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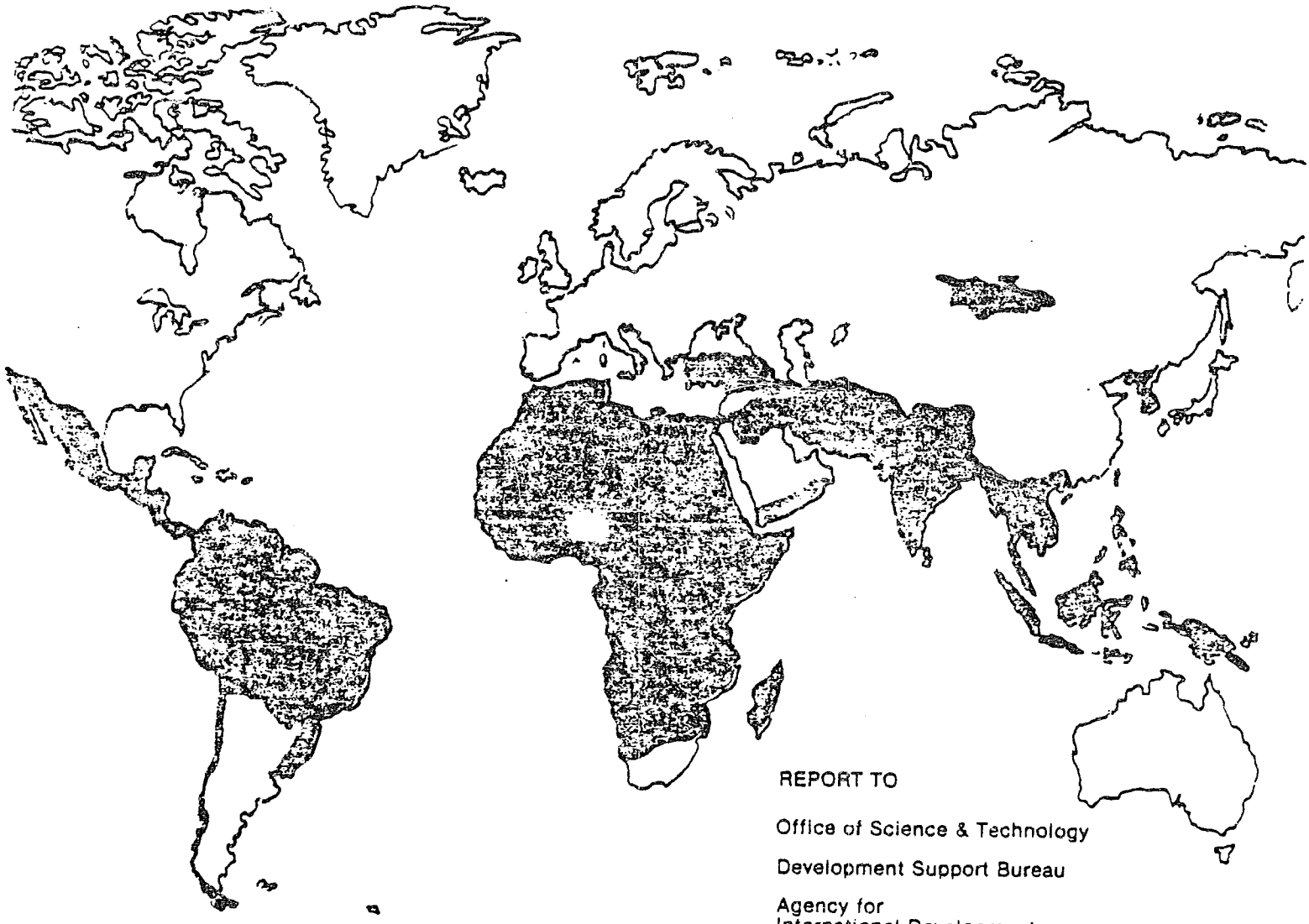
Forestry Activities and Deforestation Problems in Developing Countries



REPORT TO

Office of Science & Technology

Development Support Bureau

Agency for
International Development

PASA No. AG/TAB - 1080 - 10 - 78

Attachment 2.

PASA No. AG/TAB-1080-10-78

FORESTRY ACTIVITIES AND DEFORESTATION PROBLEMS IN DEVELOPING COUNTRIES

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For the
FOREST PRODUCTS LABORATORY
FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

July 1980

REPORT TO:

OFFICE OF SCIENCE AND TECHNOLOGY
DEVELOPMENT SUPPORT BUREAU
AGENCY FOR INTERNATIONAL DEVELOPMENT

CONTENTS

EXECUTIVE SUMMARY

Scope

The overall purpose of this report is to summarize for the U.S. Agency for International Development (A.I.D.), the recently completed, current, and proposed forestry activities in developing countries. Included here are ecological impacts of these activities, constraints in implementation of projects, and some examples of success and failure. This information is to be used by A.I.D. in designing a strategy to deal with problems associated with deforestation in developing countries. Specific objectives were to provide A.I.D. with:

1. An inventory of forestry activities being carried out by the various agencies, bilateral and multilateral, responsible for assistance to developing countries. These agencies are commonly called donors.

2. An assessment of the general ecological impact of the forest-related activities of the major donors.

3. An assessment of the present constraints placed upon the various donors in dealing with the problems of forestry and deforestation in developing countries (constraints not imposed on A.I.D.).

4. An inventory showing where the most critical obstacles or opportunities are in respect to the forestry problems of developing countries, and which of these would be appropriate for A.I.D. to address through research, pilot projects, training, or other means.

5. A compilation of selected case studies of forestry experience including examples of success and failure.

To accomplish these objectives, members of a 5-man team visited 17 developing countries, interviewed dozens of donor agencies, and reviewed the literature pertinent to those countries and agencies from a forestry viewpoint. The resulting information gives an overall picture of the kinds of forestry related problems faced by the developing countries, what is being done about them, and what kinds of approaches seem to succeed or fail.

Summary of Donor Agency Activities

The inventory of donor agency forestry projects showed a dominance of industrial activity. Industrial assistance projects cover heavily capitalized pulpmills or sawmill complexes, rather than on-the-ground establishment and management of forest stands. Continuation of this

trend would exert greater pressure on existing forest reserves and contribute to the deforestation problem.

The second largest activity is reforestation/afforestation. However, despite this emphasis, deforestation is still a major problem. Even with technological advancement and increased contributions by alternative energy sources, projected wood biomass required by the year 2000 will exceed that which will actually be produced at current rates of planting by a factor of four. Because of the need for improved forest management, the World Bank and other donors have increased their commitments to forestry projects.

In total forestry assistance for current projects, Sweden ranks first, followed by IBRD, FAO/UNDP, and USA. However, Sweden's contribution consists mainly of a single pulpmill project in North Vietnam. The IBRD projects are also heavily industrially oriented, while FAO/UNDP and U.S. programs are better balanced.

Fewer donors are involved in forestry conservation activities. A probable reason is that conservation projects are often not economically viable and are frequently implemented in high-failure probability areas.

For education projects, ongoing activities outweigh those proposed by nearly a factor of three. This is another gap in forestry assistance because the developing world is faced with a critical shortage of forestry expertise. A clear need exists to strengthen forestry educational facilities as well as curricula. The United States is responding to educational problems more than other donors.

USA is also the largest donor for research projects, but action-oriented activities are felt to be more important by donors and recipient country governments.

Integrated development projects are categorized by several components, including forestry, which are implemented in a balanced approach to development. The IBRD ranks first in current activities, followed by FAO/UNDP and Germany.

Technical assistance, the least influential category in total forestry assistance, is used more by FAO/UNDP than the other donors. This category consists of short- to medium-term direct consulting services to developing countries.

Conclusions

1. A.I.D. has not conducted an extensive forestry program recently. This lack of experience, background, and emphasis is a deterrent to making a major impact against deforestation. However, A.I.D. has recently hired four foresters, which is a small but good step in the right direction.

2. A number of donor projects are contributing to deforestation, or will fail in reducing the problem for lack of ecological concerns. Road building, agricultural, hydroelectric, colonization, and industrial forest harvest projects are potential deforestation causes.

3. Donor agencies operating in the same country, often in the same subject area, tend not to communicate with each other. This leads to duplication of effort or failure to learn from the mistakes and successes of others.

4. Where donor projects involve forestry components, decisions are often based on factors other than need. This leads to patchwork demonstrations that do little to solve the problem.

5. Forestry projects often are imposed on local residents rather than based on community involvement. If long-term projects are to escape vandalism or "help-yourself" harvest, local residents and the local political structure must be involved and must feel that some of their needs are being met by that involvement. Many donor projects have failed due to "lack of cooperation" by local residents.

6. Donor organizations often exhibit little acceptance or understanding of the value systems, cultures, and traditions of recipient countries in their design and implementation of forestry projects.

7. The causes of deforestation are principally shifting agriculture (SHAG) and the shortage of fuelwood. Forest harvest projects often induce deforestation by making areas accessible to SHAG farmers.

8. The problem of deforestation varies greatly from one nation to the next, and even among different regions within a nation.

9. Many nations have large areas of depleted land which could be restored to productive status by remedial forestry programs. By thus raising the carrying capacity of such land, there can be more production of food and fiber to support higher populations in rural areas.

10. Action programs are most needed. The problems and their solutions are already well understood in most cases and further study is often superfluous.

11. Agroforestry activities are not being supported by donor agencies to the extent they should be. Indeed, agroforestry is not well understood by most donors.

12. The installation of an energy farm to produce fuelwood is a relatively easy matter, yet few donors have taken up the challenge. The need is acute in many areas. Where economic and biologic conditions are favorable, increased fuelwood production is warranted. The possibilities for energy entrepreneurs have largely been overlooked.

13. The time to get a project from proposal stage to on-the-ground action is exceedingly long for some donors. By the time a project is ready to be implemented, the people who wrote the proposal are often no longer available. One solution would be to give Missions more flexibility in on-the-spot funding to carry out small projects as the needs arise.

14. It is possible to create a negative impact by flooding the country with too many donor activities or funds. Donor organizations may implement oversized projects in countries not yet ready to absorb them into their existing political and economic structure. The country may depend on the project as a sole source of economic well-being. More often than not, when project funding has ended, the country is ill equipped to carry on because of bottlenecks in education, managerial talents, and other factors.

15. Projects are often started but left unfinished, or not properly followed up, due to inadequate funding beyond present budgeting commitments. Also, donors often fail to recognize the long-term nature of forestry activities in their budgetary allocations. These problems may lead to lack of cooperation by local people, and even encourage sabotage of the project activities.

16. A.I.D. hiring procedures are centralized at the Washington Office, and tend to be complicated and involved. As a result, many good candidates, eager to work for A.I.D., have tired of the hiring process (which may take the better part of a year) and turned away to work elsewhere.

17. A.I.D. mission directors are responsible for keeping expenditures within the annual budget, but are limited in the use of funds by mission comptrollers. Thus, the director's flexibility is sharply reduced. Responsibility and authority should go hand in hand.

18. While donors may consider economic and ecological principles in the design of projects, these principles are often not taken seriously.

19. Forestry activities are too often subordinated to other project activities. Token status indicates a lack of appreciation for the scope of complete forestry involvement.

Recommendations

1. Balance long-term and short-term goals.--Where hunger and malnutrition are rampant, the tendency is to accept a short-term solution to meet immediate needs, usually by depleting the resource capital. This will accomplish little if not done on an ecologically and economically sound basis that provides a long-term solution. On the other extreme, forestry projects that require several decades to mature may be sound in the long

run but will likely fail because they meet so few of the immediate people-needs. Forestry projects should be planned to accommodate needed food and fuelwood production in the short term as well as sustained long-range forest resource values, both commodity and non-commodity.

2. Coordinate activities among donors, and between their efforts and national efforts.--The activities and purposes of donors are often worlds apart while the donors themselves are physically only blocks away. An impact can be made by pooling resources. A group of cooperating donors has more power than a single donor to convince the national government of a proper solution. In countries where forestry projects are supported by different bilateral or multilateral donor agencies, including A.I.D., we recommend that A.I.D. take conscientious leadership in getting agencies to communicate with one another, as has been done in Nepal.

3. Coordinate through forestry planning.--Donor and national efforts should follow a common forestry plan. Detailed studies of soils, forest land use capability, ecological life zones, and rainfall patterns have been conducted in many countries, but these are not plans. These sets of data, which take several years to produce, tend to be unused. The need is for flexible, national planning guidelines. Donor agencies should work with developing countries to establish plans for forests with the objective of maintaining optimum production of food, fuel, and roundwood as well as other forestry values including watershed and wildlife protection.

4. Coordinate through land use planning.--Proposed donor projects are often incompatible. A land use plan is essential for allocation of land to specific uses, i.e., so many hectares for agriculture, so much for livestock, so much for forestry, etc. A properly balanced land use plan will establish ecological constraints on the economic development of an area to ensure its long run, sustained productivity. Donor agencies should work with developing countries to establish overall land management plans that give due consideration to forestry in relation to other land uses. Such plans should keep in mind the problem expressed in recommendation 3, above.

5. Take action, not further study.--There is a sufficient knowledge base on which to build sound action programs to resolve urgent people-needs. Delays to acquire more knowledge, before initiating action programs, only make the deforestation problem harder to resolve. Donor agencies should place more emphasis on action programs such as nursery and plantation establishment, and efficient conversion and combustion units for wood as a source of energy rather than problem studies.

6. Provide incentives.--Local residents, landowners, decision makers (whether government officials or SHAG farmers), and technicians are usually key persons in donor activities. Such activities must provide incentives to these local people, in effect buying their enthusiasm. The key people must see an obvious personal benefit in the project, if it is to succeed. The type of incentives that will motivate people

depends on the person and the cultural background. To an entrepreneur, a tax incentive often does it. To a priest or missionary working among the villagers, other types of incentives would be appropriate. To a technician, co-authorship of an article describing his work might do it. Donor agencies in cooperation with host governments should provide incentives to local residents to encourage sound forest land and resource use.

7. Stress environmental values.--Conservation and environmental values are considered only minimally in many agricultural projects. Any economic analysis of a project will be erroneous if based only on output of food and fiber in the short run while the resource capital is being depleted. Less money needs to be allocated to resource protection if a project is implemented on flat terrain in abundant rainfall areas, as opposed to projects in steeper or drier areas. Project yields may be the same for both areas, but the extent of damage to the resources will differ. The production capability of the resource should be evaluated at different intervals during the project life. If the production capability is lower as a result of the project, this becomes a legitimate cost to be included in the project's economic analysis.

In developing countries, long-run mistakes with the natural resources leave the people nothing to fall back on. The basic ingredients necessary for long-term survival are continuing supplies of water and food, with a sustained natural resource base. Increasing one must necessarily be traded off against another. Unless a proper balance between the three is maintained, the long-run effects may be devastating to the local people. Forests should be managed to provide maximum production of food, water, and other forest land benefits consistent with environmental protection.

8. Promote social or community forestry.--A few donors have recently turned from an emphasis on industrial forestry to one more people-oriented. The World Bank's Forestry Sector Paper (1978) and the FAO Forestry Paper No. 7 (1978) nicely summarize why this is both wise and necessary. Long-term forestry projects that do not alleviate immediate, local people-needs are very susceptible to vandalism and invite failure. Recently missionaries in Haiti who had been promoting mahogany plantations for over 10 years switched to faster growing species for fuelwood. It seems that desperate fuelwood shortages precipitate cutting valuable mahoganies at night to alleviate those shortages. In working with developing countries it is more important to serve general population day-to-day needs than to develop industrial production in the short run.

9. Combat fuelwood shortages.--Not all developing countries are faced with a lack of fuelwood; of those which are, only a part of the nation may be affected. But where there is a fuelwood shortage, deforestation and often desertification are surely on the increase. To prevent this increase, fuel needs of the local residents must be met in a fashion acceptable to them. Traditional rural people are not likely to shift from wood-based fuel to coal or petroleum products, nor are these good alternatives, unless the country has its own supplies. Donors should

have few technical problems with projects that produce wood for fuel, except under extreme conditions. If the local population is in desperate need of fuelwood, recently planted seedlings will be used to cook tomorrow's food. Also, if the region is extremely dry (low rainfall accentuated by man-caused desertification and porous soils), the problem can be more of a challenge. Community fuelwood plantations have been successful in some countries and should be tried in others.

