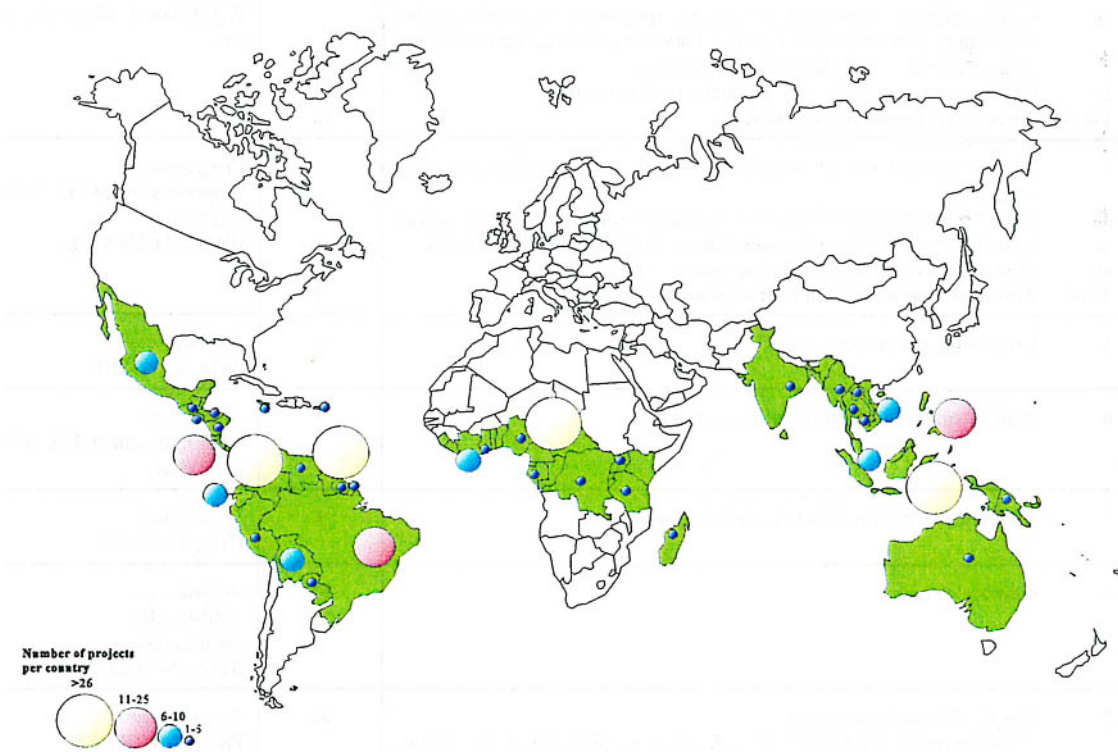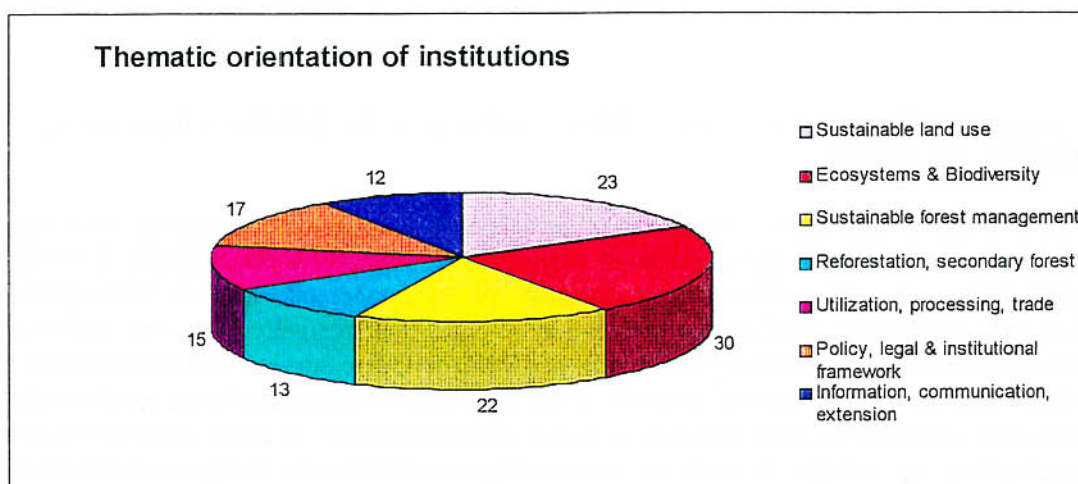

Figure 3b   Geographic orientation of Dutch TRF research

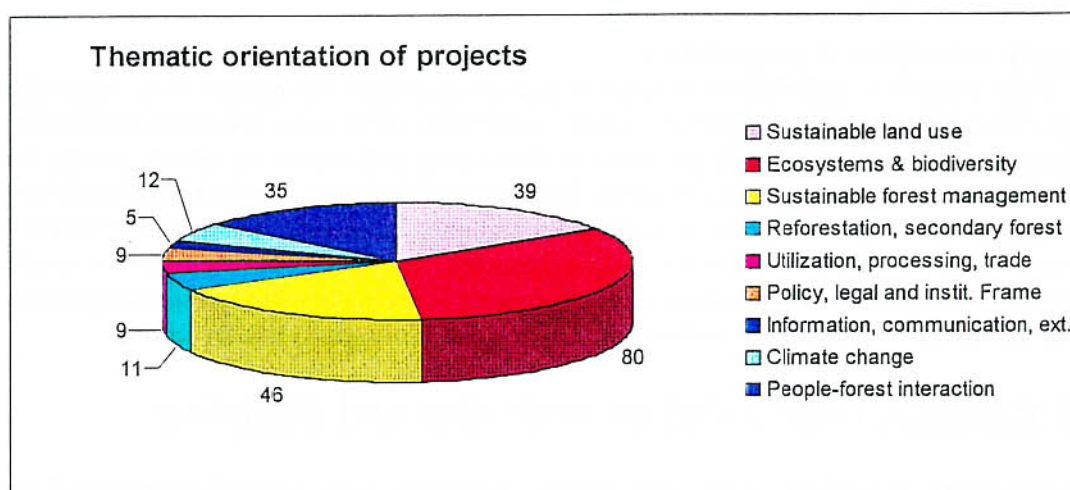# Table 3 — Thematic orientation of projects and involved programmes/institutions

Research theme	No. of projects	(main) Involved programmes and institutions [1]
1 Sustainable (forest) land use planning and development (not specified)		*Programmes:* Tropenbos, REPOSA, NRSP-2;
1a Development of survey methods for land use planning, also including development forest assessment & monitoring systems	17	*Institutions:* SC-DLO, WAU (agr, whh), ITC, ISRIC, DHV, IMAG-DLO
1b Forest/land inventories, surveys and monitoring (forest monitoring, land-use zoning, EIA)	12	
1c Development of sustainable land use options	5	
1d Survey/inventory for planning and management of conservation areas	5	
Total **Sustainable land use planning and development**	39	
2 Conservation of ecosystems and biodiversity (not specified)	2	*Programmes:* NWO-biod, Flora & Fauna Malesiana, Tropenbos
2a Ecosystem level: ecosystem functioning: nutrient and water cycling, (micro) climate; evolution, succession; plant-animal relations; vegetation structure and dynamics; biodiversity (at ecosystem level) and relation with ecosystem functioning	35	*Institutions:* RUL(rhb), NNM, UU (boev, eth), UvA (isp, ppa), WAU (bosb, pt, ton)
2b Species level: plant/animal taxonomy; plant/animal ecology, genetic - and species biodiversity	41	
2c Socio-economic aspects of biodiversity (attitudes, use)	2	
Total **Conservation of ecosystems and biodiversity**	80	
3 Sustainable forest management (not specified)	2	*Programmes:* PROMAB, Tropenbos
3a development of concepts, criteria and indicators for sustainable forest management	4	*Institutions* WAU (bosb), IBN-DLO, UU (boev, pg)
3b development of operational systems for (primarily) sustainable timber production: growth and yield studies; harvesting and logging techniques; logging impacts; lesser known timber species.	29	
3c NTFP: assessment, valuation, production and extraction	11	
Total **Sustainable forest management**	46	
4 Restoration and use of degraded/secondary forest, reforestation (not specified)		*Programmes:* Tropenbos-Indonesia, FACE
4a Forest rehabilitation/reforestation, including reintroduction of species (genetics, propagation techniques, nursery management), agroforestry	6	*Institutions* IBN-DLO, UvA (pg)
4b Productive use of degraded and secondary forests	5	
Total **Restoration and use of of degraded/secondary forest**	11	
5 **Utilization, processing, trade**	9	*Institutions:* SHR, TNO, SBH
6 **Policy, legal and institutional framework**	9	*Institutions:* AIDEnvironment, ISS, VU (cedla), RUG (law)
7 **Information, communication and extension**	5	*Institutions:* ETC, RUL (rhb)
8 **Climate change**	12	*Programmes:* NRP-II, LBA *Institutions:* RIVM, SC-DLO
9 **People - forest interactions** Including research and studies on: indigenous people & forest use; shifting cultivation; cultural aspects, perceptions; dynamics and causes of deforestation (actors, factors and processes); land tenure and land rights; community forestry.	36	*Programmes:* PROMAB, CERES *Institutions:* RUL (cml), ISS, WAU (ar), UU (ca)

