

***PERSPECTIVES FOR FORESTRY RESEARCH IN THE
AMERICAN TROPICS***

IN THE LAST LUSTRUM OF THE 20th CENTURY

**IUFRO'S XX WORLD FORESTRY CONGRESS
TAMPERE, FINLAND
August 7-11, 1995**

ABSTRACT

THE CHALLENGES OF FORESTRY RESEARCH IN THE AMERICAN TROPICS IN THE LAST LUSTRUM OF THE 20TH CENTURY.

Rubén Guevara-Moncada

The tropical forests of South and Central America are concentrated in the Amazonian and Caribbean Basins. Their biodiversity, contributions to world climate as carbon sinks, producers of oxygen or simply as water regulators, and the extensive variety of goods, and services that they provide are essential to the wellbeing of humankind.

Saving these forests from rampant deforestation or unwise use needs a multidisciplinary and holistic research effort, which should be jointly planned, and centered on key scientific institutions operating in the Latin America and the Caribbean (LAC) region. International collaboration, and support, the participation of NGO's, governments, and the private sector, and a concerted multinational effort in research and development are essential if this is to succeed.

CATIE is the region's leading forestry and agroforestry research organization, a primacy gained in 52 years of sustained efforts aimed at integrating research and development in agriculture, natural resources management, and the environment. CATIE, in association with selected CGIAR Centers, key IUFRO member organizations in the countries, and the national research institutions can tackle this challenge in the last lustrum of the 20th Century, in a coordinated effort that could lead to sustainable management, and utilization of the forests of Tropical America.

Key words: research in tropical forestry, networks, sustainable development, multidisciplinary research.

Address of the author:

Rubén Guevara-Moncada
Director General
CATIE
P.O. Box 19
7170 CATIE, Turrialba
Costa Rica
Telephone: (506) 556-6081; 556-1176
Facsimil: (506) 556-6166; 556-1533
E-mail: rguevara@catie.ac.cr

INTRODUCTION

The Present Situation of Forestry

In the twentieth century Latin America has undergone a demographic revolution, its population doubling every 37 years. At the turn of the century its population was 50 million, while at present it stands close to 500 million and will probably reach 716 million by the year 2020. Such growth places enormous pressure on social structures and natural resources. Population growth drives a two-fold process, urbanization and migration to the forest. Forest colonization has acquired extraordinary impetus, particularly after the Second World War. Thousands of migrant families, from more densely inhabited and ecologically degraded areas, have transplanted their extensive production systems, threatening the survival of indigenous peoples and intensifying degradation of very fragile ecosystems. Forest colonization has been greatly favoured by governmental policies and investments such as tax incentives and ill-planned road construction.

Perhaps the most directly affected by the influx of colonists into the forests are the estimated 10 million indigenous forest-dwelling people in Latin America and the Caribbean (LAC). Traditionally disadvantaged, these people find that as a rule, governments side with the settlers.

The economic systems of LAC countries are undergoing an unprecedented process of structural adjustment. The role of the state is changing, from a producer to a promoter of the private sector. Some countries are taking the first painful steps to stabilize their economies and embark on a growth path based on an open, outward-looking development policy, and promotion of higher value products to compete on the international market. Investment funds are severely constrained by massive foreign debt. There is also a widening import-export imbalance and great pressure to produce for export, which has led to exploitation and degradation of fragile ecosystems. In rural areas underemployment rates approach 40 percent, particularly affecting the small landholder sector.

In many respects Latin America and the Caribbean is worse off than Asia or Africa and the need for immediate international support, at unprecedented levels, is clear. The fact that the region has the largest forestry reserves in the world with the greatest diversity of forest species, mostly little known, argues strongly in favour of such immediate assistance.

The amount of forest land on either a per capita or a surface area basis puts LAC in the forefront of both the problem and potential solution. Latin America lags behind other regions in terms of total forestry projects, number of training institutions, and research expenditures in forestry. This fact becomes more alarming when the total resource endowment is taken into account, and the rations of research, training and project support on a forest unit area basis are considered. Thus, in 1980 forestry research expenditures in Asia were \$102 million versus \$27 million for LAC. According to Gregersen (1991), in 1988 Asia had almost 6,000 forestry researchers, compared to the 3,800 in LAC.