10. Enhance extension and education programs for developing country residents.--A common donor approach is to include an extension and education component in a project. However, this component tends to be inadequate because locals, while understanding the message, often do not see any personal benefits for them. Extension and education should be combined with incentives as stated in recommendation 6.

11. Implement balanced, integrated forestry projects.--Forestry must meet people-needs, and it must blend in with other enterprises that meet other people needs. The terms "agroforestry" or "agri-silviculture" have been used to cover the effort to raise crops, trees, and forage for livestock on the same landscape in an environmentally balanced fashion. Usually rural residents in developing countries will relate to and be enthusiastic about such an approach; thus will help such donor projects succeed. Ecuador is an example of a country where this is happening.

Total destruction of native vegetative cover is too high a price to pay for high-yielding monoculture plantations. Problems might include elimination of wildlife habitat, loss of livestock browse in cases of extreme drought, poor run-off retention, and other problems inherent in monocultures. Forestry programs should be planned with minimal dependence on mono-culture plantations. Small-scale plantations interspersed with patches of natural vegetation may cause much less damage.

12. Promote and support agroforestry research.--The International Council for Research in Agroforestry (ICRAF) was organized in 1978. To date A.I.D. has not been able to effectively promote financial support for this important organization, which offers an improved approach to solving land-use problems in developing countries. Greater support of agroforestry research should be provided.

13. Improve and augment talent pool.--Few employees of A.I.D., if any, are working foresters, with forestry experience in developing countries. Any A.I.D. forestry project, or project with a forestry component, should be guided by a forester familiar with the problems, solutions, species, language, and culture inherent to the particular country. The tendency now is to have A.I.D. mission personnel, often inadequately trained in any biological science, depend on short-term consultants who also may be ill-equipped to contribute to the solution of the problem at hand. It is essential that A.I.D. hire more foresters with the necessary experience without restrictions to only the U.S. talent pool. The successful approach used by the A.I.D. forestry program in Nepal shows the benefits

from having major forestry programs directed by experienced foresters, in this case from the United States.

14. Increase A.I.D. mission authority for small expenditures.--A.I.D. mission directors should be given more flexibility to carry out small project ideas as the needs arise without undue delays caused by bureaucratic procedures.

15. Review and correct previous mistakes.--A.I.D. should conduct a thorough review of previous and existing projects to determine where follow-up action is required. Past mistakes such as dam construction with no provision for watershed protection, converting forest land to agriculture when the land was not suited to agriculture, and lack of continued support for institution building and staff training should be corrected.

16. Decentralize hiring authority.--Mission directors should be free to hire on the spot within budget limitations. Centralized hiring procedures require too much time to properly respond to the needs.

17. Up-date list of forestry projects.--FAO is best equipped to maintain and periodically publish an up-to-date version of Appendix I of this report, making it available to all donors and governments that request it. A.I.D. should explore the feasibility of doing this.

18. Involved local institutions.--Local institutions such as schools, forest services, and political infrastructures should be involved in the beginning when forestry projects are being planned. Without active and eager participation by local institutions, a project is more likely to fail.

19. Promote international exchange of forestry talent.--A.I.D. should promote the exchange of forestry talent with staff and students, between the United States and developing countries, as well as between developing countries, to provide forestry practitioners with a broader based understanding of solutions to problems.

20. Strengthen total forestry commitment.--For A.I.D. and other donor agencies to be effective in the forestry area, the subordinate forestry component approach must be recognized as being ineffective. Forestry programs must be on a par with agricultural production programs. Major forestry projects must be directed by qualified and experienced foresters at both the national and regional level.

ABBREVIATIONS USED IN REPORT

ADAB--Australian Development Assistance Bureau
AfDB--African Development Bank
A.I.D.--Agency for International Development
AsDB--Asian Development Bank
ASEAN--Association of Southeast Asian Nations

BANSEFOR--Banco de Semillas Forestales (Honduras)
BFD--Bureau of Forest Development (Philippines)
BMZ--Bundesministerium für Wirtschaftliche Zusammenarbeit
BODA--British Overseas Development Administration

CARE--Cooperative for American Remittances to Everywhere, Inc.
CATIE--Centro Agronomico Tropical de Investigacion y Ensenanza
CDF--Centro de Desarrollo Forestal (Bolivia)
CIDA--Canadian International Development Agency
CILSS--Comité Permanent Interetats de Lutte Contre la Secheresse dans le Sahel
COHDEFOR--Corporacion Hondurena de Desarollo Forestal (Honduras)
COTESU--(Swiss Forestry A.I.D. program)--Cooperación Técnica Suiza
CWS--Church World Service

DANIDA--Danish International Development Agency
DBP--Development Bank of the Philippines
DGIC--Directorate General for International Cooperation (Netherlands)

EDF--European Development Fund

FAC--Fonds d' AIDE et de Cooperation
FAO--Food and Agriculture Organization
FIC--Forest Industries Corporation (Sierra Leone)
FINNIDA--Finnish International Development Agency
FIO--Forest Industry Organization (Thailand)
FORI--Forest Research Institute (Philippines)
FORPRIDECOM--Forest Products Research and Industries Development Commission (Philippines)
FPL--Forest Products Laboratory

GO--Government of --
GTZ--Deutsche Gesellschaft für Technische Zusammenarbeit

HACHO--Haitian American Community Help Organization--Harmonisation de l'Action des Communautés Haitiennes Organisees

IBRD--International Bank for Reconstruction and Development
ICRAF--International Council for Research in Agroforestry
IDB--Inter-American Development Bank
IDRC--International Development Research Center (Canada)
IICA--Interamerican Institute of Agricultural Sciences
ILO--International Labor Organization (UN)
INIF--Instituto Nacional de Investigaciones Forestales (Mexico)
INDERENA--Instituto Nacional de Recursos Naturales (Colombia)
IUCN--International Union for the Conservation of Nature and Natural Resources

JANT--Operating company formed by Honshu Paper Company, Ltd. of Japan
JICA--Japan International Cooperation Agency
JOAA--Japanese Overseas Afforestation Association

KfW--Kreditanstalt für Wiederaufbau (W. Germany)
KUNAR--Afghanistan Forestry and Sawmilling Development Association

Landsat--Land Satellite

MACA--Ministry of Rural Affairs and Agriculture (Bolivia)
MAG--Ministry of Agriculture and Livestock

NA--Not available
NEDA--National Economic Development Authority (Philippines)
NFS--National Forestry Service
NIB--Nordic Investment Bank
NORAD--Norwegian Agency for International Development

OAS--Organization of American States
ODA--Overseas Development Administration (UK)
OECD--Organization for Economic Cooperation and Development
OPEC--Organization of Petroleum Exporting Countries

PASA--Participating Agency Service Agreement
PCV--Peace Corps Volunteer
PICOP--Paper Industries Corporation of the Philippines
PNG--Papua New Guinea
PRODERO--Proyecto de Desarrollo Rural-Urbano de la Region de Occidente (Honduras)
PVO--Private Volunteer Organization

RADP--Rural Area Development Project (Nepal)
RCUP--Resource Conservation and Utilization Project
RENARE--Renewable Natural Resources Program (Panama)
RFD--Royal Forest Department (Thailand)
ROCAP--Regional Organization for Central America and Panama

SATA--Swiss Agency for Technical Assistance
SHAG--Shifting agriculture
SIDA--Swedish International Development Authority

TWICO--Tanzania Wood Industries Corporation

UN--United Nations
UNDP--United Nations Development Program
UNESCO--United Nations Educational, Scientific, and Cultural Organization
UNICEF--United Nations International Children's Emergency Fund
UNIDO--United Nations Industrial Development Organization
UNILO--United Nations International Labor Organization
UPLB--University of the Philippines at Los Baños
US or USA--United States of America

WFP--World Food Program
WWF--World Wildlife Fund

CHAPTER 1.--INTRODUCTION

Forests are becoming more important in economic development worldwide. This is reflected in the increasing attention given to forest-oriented projects in developing countries by numerous donor organizations such as the U.S. Agency for International Development (A.I.D.), World Bank (IBRD), and the Food and Agriculture Organization (FAO). In the past some of these projects have been highly successful in accomplishing their objectives; others have not.

Given a stronger international recognition of the importance of forests and forest products to the economic well-being of the developing world, donor organization forestry activities should be coordinated as smoothly as possible. Lack of such coordination results in duplication of effort and failure to learn from mistakes made by others.

This study presents a broad overview of forestry activities in the developing countries, including brief descriptions of individual projects and the donor organizations involved. Selected individual projects were studied in depth in an attempt to identify those ingredients that make a project successful or not successful.

The study is divided into five chapters and two appendixes. Chapter 1 describes the study and its objectives. Chapter 2 discusses forestry in developing countries in general. Chapter 3 describes the overall constraints to forestry programs in developing countries. Chapter 4 changes the emphasis to specific developing countries for selected in-depth studies, and Chapter 5 offers conclusions and recommendations to A.I.D. and other donor agencies for future direction. The Appendixes contain a detailed list of recently completed, ongoing, and proposed forestry projects and descriptions of individual donor agencies visited.

The information was gathered for the Forest Products Laboratory PASA study effort by the following five team members:

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Forestry Problems in Developing Countries

Of primary concern to this study are the problems of deforestation and desertification that are increasing in severity in developing countries.[1/,2/] Donor organizations have begun to recognize them as major problem areas in view of the following facts:

1. The world's forests are disappearing rapidly. As population pressure increases, so do the demands for fuelwood and farming and grazing land. The fuelwood shortage in certain developing countries is particularly severe. Just as serious are the problems associated with shifting agriculture (SHAG), where neither forestry, pasture, nor agricultural objectives are attained satisfactorily.

2. As forests are depleted, hydrological systems are upset. Floods become more severe, soils are lost or damaged through erosion, sandy soils are blown away, and plant and animal species disappear. Destruction of tropical forests might add significant amounts of carbon dioxide to the atmosphere and raise carbon dioxide concentrations. There have been some fears expressed about this causing undesirable temperature and climatic changes.

3. As forests are depleted, industrial growth and human welfare are hampered by lack of fuel or inefficient use of fuel. Problems of balance of payments in most developing countries result in reduced ability to import fossil fuels. These problems have begun to put a damper on a wide range of economic activity.

The sum total of what donor organizations are doing about these problems is not readily available. Individual donors may be fully informed about their own activities, but often they are unaware of the activities carried out by other donors. While one donor may be concerned with reforestation, another may directly contribute to the deforestation problem with a nearby project. Often individual project objectives for each donor may conflict in a broader perspective.

The forestry problems in many developing countries are severe indeed. The purpose of this Participating Agency Service Agreement is to provide A.I.D. with information on recently completed, current, and proposed forestry activities in developing countries, the ecological impacts of these activities, constraints in implementation of projects, and some

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1/ These problems are documented in publications such as Worldwatch Paper 26 (Eckholm 1979), U.S. Strategy Conference on Tropical Deforestation (A.I.D./State 1978), and others.

2/ Desertification is a result of deforestation in arid areas, but the term deforestation applies to both wet and dry areas.

examples of successes and of failures. This information will better equip A.I.D. in undertaking forestry projects in developing countries in the future.

Project Objectives

The purpose of this project is to supply A.I.D. with critical baseline data on forestry activities and deforestation problems in selected developing countries, to be used by A.I.D. in designing a strategy to deal with problems associated with deforestation in developing countries. Specific objectives are to provide A.I.D. with:

1. An inventory of forestry activities being carried out by the various major donors.

2. An assessment of the general ecological impact of the forest-related activities of the major donors.

3. An assessment of the present constraints placed upon the various donors in dealing with the problems of forestry and deforestation in developing countries (constraints not imposed on A.I.D.).

4. An inventory showing where the most critical obstacles or opportunities are in respect to the forestry problems in developing countries, and which of these would be appropriate for A.I.D. to address through research, pilot projects, training or other appropriate means.

5. A compilation of selected case studies of forestry experience including examples of success and failure.

The information and recommendations presented in this study are not likely to please everyone. What constitutes a highly successful project to some may be a dismal failure to others, depending upon one's point of view. Donor organizations may have totally different perspectives on the project and judge its merits differently than the recipients. Moreover, a project idea initiated in the field is likely to be substantially changed and molded as it passes through a variety of bureaucratic donor organization hurdles (the "pipeline"). The project that is ultimately implemented may differ entirely from the original project idea, and may not at all be the project that the country needs most. Finally, while a project may appear to be a success from a biological point of view, it may be an economic failure, or vice versa.

There often is a basic dichotomy between what donor organizations do and what the recipient country perceives it needs. A donor organization eager to sponsor successful projects may implement sophisticated or inappropriate techniques where sophistication is not at all needed, or may implement a project in the wrong region altogether. Projects are often avoided in low per-capita-income areas where the probability of

failure is greater. The end result is that project money or benefits often do not flow to areas where they are needed most. (Exceptions are the several private volunteer organizations that often seek out projects in the poorest areas.) In some cases it is best to take the safe approach; in other cases high risk projects are justifiable. This depends on the goal or motive. Donor agencies initiate projects for a wide variety of reasons. Sometimes for political purposes it is advantageous to sponsor projects, even though the chances for success are minimal.

Because there are so many different viewpoints and perspectives on what constitutes a good or a bad project, this study proposes no hard and fast solutions to the problems posed. Rather, emphasis is placed on obtaining and evaluating often conflicting information on the relative success of donor activities in recipient countries.

Procedures

The study was designed to obtain an inventory of worldwide forestry projects in developing countries sponsored by donor agencies. Selected projects that appear to be successful, or failing, are analyzed from environmental and economic points of view to provide information helpful in directing future effort and avoiding similar mistakes. In addition to a review of the pertinent literature most of the needed information was obtained through interviews with principals in donor agencies and through visits to project sites in selected developing countries.

The majority of organizations engaged in forestry activities are described in Appendix II with respect to their budget and areas of operation. The list of organizations contacted directly, or indirectly by mail or telephone, was compiled during the study through references from individual embassies and people knowledgeable about forestry activities throughout the developing world. Donor organizations in the Eastern Bloc countries were excluded.

An inventory and description of forestry projects sponsored by various organizations, in accordance with the first objective, are based on direct interviews with the organizations, annual reports, and other literature collected during the interviews. To the greatest extent possible, information was received from project participants in the recipient countries. The project descriptions are short and include, insofar as possible, budget, time horizon, plus any other information that would help describe the project.

A comparative analysis of the information received was carried out. Attempts were made to verify the information with more than one source. Thus, biased points of view and exaggerations of the facts were screened whenever possible. The "facts" indeed varied considerably according to source.

Having identified the organizations and described the projects they are sponsoring, the focus of attention shifts to certain recipient countries (Chapter 4). A sample of recipient countries was selected, based on differences in forestry problems, climatic conditions, population density and resource base. Each country is described in some detail with population, income, and other statistics that give a rudimentary picture of the country's economic health. Selected forestry activities are then evaluated in terms of successes and failures.

CHAPTER 2.--FORESTRY PROJECTS IN DEVELOPING COUNTRIES

The purposes of this chapter are to discuss where the problems are most prevalent, and the thrust of donor activities in forestry in developing countries. A list of forestry projects is given in Appendix I, including recently completed, ongoing, and proposed projects. The proposed projects are those reasonably assured of implementation in the near future. The list is organized by region, country, and type of project. Project descriptions, funding levels, and other pertinent information are taken from the existing literature and from interviews with the individual donor organizations visited. All donor organizations were not contacted because of budget and time limitations. For example, IICA (Interamerican Institute of Agricultural Sciences) programs such as IICA-Tropicos, which have considerable forestry activity and offer services to most Latin American countries, were not contacted. Literature consulted is included in a Reference section after Chapter 5.