[1] Note: acronyms of institutions are given, for full names see Appendix 1 (acronym of department between brackets)
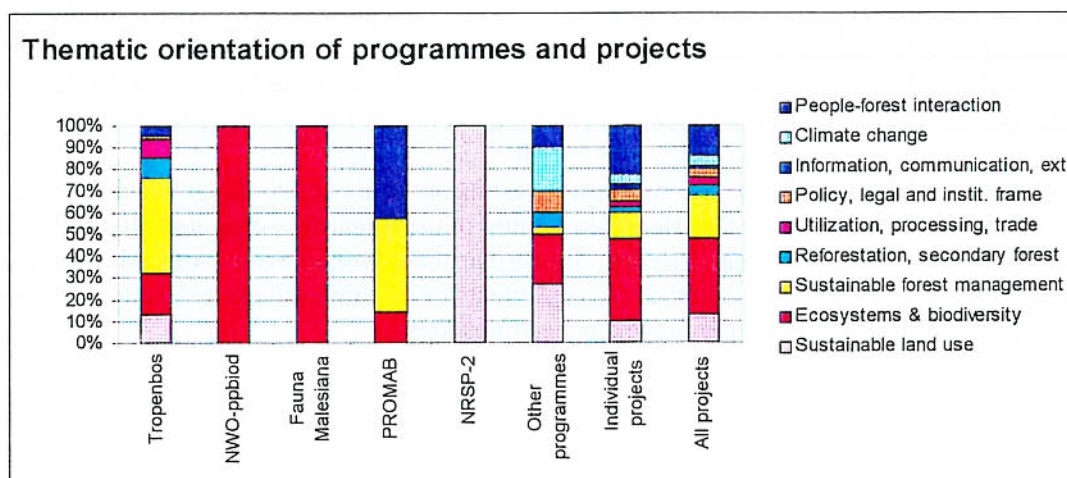
Figure 4 a-c   Thematic orientation of Dutch TRF research

Thematic orientation of institutions

- □ Sustainable land use
- ■ Ecosystems & Biodiversity
- □ Sustainable forest management
- ■ Reforestation, secondary forest
- ■ Utilization, processing, trade
- □ Policy, legal & institutional framework
- ■ Information, communication, extension

4a   Number of institutions involved per theme

Thematic orientation of projects

- □ Sustainable land use
- ■ Ecosystems & biodiversity
- □ Sustainable forest management
- ■ Reforestation, secondary forest
- ■ Utilization, processing, trade
- □ Policy, legal and instit. Frame
- ■ Information, communication, ext.
- □ Climate change
- ■ People-forest interaction

4b   Number of projects per theme

Thematic orientation of programmes and projects

- ■ People-forest interaction
- □ Climate change
- ■ Information, communication, ext.
- □ Policy, legal and instit. frame
- ■ Utilization, processing, trade
- ■ Reforestation, secondary forest
- □ Sustainable forest management
- ■ Ecosystems & biodiversity
- □ Sustainable land use

4c   Band on number of projects per theme

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The frequency of projects per theme (Table 3 and Figure 4b) indicate a focus on ecosystems & biodiversity conservation.

One should bear in mind that the number of projects is only one parameter to express the research effort in a certain theme, and that the variation in extent/size of a project is considerable. To obtain a more complete picture, research volume and budgets also need to be taken into account. Although information on project budgets is incomplete, the impression emerges that relatively high costs are involved with research on sustainable land-use planning, in particular land-use surveys and development of remote sensing based forest monitoring systems. Also, research on climate change needs high financial investments compared to i.e. taxonomic research on plant species or socio-economic studies. Dutch research efforts or volume (fte) was not assessed by research theme, but by research discipline. An assessment of involved research volume over the various institutions confirms the focus on research in the conservation of ecosystems and biodiversity, indicated by the high contribution of biological sciences in TRF research.

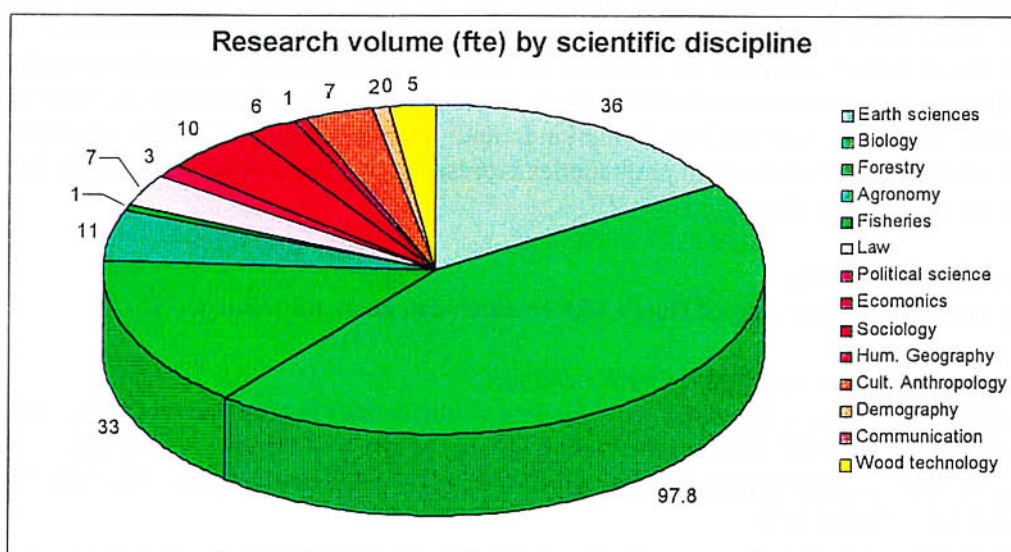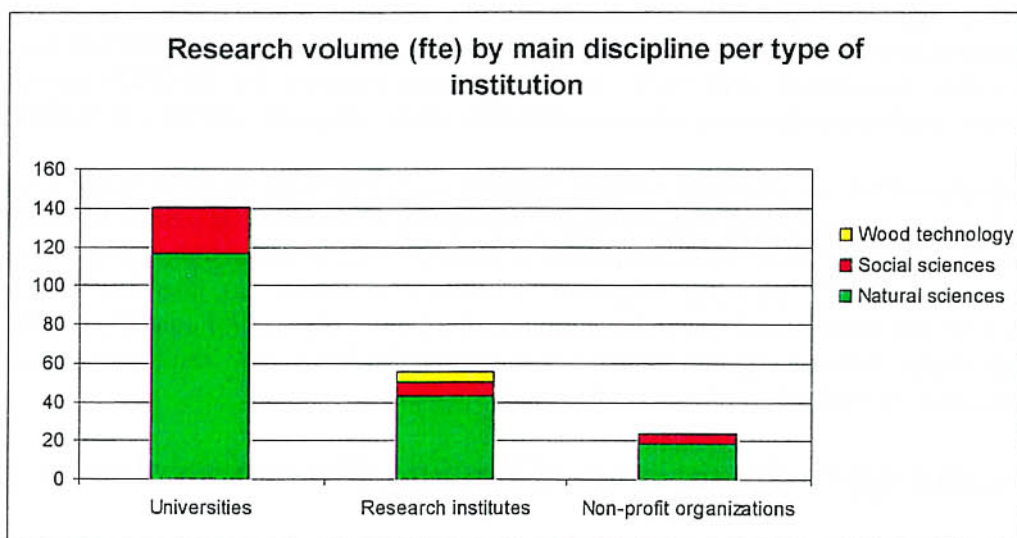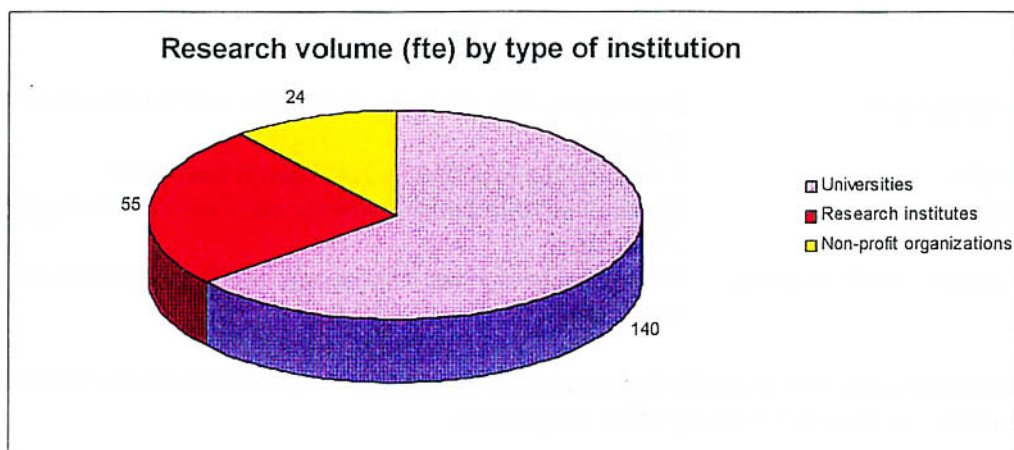**Thematic orientation of programmes**
The main objectives and themes of the research programmes are presented in Appendix 4. Some programmes, i.e. NRSP-2, NWO-biod, Flora - and Fauna Malesiana, are focussed on one particular research theme. NRSP-2 projects are aimed at developing and improving remote sensing based forest assessment and monitoring systems, while the latter programmes aim to support biodiversity conservation. Other programmes, including the Tropenbos Programme, PROMAB, and also NRP-II are broader in thematic approach, with projects in a number of research themes (Figure 4c). The main emphasis in the Tropenbos Programme, in terms of number of projects, is on sustainable forest management, with also significant research activities in sustainable land use and biodiversity conservation.