Latin America and the Caribbean has some 678 million hectares of wet tropical forest, more than half located in the Amazon basin. There are also 108 million hectares of secondary forest. Deforestation figures for the LAC region vary between 12 and 4 million hectares yearly. But even if the lowest figure is accepted it is twice the amount lost in Asia and four times that in Africa. Deforestation rates have been increasing in all countries. The annual forest conversion rates for individual countries are catastrophic: 600,000 hectares in Colombia and 250,000 hectares in Peru. The Central American region loses almost 370,000 hectares per year. Shifting cultivation and extensive cattle ranching account for 75 percent of deforestation in LAC; 13 percent is for firewood collection, and 12 percent is extracted as lumber for industry and other purposes. The World Resources Institute (WRI) has estimated that between 1950 and 1980 some 160 million hectares of forest have been converted to pastures (Table 1).

Table 1:

Forest Indicators for LAC, Africa and Asia

CHARACTERISTIC	LAC	AFRICA	ASIA
Closed Forests (mil ha)	722	220	409
Open Forests (mil ha)	207	465	87
Total Forest (mil ha)	929	685	496
Plantations	4.6	1.8	5.2
Forest Land <u>per capita</u>	1.8	0.7	0.1
Forest as % of Total Land Area	47	27	25
Forest Research Exp. (mil \$/y)	27	26	103

Source: Herd Commission Report to CGIAR, March 1991.

One of the worst features of deforestation and the utilization of unsustainable production technologies is the increase in soil degradation, particularly erosion. The most degraded areas are the densely populated foothills and highlands of Central America and the eastern slopes of the Andean Cordillera. The loss of biological diversity, especially in the Amazonian Basin, represents another level of incalculable waste.

Unlike Africa and Asia, an estimated 85 to 90 percent of Latin America's forest products are consumed within the region. Economically, the trends in production and forest product trade are difficult to deduce from available statistics. Some countries, notably Chile, Argentina and Brazil are net exporters of forest products. Most are increasingly net importers (Table 2).

Table 2:
Forest Products Trade in LAC (1983-1989)

TRADE (\$000S)	1983	1985	1987	1989
Exports from LAC	385,731	372,486	432,599	410,848
Imports to LAC	989,269	1,228,660	956,260	693,485
(Trade Imbalance)	603,538	856,174	523,661	282,637

Forest conversion to unsustainable agriculture is a primary manifestation of inappropriate policies, poor land-use planning capacity, and a shortage of applied alternatives. Traditional responses to deforestation include park and extractive reserve development, forest plantation establishment, and agroforestry.

In the last two decades Latin Americans have slowly begun to accept the fact that natural resources, particularly tropical forests, are valuable national assets that merit protection. A growing number of pressure groups have firmly established conservation in the national and international agenda. In the years to come the call for enlarging the areas under protection will grow stronger. These areas include national parks, natural monuments, wildlife sanctuaries and protective forests for critical watershed.

Protected natural areas of the American tropics have expanded considerably. A recent International Union for the Conservation of Nature and Natural Resources (IUCN) document indicates that at present they cover some 103 million hectares, still a fraction of the existing forests. However, given the growing public awareness and desire for action, it is feasible that by the year 2000 an additional 5 million hectares will be added.

Central American countries have over 3 million hectares in national parks, mostly in the wet forest of the Caribbean. Brazil has made substantial progress, and now has 20 million hectares under protection. Peru has over 4 million hectares and Bolivia 6 million. Brazil and Peru have their largest units in the Amazon basin.

There are also several million hectares of protection forests in critical watersheds where hydroelectrical projects have been constructed.

All of these protected areas are under severe pressure from a rising population.

Global Compromises

Recently, the countries of Latin America have acquired several binding, and non-binding compromises that are a bonanza of opportunities for new forestry research in the region. Among the most relevant are:

- a) Non-binding forest principles (UNCED 1992).
- b) Convention on Biodiversity (UNCED 1992).
- c) Convention on Climate Change (UNCED 1992).
- d) Convention on Desertification (1994)
- e) International Tropical Timber Agreements (1983; 1994)
- f) Creation of the Intergovernmental Committee on Forests of the U. N. Commission for Sustainable Development (CSD).
- e) Creation of the Timber Working Group of the Convention on International Trade with Endangered Species of Flora and Fauna (CITES).
- f) Certification of Timber, and Wood Products (on going activity).