The list is intended to identify the presence of different donors in a given country and what they are doing in a most generalized sense. Additional, more detailed, information on particular projects can be obtained by contacting the individual donor organizations. The sources used to prepare Appendix I do not always give a clear distinction between a forestry project and one that only contains a forestry component. Several projects are included in Appendix I when the presence of a forestry component was clearly specified. Other projects which probably included some forestry efforts were not added to the list when they did not clearly specify a forestry component. The information in Appendix I is constantly changing and hence will require periodic updating to remain useful. Detailed information on individual donor agencies is given in Appendix II.

Forestry activities are classified into seven major categories with several subcategories as follows:

1. Industrial:

    a. Feasibility studies/market surveys
    b. Logging/harvesting/transportation
    c. Sawmills/lumber/panel products
    d. Pulp and paper
    e. Charcoal and fuelwood
    f. Other

2. Conservation:

    a. Parks/reserves
    b. Fire/insect/disease control
    c. Watershed/soil conservation/erosion control
    d. Wildlife management
    e. Forest/range management
    f. Other

3. Education:

    a. Institution establishing/strengthening
    b. Vocational
    c. Academic
    d. Other

4. Research:

    a. Demonstrations
    b. Trials
    c. Resource assessment
    d. Other

5. Reforestation/Afforestation:

    a. Fuelwood/polewood
    b. Seeds/nurseries
    c. Agroforestry
    d. Conservation/dune stabilization/green belts/windbreaks
    e. Industrial purposes
    f. Other

6. Integrated Development

7. Technical/Administrative/Management Assistance

These project categories have some degree of overlap to account for projects that serve several different purposes. In general, projects were categorized by their major components. For example, a fuelwood/polewood reforestation project with minor research and training subcomponents might be listed as a reforestation project. The inventory of projects in Appendix I gives additional information on the other purposes a project may serve.

Forestry activities are also broken down into three geographical regions:

1. Africa and Middle East

2. Latin America and Caribbean

3. Asia and Pacific

The following is a general overview of recently completed, ongoing, and proposed forestry activities by each geographical region. Tables 1 through 6 summarize the recently completed (after 1976), ongoing, and proposed forestry activities by individual countries. The summaries, taken from the Appendix I list of projects, show relative weights given to each major activity category in individual countries. The relative weight is measured in terms of the aggregate amount of money spent or projected to be spent for projects within each category. These dollar magnitudes are rough indications only, as they sometimes represent annual budgets and other times the total budget for the entire project. Furthermore, cost figures for some projects are not available, nor is accurate information usually available on the amount of money earmarked for forestry components of larger scale, integrated development projects. In the latter case, the assumption is made that 5 percent of the total amount shown represents the cost of the forestry component. Based on interviews with several donor organizations this assumption is realistic. The intent of the tables is to say, with some degree of assurance, that relatively greater emphasis is placed on certain countries within a region and on certain categories of projects.

Africa and Middle East

For political and ecological reasons the Africa and Middle East region was subdivided into the following four categories: Sahel, other West Africa, East Africa, and North Africa and Middle East.

Sahel

The Sahelian countries are plagued with serious deforestation and desertification problems. The depletion of the forests is rooted in overcutting for firewood and charcoal production, overfarming, overgrazing, and fire. Economic, climatological, and social factors such as clearing land for agricultural settlements, urbanization, higher petroleum prices, animal grazing in ecologically marginal zones, and prolonged drought all contribute to the shrinking supply of fuelwood and to a shrinking forest base.

Numerous donor organizations are involved in the Sahel countries, usually coordinated through two counterpart organizations, Comite´ Permanent Interétats de Lutte Contre la Sécheresse dans le Sahel (CILSS), and Club des Amis du Sahel. CILSS, established in 1973 in Ouagadougou, Upper Volta, is an organization composed of recipient countries to identify project needs and secure donor financing. The Club des Amis du Sahel is a part of the Organization for Economic Cooperation and Development (OECD), which is composed of 24 donor countries. Most project activities in the Sahel countries are cleared through these organizations.

Table 1 shows the summary of Sahel projects taken from Appendix I. The dominant emphasis is clearly on conservation projects with nearly $37 million in ongoing projects and about $45 million in the proposal stage. In terms of total funding (aggregate of completed, ongoing, and proposed activities), conservation projects account for 42 percent. The second largest category is reforestation (34 percent), followed by integrated development projects (12 percent). In a total sense, proposed activities far outweigh those ongoing and recently completed. This is clearly a reflection of a strong, renewed interest in forestry among the donor community. The countries receiving most ongoing forestry aid are Senegal, followed by Mauritania and Cape Verde. Proposed activities are greatest for Mali and Senegal.

Other West Africa

The other West African countries are not organized as are the Sahelian countries, and hence do not have the benefit of a group such as CILSS to coordinate donor activity. Table 2 shows the forestry activities carried out by donor organizations in these West African countries. Proposed activities outweigh the ongoing ones by more than 5 to 1. Industrial activities are more prominent, followed by reforestation projects. In terms of total funding, industrial projects account for 43 percent and reforestation projects account for 36 percent. Liberia is by far the major recipient of ongoing forestry assistance, followed by Nigeria as a distant second. Ivory Coast and Cameroon will boost their forestry activities substantially if current proposals are implemented.

East Africa

Table 3 summarizes the forestry projects carried out by donor agencies in the East Africa region. Total funding for recently completed, ongoing, and proposed forestry projects is slightly over $1 billion. The three main recipients are Malawi, Tanzania, and Zambia, which together account for slightly more than 86 percent of total funding. Most of the funds are for industrial projects which account for almost 84 percent of the total funding. Overall, proposed activities far out-weigh both those recently completed and ongoing. Although Uganda has donor-assisted forestry programs, funding levels were not available and are not included in this report.

North Africa and Middle East

Table 4 is a summary of the forestry projects carried out by the donor agencies in the North Africa and Middle East region. Total funding for recently completed, ongoing, and proposed forestry projects is nearly $140 million. Main recipients are Turkey, Tunisia, Egypt, and Morocco, which together account for over 94 percent of the total funding.

Table 1.--SAHEL. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)

Forestry activity	Cape Verde	Chad	Gambia	Mali	Mauritania	Niger	Senegal	Upper Volta	Sahel Regional	Total
Industrial:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	--	180	--	--	--	--	--	--	--	180
Proposed	--	220	--	7,091	--	--	--	--	--	7,311
Conservation:										
Completed	--	24	20	--	7	520	4	--	--	575
Ongoing	4,518	--	--	--	8,561	2,636	15,850	5,343	--	36,908
Proposed	1,116	7,715	--	16,926	10,415	4,439	2,320	2,500	--	45,431
Education:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	--	--	355	300	300	2,635	3,075	6,665
Proposed	97	759	--	600	--	--	1,696	--	2,210	5,362
Research:										
Completed	--	--	--	270	--	--	--	--	--	270
Ongoing	--	--	--	190	38	141	--	--	--	369
Proposed	124	--	--	--	--	--	--	--	4,150	4,274
Reforestation/ afforestation:										
Completed	--	--	--	--	--	--	--	3,500	--	3,500
Ongoing	9,885	935	--	2,674	6,021	3,115	2,658	5,281	--	30,569
Proposed	--	2,400	2,500	10,410	10,000	2,842	5,041	--	--	33,193
Integrated development:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	--	366	--	--	--	262	1,292	--	--	1,920
Proposed	--	--	1,500	--	--	1,772	18,669	--	--	21,941
Technical/ administrative/ management assistance:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	--	--	--	--	--	--	--	--
Proposed	--	--	--	--	--	--	--	--	--	--
Total:										
Completed	--	24	20	270	7	520	4	3,500	--	4,345
Ongoing	14,403	1,481	--	2,864	14,937	6,454	20,100	13,259	3,075	73,694
Proposed	1,337	11,094	4,000	35,027	20,415	9,053	27,726	2,500	6,360	117,512

Table 2.--OTHER WEST AFRICA. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)

Forest activity	Benin	Cameroon	Central African Republic	Congo	Dahomey	Gabon	Ghana	Guinea	Ivory Coast	Liberia	Nigeria	Sierra Leone	Togo	Zaire	Total
Industrial:															
Completed	29	--	--	--	--	--	--	--	--	815	--	173	--	--	1,017
Ongoing	592	--	--	--	--	948	2,404	--	--	9,600	--	--	--	--	13,544
Proposed	1,100	37,000	--	15,000	--	--	--	--	--	--	--	--	--	--	53,100
Conservation:															
Completed	--	--	--	--	--	--	--	--	--	--	44	--	--	--	44
Ongoing	674	--	--	--	18	--	25	--	--	6	151	--	--	--	874
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Education:															
Completed	--	--	--	--	--	--	--	659	--	823	334	3	--	--	1,819
Ongoing	--	--	--	--	--	343	--	--	--	--	677	--	--	--	1,020
Proposed	--	1,680	--	--	--	--	--	--	--	--	--	--	--	--	1,680
Research:															
Completed	--	--	--	--	--	--	--	--	--	--	242	--	--	435	677
Ongoing	--	221	--	--	--	--	280	--	3,400	--	1,370	--	--	--	5,279
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Reforestation/ afforestation:															
Completed	--	--	--	--	--	--	--	--	--	--	124	--	--	--	124
Ongoing	--	--	--	--	--	--	--	--	--	--	400	--	501	--	901
Proposed	--	--	--	--	--	--	--	300	54,400	--	--	--	--	--	54,700
Integrated development:															
Completed	--	--	--	--	--	--	--	--	--	330	1,691	--	--	--	2,021
Ongoing	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Proposed	--	2,650	--	--	--	--	--	--	--	--	3,965	10,100	--	--	16,715
Technical/ administrative management assistance:															
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	180	222	--	--	--	--	--	165	1,004	72	--	--	1,643
Proposed	--	--	--	--	--	--	--	2,000	--	--	659	--	--	--	2,659
Total:															
Completed	29	--	--	--	--	--	--	659	--	1,968	2,435	176	--	435	5,702
Ongoing	1,266	221	180	222	18	1,291	2,709	--	3,400	9,771	3,610	72	501	--	23,261
Proposed	1,100	41,330	--	15,000	--	--	--	2,300	54,400	--	4,624	10,100	--	--	128,854

Table 3.--EAST AFRICA. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)

Forest Activity	Botswana	Burundi	Djibouti	Ethiopia	Kenya	Lesotho	Madagascar	Malawi	Mauritius
Industrial:									
Completed	--	--	--	--	--	--	--	--	--
Ongoing	--	2,897	--	--	100	--	49	--	--
Proposed	--	--	--	--	--	--	--	500,000	--
Conservation:									
Completed	--	--	--	10	19	--	--	--	--
Ongoing	162	2,100	--	19,908	--	--	27	--	20
Proposed	--	--	1,100	--	--	1,600	--	--	--
Education:									
Completed	--	--	--	--	--	--	--	--	--
Ongoing	170	450	--	--	--	--	254	--	--
Proposed	--	--	--	--	--	--	--	--	--
Research:									
Completed	--	--	--	--	--	--	--	--	--
Ongoing	--	120	--	--	191	--	--	--	--
Proposed	--	--	--	--	--	--	--	--	--
Reforestation/ afforestation:									
Completed	--	--	--	--	--	--	--	--	--
Ongoing	--	490	--	3,085	--	--	13,500	--	--
Proposed	--	7,700	--	--	--	--	20,000	19,000	--
Integrated development:									
Completed	--	--	--	--	--	--	--	--	--
Ongoing	--	830	--	4,900	20,000	--	--	--	--
Proposed	--	--	--	37,300	--	--	--	--	--
Technical/ administrative/ management assistance:									
Completed	--	--	--	--	--	--	--	--	--
Ongoing	--	--	--	573	288	--	1,417	--	--
Proposed	--	--	--	181	270	--	--	--	--
Total:									
Completed	--	--	--	10	19	--	--	--	--
Ongoing	332	6,887	--	28,466	20,579	--	15,247	--	20
Proposed	--	7,700	1,100	37,481	270	1,600	20,000	519,000	--

Table 3.--EAST AFRICA. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)--con.

Forestry activity	Mozambique	Rwanda	Seychelles	Somalia	Sudan	Swaziland	Tanzania	Zambia	Regional	Total
Industrial:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	52,613	--	190	--	--	--	--	1,000	--	56,849
Proposed	--	--	--	--	--	--	252,000	154,000	--	906,000
Conservation:										
Completed	--	6	--	--	--	--	--	--	--	35
Ongoing	--	33	--	--	--	--	15	--	20	22,285
Proposed	--	244	--	--	--	--	250	--	--	3,194
Education:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	--	--	461	--	--	--	--	1,335
Proposed	--	--	--	399	--	--	--	--	--	399
Research:										
Completed	--	--	--	--	--	--	--	--	88	88
Ongoing	--	--	--	--	165	--	14	--	172	662
Proposed	--	--	--	--	--	--	--	--	250	250
Reforestation/ afforestation:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	298	700	--	--	100	--	200	--	--	18,373
Proposed	140	243	--	--	--	--	--	--	--	47,083
Integrated development:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	--	1,100	--	--	--	--	5,900	--	--	32,730
Proposed	--	9,000	--	15,000	--	--	--	--	--	61,300
Technical/ administrative/ management assistance:										
Completed	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	--	--	--	--	--	--	--	2,278
Proposed	--	--	--	--	--	--	--	--	--	451
Total:										
Completed	--	6	--	--	--	--	--	--	88	123
Ongoing	52,911	1,833	190	--	726	--	6,129	1,000	192	134,512
Proposed	140	9,487	--	15,399	--	--	252,250	154,000	250	1,016,200

Table 4.--NORTH AFRICA AND MIDDLE EAST. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)

Forestry activity	Algeria	Cyprus	Egypt	Iraq	Jordan	Libya	Morocco	Oman	Tunisia	Turkey	Yemen Arab Republic	Yemen	Total
Industrial:													
Completed	--	291	--	--	--	--	--	--	--	--	--	--	291
Ongoing	--	--	--	--	--	--	10,000	--	--	509	--	--	10,509
Proposed	--	--	24,000	--	--	--	--	--	--	--	--	--	24,000
Conservation:													
Completed	9	--	--	--	25	--	832	--	1,621	--	--	--	2,487
Ongoing	--	--	--	--	--	--	--	--	--	--	--	--	--
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--
Education:													
Completed	--	--	--	--	--	--	1,934	--	--	--	--	--	1,934
Ongoing	--	1,170	--	--	1,104	--	77	--	--	--	--	--	2,351
Proposed	--	--	--	--	--	--	250	--	--	--	--	--	250
Research:													
Completed	--	--	--	--	--	--	--	1	--	--	--	--	1
Ongoing	--	--	134	955	168	--	--	--	213	--	--	--	1,470
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--
Reforestation/ afforestation:													
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	--	--	--	--	588	--	--	--	--	--	588
Proposed	--	--	100	--	--	--	--	--	--	--	--	--	100
Integrated development:													
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	4,233	--	--	--	--	--	--	--	--	86,200	--	--	90,433
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--
Technical/ administrative/ management assistance:													
Completed	--	--	--	--	--	--	--	--	2,435	--	--	--	2,435
Ongoing	--	--	--	--	--	--	150	--	--	--	--	--	150
Proposed	--	--	--	--	--	--	--	--	--	--	--	79	79
Total:													
Completed	9	291	--	--	25	--	2,766	1	4,056	--	--	--	7,148
Ongoing	4,233	1,170	134	955	1,272	--	10,815	--	213	86,709	--	--	105,501
Proposed	--	--	24,100	--	--	--	250	--	--	--	--	79	24,429

Industrial and integrated development activities account for over 91 percent of the total funding. Overall, ongoing activities far outweigh both recently completed and proposed activities. Although Syria and Lebanon have donor-assisted forestry programs, funding levels were not available and are not included in this report.

Latin America and Caribbean

The Latin American and Caribbean countries provide examples of forests ranging from very good condition to very seriously depleted. Haiti has the most deteriorated forest lands in the Western Hemisphere and some of the world's most pressing forestry problems. On the other hand, Honduras, Colombia, Bolivia, and Peru, for example, have very extensive pine and mixed hardwood forests that can be saved and effectively managed for the future if proper steps are taken now. This includes the necessity to improve cutting practices, which have been initiated in sawmill projects sponsored by donor agencies, and controlling colonization by natives.