4.5 Research efforts (fte) by institution and discipline

Analysis of research efforts (= research volume), expressed in fte, is based on question 11 of the data sheet. Results are presented in Figures 5a-c and Appendix 5. The research efforts of private consultancy firms were not included in these analyses, for two reasons: (a) the work of consultancy firms is mostly applied, implementing projects on the border area of what we defined as research, and (b) inclusion of the reported fte of consultancy firms (i.e. DHV and Euroconsult) is difficult to compare with reported fte of universities and research institutes and would result in a rather distorted picture of the Dutch research efforts. Yet, the consultancy firms occupy a certain niche in the Dutch supply side.

The total present Dutch efforts in TRF research are estimated at about 220 fte, of which 140 fte, or nearly two thirds at universities (Figure 5a). Here, nearly 60% of the research is executed by junior staff (aio's, oio's). Four universities, Leiden, Utrecht, Amsterdam and Wageningen (Appendix 5), are the key institutions and a relatively small number of departments or research groups dominate the present scene (the main geographic orientation is shown between brackets):

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Figure 5 a-c Dutch research efforts (fte) in TRF research

University of Amsterdam:	Department of Systematics, Evolution and Paleobiology (Latin America)
Leiden University:	CML and the RijksHerbarium (South East Asia)
Utrecht University:	Department of Botanical Ecology and Evolution Biology (Latin America)
Wageningen Agricultural University:	Departments of Plant Taxonomy, and Forestry (Africa, Latin America)

These research groups have a long established research experience in tropical rain forests, and they are also involved in the execution of the Tropenbos Programme.

Among the research institutions, the Agricultural Research Department, DLO (IBN and SC), RIVM, and NNM are most strongly involved in TRF research. A considerable part of DLO research in tropical rain forests is executed under the Tropenbos Programme. Non-profit organizations include the Plant Resources in South-East Asia Foundation (PROSEA), exclusively implementing the PROSEA-project, and AIDEnvironment, predominantly involved in research/desk studies on policy advice and evaluation.

Figures 5b-c clearly indicate the dominant position of natural sciences (including earth sciences) in TRF research, and there are quite a number Dutch biologists attempting to contribute to a better understanding of the tropical rain forest ecosystem. The involvement of social sciences is still marginal, only some 16%, and this pattern is similar for the three categories of institutions (Figure 5c). The five fte in wood technology is with two Dutch wood research institutions, the Timber Research Foundation (SHR) and the Netherlands Organization for Applied Natural Science Research (TNO). Both institutions concentrate part of their research on tropical rain forest timber species.

4.6 Ways and approximate level of funding (financial volume)

It was difficult to obtain a comprehensive overview of the present financial volume of Dutch research in tropical rain forests. Financial details were available for only half of the projects, and there are inconsistencies in presentation of project budgets. For instance, salary costs of researchers are not always included. The fact that many projects are financed by more than one agency is another complicating factor. The following presentation concentrates on mechanisms and ways of funding, i.e. what are the principal funding agencies, both in The Netherlands and internationally, of Dutch research? The approximate financial volume of the main programmes is presented, and an assessment is made based on information in the projects database.

Ways, mechanisms of funding
The following main ways of funding of Dutch   research can be distinguished:

1)   Core funding of universities and research institutes.
     This is covered by various Ministries: core funding of universities is provided by OCW, except for the WAU (by LNV). LNV finances the DLO institutes, while VROM supports RIVM.
2)   Funding by NWO either in programmes (e.g. NWO-biod) or individual projects. The NWO budget is covered for 95% by OCW.

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3) Medium to long term support through core funding to strategic research programmes, such as NRP-II, NRSP-2, Tropenbos.
These programmes are funded by various Ministries. DGIS is the main funding agency for the Tropenbos programme, VROM for NRP-I, while NRSP-2 is more evenly funded by a number of Ministries.

4) Contract financing of projects/programmes; usually on a more short-term basis to finance clearly defined activities.
This involves both Dutch and foreign funding agencies. In the latter category, the EU, ITTO and CIFOR finance Dutch TRF research activities. CIFOR and ITTO both receive core funding from the Dutch Government (i.e. DGIS and EZ).

Universities and research institutes generally have a mix of the above funding sources, and they depend to an increasing extent on NWO funds (universities) and contract financing. Non-profit organizations are financed in various ways, also depending on the type of organisation, while private consultancy firms operate exclusively on contract work/financing.

Financial volume
Although not comprehensive and complete, the following estimations and data give a good indication of extent and level of the financial volume, and on the contribution of some funding agencies:

DGIS funding
In 1996, Dfl 72 million of the Netherlands Official Development Aid (ODA) budget was spent on tropical rain forests, equivalent to 1% of the total ODA budget (DGIS, 1997c). For the same year the total budget spent on research is estimated at some Dfl 9 million, out of which Dfl 4 million to international organizations and Dfl 5 million to Dutch organizations and projects. Support to international organizations involves tropical forests in general and includes core funding of CIFOR and ICRAF and financing of programmes/projects of CIFOR, the International Institute for Environment and Development (IIED), the World Conservation Monitoring Centre (WCMC) and WRI. Funding of Dutch TRF research initiatives include Dfl 3,5 million as programme support to the Tropenbos Programme, Dfl 0,4 million to PROSEA, and 0,7 million to PROMAB (source: database 'IAC/IKC Forestry support group', 1996).

Exact details on financial contributions of other Ministries, LNV, VROM, OCW, EZ, were more difficult to obtain. Appendix 4 also gives information on budget/funding, indicating which Ministries contribute to the various Dutch TRF research programmes.

Budgets of selected TRF research programmes
Details on budget and funding are given in Appendix 4, and summarized in Table 4.

Table 4   Approximate yearly expenses of selected Dutch TRF research programmes

Programme	Approximate yearly expenses (Dfl x million) 1996		
	Programme/core	Other (mainly from executing institutions)	Total
NRP-II [1]			1.3
NRSP-2 [2]	0.4	0.2	0.6
NWO-biod	0.85	0.4	1.25
Tropenbos	6.3	4.9	11.3
PROMAB	0.6	0.4	1
PROSEA			1.3

[1] : budget of projects included in TRF database, total NRP-II budget app. Dfl 17 million/year
[2] : estimated contribution to TRF research

Estimation of yearly expenses based on the project database
Based on budget details of 114 projects, out of a total of 239 projects, the yearly financial volume of these 114 projects is estimated at Dfl 23 million. Extrapolation of this figure to the total of projects would give a yearly volume of Dfl. 48 million. However, this is a rather unreliable estimate, as the variation in individual project costs is very high, ranging from approximately Dfl 50,000 to several million per year.