National governmental and private research organizations, and regional or international centers or institutions have to gear up to provide opportune, and convincing answers to the problems that these compromises try to address. This sort of response would lead to an increased impact of forestry research, and therefore to stronger support from all quarters to such research.

TROPICAL FORESTRY RESEARCH IN LATIN AMERICA AND THE CARIBBEAN

The Existing System

Forestry research in Latin America is conducted by a plethora (205) of institutions of varying capabilities, competing for limited resources, and undertaking an extraordinary diversity of research. According to de Camino (1988), 75 percent of all research institutions are concentrated in five countries: Argentina, Brazil, Chile, Colombia and Mexico. Of all institutions carrying out forestry research, universities represent 41%; another 24% are public research centres; 23% are forest services; and 12% are private. There is a wide variation in quality, size and capacity. Some only have a single researcher, and others up to 200, the average number of technical personnel being 16.

With respect to the academic training of forestry researchers in LAC, about 6 percent hold Ph.D.'s, a suprisingly high 46 percent hold Masters' degrees and 27 percent hold Bachelor degrees. There is a paucity of technical personnel: 21 percent.

Forest service in most countries do very little research, spending most of their resources in fiscal control and police actions. Most countries do not have forestry extension services. Generally there is a critical lack of even the most basic extension materials such as flipcharts, films or user's manuals. Most of the existing teaching material is not adapted to the socio-economic and cultural conditions of peasant farmers.

Few centres have a critical mass of researchers. They tend to have too many principal staff relative to assistants and support staff. In most institutions, the best scientists lack assistants, who could multiply their capacity. Generally there is poor motivation due to low salaries, weak incentives, low productivity and inadequate support. There is very little interdisciplinary teamwork. A few national and regional institutions are staffed by outstanding professionals capable of producing good research, but are stultified by the lack of operating funds. All centres have libraries but most libraries are poorly stocked. Lack of funding prevents them from subscribing to scientific journals or from publishing and distributing results. Even the good organizations suffer from instability and excessive diversity in research topics. Personnel turnover is high, thus much research is abandoned half way.

A large number of programmes concentrate on plantations and silvicultural practices, including nurseries, reforestation and plantation management. There has been neglect of fields such as policy and human settlements. At the same time there are fields such as silviculture of native forests, in which much work has been done but with very little transfer of knowledge gained.

At the regional and country level there are many institutions performing uncoordinated research. Only a fraction of the research is passed on. Much of the research carried out has a limited application in the real world of problems. An inordinate proportion of resources has been invested in buildings and laboratories, while there is low availability of operating equipment, and minuscule operating and maintenance budgets.

In a recent paper (1989), Gregersen shows that forestry researchers in Latin America and the Caribbean feel that increased investment in forestry research should be distributed, first, to incorporating and training more scientific and technical personnel; second, to improving equipment; and third, on more experimental stations, installations and support for libraries. A forestry research programme to improve Latin America's natural resource management and sustainability must address both research agenda and institutional constraints which limit its implementation.

Research Needs

Based on the developmental, environmental and institutional profiles sketched above, several attempts have been made in recent years to identify the priority areas in which research should be concentrated (CGIAR 1990, IUFRO 1987, Bellagio II 1988, Gregersen *et al.* 1989, INFORANDES 1990). The following list of priority research areas specific to the American tropics builds on those efforts.

1. Agroforestry
2. Natural forest management and conservation
3. Tree breeding and improvement
4. Utilization and market development
5. Policy and socio-economic issues.

Furthermore, with the global compromises outlined before, the priorities in forestry research should include the major themes comprised in them, which our countries must comply with.

Who can take the lead in each research area?

There are outstanding national, regional and international institutions with strong programmes in particular areas, e.g. CATIE in integrated applied research, CIAT in land use hillside farming, the Smithsonian Tropical Research Institute and the Organization of Tropical Studies in tropical forest ecology. Among the national agricultural research institutions (NARs) in tropical Latin America, Brazil's EMBRAPA clearly stands out as one of the best.