Unfortunately, according to FAO (1979) the forests of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama will suffer the largest relative decrease--29 percent--by the year 2000. Even greater depletion in total area is forecast to occur in Colombia, Ecuador, and the Amazon Basin.

A.I.D. has a regional organization, ROCAP (Regional Organization for Central America and Panama), which is set up to coordinate A.I.D.'s activities in Central America and Panama. Their forest-related activity has been minimal. In Haiti, there are over 200 missionary groups and about half of them are providing forestry assistance, particularly in the production of tree nursery stock. Other agencies peculiar to Haiti for providing forestry assistance are CARE and HACHO (Harmonisation de l'Action des Communautés Haitiennes Organisees). HACHO was funded by the Government of Honduras, Germany, and A.I.D., but the A.I.D. support ended in 1979.

Together with the multilateral and bilateral donor agency activity, industrial investment has also had some impact on stand regeneration and plantation establishment. Swedish Match was instrumental in establishing poplar plantations in Chile, and International Paper has sponsored plantations of Caribbean pine in French Guiana. The Cartón de Colombia Co. in Colombia manages both plantations and natural forest.

The FAO-sponsored "Food for Work" program has been applied widely throughout the region and appears to be quite successful. Other donors are also trying the "Food for Work" approach.

Table 5 is a summary of the forestry projects carried out by the donor agencies in the Latin American and Caribbean region. Total funding for recently completed, ongoing, and proposed forestry projects is nearly

Table 5.--LATIN AMERICA AND CARIBBEAN. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)

Forestry activity	Belize	Bolivia	Brazil	Chile	Colombia	Costa Rica	Cuba	Dominica	Dominican Republic	Ecuador	El Salvador	French Guiana	Guatemala	Guyana
Industrial:														
Completed	134	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	4,000	3,576	1,997	469	--	--	--	--	--	--	--	--	7,492
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conservation:														
Completed	--	90	--	--	--	32	--	29	--	86	--	--	--	--
Ongoing	--	--	12	--	--	35	15	15	--	47	--	--	--	--
Proposed	--	--	--	--	--	--	--	--	--	--	1,279	--	--	--
Education:														
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	1,500	1,500	--	--	7,050	--	--	--	--	--	--	--	2,052
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Research:														
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	809	--	--	--	1,466	--	--	--	210	--	1,800	32	--
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Reforestation/ afforestation:														
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	100	--	200	--	--	--	--	--	280	--	--	--
Proposed	--	--	--	--	--	--	--	--	--	--	50	--	--	--
Integrated development:														
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	2,000	--	--	700	453	--	--	200	--	--	--	--	--
Proposed	--	2,800	--	--	--	--	--	--	--	--	--	--	--	--
Technical/ administrative/ management assistance:														
Completed	--	1,140	--	--	--	--	--	--	--	--	--	--	111	--
Ongoing	--	--	--	--	--	844	--	--	--	--	--	--	--	--
Proposed	--	--	--	--	--	--	--	--	--	4,535	--	--	--	--
Total:														
Completed	134	1,230	--	--	--	32	--	29	--	86	--	--	111	--
Ongoing	--	8,309	5,188	1,997	1,369	9,848	15	15	200	25	280	1,800	32	9,544
Proposed	--	2,800	--	--	--	--	--	--	--	4,535	1,329	--	--	--

Table 5.--LATIN AMERICA AND CARIBBEAN. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)--con.

Forestry activity	Haiti	Honduras	Jamaica	Mexico	Nicaragua	Panama	Paraguay	Peru	St. Lucia	Surinam	Trinidad and Tobago	Venezuela	Regional	Total
Industrial:														
Completed	--	--	--	--	--	--	--	1,372	--	2,100	--	--	--	3,606
Ongoing	--	1,097	32,000	--	--	--	--	--	--	--	--	--	--	50,631
Proposed	--	30,000	--	--	--	--	--	--	--	--	--	--	--	30,000
Conservation:														
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--	237
Ongoing	1,550	694	--	--	300	16,805	--	3,227	--	60	--	--	185	22,945
Proposed	1,161	--	--	--	--	--	--	--	--	--	--	--	--	2,440
Education:														
Completed	--	--	--	--	--	--	179	7	--	--	--	--	--	186
Ongoing	--	200	4,893	--	--	--	15,000	810	--	--	--	--	--	33,005
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Research:														
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	252	--	--	300	--	--	2,300	--	950	--	--	88	8,207
Proposed	--	--	--	--	--	--	1,000	--	--	--	--	--	--	1,000
Reforestation/ afforestation:														
Completed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	1,804	--	--	--	--	--	--	490	--	--	1,038	--	--	3,912
Proposed	--	--	--	--	--	--	14,500	1,600	--	--	--	--	--	16,150
Integrated development:														
Completed	--	--	--	--	--	--	--	74	--	--	--	--	--	74
Ongoing	--	2,000	775	--	--	--	--	--	--	--	--	--	--	6,128
Proposed	--	--	--	--	--	1,900	--	--	--	--	--	--	--	4,700
Technical/ administrative/ management assistance:														
Completed	--	86	--	--	--	50	--	88	--	2,400	--	--	--	3,875
Ongoing	294	--	670	--	--	--	831	--	--	--	--	--	--	2,639
Proposed	--	--	--	--	--	--	--	--	--	--	--	--	--	4,535
Total:														
Completed	--	86	--	--	--	50	179	1,541	--	4,500	--	--	--	7,978
Ongoing	3,648	4,243	38,338	--	600	16,805	15,831	6,827	--	1,010	1,038	--	273	127,467
Proposed	1,161	30,000	--	--	--	1,900	15,500	1,600	--	--	--	--	--	58,825

$200 million. The main recipients are Jamaica, Honduras, Paraguay, Panama, and Bolivia, which together account for nearly 70 percent of the total funding. Emphasis is placed on industrial, conservation, and education activities, which together account for 74 percent of the total funding. Overall, ongoing activities far outweigh both recently completed and proposed ones. Although Argentina and Uruguay have donor-assisted forestry programs, funding levels were not available and are not included in this report.

Asia and Pacific

Table 6 summarizes the forestry projects carried out by the donor agencies in the Asia and Pacific region. Total funding for recently completed, ongoing, and proposed forestry projects is $670 million. The three main recipients are Viet-Nam, Burma, and India, which together account for 68 percent of the total funding. Most of the funds are for industrial projects, which account for 64 percent of the total funding. Ongoing industrial projects far outweigh both completed and proposed projects. This is largely because of one large-scale pulp and paper project financed by Sweden in Viet-Nam. Similarly, the overall ongoing activities far outweigh both the completed and proposed ones. Although much of the land in the region is in need of reforestation, this category receives only about 8.6 percent of the total funding. Current emphasis in reforestation is in the Philippines, Viet-Nam, Korea, and Sri Lanka, while proposed reforestation activity will be concentrated in India, the Philippines, and Thailand. Although Cambodia has donor-assisted forestry programs, funding levels were not available and are not included in this report.

Table 6.--ASIA AND PACIFIC. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)

Forestry activity	Afghanistan	Bangladesh	Bhutan	Burma	Fiji	India	Indonesia	Iran	Korea	Laos	Malaysia	Mongolia
Industrial:												
Completed	--	--	--	--	--	36	--	--	--	--	155	--
Ongoing	1,345	12,790	3,120	26,300	--	10,000	2,200	--	--	2,000	1,322	--
Proposed	--	--	--	35,000	--	50	--	--	--	--	153	--
Conservation:												
Completed	--	--	--	--	--	--	316	35	--	--	--	--
Ongoing	67	--	86	--	6	189	3,200	4,834	--	--	--	--
Proposed	--	--	--	--	--	--	--	--	--	--	--	--
Education:												
Completed	--	--	--	--	--	23	589	268	--	--	--	--
Ongoing	--	870	--	1,318	--	4,535	1,554	--	566	--	--	--
Proposed	--	--	--	--	--	287	7,000	--	--	--	--	--
Research:												
Completed	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	--	--	--	5,834	1,582	--	--	--	619	--
Proposed	--	--	--	158	--	--	--	--	--	--	--	--
Reforestation/ afforestation:												
Completed	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	--	--	--	--	--	--	3,000	--	--	--
Proposed	--	--	--	--	--	21,150	--	--	--	--	--	--
Integrated development:												
Completed	--	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	--	1,122	--	--	--	7,600	--	2,161	--	--	--
Proposed	--	--	--	--	--	3,900	--	--	--	--	--	--
Technical/ administrative/ management assistance:												
Completed	--	--	--	--	162	28	152	--	--	--	--	--
Ongoing	--	--	--	--	711	--	30	--	--	74	--	--
Proposed	--	--	--	--	--	--	200	--	--	--	--	--
Total:												
Completed	--	--	--	--	162	87	1,057	303	--	--	155	--
Ongoing	1,412	13,660	4,328	27,618	717	20,558	16,166	4,834	5,727	2,074	1,941	--
Proposed	--	--	--	35,158	--	25,387	7,200	--	--	--	153	--

Table 6.--ASIA AND PACIFIC. Summary of donor agency expenditures by country, forestry activity, and project status (in $1,000 U.S.)--con.

Forestry activity	Nepal	Pakistan	Papua New Guinea	Philippines	Solomon Islands	Sri Lanka	Thailand	Vietnam	West Samoa	Regional	Total
Industrial:											
Completed	--	--	--	--	--	--	--	--	494	252	937
Ongoing	--	793	--	--	--	1,275	--	330,000	1,332	487	392,964
Proposed	300	--	--	--	30	--	--	2,500	--	--	38,033
Conservation:											
Completed	65	--	1	--	--	--	--	--	--	--	417
Ongoing	2,056	--	--	--	--	--	2,478	--	15	--	12,931
Proposed	--	--	--	--	--	--	--	--	--	--	--
Education:											
Completed	--	--	--	--	--	--	--	--	--	--	880
Ongoing	--	--	--	6,985	--	--	--	--	148	--	15,976
Proposed	103	2,903	--	--	--	--	--	5,467	--	--	15,760
Research:											
Completed	--	--	--	886	--	--	106	--	--	--	972
Ongoing	--	1,925	--	2,750	--	--	53	--	--	--	12,763
Proposed	--	--	--	--	--	--	--	--	--	--	158
Reforestation/ afforestation:											
Completed	--	--	--	--	--	--	--	--	--	--	--
Ongoing	--	100	--	18,150	--	3,600	--	8,712	--	--	33,562
Proposed	--	--	--	2,300	--	--	1,013	--	--	--	24,463
Integrated development:											
Completed	--	--	--	--	--	--	--	--	--	--	--
Ongoing	18,546	5,300	--	--	--	--	400	--	--	--	35,129
Proposed	73,875	--	--	--	--	--	2,250	--	--	--	80,025
Technical/ administrative/											
Completed	--	--	--	570	--	--	2,650	35	--	37	3,634
Ongoing	--	--	--	550	--	--	--	--	--	--	1,365
Proposed	--	--	--	--	--	--	--	--	--	--	200
Total:											
Completed	65	--	1	1,436	--	--	2,756	35	494	289	6,840
Ongoing	20,602	8,118	--	28,435	--	4,875	2,931	338,712	1,495	487	504,690
Proposed	74,278	2,903	--	2,300	30	--	3,263	7,967	--	--	158,639

Summary of Donor Agency Activities

Table 7 summarizes the information contained in tables 1 to 6 and reflects regional differences among project categories. This provides an overall view of the types of ongoing and proposed forestry activities, and was made to identify any obvious gaps between perceived needs and what is actually taking place.

The table shows a clear dominance of industrial activity, both in terms of ongoing and proposed projects. The large figures in the industrial category represent heavily capitalized pulp mills or sawmill complexes, rather than on-the-ground establishment and management of forest stands. This heavy emphasis on industrial activity is of great concern because creation of additional pulping and sawmilling capacity will certainly exert greater pressure on existing forest reserves and contribute to the overall deforestation problem.

The second most dominant activity is reforestation/afforestation. Spears' (1978) World Bank summary of overall world needs in wood biomass, particularly for energy, points to the severity of the deforestation problem. Even when considering technological advancement and increased utilization of alternative energy sources, such as solar, wind, etc., projected wood biomass required by the year 2000 will exceed that which will actually be produced at current rates of planting by a factor of four.

In response the World Bank, and numerous other worldwide donors, have substantially increased their commitment to forestry (see appendix I and summary tables in chapter 2). Yet the situation is likely to get worse before the trend is reversed. This happens when people are turning to alternative energy sources without regard for, or understanding of, the consequences of changing the energy source. As fuelwood becomes increasingly scarce, and people switch to the alternatives, food production will be foregone because of losses in nutrients and soil productivity. This quickly becomes a vicious circle which is difficult to alter.

The reforestation/afforestation category is an obvious gap in donor-sponsored forestry activities in developing countries in view of the World Bank estimates of wood biomass requirements by the year 2000 (1978). A.I.D. is well advised to concentrate its activities in this area.

Table 8 is a ranking of donor project involvement in terms of total cost in the seven defined forestry activities.

In terms of total forestry assistance for ongoing projects, Sweden ranks first followed by IBRD, FAO/UNDP, and USA. Sweden's contribution, however, is attributable largely to a single large-scale, heavily capitalized pulpmill project in North Vietnam. The IBRD projects are also heavily on the industrial side whereas the FAO/UNDP and U.S. activities are spread out over all categories. In proposed activities

Table 7.--Ongoing and proposed forestry activities by region and project category (in $1,000 U.S.)

Region	Industrial		Conservation		Education		Research		Reforestation/ afforestation		Integrated development		Technical assistance	
	Ongoing	Proposed	Ongoing	Proposed	Ongoing	Proposed	Ongoing	Proposed	Ongoing	Proposed	Ongoing	Proposed	Ongoing	Proposed
Sahel	180	1/6,083	36,908	2/13,033	6,669	3/600	369	4/2,500	30,573	5/31,982	1,920	21,941	--	--
Other West Africa	13,544	53,100	874	--	1,020	1,680	5,279	--	901	54,700	--	16,715	1,643	2,659
East Africa	56,849	906,000	22,285	3,194	1,335	399	662	250	18,373	47,083	32,730	61,300	2,278	451
North Africa and Middle East	10,509	24,000	--	--	2,351	250	1,470	--	588	100	90,433	--	150	79
Africa-wide	--	--	--	--	--	9,000	--	--	--	8,300	--	--	--	--
Latin America and Caribbean	50,631	30,000	22,946	2,440	33,005	--	8,207	1,000	3,912	16,150	6,129	4,700	2,639	4,535
Asia and Pacific	392,963	38,033	12,931	--	15,977	15,760	12,763	158	33,562	24,463	35,129	80,025	1,365	200
Total	524,676	1,057,216	95,944	18,667	60,357	27,689	28,750	3,908	87,909	182,778	166,341	184,681	8,075	7,924

Grand Total:
Ongoing 972,052
Proposed 1,482,863

1/ Additional projects totaling $1,228,000 have been proposed, but no donors designated.
2/ Additional projects totaling $32,398,000 have been proposed, but no donors designated.
3/ Additional projects totaling $4,762,000 have been proposed, but no donors designated.
4/ Additional projects totaling $1,774,000 have been proposed, but no donors designated.
5/ Additional projects totaling $1,211,000 have been proposed, but no donors designated.