Details on project budgets and funding also indicate the contributions of the various funding agencies. The main funding agencies are: DGIS (direct support to projects, and indirectly through Tropenbos), the EU, NWO and the universities. The contribution of the EU is considerable: the present approximate level of funding amounts to some Dfl 7 million/year, including contributions to the LBA-programme in Brazil (SC-DLO), a wood research project (TNO), a project to develop sustainable forest management in Kalimantan, Indonesia (DHV), and contributions to the Tropenbos programme (i.e. Cameroon site).

4.7 Results and achievements

Replies in the projects results section of the data sheet varied considerably and there are also too many gaps to allow a quantitative analysis of research results. Instead, a more qualitative reflection on the achievements and impact of Dutch TRF research is given.

Results and achievements of research can be measured, assessed in the following categories (adapted from Spaapen and Wamelink, 1996):
(i)   generated knowledge and insights (scientific and applied), indicated by quality and quantity of scientific publications, books, other reports, maps and databases;
(ii)   impact on policy, indicated by adaptations in legislation, regulations and guidelines;
(iii)   impact on management for forest conservation and production, indicated by, among others: improved conservation of ecosystems and species (e.g. newly gazetted conservation areas, reintroduced species, strengthened management of conservation areas); deforestation slowed down; area reforested or rehabilitated; adaptation and application of techniques for sustainable harvesting of timber and NTFP; introduction of more sustainable land use practices, i.e. through agroforestry and soil conservation;
(iv)   capacity at various levels, indicated by: number and level of educated and trained students; number of trained forest guards; number of local communities/households reached by extension activities.

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Results in categories (ii) and (iii) are more difficult to assess, also due to a sometimes considerable time gap between the execution of the research and the application of new insights in policy and management.

The extent to which these categories are relevant depends on the type of research. Basic, fundamental research is aimed at generating (new) scientific knowledge, and success or failure is primarily assessed by results in the first category. The main concern of applied research, on the other hand, is to find practical, applicable solutions for societal demands. Achievements are mostly in the third category. Strategic research has a mixture of both elements, is generally implemented through medium to long-term programmes (e.g. NRP, Tropenbos, PROMAB), and aims to generate outputs in all categories.

Success and impact of research, in particular of applied and strategic research geared to local needs, is further determined by the following factors/conditions:

the anchoring of projects and programmes in the local situation, indicated by collaboration with local institutions, local communities and other target groups, both in formulation and execution of the research;

international anchoring and collaboration, indicated by participation in international forestry research programmes, i.e. CIFOR, ICRAF and international climate change programmes.

In general terms it can be stated that most Dutch TRF research is executed in collaboration with partner institutions in the host countries. However, intensity and degree vary considerably, both in research formulation and execution. Fundamental scientific research, e.g. NWO-biod, tends to be less anchored in the local situation, while in strategic and applied research (Tropenbos, PROMAB, action research of NGOs) strengthening of local institutions and target beneficiaries is an important objective of the programme/project. All multi-institutional national research programmes have linkages with international research programmes.

Achievements of selected Dutch TRF research are presented in Table 5. It is an indication of achievements rather than a complete overview. In addition to the listed achievements, the programmes concerned have resulted in a great number of publications, reports and books, and numerous students, scientists and forest guards have been educated and trained.

Table 5   Achievements of selected Dutch TRF research programmes and projects

Programme	Sub-programme / project	Achievements/ Results			
		Knowledge on / Insight in	Policy	Management	Other
NRP-II	Development and testing of the IMAGE 2 model (Integrated Model to Assess the Greenhouse Effect)	Linkages, interactions and feedbacks in the society-biosphere-climate system. Geographic explicit and dynamic land use, C-cycle and impact modelling.	Support to the development of the periodic (Dutch) National Environmental Policy Plans, and inputs to Global policy on Climate Change. Provision of a dynamic and long term (50 to 100 years) perspective about consequences of environmental change		.
	Dynamics of Tropical Forest depletion and protection (CML)	Mechanisms (causes, actors, role of local, national and global policies) of tropical deforestation	Policy recommendations at national and global level to counteract deforestation		
NRSP-2	1.Remote sensing of tropical rain forests 2.Forest Management Indonesia 3.AIRSAR 93 Tropical Rain forest	Potential and practical applications/capabilities of optical - and radar remote sensing in forest inventory and monitoring	Development of remote sensing based Forest Monitoring systems for surveillance, management and law enforcement. So far, not yet operational on a large scale.		
NWO 'Biodiversity in disturbed ecosystems'		Scientific, fundamental knowledge on biodiversity, with emphasis at species level, and on interactions between species and the ecosystem	Support to conservation policy and strategies for biodiversity conservation		
PROMAB		Population/growth dynamics of selected timber- and non-timber species; role of NTFP (a.o. Amazon nut) in the local economy; biodiversity		Improved production and harvesting system of Amazon nut, i.e. by enrichment planting. Local communities are applying those techniques.	Orientation is on participatory research, with benefits for the local communities
PROSEA		Plant resources of SE Asia: botanical- and economic properties and their use			PROSEA Handbook (11 volumes produced, 9 planned) and data bank; many derived education and extension materials

Programme	Sub-programme / project	Achievements/ Results			
		Knowledge on / Insight in	Policy	Management	Other
Flora Programmes	Flora Malesiana, Flora of the Guianas, ECOSYN	Plant systematics and botanical diversity of South-East Asia, the Guianas and West Africa respectively	Support to biodiversity conservation policy, and ecologically sound forest management		Information and extension materials including: Herbarium collections and identification/ field guides
Tropenbos	Indonesia	Sustainable forest management (focus on harvesting and replanting of Dipterocarps); forest rehabilitation; biodiversity conservation, with the orang utan as a key species	Adaptation of Indonesian forest policy and regulations, based on major project findings; national guidelines for reintroduction of orang utans	Application of propagation and nursery techniques by concessionaires; tó date more than 100 new meranti trees have been planted	Extension-training to Indonesian foresters on Dipterocarp nursery technologies, and on orang utan reintroduction
	Colombia	Land use planning (methodology), forest ecology and biodiversity; indigenous forest use	Research findings were used for elaboration of a Colombian research strategy; local governments in the Amazon have incorporated the approach to land use planning in their land-use policies	GIS used as a basis for development planning in Guaviare	Fourteen volumes published in Spanish in the Tropenbos-Colombia Series

5. ANALYSIS AND CONCLUSIONS

The present study concentrated on the compilation of a comprehensive overview of Dutch research activities on tropical rain forests. Some vital aspects of research could not be analysed satisfactorily, including: (i) development of research agendas and prioritization, (ii) participation/involvement of local institutions and other stakeholder groups in the TRF countries, both in formulation and execution of the research, (iii) achievements and impacts of the research. Although we can assume that not all Dutch TRF research projects and involved institutions are included in the database, the present overview gives a good insight into current efforts of Dutch institutions and programmes, both in terms of thematic orientation and involved research volume (fte).

It was not always easy, even when applying the definitions and delimitations of TRF research (par. 2.1), to decide whether projects should be included in the overview. There were two main issues in this:
(i)   **how to define research**: a broad definition was applied, including surveys/inventories, and desk studies. Some organizations, i.e. NGOs, executing action research and/or evaluations of policy, usually replied that they had no involvement in research.
(ii)   **what research is relevant for conservation and sustainable use of TRF**: here the main problems were in the category of sustainable land use. In our definition, there needed to be a clearly defined relation between for instance agricultural research and use/conservation of forests, expressed in the research objectives. Many projects on sustainable land use are formulated in more general terms, and link sustainable land use with environmental protection, or focus on empowerment of local communities to improve natural resource management. These more general land use projects were not included in the overview. However, they may have the same relevance for the fate of tropical rain forests than projects aimed at biodiversity conservation or sustainable forest management.
As a result of the above, not all research activities relevant to tropical rain forests are included in the overview, which is primarily focused on tropical rain forest research proper.

Thematic orientation of Dutch TRF research
The thematic overview of projects and programmes (Table 3, Appendix 4) indicate that all themes in TRF research are covered by the ongoing Dutch efforts, with a concentration on sustainable land use, conservation of ecosystems and biodiversity, sustainable forest management, and people-forest interactions. Themes which are somewhat under represented are forest rehabilitation, use of secondary forest, and policy, legal and institutional framework. We have to consider that not all themes require the same input and effort in order to be properly addressed, depending on the complexity of research issues and problems, and knowledge/insights already available.