At international fora it has been stressed that the key to successful research is strengthening the regional, and national institutions with a continuous trade record in research. The biological, cultural and institutional diversity of Latin America and the Caribbean requires that field research be dispersed among different locations and organizations, which, in turn, requires an efficient conduit for external assistance. The regional institutions mentioned above have long fulfilled this role. They have proven to be the fastest, most cost-effective mechanism, and the one with greatest continuity.

CATIE'S UNIQUE FORESTRY CAPABILITIES

CATIE is the only regional forestry and agroforestry research centre in Latin America. It has developed extensive experience and qualifications in integrating research in agriculture and livestock production with forestry. This experience is available to help meet Latin America's research needs, potential and interest in participating in an expanded forestry research effort.

CATIE has been pursuing integrated, multidisciplinary research in tropical America since 1942. It began agroforestry research in 1952, and forestry in 1950.

It has a strong institutional memory reflected in continuous records of research performed on its own experimental sites and in the scientific and popular publications over the past five decades. This experience has generated exceptional qualifications and capabilities:

- CATIE is located in a humid tropical forest area, on its own 1 100 hectare experiment station. This station includes habitats, ranging from clear cultivation, through pastures, to regenerated and natural forests. Its woody plant collections are the most comprehensive in the hemisphere and are available to investigators in tropical Latin America. CATIE's stability, its record in maintaining and expanding this collection for half a century, and its tissue culture capabilities, makes this an optional choice as a centre for tropical germplasm research.
- A complete physical complex is in place, including offices, shops, housing, laboratories, classrooms, communication facilities, library and special collections, supporting electronics, and the staff to manage them. CATIE's capability in geographic information system (GIS) is one of the best in Latin America.

- Over the last decade, CATIE, jointly with national institutions has built a unique multiple-use-tree silviculture database (MIRA) which has already been used to develop yield and growth models. Likewise, CATIE's work in primary and secondary forest management and agroforestry systems is pioneering.
- CATIE has a dedicated staff of 500, of whom 200 are professionals (over 60 with doctorate, over 80 with master's level). Staff members originate from North and South America, the Middle East, Asia, and Europe. The Center oversees an eleven-country network in agriculture and renewable resources (REDCA) that promotes cooperation and complementarity in research and education. Through this network, CATIE maintains close ties with national and international research institutes, universities, ministries, and non-governmental organizations in member countries. The Center has strong links with similar institutes in Europe, the United States, Asia, and Africa.
- CATIE operates one of the world's premier graduate programs in tropical forestry, agroforestry, and agriculture. Graduates represent some 35 nations, and two thirds work for national research institutes and universities in their country of origin. Short courses tied to research are attended each year by up to 3000 people from around the world.

CATIE serves as a regional base for: The Worldwide Fund for Nature (WWF), the International Union for the Conservation of Nature (IUCN), CIFOR, France's International Center for Agricultural Development (CIRAD), Britain's Natural Resources Institute (NRI), and the International Plant Genetics Research Institute (IPGRI). The research agendas of these organizations are fused with those approved in CATIE's strategic plans which adds a tremendous strength to forestry and agroforestry research.

These basic capabilities are being matched by significant improvements in management. CATIE conducted an inventory of all ongoing research in the member countries and reprogrammed its operations in a ten-year strategy. This was supplemented by an independent evaluation which has led to further improvements in management and governance.

CATIE in 1992 revised its constitution to create a self-perpetuating board in the Consultative Group for International Agriculture Research (CGIAR) pattern. This revision was sponsored by CATIE's donor support group (the same as CGIAR's) and was approved by the Inter-American Board of Agriculture made up of the Ministers of Agriculture or equivalent, of the 34 nations in the American continent.

It is worth mentioning that CATIE's capabilities to operate at a continental level have been additionally enhanced by the signature of a cooperation agreement with the International Center for Tropical Agriculture (CIAT) and the Inter-American Institute for Cooperation in Agriculture (IICA).