Table 8.--Forestry related projects--current (1979) and proposed ($1,000 U.S.)[1/]

Donor	Industrial		Conservation		Education		Research		Reforestation/ afforestation		Integrated Development		Technical Assistance		Total				Overall	
	Current	Planned	Current	Planned	Current	Planned	Current	Planned	Current	Planned	Current	Planned	Current	Planned	Current	Rank of current	Planned	Rank of planned	Total	Rank
IBRD	18,665	833,500	2,613	--	--	--	4,700	--	30,493	125,230	122,276	28,465	--	--	178,747	2	987,195	1	1,165,942	1
Sweden	369,400	36,000	--	--	5,441	--	--	--	--	--	4,900	--	--	--	379,741	1	36,000	6	415,741	2
USA	--	--	30,626	2,094	14,453	9,250	2,538	500	11,210	29,228	3,637	75,647	150	6,500	62,614	4	123,219	2	185,833	3
Germany	19,600	43,183	6,481	8,133	6,642	--	1,723	--	5,454	3,550	11,816	10,100	--	--	51,716	5	64,966	3	116,682	4
UNDP/FAO	23,861	333	17,038	2,440	10,720	10,736	3,878	656	1,905	2,938	1,805	18,669	5,070	1,224	64,277	3	36,898	5	101,175	5
Norway	35,239	36,000	--	--	--	--	--	--	--	--	--	--	--	--	35,239	6	36,000	6	71,239	6
World Food Program	--	--	20,426	--	--	--	--	--	9,104	--	122	37,300	--	--	29,652	8	37,300	4	66,952	7
Kuwait Fund	--	36,000	--	--	--	--	--	--	--	--	--	--	--	--	--	27	36,000	6	36,000	8
Nordic Investment Bank	--	36,000	--	--	--	--	--	--	--	--	--	--	--	--	--	27	36,000	6	36,000	8
OPEC	--	36,000	--	--	--	--	--	--	--	--	--	--	--	--	--	27	36,000	6	36,000	8
Asian Development Bank	25,100	--	--	--	--	--	--	--	--	--	6,500	--	74	--	31,674	7	--	21	31,674	9
Japan	--	--	--	--	18,500	7,000	1,000	1,000	750	--	--	--	--	--	20,250	9	8,000	12	28,250	10
Switzerland	--	--	1,170	6,000	2,072	300	544	250	1,029	209	4,422	9,500	2,261	--	11,498	14	16,259	10	27,757	11
Great Britain	16,000	--	160	--	--	--	1,344	--	--	--	--	5,000	72	--	17,576	10	5,000	13	22,576	12
France	--	--	5,702	--	267	--	3,740	500	6,335	2,880	646	--	--	--	16,690	11	3,380	14	20,070	13
Canada	4,090	--	5,283	--	1,554	--	4,209	500	--	2,218	--	--	30	200	15,166	12	2,918	15	18,084	14
IDB	--	--	--	--	--	--	--	--	--	14,500	667	--	--	--	667	25	14,500	11	15,167	15
European Development Fund	10,389	--	1,373	--	--	--	--	--	1,038	1,925	--	--	--	--	12,800	13	1,925	16	14,725	16
Australia	1,332	300	--	--	--	103	619	--	--	--	8,720	--	418	--	11,089	15	403	18	11,492	17
Philippine Development Bank	--	--	--	--	--	--	--	--	8,200	--	--	--	--	--	8,200	16	--	21	8,200	18
Netherlands	--	--	220	--	--	300	1,232	--	5,102	--	--	--	--	--	6,554	17	300	19	6,854	19
Lutheran World Service	--	--	--	--	--	--	--	--	6,129	--	--	--	--	--	6,129	18	--	21	6,129	20
Belgium	--	--	548	--	708	--	700	500	915	--	830	--	--	--	3,671	19	500	17	4,171	21
African Development Bank	--	--	2,613	--	--	--	--	--	--	--	--	--	--	--	2,613	20	--	21	2,613	22
IUCN/WWF	--	--	1,721	--	--	--	--	--	--	--	--	--	--	--	1,721	21	--	21	1,721	23
UNESCO	--	--	--	--	--	--	1,700	--	--	--	--	--	--	--	1,700	22	--	21	1,700	24
Finland	1,000	--	--	--	--	--	--	--	--	100	--	--	--	--	1,000	23	100	20	1,100	25
Denmark	--	--	--	--	--	--	823	--	--	--	--	--	--	--	823	24	--	21	823	26
Church World Service	--	--	--	--	--	--	--	--	245	--	--	--	--	--	245	26	--	21	245	27
Total	524,576	972,052	95,944	18,667	60,357	27,689	28,750	3,906	87,909	182,778	166,341	184,681	8,075	7,924	972,052		1,482,863		2,454,915	

1/ For projects with multiple donors, an average was calculated from the total contributions and their average was allocated to each donor.

IBRD ranks first, based largely on industrial activities, followed by USA, Germany, and WFP.

Fewer donors are involved in forestry conservation activities than in most of the other categories. A probable reason is that conservation projects tend not to be economically feasible and are often implemented in high-failure probability areas such as several of the arid Sahelian countries. USA ranks first in ongoing, but only fourth in planned categories.

Education projects seem to have a dismal future since ongoing activities outweigh those proposed by nearly a factor of three (see table 8). This is indeed another gap in overall forestry assistance since the developing world is faced with a critical shortage of forestry expertise. A U.S. proposal for a $9 million Africa-wide education program is in an embryonic stage. A clear need exists to strengthen forestry educational institutions in terms of physical facilities and curricula development in many developing countries. The United States is addressing the educational problems more than other donors.

USA is also the largest donor in research projects, both in terms of ongoing and proposed activities. Again, ongoing projects far outweigh those planned (see table 8). The general consensus among donors as well as recipient country governments is that research and further studies of the forestry problems would, at this stage, be of a cosmetic nature. What is needed are action-oriented activities, if we are to effectively stem the alarming rate of deforestation.

In the reforestation/afforestation category, proposed activities are 51 percent greater than those of the ongoing activities. This is a desirable trend to be sure, albeit far from adequately addressing the magnitudes of the deforestation problems. Much more is needed. The IBRD ranks first in both ongoing and proposed activities, with USA a distant second.

Integrated development projects are those containing several components, including forestry, which are implemented in a balanced approach to development. These are the projects that could not comfortably be placed in any of the other defined forestry categories. The IBRD ranks first in ongoing activities, followed by FAO/UNDP and Germany.

Finally, Technical Assistance, the least influential category in terms of total forestry assistance is used more by FAO/UNDP than the other donors. This category consists of short- to medium-term direct consulting services to developing countries, addressing specific problem areas.

CHAPTER 3.--OVERALL CONSTRAINTS TO DONOR FORESTRY PROGRAMS

General and specific constraints or limitations operate on donor agencies involved in forestry, forest development, and conservation efforts in developing countries. Many of these are imposed by or otherwise due to the recipient country, but other constraints are self-imposed or otherwise inherent in the donor agency itself.

Constraints Imposed by Recipient Countries

Those constraints imposed by the recipient countries or by the situation, common to all donors and part of the ground rules, are as follows (items 1 through 8 were adapted from FAO (UNFAO 1978)):

1. Growing population pressures and migration of landless people into the forest areas have forced the expansion of shifting agriculture (SHAG). FAO estimates there are now 200 million people living in the tropical forest and practicing SHAG on approximately 300 million hectares of forest land (FAO 1978, Forestry Paper No. 7). Traditional systems of SHAG, which employed a lengthy fallow period, have largely broken down so they neither restore soil fertility nor recreate usable forest crops. Similar trends are evidenced in the savannah woodlands of more arid areas.

2. In much of the developing world, the local economy is based on subsistence farming, where diet is the primary factor determining land use. Dietary habits are among the deepest rooted and stablest elements in a way of life. Diets based on a single cereal, produced by alternating crop and fallow, need a large area per household and are most likely to exclude forestry. Diets based on a high level of animal products from free-range grazing are also likely to exclude forestry. People that rely on a single main plant crop or enjoy the leisure afforded by free-range grazing have extreme difficulty in adapting more extensive methods which include a forestry component. But such local economies are also highly dependent on wood for fuel.

3. In most developing countries the question of land use planning is usually confused by the lack of information about land capabilities and about other factors of adequate land use planning. The boundaries between land which can support sustained cropping and land which needs to be kept in forest cover are seldom known. Much of the forest land unsuitable for permanent agriculture is cleared through ignorance or desperate need.

4. The timescale of forestry is in direct conflict with the priorities of the rural poor, which are logically focused on meeting present needs. Land, labor, and other resources which could be devoted to the providing of food, fuel, and income needed today cannot easily be diverted to the production of wood which will be available several or many years into the future.

5. Insecure land tenure is a major constraint to good forestry practice in most of the developing world. The farmer, community, and the forest concessionaire must have adequate assurance about control over the land on which trees are planted at the time when they are ready for harvest. In large areas of Latin America and Southeast Asia where the bulk of farmers are either tenant or SHAG farmers, the insecurity of tenure mitigates strongly against relatively long-term forestry activities. In many areas of Africa, patterns and traditions of tribal or communal land use make no provisions for forestry which requires the setting aside of land for a relatively lengthy time.

6. The rural poor in most developing countries lack understanding of the role of forest trees in maintaining soil fertility, and are unable or reluctant to recognize the consequences of soil loss, erosion, siltation, etc., that will inevitably follow from continued destruction of the adjacent forest cover.

7. In most developing countries there are constraints arising from the bureaucratic structures: Rigid procedures, emphasis on interpretation of the rules rather than on the rationale for the rules, inadequate training at lower levels, arrogance and insensitivity of petty officials (especially to the rural poor), and fragmentation of responsibility for rural development and forestry.

8. In many developing countries, there is a preoccupation with traditional values of forestry management objectives, which focus on the production of wood for industry, or on conservation. These values are usually at variance with those of the rural people who depend on the forest for food and shelter. This bias is usually reflected in the staffing, structure, and budgets of forestry administrations. This bias is also reflected in the traditional training of foresters who find themselves well-equipped to deal with trees but ill-prepared to deal with people. Thus, there is an urgent need for a radical reorientation extending from policy all the way through to its technical foundations.

9. Squatters, encroachment, trespass, and other forms of noncooperation by local residents severely constrain successful forestry projects. Local people consider the land as part of their working capital. If that working capital is to be set aside for long-term forestry use, and the local government is unable to prevent trespass, the donor must become expert in inspiring an eager, cooperative attitude in local people. There are cases where this has worked very well, and many of these deal with the concept of social or community forestry. Social or community forestry, as opposed to industrial forestry, is aimed at benefiting the poor, local, rural citizen. Many industrial forestry projects have failed because this local resident's vital forest products needs were not being satisfied. Many donor agencies, and also many forest products industries, are now convinced that individual and community forestry needs must be met before industrial projects can succeed. Community forestry is indeed a primary goal rather than secondary. In developing

countries, community forestry can logically take precedence over industrial forestry, although in some cases the two can operate concurrently. There are also many cases of failure. Care must be used in planning such land use changes. If use of the working capital (land) for forestry causes great stress on the means of survival of local groups or individuals, the net effect of the forestry effort may be negative, either in real terms or in the minds of local residents.

10. Forestry projects are often unpopular when alternative land uses are available. While a country may desperately need forestry projects, agriculture, urban development, infrastructure, and other highly visible, shorter term, vote-getting projects may be more popular. For example, recipient countries are often reluctant to release land for forestry projects if the same acreage can be allocated to food production, even when the latter causes more site deterioration and is a less stable system. Moreover, politicians who allocate aid monies are more prone to spend money on projects that will produce visible results during their tenure in office. Forestry projects, which are longer term, do not provide the same political impact as the shorter term ones. But in the long term the forestry project often is the only viable solution to many survival problems (food, erosion, fuelwood, and water supply).

11. Several nations have few or no trained forestry professionals and technicians. Once educated, there may be little incentive, in some nations, for them to remain, so they emigrate. Without local talent, a donor agency can hardly hope for a long-term impact.

12. Forestry departments and other agencies in developing countries have their own local, traditional modus operandi. This is sometimes interpreted by outsiders as "inefficiency", "ruthlessness", "corruption", etc. that donors often attempt to by-pass. However, donors do not have the luxury of imposing a foreign modus operandi on local agencies. The donors must function within the local frame of reference if they are to be successful.

Constraints Self-Imposed by Donors

Those constraints that are self-imposed or inherent in the donors themselves include the following:

1. Lack of coordination between the various donor agencies within specific developing countries. Often the representatives of one donor agency do not know or have never met the representatives of the other donor agencies, although they live and work in the same city.

2. Failure to appreciate or to include the role of forestry in integrated rural development projects and water projects such as dams and reservoirs for hydroelectric power generation or to supply water for drinking or for irrigation.

3. Some bilateral donor agencies are required by law to concentrate on agriculture to the exclusion of forestry. This narrow approach must be rejected in favor of a more balanced one.

4. A bias against long-range forestry projects. Too much interest in short-term, highly visible projects is clearly evident and may lead to disastrous results in the long run.

5. Lack of continuity on longer range projects. For example, donor agency personnel often do not remain in a given country for longer than 2 or 3 years.

6. Too many strings attached. Several donors require matching funds, harsh repayment terms, purchase of equipment from the donor country, or more counterparts than the developing country can afford. Some donors exercise excessive control over the project by professionals from the donor country.

7. Low budgets. In a few cases a shortage of capital can be the deciding factor. A.I.D., World Bank, and IDB are freer of this constraint than are most other donors.

8. Technical assistance. A.I.D.'s technical assistance is drawn almost exclusively from the U.S. talent pool. This is in contrast with FAO and many other donors who draw from a world-wide talent pool. In theory, A.I.D. is free to do so, but in practice it rarely does.

9. Narrow economic analysis. Some donors are restricted in types of projects that require economic viability without consideration of other, less quantifiable benefits that result directly from the project. If reforestation of a hillside will not pay for itself in terms of wood products alone, it may be economically viable when considering improved water harvest, less soil erosion, more wildlife for hunting, better grazing, and higher carrying capacity, in addition to the wood products. A.I.D. should be able to accommodate this broader economic analysis in justifying certain projects.

10. Inflexibility in use of funds at the local level. Some donors are more free than others in making expenditures decisions locally. A flexible petty cash policy can substantially improve the success and efficiency of donor activity.

11. Inability to make small to medium decisions at the country level. Mission directors in some donor agencies are needlessly restricted by having to refer all problem situations to the central office.

CHAPTER 4.--SELECTED RECIPIENT COUNTRIES--IN-DEPTH STUDIES

The team visited 17 countries in the three geographical regions--Latin America and Caribbean, Africa and Middle East, and Asia and Pacific. Eleven countries were in the Latin America and Caribbean region, one in the Africa and Middle East region, and five in Asia and Pacific region. Most of Africa was excluded due to lack of concurrence by the A.I.D. Africa Bureau.

Most of the countries visited have severe deforestation problems. The severity of the problems varies between and within countries. These countries also differ substantially in other respects. To highlight the differences, the countries are described in some statistical detail in terms of population, income, life expectancy, and literacy.

From this general statistical overview of the individual countries, the focus of attention shifts to forestry activities in greater detail, specific problems in terms of ecological impacts and constraints to project implementation, and evaluation of successes and failures.

Table 9 shows statistics on population density, per capita income, life expectancy, and literacy for each country visited. These data provide some indication of the relative status of developing country problems in poverty, land use, and health and give an indication of the dependency on outside assistance. Other important considerations in determining forestry aid include fossil fuel imports, percentage of land forested or capable of supporting forests, annual rate of deforestation or afforestation, and importance of roundwood production.

A comprehensive assessment of trends in forest usage in developing countries is provided in the publication, "Present and Future Forest and Plantation Areas in the Tropics", by J. P. Lanly and J. Clement, FAO, Rome, 1979. Forest products exports are significant revenue producers for the following countries visited: Honduras, Indonesia, Paraguay, and the Philippines. Of the countries visited, only Bolivia, Ecuador, Indonesia, and Mexico have adequate fossil fuel supplies.

Bolivia

Bolivia is a landlocked country situated mostly within the tropical-subtropical zone of Latin America. The forest cover is estimated to be approximately 463,000 square kilometers and represents about 40 percent of the land area. The southwestern region is dominated by the Andes. The most important area in the Andean region is the Altiplano, a high valley which runs north to south and is flanked by the high Andes to both east and west. The extensive lowlands, known as the "Oriente," form a broad arc from the Peruvian border in the northwest to Paraguayan-Argentine Chaco in the southeast.