The following section deals with some striking aspects of thematic orientation in Dutch TRF research. It does nor give a full account of all aspects and issues.

Sustainable land use (planning)
Current innovative research concentrates on two issues: the development/improvement of (i) forest monitoring systems, and (ii) land-use planning methodologies. Remote sensing and GIS are important tools in this research. Besides innovative research, considerable efforts are spent in actual survey and inventory work, i.e. land use zoning both for conservation and production. There is relatively little

research on the development of alternative land-use options to relieve the pressure on primary forest. While social, cultural and economic aspects are important factors in land use planning, this is not yet sufficiently reflected in the current contribution of social sciences in the ongoing research.

Conservation of ecosystems and biodiversity
Current research is primarily of a fundamental scientific nature, with a large involvement of plant/animal taxonomy and biosystematics, and much research at a detailed level, i.e. species level, nutrient cycling. One of the strengths of Dutch TRF research is in plant taxonomy, based on long experience. There is little attention paid to more strategic conservation issues, addressing questions such as: what are the most threatened forest ecosystems, for instance at regional or national level?; how can they be characterized (both in terms of flora and fauna diversity)?; what is the minimum size of conservation areas to guarantee ecosystem and biodiversity conservation?; what are the impacts of biodiversity loss on ecosystem functioning?; and is the existing protected area system, with accompanying legislation and law enforcement, sufficient?

Socio-economic aspects of ecosystem and biodiversity conservation, e.g. attitudes of local communities, property rights, are largely neglected in the ongoing research, and involvement of social and societal sciences is still marginal.

Also due to the many different interpretations of biodiversity and the general vagueness surrounding it, a clear coherence and strategic direction of research on biodiversity is still lacking. Implications of research results for policy and management are not always clear.

Sustainable forest management
A large part of the current research, which is mostly strategic and applied, attempts to develop more careful operational systems for timber harvesting. Research includes growth and yield studies, studies on logging impacts, development and testing of sylvicultural systems, and research on impacts of logging on biodiversity. Communication and collaboration with timber companies receives more and more attention in this type of research.

Current efforts in research on NTFP are considerable and increasing. The role and importance of NTFP, in particular for local communities, have been highlighted and emphasised by (inter)national NGOs (IUCN, WWF). As a result, NTFP are now included as a focal issue in Dutch research programmes (PROSEA, PROMAB, Tropenbos) and in international research (CIFOR). Much attention is on the socio-economic aspects of NTFP.

People and forest interactions
Current research, often in the form of case studies, covers a variety of topics, including: dynamics of deforestation, indigenous knowledge and forest use, land tenure and land rights, etnobotany, and cultural and socio-economic aspects of natural resource use. Research mainly involves social disciplines.

A final remark on present thematic orientation, strengths and weaknesses, relates to Dutch TRF research in the international context. A comprehensive evaluation of Dutch efforts has to be made in relation to (inter)national research i.e. CIFOR and other programmes. Dutch research does not necessarily have to address all aspects and issues, when these are already sufficiently covered by other programmes. Strategically, it may be preferable to further strengthen ones own strong points, rather then trying to address all relevant research themes, possibly at the cost of quality.

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Involvement of research disciplines

Although the share of social sciences in Dutch TRF research seems to be growing, total contribution is still relatively marginal. Within the natural sciences, the dominant share of biological sciences is evident, reflecting the research focus on conservation of ecosystems and biodiversity.

Partly due to the underrepresentation of social sciences, multi-disciplinary research is scarce. If implemented in a programme, the situation prevails that social scientists execute their research separately from the natural scientists who have their own projects. It is an exception that they jointly work together in one and the same project to tackle commonly defined research problems/questions.

Relevance of research in relation to Dutch policy

Comparing the thematic orientation of ongoing research with the defined priorities in Dutch TRF policy, reveals at first glance a good attunement and matching. Policy priorities, i.e. sound land use, biodiversity conservation, sustainable forest management and climate change, are all addressed in the current Dutch TRF research. This is not surprising as most Dutch key research programmes and institutions refer to Dutch policy in their formulated research agendas and strategies. However, policy is defined in very general terms and can be interpreted according to one's own specific interests and priorities. For instance, the statement that more research on biodiversity conservation is needed can lead to the development of a whole range of research projects, varying from 'Terrestrial planarians as indicator taxa: an important component of soil biodiversity in tropical forests' to 'Involvement of rural communities in biodiversity conservation: an alternative management strategy for the East Usambaras, Tanzania'. The process of translating general policy strategies into a research agenda is primarily in the hands of the research community. The problem here is that the results and outputs the scientists think are needed do not necessarily match the needs of society and policy makers.

Relevance and impacts of research in relation to present problems and issues in tropical rain forests

Tropical rain forests are predominantly located in developing regions, where thousands of people still exist in poverty that denies them their basic human needs, and where the human population is fast expanding. This puts an ever increasing pressure on the remaining tropical rain forests, and associated environmental problems include deforestation, ecosystem destruction and extinction of species. In the industrialized world, while populations are stabilizing, the consumption of fossil fuels, water and timber stocks, and other natural resources continues to grow steadily, also affecting tropical rain forests. In 1990 the total area of tropical rain forest was estimated at 718 million ha, concentrated in South-East Asia, Central Africa and Latin America. Yearly loss of tropical rain forests during 1980-1990 was estimated at 4,5 million ha (0,6%) (FAO, 1993). The reasons for rapid deforestation of tropical rain forests are complex, but are all related to the way in which governments manage the growth and development of the human societies in their care. Development patterns in most countries have resulted in financial and material benefits for relatively few people, at the expense of an impoverished majority. Direct causes of deforestation include, among others, clearing for agriculture and unsustainable timber harvesting.

The present challenge is to combine development needs with conservation. Can development strategies be found that reconcile the fulfilment of human needs with conservation of ecosystems and biological diversity? This challenge should be a driving force in research on tropical rain forests. TRF research should generate knowledge that facilitates the development of these strategies.

Major current issues in conservation and sustainable use of tropical rain forests include:
- development of more holistic, intersectoral approaches;
- achieving sustainable forest management by the year 2000;
- NTFP, traditional knowledge and indigenous forest management;
- conservation of biodiversity and genetic resources.

To answer the question as to whether Dutch TRF research is sufficiently geared to develop strategies related to these issues, is not easy. Certainly, through the contributions of Dutch research we know more and more about tropical rain forests, how they function, how biologically diverse and rich they are, how fragile they are, how they could be managed in a more sustainable way, and how they disappear. A critical issue is how to incorporate and use new insights and knowledge in practical policy, planning and management. Perhaps more research is needed on this theme, in order to indicate mechanisms and conditions for this process, and to develop strategies for extension, communication and policy implementation.

Recommendations for follow-up analysis
The present overview and database provides a good basis and reference for further in-depth analysis of Dutch TRF research. Studies are needed / recommended on the following issues:
- development of research agendas, both in the TRF countries and in The Netherlands: mechanisms, priority setting etc.;
- coherence and collaboration in Dutch TRF research, also in relation to international research;
- participation/involvement of local institutions and other stakeholder groups in the TRF countries, both in formulation and execution of the research;
- achievements and impacts of research, with emphasis on views of clients, target groups and beneficiaries in the TRF countries.