CIAT

The International Center for Tropical Agriculture (CIAT) is one of 16 members of the CGIAR, specializing in bean, cassava, tropical pastures, and land-use planning. In 1992, CIAT initiated a natural resource ecosystem management program with emphasis in forest margins, and hillsides. Presently, this program has gained momentum, and is beginning to have an impact in tropical America.

CIAT is working closely with the International Center for Agroforestry Research (ICRAF), the Center for International Forestry Research (CIFOR), and CATIE in the hillsides of Central America, the Amazon Basin, and the Andean region. There is a close relationship with the Inter-American Institute for Cooperation on Agriculture (IICA), and other specialized regional institution or members of the CGIAR family.

A PROPOSED LATIN AMERICAN FORESTRY RESEARCH NETWORK

To address the topic areas identified in previous sections an imaginative institutional set up will be required. The conceptual framework for such an approach is outlined in the next section and the concrete proposal is developed in the last section.

Past experience in international research demonstrates that there are eight basic principles for resolving institutional constraints:

- (1) Tight network linkages produce a critical mass. Given the ecological, institutional, and cultural diversity of the region, an effective and efficient forestry research programme must be based on a network of superior regional and national institutions, tightly linked by an agreed research agenda. Properly led, such a network provides the critical mass of professionals needed for tangible results. Support to this network should seek to maximize the effectiveness of existing capacity, facilitate intra-network interchange, and encourage expanded support from domestic sources and donors.
- (2) Strong central leadership. With limited funds, maintenance of the needed focus on a taut research agenda requires effective central leadership. The lead institution must enforce adherence to the agreed agenda, yet be aggressive in cutting off unproductive lines of work. The leader must be constantly aware of work in progress, and facilitate the interchange of information which can drive progress towards the desired goal.
- (3) Stability and continuity. Historically, programme stability and continuity has been a function of donor involvement. CGIAR, operating within an essentially unlimited time frame, should bring to network operations a stability that improves on the typical 5-year span of donor projects.
- (4) Commitment. The effectiveness of research performance, like that of institutional performance, requires commitment by investigators and management alike. They must be involved in the agenda formulation process, and must become committed both to the goals which emerge, and the pathways to those goals.

(5) Concentration. The tremendous variety of worthwhile topics to be researched in tropical America is a major factor in the dispersed character of tropical research. In addition to defining a concentrated network of institutions and investigators, CGIAR will have to assure a comparable disciplining of a highly delimited research agenda.

(6) Synthesis of existing research results. Latin American forestry research has concentrated on silviculture, reforestation, plantation management, and tree characteristics, almost to the exclusion of the management of natural forests. This repetitive research should be discouraged until the acquired knowledge has been synthesized and specific gaps defined. Without it, the wasteful repetition will continue and more productive lines will be neglected.

(7) Integration. Forestry research cannot be conducted in isolation from other natural resource utilization or from the socioeconomic impact of human populations. The disappearance of natural forests is a phenomenon of human wants and needs, in large part to convert the land on which the forest grows to agricultural uses. Protection of the forest requires that ways be found to satisfy these human needs, to mitigate or delay their impact. This will require the integration into forestry research of agriculture, agroforestry, watershed management, land use policy, land use planning and incentives, as well as research into the socioeconomics of human settlements. This integrative approach is of necessity multidisciplinary.

(8) Incorporation of policy research. The studies of natural resource policy, which in essence provides the incentives, disincentives and regulation of human endeavour, including natural resource use, has been neglected. Yet the current crisis in natural resource management is less the result of "natural" phenomena than of misguided and outmoded policies established by governments. The need to clear land in order to claim title, the skewed economic incentives for rearing livestock rather than timber, and the distorted land market and labour policies which stimulate settlement are examples of these policy flaws.