Table 9.--Comparative statistics of recipient countries visited[1/,2/,3/]

Country	Population density per square mile	Income per capita	Life expectancy	Literacy
		U.S. $	Yr	Pct
Bolivia	14	382	48	57
Chile	40	1,233	62	91
Colombia	59	592	61	78
Dominican Republic	280	834	58	68
Ecuador	77	554	62	75
Haiti	527	197	46	15
Honduras	79	485	55	52
Indonesia	180	195	48	62
Mexico	89	996	61	76
Morocco	112	322	50	28
Nepal	241	195	44	19
Panama	65	1,288	65	52
Papua New Guinea	18	815	47	32
Paraguay	19	498	61	74
Peru	35	760	55	72
Philippines	432	550	58	87
Thailand	233	516	59	82

1/ World Food System Data Sheet. World Resources Inventory Division of the World Game. 1977. 3500 Market Street, Philadelphia, Pa. 19104.

2/ World Indicators. The World Bank. June 1979.

3/ The World in Development. Canadian International Development Agency. 1977.

The large concentrations of population in the Altiplano, with their poor cultivation methods, overgrazing of domestic animals (especially sheep) and resulting erosion, have led to loss of land productivity. Erosion is less of a problem in the Oriente, but in the agricultural area of Santa Cruz, slash and burn agriculture practices by small farmers lead to soil erosion and abandonment of the land.

The Ministry of Rural Affairs and Agriculture (MACA) established a forestry department in Bolivia in 1954. Because of vague legislation concerning the forestry sector and the lack of forestry policy the Center for Forestry Development (Centro de Desarrollo Forestal-CDF) was created by governmental decree in August 1974. The CDF is a decentralized dependency of MACA with independent financing, legal personnel, and administrative autonomy. The 1974 Forestry Law also created the National Forestry Fund (Fondo Forestal de la Nacion) to provide a financial base for CDF operations. The Fondo receives annual assignments from the national budget, 75 percent of the timber cutting permits granted by CDF and 100 percent of the income from CDF sales, sanctions, and fines.

The uplands of Bolivia where much of the population lives is almost entirely devoid of forests. A few scattered attempts, partially with German assistance, have been made to plant Eucalyptus.

In the Tarija region, southwestern Bolivia, forests have been depleted and erosion has advanced to the point the land is totally unproductive. The forestry school is located at Tarija. The school, along with FAO and other donor agencies, is setting up projects to overcome this problem. Active donor agencies and countries include A.I.D., CIDA, Switzerland, Japan, World Bank, and IDB.

Forestry Problems and Activities

In the eastern lowlands the native forest, which was rich in mahogany, has been high-graded and the remaining mahogany is predicted to be depleted within the next 10 years. Only a few of the many other species present are harvested. Nearly all of the harvested wood is for export. The city of Santa Cruz has developed as a modern wood processing center for exporting high-value species. Unless the unused forest species are able to enter the market, or unless regeneration problems with preferred or fast-growth species are solved immediately, this modern wood industry will soon collapse for lack of raw material.

The FAO in Santa Cruz is working on reforestation problems. The Camara Forestal, which is an association of wood industries, hopes to begin reforestation of large areas. On the other hand A.I.D. and other agencies have been involved in a colonization effort in the middle of one of the forestry preserves. This, combined with illegal slash and burn colonization, is destroying large areas of tropical forest land. One popular alternative is to harvest the forest and put in coca plantations to supply the illicit drug market. To find sites for colonization

for highlanders, A.I.D. will be using Landsat to map land use and land cover in the lowlands.

Along with the problem of a vanishing forestry source, Santa Cruz will double its population by 1990 and this will result in even greater pressure on the forest. Better use of these forests would be made by marketing more of the available species, but in either case regeneration problems must be solved. To market more species, markets must be developed.

The German assistance program has been involved in two major projects. One recently finished was the reorganization of the Forest Service (the CDF). The other is to sponsor a forestry school at Cochabamba which should open in 1981 to train forest technicians and guards (p. I-28).

Canada is sponsoring a wood technology laboratory in Santa Cruz (Andean Pact Project).

Ecological Impacts

The harvest of mahogany per se is not a cause of deforestation. Even when a few other valuable species are added to the harvest, so few stems per hectare are taken (because of the great species diversity) that a forest remains after harvest. However, logging requires the construction of access roads, which in turn encourage squatters and SHAG practices. Also the entire destruction of a few marketable species leads to gene erosion of the ecosystem.

The colonization of forest lands which are largely unsuited to agriculture, whether by squatters or by government and donor agency colonization programs, leads to deforestation and the resultant destruction of the productive capacity of the land.

FAO and other agencies are involved in projects dealing with the eroded areas near Tarija. The ecological impacts will likely be positive because this type of remedial forestry is often the only way to restore a devastated site to any kind of productivity.

Constraints, Successes, and Failures

The Germans sent an assistance mission to Bolivia to reorganize the Forest Service. The product of this effort was, on paper, a total success from the Teutonic point of view. In implementing this plan Bolivians were restricted by inadequate local expertise and bureaucratic traditions. The result of the plan was totally incompatible with the local "modus operandi."

There presently exists a conflict between the forest reserve areas and colonization areas, both designated by the Bolivian government. Donor

agency activity should be discouraged in areas which are designated for two or more conflicting land uses by two or more government agencies.

A.I.D. has been involved in such conflicts and may still be participating in a colonization effort in the eastern lowlands. Chances are this effort will fail because of inappropriateness of the site. This may well result in irreversible ecological changes that would render the site unproductive for either forestry or agriculture.

Chile

Forests in Chile are mostly temperate or boreal, ranging from sea level to high altitude and from near polar to about 20° S latitude. In the dry north very little vegetation is found. In the wet south native forests abound with species of southern beech and other valuable woods. Large sections of native forest have been cut, and on some of these deforested lands radiata pine has been quite successfully planted. Regeneration of native species is inadequate to ensure a continued, long-term harvest.

Forestry Problems and Activities

Forestry in Chile means, to a large extent, industries based on plantations of Pinus radiata. These plantations occur, for the most part, on eroded infertile soils which were formerly unproductive. Through intensive, modern management Chile is able to export significant amounts of fiber and wood products that contribute to foreign exchange now and should be sustainable in the future.

Another enterprise is the plantation of Populus by the Swedish Match Company. Through intensive culture using the highest quality soils, irrigation, fertilizers, and genetic improvement, the Company produces 35 m^3/ha/yr on some 2,000 hectares to meet their own needs for raw material. (Swedish Match, Celulosa Argentina, and Jari Florestal (Brazil) are three South American companies that profitably practice agroforestry.)

There is also some planting of eucalypts in the highlands for local carpentry and fuels.

One reason forestry has been a successful endeavor in Chile is the large pool of highly skilled forestry talent there, including the Chilean Forest Service and foresters at the universities and private companies. Donor agencies that were involved in the formation of that pool can take pride in their accomplishment. Chilean foresters are now exporting their talent via a bilateral aid program with Paraguay.

Ecological Impacts

The exploitation of native species puts pressure on natural ecosystems that will not survive unless protected. National parks and other gene pool preserves are being promoted to solve this problem.

The use of exotics such as Eucalyptus globulus, Pinus radiata, and Populus deltoides, especially in large monoculture plantations, can be criticized on ecological principles. There is nothing wrong with the theory behind such criticism. But since these plantations have been economically successful at least in the short run, serve a great many human needs, and since eco-disasters supposedly inherent in exotic tree monocultures have been few on a world-wide basis, not many decision makers have yielded to such criticism. Fortunately, exotic tree monocultures usually deal with broad gene pools not yet genetically "improved" to the extreme that agricultural monocultures are.

Constraints, Successes, and Failures

Donor forestry activity in Chile will probably be limited to bank loans, graduate school scholarships, and occasional consultancies by FAO. Local talent seems to have the situation well in hand.

The development of a strong Forest Service, aided by FAO, is a major accomplishment. So strong was the Service (and the pool of forestry talent that developed concomitantly with it) that it has survived intact despite considerable personnel turnover due to political upheaval and emigration of professionals.

Colombia

Colombia is a very large country (440,000 square miles or 1.6 times the size of Texas) with tremendous ecological diversity and, in many areas, high population pressures. Forested areas, which receive from 3 to 10 meters of rain per year, contain a great variety of mixed tropical hardwood species and constitute an important national resource if managed properly. Other drier forest areas tend to have higher population densities and, in many cases, are or soon will be faced with problems of wood famine.

Present annual reforestation in this country is about 8,000 hectares and the total planted thus far is over 70,000 hectares. This planting rate is expected to increase to 20,000 hectares per year very shortly, because new incentives are beginning to work, and plantations are becoming profitable. There are tax and credit incentives and there are some concessions to avoid being subject to agrarian reform.

Forestry Problems and Activities

Deforestation in the highlands is responsible for erosion problems which the Forest Service (INDERENA) is trying to solve. In the drier highland area this is further complicated by the local custom of burning vegetation on the slopes for farming. Carton de Colombia, a paper mill in Cali, has for many years been harvesting the wet lowland forest on an any tree/all tree basis. Regeneration of harvested areas is excellent but squatters move in and render the area useless for future forestry use. In middle altitudes Carton de Colombia has for years been reforesting to the extent of 9 million seedlings per year. They are planting mostly pines, cypress, and eucalypts. The pine and the cypress provide the required long fiber for mixing with the lowland hardwood and eucalypt short-fiber species. The drier zones, such as the Guajira peninsula, are faced with Sahelian style problems of firewood harvest and burning of vegetation.

The GOC has recently set up within their National Planning Department an office to coordinate donor agency and local forestry activities throughout the country.

As in most tropical countries the main cause of deforestation in Colombia is SHAG. Population pressures on the land and the local land tenure situation, in which farming is tantamount to ownership, force small farmers into shifting agriculture.

Ecological Impacts

In the highlands (1,500 to 2,000 m) forest destruction has been great. The inactivity or lack of success by the government in preventing and correcting deforestation has resulted in impacts which are possibly irreversible in many areas. The problem increases annually and, if remedial forestry measures are not taken immediately, large parts of Colombia (already less productive than in the past), may be rendered uninhabitable in the future because of desertification. Colombians are emigrating into neighboring countries, particularly Panama, where forests have not been depleted. This trend can be expected to increase greatly in the future.

The clearcut harvest of tropical lowland hardwoods by Carton de Colombia can be considered a major breakthrough in the field of tropical forest management. It is unique for tropical species to be used in the mixtures as they grow naturally. Ordinarily only scattered trees of valuable species are used. However, the uncontrolled and illegal trespass of settlers in the harvested area negates the benefits of this new silvicultural system.

The plantation effort of Carton de Colombia has demonstrated the feasibility of reforesting deforested slopes at a profit. Although some ecologists would claim this to be a negative ecological impact, others

would suggest that reforesting totally devastated ecosystems (remedial forestry) constitutes a positive ecological impact.

Constraints, Successes, and Failures

Some plantation efforts of Carton de Colombia, which have generated some jobs and restored 1,000 hectares per year without cost to the public sector, must be considered a successful approach to a forestry problem. Unfortunately, squatters present a negative impact which may refute the above accomplishment. A constraint to donor activity is the fact that after each election most public servants, including Forest Service employees, are replaced. Continuity and progress of projects may suffer as a result.

Dominican Republic

The Dominican Republic is over 50 percent forest land. There are extensive natural stands of hardwoods from Acacia and Prosopis to lignumvitae and mahogany. On paper there are ten National parks, but none is managed. Reforestation projects are progressing slowly.

Forestry Problems and Activities

The main forestry problems in the Dominican Republic are cutting for charcoal, fuelwood, and industrial roundwood, without destroying watersheds.

Since 1967, it has been illegal to cut trees on public lands in the Dominican Republic for commercial purposes. The Forest Service also recently made a decision to prohibit cutting of wood for charcoal. This is difficult to enforce because 80 percent of the population depends on charcoal for cooking. The remainder cooks mostly with firewood directly. The problem could be alleviated by putting to use some of the unpopulated public lands which are suited for charcoal production. A more precise problem definition has been prepared by a Peace Corps Volunteer who is conducting a national survey on charcoal and firewood use as part of Plan Sierra. Under Plan Sierra a nursery to provide trees for reforestation is also being started by the local government and other forestry activities are planned (Jennings and Ferreiras, 1979).

Project Siedra, a separate project, has been funded by A.I.D. in cooperation with USDA and Michigan State University. Its aim is to inventory basic natural resources and evaluate climate and soils. This will aid in land classification for planning purposes. The work is based on OAS maps for soils and life zones and on Landsat photoimagery, together with an informational input on present land use. Trends in land use changes are also studied.

IICA has programs in the Dominican Republic, in agronomy, livestock, communicatons, extension, and rural development, but little in forestry. In 1976 it brought in a consultant to study the Taveras Reservoir Watershed. IICA is involved in land use studies, and is interested in setting up a Dominican Soil Conservation Service. It is preparing a project which includes setting up a demonstration mini-watershed for training, much like FAO's Limbe River project in Haiti. To do this IICA must overcome a problem caused by the overlapping of several national institutions on water matters. The Dominican Republic president is attempting to coordinate these programs.

The Dominican Republic Forest Service is now planting about 100 hectares with about 250,000 trees (Eucalyptus robusta) for a fuelwood plantation. This project, called Proyecto Catarey, is financed entirely without outside assistance. With IDB money, the Forest Service has also replanted areas upstream from dams including Taveras and Rio Yaque del Norte. Prior to 1979 this project covered 310 hectares, and 500 hectares were planned for 1979. The Government also has about 200 hectares of pine plantations in other areas.

Besides its activity in land use planning OAS is sponsoring work on development of a management plan for Parque Nacional de Este, and planning natural resources utilization in the Northeast. OAS also proposes to work on a description of all National Parks in the Dominican Republic during the next year.

Ecological Impacts

Plantations are too few to have a significant ecological impact. Other forest management activities such as resettling people from National Parks and prohibiting cutting for charcoal production on national lands can help in combating deforestation and erosion problems. However, resettled people and charcoal makers must be given realistic alternatives to avoid future negative impacts.

Constraints, Successes, and Failures

The dominant constraint to good forestry practice in the Dominican Republic is the demand for large quantities of fuelwood and charcoal for cooking. Eighty percent of the population depends on charcoal. More wood for furniture and other products is also needed.

Attempts at plantations and resettlement of people appear to be successful, but because of the low level of these activities the overall effects are minor. More concentrated efforts are needed to (1) produce firewood and charcoal, (2) develop watersheds with hydroelectric potential, (3) cultivate conifers, and (4) utilize firewood and charcoal more efficiently. Penelope Jennings, a Peace Corps worker in the Dominican Republic, felt that with proper use of the natural forests,

plenty of wood fuel and charcoal could be produced to meet all current needs. This would not include needs for petroleum fuels, but would include fuel for industries such as bakeries and sugar refineries.

Ecuador

From the forest resource point of view, Ecuador has three regions: (1) the Sierra or Andean mountain zone; (2) the Oriente consisting of the humid lowlands in the upper Amazon basin; and (3) the Costa containing the arid to humid coastal lowlands. The country is richly blessed with forest resources on a per capita basis, although some regions are suffering the effects of deforestation due to poor land use. If future generations are to enjoy a wood surplus, forests must be better managed. Also, much of Ecuador's forest resource is inaccessible.

The Forest Service and donor agencies are struggling to combat some of the problems of the past, but are faced with limited budgets and a shortage of qualified personnel. Approximately 52 percent of Ecuador is still forested, primarily in the Oriente.

Forestry Problems and Activities

The southwest region of Ecuador is extremely dry, and the main cause of deforestation is overharvesting for fuelwood. The British (ODA) have conducted species trials in this region which should provide a base of information available to other donors for establishment of energy plantations. However, there is little action underway at present to solve the great demand for fuelwood, and desertification increases annually. Destruction of coastal lowland forests and poor agricultural grazing practices are the causes for desertification.

In the northwest part of Ecuador, the forest contains mixed hardwoods valuable for fine cabinetry and furniture. This region has been supplying wood to the country for many years because it is accessible. If successful management plans are not developed, this resource will run out in a few decades. Problems include movement of squatters into forested areas after logging, road construction, and wood harvest. FAO carried out a series of studies in this region including inventories, species evaluations, and concessions. The results of these studies were shelved when FAO terminated its program. Now, there is much criticism of the concessions program in the northwest based on the fear that it leads only to deforestation and change to non-forest land use.