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Dr. E.M.A. Smaling	AB-DLO

INSTITUTION AND PROJECT DATA SHEET

INSTITUTION PROFILE		
Nr.		**Please fill in, check and/or add, correct**
1	**Name of institution**	
2	**Address of institution**	
3	**Telephone** *General or of contact person*	
4	**Facsimile**	
5	**Email** *General or of contact person*	
6	**Name of contact person**	
7	**Category of your institution** *Please mark option that best describes your institution*	☐ 7.1 Research Institute ☐ 7.2 University ☐ 7.3 Non-profit organization ☐ 7.4 Private consulting firm ☐ 7.5 Governmental organization
8	**Mission of your institution** *Please briefly describe*	
9	**Regions, countries of your institution's experience in tropical rainforest research** *Please indicate and specify* ☐ 9.1 African countries, pls specify ☐ 9.2 Latin American countries, pls specify ☐ 9.3 Asian countries, pls specify ☐ 9.4 Regional projects/programmes in Africa ☐ 9.5 Regional projects/programmes in Latin America ☐ 9.6 Regional projects/programmes in Asia ☐ 9.7 Projects/programmes with a worldwide scope (either <u>a)</u> with sites in the three tropical rainforest regions, or <u>b)</u> not site specific, with relevance for tropical forests in general)	

10	**Research theme(s)** *Please indicate the research theme(s) of your institute's research in tropical rainforest*
	□ 10.1 Sustainable land use planning and development (including research on: Methods and surveys for land use planning, Development of alternative land-use options; Identification and designation of protected areas, Agroforestry)
	□ 10.2 Conservation of ecosystems and biodiversity (including research on: Protection of biodiversity and ecological functions; Bufferzone development and management; Management for biodiversity and diverse products; Management of protected areas)
	□ 10.3 Sustainable forest management (including research on: Development of concepts, criteria and indicators for sustainable timber production; Development of operational systems for sustainable timber production; Sustainable extraction of non-timber forest products; Indigenous forest management)
	□ 10.4 Restoration and use of degraded forest, and reforestation (including research on: Reforestation and plantation management; Forest rehabilitation, including reintroduction of species; Productive use and management of degraded and secondary forests)
	□ 10.5 Utilization, marketing and trading of forest products (including research on: (Industrial) timber; Non-timber forest products)
	□ 10.6 Policy, legal and institutional framework
	□ 10.7 Information, communication and extension
	□ 10.8 Other, please specify

			Capacity (fte)	

11   **Research disciplines and capacity** *Please indicate the discipline(s) represented in your institution and involved in tropical rainforest research, and the present (approximate) research capacity in terms of full time equivalent[1]*

		Research discipline	Senior	Junior (AIO, OIO)
		Natural sciences		
❑	11.1	Earth sciences (including remote sensing, GIS)	.....	.....
❑	11.2	Biology	.....	.....
❑	11.3	Forestry	.....	.....
❑	11.4	Agronomy	.....	.....
❑	11.5	Fisheries	.....	.....
		Society and social sciences		
❑	11.6	Law	.....	.....
❑	11.7	Political science	.....	.....
❑	11.8	Economics	.....	.....
❑	11.9	Sociology	.....	.....
❑	11.10	Human geography	.....	.....
❑	11.11	Cultural anthropology	.....	.....
❑	11.12	Demography / Population studies	.....	.....
❑	11.13	Communication	.....	.....
❑	11.14	Other, pls specify	.....	.....
		TOTAL fte	.....	.....

[1] :   1 fte is one researcher being full time (app. 36 h week) involved for the whole year, or two persons each half a year. 0,2 fte: one day per week involvement for the whole year, etc.

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12   **Involvement in national and/or international research programmes on tropical rainforest** *Is your institution presently involved or has been involved during 1996 - 1997 in any national (Dutch) or international research programme?*

❑	12.1	Yes
❑	12.2	No

If yes, please specify

PROJECT DATA SHEET

Name Institution:

		No
1	**Title of project**	
	Is the project part of an overall programme? *If yes, pls specify*	
	Period *start -, end date*	
	Location *country(s)*	
	Research objective(s) *Pls briefly describe*	

	(expected) Outputs and achievements *Pls indicate and quantify, specify*
	
	☐ A Reports, publications, including maps and databases (attach list of research publications)
	
	     B Innovations, improvements:
	☐ B1 In research methodology/techniques
	☐ B2 In forest planning and management (for conservation and/or production)
	☐ B3 In ecosystem or species (plant/animal) conservation and management
	☐ B4 In production/cultivation systems (forest and/or agricultural products)
	☐ B5 In forest harvesting and utilization, timber processing etc.
	☐ B6 In training, extension, communication
	☐ B7 Other, pls specify
	
	     C Outputs in training and capacity building (numbers)
	☐ C1 MSc graduated from host country
	☐ C2 PhD graduated from host country
	☐ C3 MSc graduated from The Netherlands
	☐ C4 PhD graduated from The Netherlands
	☐ C5 Other training and capacity building outputs (from training seminars, courses etc.)
	
	☐ D Others: research outputs not mentioned under categories A-C (briefly specify)	

	Other executing institution(s)	
	Total project budget (in Dfl) & main funding agency(s)	

BCRS - National Remote Sensing Programme 1990-2000 (NRSP-2)

Goal
The NRSP-2 aims at firmly securing the remote sensing techniques among operational users within government and industry in The Netherlands. It also seeks to develop and strengthen applications in development cooperation.

Research themes
1. Meteorology and oceanography
2. Tidal - and inland waters
3. Land use management, urban change, agriculture, forestry and nature conservation
4. Climate and environment

Disciplines
Natural - and technical sciences

Sub-programme (relevant to tropical rain forest)
Working group remote sensing research on forest (ROBO)

Objective
Develop and establish systematic observation and monitoring of forest, using remote sensing, as a supportive instrument for sustainable forest management

Location/sites
Brazil, Colombia, Guyana, Indonesia

Participating institutions
IBN-DLO, ITC, NLR, WAU

Linkages with other programmes
Tropenbos, DLO-research programme

Budget/funding
For 1996-2000: approximately Dfl 25 million (Ministries of EZ, OCW, DGIS, LNV, VROM, Defense, VWS). Approximate yearly BCRS-contribution to ROBO projects: Dfl 400,000.

DUTCH RESEARCH PROGRAMMES ON TROPICAL RAIN FORESTS

I   MULTI-INSTITUTIONAL NATIONAL RESEARCH PROGRAMMES

National Research Programme on Global Air Pollution and Climatic Change (NRP II, 1995-2000)

Goal
The main aim of the programme is to support policy development. In addition to supporting national and international climate change policy in this field, the programme aims to reduce scientific uncertainties in this area and to underpin the Dutch policy response to this issue. The programme seeks to increase the awareness and decision-making process associated with climate change. It seeks to discover what climatic changes are taking place; what are the causes, and what are the effects and possible solutions? How to integrate these different aspects of the issue is also an important aspect of the programme.

Research themes:
1   Dynamics of the climate system and its component parts
2   Vulnerability of natural and societal systems to climate change
3   Societal causes and solutions
4   Integration and assessment

Discipline(s)
Technical, natural and social sciences

Location/sites or scope
Global, worldwide in approach and applications, with local projects also in tropical rain forest regions

Participating institutions (in TRF research)
RIVM, WAU, CML

Linkages with other programmes
International Geosphere-Biosphere Programme (IGBP), LBA-Brazil, EU-JRC TREES-project, IHDP, WCRP.

Budget/funding
Dfl 54,5 million covered by the programme. Ministry of VROM: 46 million, NWO 9,5 million. In addition some Dfl 50 million contributed by the participating institutions.

NWO Priority Programme 'Biodiversity in disturbed ecosytems' (1994-2004)

Goal
The fundamental and strategic scientific aims of this programme are to provide mankind as a species with the proper tools to conserve biodiversity through:
- The generation of fundamental and generalized knowledge of species composition and of the extent, the structure and the dynamics of genetic variation;
- The integration of this with knowledge of complex interactions between species in an ecosystem;
- The dissemination of the acquired knowledge and expertise in order to support environmental policy.

Research themes
1. Comparative studies of the species composition and structure of pioneer communities and disturbed habitats
2. Systematic and biogeographic study of selected taxa that are characteristic for pioneer communities and disturbed habitats
3. Relations between the amount of genetic variation, population size and extinction of probability and population fragmentation and management
4. Relation between community biodiversity and ecosystem stability.

Discipline(s)
Biology: biosystematics, taxonomy, ecology, population genetics

Location/sites:
Terrestrial (lowland) ecosystems. South-East Asia, Amazon region, Cameroon, Costa Rica, Indonesia.

Participating institutions
UvA, NNM, RUL-rhb, RUG, WAU, CTO-NIOO, CBS-KNAW

Linkages with other programmes
Tropenbos

Budget/funding
Dfl 8,5 million for a period of 10 years (NWO), in addition some Dfl 4 million contributed by the participating institutions.

The Tropenbos Foundation Research Programme (third phase) (1994-1999)

Goal
- To contribute effectively to the conservation and wise use of tropical rain forests, through generating relevant knowledge, deepening insights and developing and testing methods for forest policy and management;
- to involve local research institutions and to strengthen research capacity in tropical rain forest countries.

Research themes
1. Sound land use planning
2. Protected area management for biodiversity conservation
3. Sustainable forest management
4. Restoration and use of degraded forests.