PROPOSAL FOR A RESEARCH NETWORK LED BY CATIE

CATIE proposes to address the research issues identified in previous chapters through a networking mechanism which will operate in Latin America and the Caribbean. CATIE, CIAT, and IICA would be the leading agencies in charge of its implementation. Given that the Mesoamerican tropics (Mexico, Central America and the Caribbean), the Amazon and the Andes, are three distinctive regions and that their institutional arrangements that facilitate networking activities already exist, CATIE proposes to operate as follows:

(1) In Mesoamerica

In the Mesoamerican tropics the focal mechanism will be the Regional Cooperation Network for Research, Higher Education, and Outreach on Agriculture and Natural Resources (REDCA). This network was founded by CATIE in 1986 and at present has over 150 research, education and policy institutions from Mexico, Belize, USA, Canadá, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, the Dominican Republic, and Venezuela. REDCA in the next few months. REDCA also has affiliates that operate at the regional level, such as the Central

American Programme of the International Union for the Conservation of Nature and Natural Resources (IUCN). REDCA by-laws allow for the incorporation of institutions from other countries, such as Brazil and the Caribbean Islands, if desired. CATIE and some individual members of the network already have links with other research organizations in the region such as the Smithsonian Tropical Research Institute (STRI) and the Organization for Tropical Studies (OTS).

(2) In the Amazon Basin

In the tropical region of South America, CATIE proposes to develop forestry and agroforestry research with CIAT and PROCITROPICOS as the focal mechanism. PROCITROPICOS is a network sponsored by the Inter-American Institute for Cooperation in Agriculture (IICA), consists of national research institutions from Brazil, Guyana, Venezuela, Colombia, Ecuador and Peru.

(3) In the Andean Region

In the Andean region (Venezuela, Colombia, Ecuador, Bolivia, Peru, Argentina, Chile) CATIE intends to work with CIAT, and the INFORANDES forestry research network which has been endorsed by the Ministers of Agriculture of the first five of these countries. The intent of INFORANDES is to strengthen the research capability of the national institutions, and to identify and execute national and regional research projects. It operates with the help of a regional coordinator, as well as with coordinators in each country. This network has identified research priorities which have been included in this CATIE proposal. Contacts with the Amazonian Cooperation Treaty, a protempore entity, will also be established in the near future.

The forestry, and agroforestry specialized research institutes of the different countries would also be included. Likewise, other CGIAR centers such as CIFOR, ICRAF, IPGRI, and ISNAR will be participating in their areas of specialization, in this effort.

Conclusions

The following conclusions can be derived from the previous discussion:

1. Forestry research in LAC is carried out by many institutions that are mostly small and work. However, CATIE stands out as the best in the region, with a long track record, and a strong program.
2. These are strong institutions or instances such as OTS, STRI, CIAT, INFORANDES, PROCITROPICOS, and a few CGIAR Centers that are beginning to do research in forestry.
3. The best results in forestry research in the region could be achieved if these institutions, instances, and some strong national institutions such as EMBRAPA join forces in a network, where CIFOR, ICRAF, IPGRI, and other organizations should participate.
4. These are new opportunities to boost forestry research in the region due to the global compromises derived from UNCED 1992, and other agreements such as ITTA 1994, CITES, and CSD.

Acknowledgments

CATIE wishes to acknowledge those whose contributions and support have made this paper possible, in particular Stanley Heckadon-Moreno, Alberto "Scaff" Brown, David Gibson, Henry Tschinkel, Raymond Waldron, Eduardo Trigo, Ronnie de Camino, Gustavo Nores, Filemón Torres, Manuel Tourinho, John Palmer, Frank Wadsworth and George Angher.

References

- CGIAR. 1990. A possible expansion of the CGIAR. TAC Secretariat/FAO, AGR/TAC:IAR/90/24. Washington. 200 p.
- De Camino, R. 1988. Some considerations about tropical forestry research in Latin America; a background paper for the Task Force on Tropical Forestry Research. CATIE, Costa Rica. 67 p.
- Gregersen, H. 1991. Key forestry issues facing developing countries: a focus on policy and socioeconomic research needs and opportunities. IUFRO-SPDC/IFPRIUSAID Workshop on Forestry and Agroforestry Policy Research, July 9-12. Washington.
- Gregersen, H.; de Camino, R.; Kio, P.; Oram, P. 1989. International and Regional Organizations and Networks Involved in Tropical Forestry Research. A Stock Taking. Report prepared for the TAC.
- INFORANDES. 1990. Memoria de la Reunión de Expertos de Investigación Forestal en Los Andes. Quito, Ecuador. 246 p.