In the Andean highlands, soil erosion is severe in many areas due mainly to overgrazing on steep slopes, cultivation on marginal lands, deforestation, and easily erodible soils. Massive reforestation programs appear to be the only solution in many of these areas. Planting, combined with

controlled grazing, could restore these lands to productive status and improve their watershed capacity through run-off retention.

In the Oriente, which is composed of gently sloping land in flat valleys, the soil is relatively infertile, with poor drainage. The Oriente is mixed hardwood forest, and represents 57 percent of the total land areas of Ecuador. Due to the inaccessibility of the area, forestry activity has been minimal in spite of the wealth of the forest resource. Spontaneous colonization, where occurring, has resulted in exploitation of the valuable hardwoods for furniture while other species are simply wasted. Unless a total resource management plan is developed, the valuable resource in the Oriente will be lost. There was no evidence of a management plan being developed.

Ecological Impacts

In the uplands, tremendous areas have been eroded for the reasons mentioned previously. Given the high population density in the uplands, a program can be justified to restore these eroded unproductive lands to a productive status. A plantation program, whether by the local Forest Service or donor agencies, would have a very positive ecological impact on large areas in the uplands. Exploration is continuing throughout the tropical rain forest. As roads are cut and pipelines built, spontaneous migrations bring people who clear the land along the road cuts, and deforestation results.

The British program for species selection will result in a positive ecological impact in the dry southwest once the species trial results are put into practice.

On the other hand, negative ecological impacts will be felt because of two FAO-related programs. One deals with concessions in the northwest and the other with colonization in the Oriente. Both of these lead to settlement, planned or otherwise, of large numbers of people on land with soils inadequate for non-forestry use.

Constraints, Successes, and Failures

Three forestry programs in the uplands have been especially successful. The Ecuador Forest Service has sponsored two of these, the plantation of *Eucalyptus globulus* and the plantation of *Pinus radiata*. Several thousand hectares of *Eucalyptus globulus* have been planted in the highlands over the years. This forms the only wood supply available to large segments of the population of Ecuador. In higher regions where the native vegetation is paramo, recent efforts with *Pinus radiata* have resulted in at least 5,000 hectares being successfully established. This effort nicely complements the plantation of *Eucalyptus* and provides a more versatile raw material for construction lumber and pulpwood. The

marketing of both these species has been successful enough to continue plantation efforts.

The third successful forestry effort, a joint enterprise between FAO and the Forest Service, has been established at the forestry technician school at Conocoto. This school has been operating for over 15 years with excellent professional staffing and graduates about 20 students annually. Most of the graduates are employed by the Forest Service.

A unique and successful forestry enterprise in the southwest region of Ecuador is the plantation of balsa. For years, private enterprise in Guayaquil has controlled 98 percent of the world's balsa production, based on the harvest of natural regeneration. Recent increases in demand have lead to the very successful plantation of 1,000 hectares in the Guayas river basin. Planted on top-quality agriculture soils, this plantation pays far better than agricultural use. Although the southwest section of Eucador receives little rainfall, the soils along the Guayas river are naturally irrigated by the high waters of the river.

Equally successful is a wood technology project established in Conocoto in cooperation with the Canadians through the Andean Pact Countries. This project is active in evaluating the physical, mechanical and chemical properties of wood, and was established with the assistance of Martin Chudnoff of the USDA Forest Products Laboratory, Madison, Wis. Project scientists have a well-equipped laboratory and are doing very interesting work on the product potential of the local species for lumber, plywood, furniture, pulp, poles, and railroad ties.

Haiti

Haiti's terrain is predominently mountainous and the only land not being cultivated is on the slopes. Even sloping land best suited for grazing, forestry, or tree crops is being put into agriculture, and is not adequately protected against erosion. It is quickly lost, not only to crop production, but to any other type of vegetation that may serve as a water and soil retainer. As the population grows, so too does the demand for fuel, not only for local consumption but also for sale in the cities as charcoal. In fact, charcoal making is a principal cottage industry. It provides a supplementary income to hundreds of thousands of rural inhabitants and contributes to the rapid denuding of the forests.

Forestry Problems and Activities

Haiti is the poorest nation in the western hemisphere and, with a per capita income of $197, one of the poorest in the world. It also has some of the most pressing land problems.

Haiti's mountainous terrain is best suited for forests. Because of the need for food production, many slopes are cultivated for agricultural crops, leading to deforestation and destruction of the land through erosion. Another heavy drain on the forest is cutting of wood for charcoal. With increasing population, charcoal demand is increasing.

Given the opportunities and need for forest production in Haiti, the forestry activities are minimal. Presently, one slope close to Port au Prince of several thousand hectares is being planted in trees, mostly pine. For about 30 years the same man has been head of the lands, forests, and water department within Haiti's Ministry of Agriculture. Given his long tenure with the Forest Service, the forestry accomplishments under him are unimpressive. Few Haitians trained as foresters are working for the Forest Service. Of scores who have been trained, only about three are employed by the Forest Service. Few Haitian foresters have remained in Haiti.

At Gran Riviere du Nord a Mennonite missionary group has undertaken a project for reforestation and a craftmen's cooperative.

The most extensive donor agency projects in Haiti are sponsored by FAO. One existing project is reforestation for erosion control run cooperatively with the Swiss government, south of Cap Haitien. Another is a watershed project on a tributary of the Limbe River. Another extensive project for a center of information on the management of watersheds is proposed.

The Limbe project is aimed at increasing productivity and stabilizing soils on slopes where agriculture is being practiced. In connection with the project FAO has a nursery for fruit, forest, and ornamental trees including mahogany, bois pele, coffee, chén, ipil-ipil, and Cassia siamea. Total production is 400,000 trees per year. Local people are encouraged to plant the seedlings which are available free. Representatives from the local agricultural economy are also hired, on a rotating basis, to work in the nursery, and are paid with food.

In FAO's model watershed, precise terraces with a 1 percent slope are established along the land contours. The steeper the slope, the narrower the terrace used. If the soil is too shallow for terraces, the slope is reserved for trees or pasture. Otherwise, slopes under 45 percent are put into corn, pigeon peas, and similar crops. Slopes from 45 to 60 percent are reserved for fruit trees and coffee and those over 60 percent are for forestry. However, the purpose of this forestry activity is mainly for watershed protection, since timber harvest on such steep slopes might be too damaging to the land.

Another strong donor agency effort is conducted by HACHO (Harmonisation de l'Action des Communautés Haitiennes Organisees). The budget of this organization was approximately $1.8 million for 1979. Of this about $600,000 was from the Government of Haiti, about $1 million from Fonds Agricole of the Federal Republic of Germany's Ministry of Co-operation

and the private West German group, "Deutsche Welthungerhilfe", and about $204,000 was from A.I.D. However, the A.I.D. support provided for 5 years recently ended.

Under contract to HACHO, Virginia Polytechnic Institute employees conducted a study on suitable trees for replanting in Northwest Haiti. About 30 different species were tested, and recommendations for eight different subzones were provided. However, a complete site analysis of each area is necessary before more detailed alternative reforestation plans can be formulated and evaluated.

HACHO planted 250,000 trees last year (1979), 50,000 of which were fruit trees. It aims at 1 million trees this year. Their forester has established four nurseries in northwestern Haiti, and each produces about 100,000 trees per year. A fifth nursery to be established in Bromais will be used for research and training. About 650,000 trees per year should be produced in total. The goal is 1 million trees for planting annually, but each year 10 million are being cut.

As an extension of CARE's food-for-work programs that have been ongoing in Haiti for the past 12 years, additional seedlings will be produced and planted, and complementary soil conservation measures, such as provision of drainage ditches, will be undertaken.

Ecological Impacts

FAO estimated in 1974 that there were 160 million cubic feet of remaining forests in Haiti while annual consumption was estimated at 4.75 million cubic feet, almost entirely for firewood and charcoal. With natural regrowth there is still an annual loss of 3.75 million cubic feet. Some projections have this rising to 7.5 million cubic feet by 1995 with all forests completely exhausted by the end of the century.

The erosion resulting from deforestation has been characterized by UNDP as Haiti's principal problem. In some cases the damage is irreversible and seriously threatens the economic stability of agriculture. While the total effect is difficult to determine, in the 1960's AID and USDA estimated it as affecting 80 percent of the arable land.

Constraints, Successes, and Failures

There are reportedly 200 missionary groups working in the country and about one-half of these are doing some work in reforestation. Among the more noteworthy is a project in the Kenscoff area headed by Wally Turnbull of the Baptist mission. Mr. Turnbull has established a forest tree nursery and provides planting stock for local citizens on a free or low-cost basis. People on foot receive them free and people driving in cars pay a nominal charge. He hoped to produce 1/2 million trees during 1979. In the previous 4 to 5 years he produced a total of

1-1/2 million trees. Species grown by Mr. Turnbull are predominantly the locally preferred pines with other alternatives which include Grevillea robusta, Eucalyptus globulus, and Eucalyptus camaldulensis.

At the Le Bon Samaritain Hospital Baptist mission in Limbe, Ron Smith has been sponsoring nursery work and plantations for almost 10 years. At first Mr. Smith promoted bigleaf mahogany, with good success, but recently shifted to species which grow faster. Reasons are that mahogany takes too long to mature; failure to thin mahogany plantations causes stagnation of growth; fast-growing species are desperately needed for firewood and charcoal; and people have begun to cut mahogany and fruit trees for fuel.

Mr. Smith anticipates good success with Cassia siamea for fuelwood, and is pleased with Hibiscus elatus as a fast-growing cabinet wood to replace mahogany. Such wood is needed for local craft industries which have recently had to import raw material. Mr. Smith is also raising Hura crepitans as a timber and veneer species. However, this tree has some undesirable properties, including thorns and, more seriously, a caustic sap.

Plantations suffer some from grazing by goats. Fire is not a serious hazard. Charcoal hunters may be the main danger.

With the combined attempts at reforestation in Haiti it is estimated that they do not attain 10 percent of the need. Despite the overwhelming, acknowledged need, no long-range comprehensive program is addressing it.

The seriousness of the deforestation and erosion of the country is well known by the Haitian Government, but the resources to mount an effective campaign to combat the problem have been lacking. Even if the money to do the work were available, it is unlikely that the Government could develop the organization and recruit the necessary staff.

The Government has taken some small steps to solve the problem. Three years ago a law was passed requiring Haitian villages to reforest 1 hectare per year of trees from their own resources. There was some success the first year but after that it became impossible to enforce the law or even to ascertain if it were being observed. Later the program was discontinued. In another effort, a Government agency, Coumbite, was created to foster community efforts in reforestation. It is limited to providing seedlings and technical information to those communities, agencies, or groups that are interested.

Honduras

Honduras, with approximately 112,400 square kilometers, is one of the less developed countries in the Western Hemisphere. The country is highly mountainous (82 percent) with some valleys in the center of the

country. In physiographic terms the country can be divided into three provinces: (a) the lowlands of the northern and eastern part of the country which have a tropical climate with high precipitation; (b) the dry lowland of the south, which has, for 10 years, received below average precipitation; and (c) the mountains in the central part of the country. The most important basins are located in the northern and eastern parts of the country. Basically there is more population pressure in the western part of the country in which 60 percent of the total population lives on only 9 percent of the arable land.

The eastern part of the country has a very low population density and regions in that part of the country represent the highest potential for economic development. The majority of renewable material resources (wood, bagasse) are located in these regions.

Forest products are one of the principal export products. Principal imports include transport equipment and fuel, food products, durable consumer goods, and capital goods. Eighty to 90 percent of forest products are exported. The value of paper products imported may represent as much as 95 percent of the value of exports, much of which is used for packaging of fruit for export.

Forestry Problems and Activities

In Honduras there are 7 million hectares of forests, 4 million of which are hardwoods. The Government agency, COHDEFOR, (Corporacion Hondurena de Desarollo Forestal) is the primary influence in Honduran forestry matters. COHDEFOR controls all of the timber cut in the country, collects revenue from the sale of timber, and regulates forest management practices. The sales and regulatory management functions are contradictory, and as a result, the agency is subject to much criticism.

The U.S. Peace Corps is quite active in forestry matters in Honduras. It is involved in a fuelwood survey to determine fuelwood use in commercial operations such as sugar refineries, bakeries, laundries, and brick and lime kilns as well as residences. Fuel costs, transportation distances, preferred species, and species used are being investigated in addition to consumption quantities. There is interest in working with fuelwood plantations, improved stoves, and pyrolytic converters to solve fuelwood problems.

The Peace Corps is also active in planning nationwide species trials for native and exotic species.

There is also much emphasis on watershed protection and watershed development. Peace Corps Volunteers will collect, field check, and analyze basic information on soils, water, vegetation, and actual and potential land use. They will establish and implement long-range programs to solve critical water supply and soil erosion problems through

soil conservation techniques, reforestation, and intensive agricultural projects.

ROCAP, the A.I.D. Regional Organization for Central America and Panama, has a new project on fuelwood and alternative energy which will investigate the potential demand for using wood industrially for fuel.

A large development project is PRODERO (Proyecto de Desarrollo Rural-Urban de la Region de Occidente). It involves participation by UNDP/FAO, OAS, and COHDEFOR. IDB is an interested observer. Under this program about 500 hectares will be reforested. One million trees have been planted. The World Bank has proposed extending this project to 4,000 hectares, but COHDEFOR prefers to wait until more experience has been accumulated. This will require a few more years. On the other hand CONSUPLANE, the Honduras National Planning Board, projects 12,500 hectares to be reforested in pine over a 5-year period at a cost of 4 million lempiras (U.S. $2 million) funded by IDB, the World Bank, and the International Finance Corporation.

In another project in the Poncaya hardwood region, 700,000 hectares are being developed. A road into the area will soon be completed, and a sawmill will be brought in. Canada is involved with COHDEFOR in this effort. One concern was to stabilize a new community of immigrants who were resettled there by the Government when drought hit their home area on the south coast. Canada has provided a line of credit for installation of two new sawmills. One of these, Fiafsa, at Agua Fria has a capacity of 100,000 cubic meters per year, and is presently cutting 50,000 cubic meters per year. The other mill, Casisa, is in Siguatepeque and produces lumber, parquet flooring, broom handles, and fruit boxes. Twenty-five percent of the lumber is for export. Both mills saw pine exclusively. Canada is also involved in road building in the Olancho area.

IBRD is proposing to develop a pulp and paper industry as the second stage of the Olancho project. Eventually, a new steel mill to operate with charcoal for iron ore reduction is to be built in Olancho. Trees for use in producing the charcoal are already being planted. With a line of credit from Finland, Jaakko Pöyry (Finnish consulting company), is conducting a feasibility study for the forest products industry in the province of Olancho.

Other FAO/UNDP projects include the following:

1. Inventory and forest management in Comayagua funded at over $1 million.

2. Watershed management project near San Pedro Sula funded at $674,000.

3. Training project for forestry technicians at Siguatepeque.

4. Improvement of the drying and impregnation of wood with preservatives to extend durability.

Another large project is the El Cajon hydroelectric facility. IDB proposes reforestation of 12,500 hectares over a 20-year period on the watershed for this project. Some planting has begun.

A number of other countries are providing bilateral assistance to Honduras. Spain has provided a line of credit, Switzerland has an integrated rural development project near the El Salvador border, and Germany is sponsoring five students per year at the Siguatepeque technicians' school.

Another important forestry operation in Honduras is the Siguatepeque seed bank. This was established by the British, but is now operated by COHDEFOR. Tropical foresters worldwide depend on this bank for seeds of Pinus caribaea and Pinus oocarpa. Demand is much greater than supply, which drives the price up.

Forestry education is also important in Honduras. The technician school at Siguatepeque draws on the entire Central American and Caribbean area for students, and also gets some students from South America. The National Agriculture and Forestry school in the north-coast town of Curla is graduating foresters.