Disciplines
Natural and social sciences

Location/sites
Cameroon, Colombia, Côte d'Ivoire, Gabon, Guyana, Indonesia

Participating institutions
IBN-DLO, SC-DLO, RUG, RUL, RUU, SC-DLO, UvA, WAU, and partner institutions in host countries

Linkages with other programmes
NRSP-2, CIFOR, NWO-biod

Budget/funding
Approximately Dfl 10 million per year, of which 50-60% provided through core funding by the Dutch Government (DGIS, LNV, OCW (by NWO), VROM). The remainder is covered by the executing agencies and the counterpart organizations, and the programme is also supported by international organizations (i.e. EU, ITTO) and the private sector.

II   RESEARCH AT UNIVERSITIES

Research school Netherlands Centre for Geo-ecological research (ICG), research programme 'Patterns and Processes in Changing Environments' (1994-1998)

Goal
The research programme (involving fundamental and applied research) investigates the evolution of the landscape in temporal scales of different length, the response of landscape-forming processes to climate, vegetation, tectonic, human and other factors, fluxes of water, sediments and chemicals in the landscape, the spatial pattern of landscape elements as a result of these processes, and evaluates the landscape in terms of hazards, risks and sustainability.

Research themes
1.   'Dynamics and Paleorecords of Depositional Environments' (1a: 'Dynamics and paleorecords of river and coastal systems' and 1b: 'Paleoclimatology and paleoecology of the Quaternary')
2.   'Functioning of Landscape Ecosystems' (2a: 'Processes and change in terrestrial ecosystems' and 2b: 'Processes and change in geomorphological systems')
For 1996, 23 projects on a total of 147 projects were related to tropical rain forests.

Disciplines
Natural sciences (earth sciences, biology)

Locations/sites (TRF countries)
Brazil, Cameroon, Colombia, Costa Rica, Ecuador, Guyana, Indonesia, Mexico, Peru

Participating institutions
Uva-pg, UvA-ppa, UU-pg, VU-es

Linkages with / participation in other programmes
NWO-biod, Tropenbos (Colombia, Guyana)

Budget/funding
NWO-WOTRO, Universities, GOA (The Netherlands Geosciences Foundation), the Tropenbos Foundation

Research School 'Centre for Resource Studies for Development' (CERES), research programme

Goal

CERES aims at studying interactions between resources (natural and human), agents and institutions. Its problem orientation indicates a multi disciplinary approach, using a variety of paradigms and multilevel methodology, ranging from case studies to global surveys.

Research themes (working programmes)

1. Natural resource management: knowledge transfer, cultural coping and social insecurity
2. Rural transformations: resources, adaptations and linkages
3. Comparative industrialisation and urbanization
4. State formation and disintegration
5. Globalization
6. Culture, religion and identity formation

Disciplines

Social - and natural sciences

Location/sites

Tropical rain forest countries in Latin America, Africa and Asia

Participating institutions

RUU, UvA, WAU, KUN, ISS, VU

Linkages with / participation in other programmes

PROMAB, Tropenbos

Budget/funding

Estimated research budget for 1998: Dfl 7,9 million. Paid by universities.

Research school Biodiversity: research programmes of the participating core institutes

Goal
The research and training programme of the school seeks to analyse the mutual relationships between the processes of evolution and the patterns that result from it, that is, the processes of speciation and the patterns of phylogenetic relationships and species dispersal that followed from speciation events. Process and pattern analysis are different but complementary ways towards understanding biodiversity. The research can lead to both theoretical and practical studies in nature conservation and biological control of pest species. Six core institutes participate in the research school. A coherent common research programme is not formulated, rather, each institution has its own programme some of them including tropical rain forest research.

Disciplines
Biology

Participating institutions
UvA-iss; ETI (UvA); RUL-rhb; NNM; Research Institute of Evolutionary and Ecological Sciences, RUL; CBS; RUU-herb.

Research Institute Systematics and Population Biology, UvA

Goal
To analyse the relationships between the processes of evolution and the patterns that result from the evolution, between differentiation and speciation studies (micro evolution) and pattern analysis (macro evolution).

Disciplines
Biology (zoological phylogeny, biogeography)

Location/sites
Costa Rica, Indonesia

Linkages with / participation in other programmes
NWO-biod

Budget/funding
UvA, external: NWO/WOTRO

Rijksherbarium /Horticus Botanicus, RUL: Tropical Phanerogams - Flora Malesiana Research Group

Goal

Flora Malesiana (1947-ongoing) aims at a comprehensive and critical inventory of the higher plant diversity of the Malaysian region and at development of identification keys. Plant biogeography and phylogenetic analysis of Malaysian plants are also focal points in the research. From 1993 onwards it coordinates an extensive European network, funded by the European Community, to study the plant diversity of the Indo-Pacific region.

Research themes

1. Taxonomic research for Flora Malesiana
2. Phylogeny and biogeography
3. Strategic and applied biodiversity research

Disciplines

Biology (plant taxonomy, biosystematics)

Locations/sites

Southeast Asia: Indonesia, Malaysia, the Philippines, Papua New Guinea, Singapore, Brunei

Participating institutions

In Flora Malesiana: 28 sister institutions, in Europe, USA and SE Asia

Linkages with / participation in other programmes

Tropenbos-Indonesia, NWO 'Biodiversity of disturbed ecosystems', NWO 'Irian Jaya Studies', PROSEA

Budget/funding

RUL, external: NWO/WOTRO, Tropenbos

National Natural History Museum Leiden

Two research programmes relevant to tropical rain forests:

1.   Fauna Malesiana Terrestrica

Goal
Fauna Malesiana is an inventory of recent and fossil zoodiversity of Southeast Asia. Current objectives: explore key faunas and analyse the diversity generators on various levels of spatiotemporal integration: ecological, geographical, evolutionary. Another objective is the production of Fauna Malesiana handbooks.

Location/site
Southeast Asia, concentrating on Indonesia

2.   Eco-evolutionary analysis of biodiversity

Goal
Research on short-term changes in biodiversity of complex ecosystems in relation to unique evolutionary values such as species diversity and endemism.

Location / site
Brazil, Cameroon, worldwide

Research themes
Biogeography, phylogenetic relationships, biodiversity

Disciplines
Biology (zoological taxonomy, systematics)

Participation in other programmes
NWO-biod

Budget/funding
NWO/WOTRO, NNM, SLW, RUL

Herbarium, UU: Research programme

Goal
To generate essential knowledge and data for identification of neotropical plant taxa, understanding of development of biodiversity in relation to the ecosystems past and present, and establishment of the phylogenetic history of plant taxa under study. Two projects have been initiated:

Annonnaceae Project (1984-ongoing)
Research centres around three topics: monographic research in certain genera: character analysis of morphology of flowers, fruits and seeds; and establishment of bibliographical databases.

Flora of the Guianas project (1984-ongoing)
The project covers the geographical area of French Guiana, Suriname, and Guyana. The project aims at publishing treatments of families of Phanerogams and Cryptogams occurring in the region. Its is a cooperative project of departments or institutions, focussing on systematic botany, of Berlin, Kew, New York, ORSTOM in Cayenne, Paris, Washington, and of the Universities of Guyana, Suriname and Utrecht.

Disciplines
Biology (plant taxonomy, biosystematics)

Location/site
French Guiana, Guyana, Suriname

Linkages with / participation in other programmes
Tropenbos-Guyana

WAU Interdepartmental Research programme REPOSA (Research programme on the sustainability of Agriculture) (1986-1998)

Goal
The development of a methodology for analysis and evaluation of alternative scenarios for profitable and sustainable land use, at the farm, (sub)regional and, possibly, national level. The farm level refers to a farm household and its resources.

Research themes
Land-use planning methodology

Disciplines
Interdisciplinary: natural - and social sciences

Location/site
Costa Rica

Participating institutions
WAU (various departments), the Tropical Agronomy Research and Higher Education Centre (CATIE) in Costa Rica, and the Costa Rican Ministry of Agriculture and Livestock (MAG)

Budget/funding
Dfl 1,2 million/year. WAU

PROMAB - Sustainable use of forest products in the rain forest of Northern Bolivia, Utrecht University (1992-1999)

Goal

The two main objectives of the programme are:

(i)   To develop and implement sustainable and multiple-use forest exploitation systems through:
-       provision of a forest-ecological and socioeconomic basis for sustainable and multiple-use forest management systems including the protection of its biological diversity;
-       development of methods for analysing and evaluating the sustainability of different forest exploitation systems.

(ii)   To strengthen the research, extension and institutional capacity of the participating organisations in the field of sustainable forest exploitation.

Research themes

The research programme encompasses strategic and applied research directed towards the design of management scenarios integrating conservation and development through sustainable use of forest resources. The scenarios include non-timber and timber products. Two main themes are:

1.   Ecological basis for forest management, having a species- and ecosystem-oriented component.
2.   Socioeconomic basis of forest management.

Disciplines
Natural - and social sciences

Location /site
Northern Bolivia

Participating institutions
Utrecht University, Universidad Tecnica del Beni (UTB), Instituto para Hombre Agricultura y Ecologica (IPHAE), CIFOR

Linkages with / participation in other programmes
CIFOR - Non Timber Forest Products programme

Budget/funding
Approximately Dfl 1 million/year, of which 0,6 million provided by DGIS. Remainder funded by CIFOR and Utrecht University.

Centre for Environmental Sciences (CML), RUL: Programme Environment & Development

Goal
Execute research in the field of environmental problems (analysis and/or explanation) and to contribute to solutions of these problems.

Research themes
1. Depletion dynamics
2. Local resource management: (i) transitions in agricultural land; (ii) co-management of nature

Disciplines
Natural - and social sciences

Location/site
Cameroon, Ecuador, Philippines

Linkages with / participation in other programmes
NRP-II

Budget/funding
RUL, and main external funds: DGIS, IUCN, NRP-II, NUFFIC, NWO/WOTRO

Research programme in Tropical Forestry of the Forestry Department WAU (1994-1998)

1. Ecology, silvicultural systems and management of tropical rain forest
Goal
To contribute towards obtaining fundamental knowledge about the ecological processes influencing natural regeneration, tree growth and forest succession, and to develop new knowledge systems for silvicultural and management planning in forests.

Research themes
Effects of light as an ecological fact; commercially interesting tree species; improvement of silvicultural and extraction systems.

Disciplines
Forestry, biology (forest ecology)

Location/site
Concentrated in Cameroon and French Guiana, additional work in Malaysia, Suriname, Côte d'Ivoire.

Linkages with / participation in other programmes
CERES, CNRS, Tropenbos-Cameroon

Budget/funding
WAU, NWO/WOTRO, EU, ITTO, Tropenbos

2. Community forestry development and rural transformation in tropical countries
Goal
To develop scientific information on the role of forests for local communities and on the nature and development scope of community forestry under different socio-economic and cultural conditions, as well as on the significance of social forestry for stimulating community forest management.

Research themes
Relations between human societies and forest environment, including indigenous methods of forest utilization and management; forest policies and approaches for planning forestry development interventions aimed at transferring (part of the) management responsibility to rural communities.

Disciplines
Sociology, economics, forestry

Location/site
Costa Rica, Mexico, Tanzania

Linkages with/participation in other programmes
CERES, Tropenbos-Cameroon, CIFOR, ICRAF, FAO (Forests Trees & People programme), ODI, IUFRO

Budget/funding
WAU, NWO/WOTRO, ICRAF, FAO

III RESEARCH PROGRAMMES OF RESEARCH INSTITUTES

Agricultural Research Department (DLO) - Research programme North-South (in development, starting in 1998, and combining two ongoing DLO programmes)

Goal
Strategic and applied research to support the development of (inter)national policy on agriculture, nature and environment, and to increase knowledge on sustainable agricultural production and sustainable management of the natural resources soil, water and forests, nature and biodiversity. The aim is to find a balance between ecology and economy, with sustainable land use as a main issue. Research is aimed both at poverty alleviation and economic development, and dissemination and sharing of knowledge with partners and clients in Africa, Asia and Latin America is a high priority.

Research themes
1. Rural development and food security
2. Plant and animal health
3. Soil, water and nutrients
4. Forests, nature and wetlands
5. Biodiversity
6. Agro-production chains
7. Peri-urban land use
8. Guidelines, regulations, standards and certification

Disciplines
Natural and social sciences

Executing institutions
All DLO institutions. Most relevant for TRF research: IBN-DLO, SC-DLO.

Linkages with other programmes
The Tropenbos programme, WWF conservation programme, BCRS, LBA

Budget/funding
Estimated for 1998: approximately Dfl. 5 million by LNV, and Dfl 1,7 million through external funding from EU, Tropenbos, ITTO.

LBA: The Large Scale Biosphere-Atmosphere Experiment in Amazonia (SC-DLO is European LBA-office) (1997-2003)

Goal
The motivation for LBA is to increase the scientific understanding, through field and modelling studies, of how Amazonia currently functions as a regional environmental entity, and how future land use and climate changes may affect this functioning, thereby influencing the sustainability of development of the region and the role of Amazonia in the global climate.

Research themes
1. Physical climate
2. Carbon storage and exchange
3. Biogeochemistry
4. Atmospheric chemistry
5. Land surface hydrology and water chemistry
6. Land use and land cover
7. Remote sensing

Disciplines
Natural sciences (earth sciences, biology)

Participating institutions
In Netherlands: SC-DLO (involved in themes 1,5), RUG, VU, WAU. Leading institution in Brazil: INPE. NASA will be a leading executing agency and various scientists from South America, Europe and the USA will participate in the programme.

Budget/funding
Total core funding for 1998-2003 will be US$ 80-90 million, of which US$ 50-60 million is funded by NASA. European contribution is ECU 20 million. The SC-DLO budget will be ECU 5 million, of which 2 million is provided by LNV (own means).

PROSEA: Plant Resources in South-East Asia, phase 3 (1996-2000)

Goal
Documentation and information on plant resources of SE Asia; to make available the knowledge for education and extension; to make operational a computerized databank; to publish an illustrated multi-volume handbook; to promote dissemination of the information gathered.

Research themes
Sustainable use of plant resources; information and extension.

Disciplines
Agronomy, biology, forestry

Location/sites
South-East Asia: Indonesia, Malaysia. Papua New Guinea, the Philippines, Thailand and Vietnam

Participating institutions
PROSEA Foundation, Herbarium RUL, Departments of Plant Taxonomy, Agronomy WAU, and various institutions in host countries.

Budget/funding
For three phases (1985-2000) a total budget of Dfl 20 million. Funding agencies: DGIS, OCW, LNV EC, ITTO, WAU, Tropenbos, IDRC, FINNIDA, Sarana Wanajaya Foundation Indonesia

RESEARCH VOLUME BY INSTITUTION (AGGREGATED BY UNIVERSITY)

Institution Main discipline	Universities								Research Institutes							Non-profit organizations
	UvA	VU	RUL	RUG	UU	WAU	TUT	Total	DLO	RIVM	NNM	ISRIC	ITC	Other	Total	
Natural Sciences	31	7	20	1	30	28		117	15	8	7	3	4	6	43	18
Social sciences	3	1	6	4	4	5	1	23		4			1	2	7	
Wood technology														5	5	6
Total	34	8	26	5	34	33	1	140	15	12	7	3	5		55	24

EXPLANATION ON USE OF DATABASE

The overview of Dutch research on Tropical Forest Research is presented on diskette which contains three files. A Microsoft Acces file (Dutch_Overview) and a Microsoft Excel file (Overview). The differences between the files and their usage is explained below. The third file is a short version of this explanation.

Microsoft Access 97
Microsoft Access is the standard database programme of Microsoft and is part of the standard Microsoft software Package. The database consists of three tables and two forms.
Tables
The tables are the basis of each database. It is advisable not to enter these tables as changes may hamper the use of the database. The tables contain the data of Dutch institutes involved in Tropical Forest Research (76 records) and the overview of the current Dutch research projects (239 records). The third table contains an overview of the general used AGRIS-CARIS codes with their description.
Forms
Forms are used for changing or adding information and to scroll through the database. To view the database click on form select the form (institutes or projects) you are interested in and click open. The first record is shown on your screen. For easy scrolling select the data sheet view (utmost left in the toolbar).
Queries
Queries are the tool to make your own defined selections out of the records. The big advantage of Access is the fact that the queries can search the different tables at the same time, so you can search on institute and projects at the same time. To start a query just click on the query logo at the first screen. Then ask for a new query and follow the instructions as given by the programme.
Report
Report is the device on how to print the data selected by the querie. To use report click on report and choose for a new report (use the wizard when you have never worked with Access before as this device will guide you through the definition of a report).
The use of Access is fairly simple and is described in a number of books and more information on Access can also be retrieved through internet.
Microsoft Excel 97
Both tables of the Access database are also available in an Excel spreadsheet format for easy printout, scrolling or to import the data in another database programme. The two worksheets are titled projects and institutes and contain the same information as the tables in the Access database.

For more information on the databases or to retrieve more (or new) copies of the document or the diskette please contact:
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