Ecological Impacts

Honduras does not have the severe deforestation problems of many developing countries, but according to information compiled by A.I.D. the projections for the near future are not good. A.I.D. reports the following from preliminary findings:

1. In much less than a generation, Honduran forests will be depleted to a point where they will not sustain the commercial forest industries now being planned and financed. Canadian technicians estimate that commercial stands will be depleted within 8 to 10 years, after the new industries come on line, leaving a costly forest industry without viability.

2. In less than two generations, at current rates of depletion, the forest cover of Honduras will be virtually eliminated. The one-third of rural Hondurans who live in or at the edge of the forests will have no effective means for sustaining themselves through the life support system they presently have.

3. In less than three generations, flooding in the valleys and alluvial plains, already serious, will be beyond the capacity of Honduras to manage with its own financial resources and environmental damage will be irreversible.

4. Progressive depletion of forest cover will change rainfall, water runoff, and stream flow, and climate patterns in ways which cannot now be predicted. The example of Haiti is a recent and nearby warning of the likely disastrous consequences.

5. Not only does the Government of Honduras not have a rational land-use policy, the independent activities of Honduras Government agencies are exacerbating the problem. The increased quantity of settlements in forest areas, added to planned commercial exploitation, is accelerating the rate of depletion to a point where a catastrophe threatens.

6. Settlement activities in the Upper Patuca region, for example, have resulted in 25 percent of the forest cover being destroyed within the last 3 years. Soil from the Ulua River watershed is disappearing at an annual rate which would cover 25,000 hectares to the depth of 20-25 centimeters. Natural soil accumulated over tens of thousands of years has already been lost. Areas where there is ground cover, compared with bare and denuded ground, retain 1,500 to 3,000 percent more water, thereby ensuring more even streamflow between rainy seasons and availability of water for such purposes as irrigation and raising cattle.

7. The substitution of large-scale capital-intensive forest industries for previous labor-intensive forest industries is reducing employment opportunities for the rural poor at a time and in places where they are most needed. There is virtually no planning for alternative life support systems for the one-third of rural Hondurans, living in or at the edge of the forests, to protect their present subsistence existence, to say nothing about improving their quality of life in the intermediate and longer term.

8. Past surveys and studies, plus recent aerial photographs, reveal that forest cover in Honduras is much less than had been anticipated. Depletion is proceeding at more rapid rates than had been thought. Compared with present and former forest lands, there has already been a reduction of 30 to 40 percent of forests, mainly in the past 20 years. The forest resource assumptions on which present exploitation plans are based are both faulty and overly optimistic.

9. Currently 80 to 90 percent of forest products are exported. The value of paper products imported may represent as much as 95 percent of the value of exports, much of which is used for packaging of fruit for export. While the economy benefits on a net basis, in the short run, the long-term damage to the environment--to the heritage and future of Honduras--is barely calculable.

10. The life system of substantial numbers of rural Hondurans, who presently have no employment alternatives, depends on slash and burn and encroachment into the forests. In many cases the soil lost in this practice will not sustain regeneration of the forest cover within the next 100 years. The value of a hectare of mature pine in the export market is about $17,000. The value of corn and beans per hectare (over

the 3-year period of average use) is about $1,000. Slash and burn agriculture is not economical, except as viewed by the individual campesinos, but it will continue until the rural poor have a viable employment alternative.

Constraints, Successes, and Failures

A serious constraint to forest management improvement in Honduras is the organization of both forest products sales and forest management within the COHDEFOR agency. Despite all good intentions there is inherent conflict in the objective of product sales for maximum economic return and optimum forest management over the long term. Other Honduran Government agencies are supported by COHDEFOR receipts.

Negative impacts were observed from the operation of the two large sawmills. The operating output of the Fiafsa mill (50,000 cubic meters per year) and the design capacity (100,000 cubic meters per year) are beyond the capacity of sustained yield of the existing forest. Native pine forests for miles around will soon be eliminated by such harvest levels. A plantation program could feed the mill if fires and shifting agriculture could be controlled. The Casisa mill has some serious design deficiencies from the standpoint of efficiency and conservation, although the utilization factor overall appears to be good. Although the two mills were built entirely with Canadian credit and machinery, Canadian representatives explain that they should not be held responsible for the deficiencies. Planning was completed before the Canadians became involved.

Indonesia

The natural forest resource of Indonesia includes over half of the total tropical forest in Asia. Much of it is untouched and without any infrastructure to make it accessible. These forests include highly valuable dipterocarps as well as southern hemisphere conifers such as Araucaria and Agathis. Foreign companies covet this resource and could cause its destruction if control and management schemes are not enforced by the Indonesian Government.

Forestry Problems and Activities

In this vast and varied nation it is impossible to write an all-inclusive description of on-going forestry activities. Highlights include exploitation of primary forests in Kalimantan, cutting of native pines in Sumatra, foraging for firewood in the drier Celebes and smaller islands south of Celebes, colonization in Kalimantan (both planned and spontaneous), plantations for fuel and wood products in Java, and several efforts to preserve endangered animal species.

The forest department has for years sold concessions to logging firms which have removed enormous amounts of wood, mostly for export. Indeed most of the cutting has been done by foreign companies, mainly from the United States and Japan. Results have not been very beneficial to the Indonesians. Logging produces road access which leads to SHAG and fires. In Indonesia Imperata grass follows this chain of events, leaving a site which is nearly impossible to return to productive status. Native tree reproduction cannot compete with this grass, nor is grazing an alternative. Recently the Government has decided to clamp down on new concessions, but most areas of the nation, except those that are to any extent populated, have apparently already been placed in concessions.

Native stands of Pinus merkusii have been harvested for years in Sumatra, but no information was gathered concerning the use of this resource.

In the islands of Timor and Flores, communities depend to such an extent on wood for fuel that it has become quite scarce. Rainfall is a limiting factor, so this resource is not renewable fast enough to meet demand. An intensive plantation program could probably solve the problem, however, and this would be an interesting project for a donor agency.

Colonization programs and spontaneous settlement of lands after access is made possible usually fail. If the land were appropriate for settlement (implying agriculture or pasture) it would already have been settled. The days of good, free, available land are just about over, and chances of finding any are close to nil. Java is the most crowded large piece of geography on earth; it is understandable why the Indonesian Government insists on trying to relocate a large number of Javanese to islands which have very low population densities. It is also understandable why many relocated farmers complain that they could produce more on their tiny plot of land in Java than they can on the 2.5 hectares given them by the government on another island. Java has deep, rich, rather stable soils; colonized areas lose fertility within a year after clearing the forest.

The international community is rightly concerned about endangered wildlife in Indonesia, and several donors are working with the Indonesians to find solutions. One step which must be taken is to stop the illegal international trade in skins and other products of such animals.

Ecological Impacts

The concession system of harvesting wood in Kalimantan has resulted in tremendous negative impacts on the primary forest which covers most of the island. The sequence of logging, access, SHAG, fire, and Imperata grass has been mentioned. Large-scale depletion of gene resources is a strong possibility for animal species and a likelihood for plant species. The Weyerhaeuser Company has set up a research center to show how East Kalimantan can continue producing wood from plantations after the primary forest is felled. What success they have had is dampened by spontaneous colonization after the initial harvest. Furthermore,

plantations do not necessarily solve the problem of maintaining the primary forest resource.

The scarcity of fuel in Timor and Flores is leading to desertification on these dry, heavily populated islands. Fuelwood plantations need to be established now.

The wildlife of Indonesia represent a resource to both the national and international communities. Both must work together to protect endangered animals, and indeed a few wildlife preserves are now being established.

Planned and spontaneous colonization, often most destructive activities, render few benefits to individuals or to society. Donor action in this area should be re-evaluated and perhaps reversed. The present government colonization program is financed by the World Bank.

Constraints, Successes, and Failures

Constraints to forestry development in Indonesia are reflections of the problems--the major one being population pressure. The country was, in the past, blessed with seemingly endless supplies of wood for various uses, supplies which have since gradually been depleted. Now the problem has intensified by the policy of moving families from Java and Bali to Kalimantan and other places where the forest is being converted to low-productivity agriculture at a rapid pace. In addition, the logging concessions awarded to numerous foreign companies, apparently by way of graft and corruption, have resulted in timber mining, primarily for export. Wood, in addition to oil, has been an important export item for Indonesia, but one which will taper off as the forests are depleted.

Despite the problems of population pressure on the forests, and the obstacles of graft and corruption, a substantial increase in donor involvement is anticipated. This, however, is likely to be on an individual donor/recipient basis rather than a cooperative one. Little, if any contact among donors regarding their respective forestry activities, is maintained. This lack of communication among donors, a phenomenon found in the majority of countries visited (with Nepal being an exception), is indeed a severe constraint to a coordinated and efficient development and protection of the forest resources.

While forestry efforts in Indonesia may be plagued with a variety of problems that would normally negate successful efforts, there are ongoing, isolated activities that could be cautiously labeled successful. One such effort is a 5-year-old reforestation for firewood project carried out by the Indonesians without any donor assistance. The central thrust of the project is to increase the supply of firewood while protecting the native forests.

Because of population pressure and increasing firewood demands, the natural forests containing highly valuable commercial species, such as

teak, are being rapidly depleted for firewood. To protect the natural forests, dense, wide buffer zones around the forests are planted using Calliandra, a species not indigeous to the area. The Calliandra is a fast-growing species with a rotation age of a minimum of 1 to 2 years that is planted once, producing coppice crops thereafter. It is well suited for firewood and the foliage can be used for fodder. Leucaena was planted originally, but its growth rate was too slow to alleviate trespassing for firewood.

To date approximately 34,000 hectares of Calliandra buffer zones have been planted, not only meeting but exceeding current firewood demands in nearby regions. A second phase of the project is now in the planning stages and donor involvement will be sought. The central thrust of this phase will be to provide an incentive structure for local farmers to plant Calliandra, or the most adaptable of several species considered, on their small farms. The idea is to make the farmer self-sufficient in firewood plus produce an additional amount sufficient to meet the demands of local industry.

Mexico

Mexico has large areas of tropical forest which include all of the Yucatan Peninsula and most of the coastal region along both the Atlantic and Pacific sides. This rich natural resource is under great pressure due to the heavy population density and growth rate. Those primary forests still remaining will soon all be gone, if not protected. Those areas that have been felled are now largely used for SHAG, which is a rather inefficient and destructive land use when population levels are high.

Forestry Problems and Activities

Mexico has recently greatly increased its forestry effort in tropical areas. Encouraged by a World Bank loan, the Instituto Nacional de Investigaciones Forestales (The Forest Service Research Arm) has set up a central administrative office for tropical work in Campeche, with three field stations: Escárcega, Bacalar, and Tuxla de Gutiérrez. Together, they cover most of the Yucatan peninsula research effort.

Most of this geographic region is of limestone origin, and has a harsh dry season which greatly influences forestry in the area. Agri-silvicultural systems are being studied as a method to support larger numbers of people on land that is not very productive. The Government considers the peninsula under-populated and has plans for colonization. The research center at Bacalar has set up a model farm which deserves more attention, donor support, and promotion in other tropical nations.

Colonization schemes often fail for lack of respect for ecological principles, but the author (Janier Chavelas Polito) of this model farm obviously understood these principles as well as human needs.

Results from this group of research centers will be of interest to students of both agri-silviculture and forest regeneration based on native species.

Ecological Impacts

Colonization efforts often do not consider the carrying capacity of the site, and fail when that capacity is exceeded. Presently, throughout the Yucatan peninsula, slash and burn agriculture provides a meager living because population levels are too high to support that kind of agriculture. Theoretically the Maya civilization, which once thrived in the same region, declined because population densities increased beyond the limit for SHAG technology on such a site. The only alternatives are to control the number of people at or below the carrying capacity, or to use new technology to increase the carrying capacity. Agri-silviculture, model farms, and finding new sources of water are techniques that might increase the land's ability to support more people, but it is not likely that large increases will be possible. Thus a government colonization program would have to proceed very cautiously.

The present, ubiquitous SHAG system, practiced here for centuries, will only lead to increased poverty and further desertification of the site. Increasing the population levels without different land use technology will only hasten the process.

Constraints, Successes, and Failures

While Mexico is not a country that qualifies for A.I.D. assistance much can be learned about Mexican techniques and successes from highly qualified and experienced Mexican scientists and practitioners such as Sr. Chavelas.

During the last 5 years there has been no sign of technology transfer by the Mexican Forest Service in the Yucatan region. The model farm, the regeneration of forests using native or exotic species, and agri-silviculture are operating well on experiment stations run by the Forest Service. But once off the Forest Service Station lands, none of these practices are used. This indicates the difficulty in changing SHAG farmers to stable, less land-hungry systems.

Morocco

Morocco's forests are spread over 8 million hectares and are administered by the Moroccan Forest Service (Administration des Eaux et Forets). The climate ranges from wet in the north and semi-arid further south to arid in the south. Several species of conifers, eucalyptus, and oak grow naturally or are planted. The largest area administered by the Moroccan Forest Service is occupied by alfa, a robust plant growing under dry conditions. It is not a woody plant but can be used for pulping in fine paper manufacturing. The alfa is also being used for forage when little else is available.

Cork oak is a slowly vanishing species, by choice. Cork is being replaced in the world market by substitute products. After the cork oak trees are harvested the area is reforested with eucalyptus, especially in northern Morocco, which supplies Morocco's only pulp mill. The oak wood is converted into high-quality charcoal. The second largest Forest Service land occupant is green oak, an excellent charcoal species. It is being used for little else, but is considered to have great potential for other products such as furniture.

Argan trees, covering 740,000 hectares, grow principally in the south under extremely arid conditions with less than 200 millimeters rainfall annually. It is a species of great interest to the Moroccan Forest Service, and should have potential for the dry Sahelian and other arid, hot countries. The tree can withstand long periods of extreme drought and is often the sole means for livestock survival. After a growth of 5 to 10 years it produces crops of nuts that make an excellent oil, used primarily for cooking. The argan foliage is also used extensively for fodder. The wood makes an excellent charcoal, and stems cut from thinnings are used extensively as polewood in construction. The utilization of argan is therefore complete. Furthermore, the shading and moisture retention in argan stands allow for growth of barley and other cereal crops under the trees. Although the yields are very low, the absence of the trees would make any agriculture in these areas impossible.

Forestry Problems and Activities

The productivity and utilization of the 8 million hectares are well below potential. The possible increase in biological productivity from changing silvicultural management is substantial but is held back for lack of adequate budgets, qualified manpower, and necessary resource information. Economic productivity of the forest is also deferred for lack of any economic analyses of the resources and their utilization.

Of primary concern on the economic front at this time is the desire to reduce imports of forest products and supplant them with increased domestic production.

The major single problem in Moroccan forestry is clearly the interaction between forestry and grazing. This, coupled with a 3.2 percent annual increase in population, increases the grazing pressure in the forests as more of the range land is converted to agriculture. The range land is indeed severely depleted and much of the remaining edible vegetation is found only in the forests. Trampling, browsing, and soil compaction damage is severe and reforestation efforts are greatly hampered. The number of animals clearly exceeds the carrying capacity of the range. While this has been legislatively recognized in some areas, enforcement is lacking. The annual net loss to deforestation is about 30,000 hectares.

Donor organizations active in forestry in Morocco include FAO/UNDP, Germany, and potentially the World Bank and USA (see Appendix I). The FAO project, started in 1975 and scheduled for completion in 1980, is designed to regulate grazing on the forest land and to improve pasture and general range management. The strategy is to move grazing out of the forests during the reforestation phase and onto the range pastures. The range, presently almost depleted, will be reseeded with supplies from two grass seed nurseries established by FAO 3 years ago. The nursery capacity, however, is not nearly sufficient to solve the problem. Additional nurseries are planned.

There is relatively little on-the-ground donor activity in Morocco. Ongoing projects are largely in the educational/research areas. In terms of potentials, the World Bank has proposed a fairly large integrated development project with a strong forestry component. Implementation, however, is not yet certain.

A.I.D. is presently involved in three major agricultural projects in Morocco, none of which has significant forestry components. They are:

1. Strengthening the Agricultural University (Hassan II) in Rabat.

2. Dryland farming project.

3. Range management improvement.

In addition, A.I.D. has a small forestry project ($150,000) underway to explore to what extent forestry could fit into the A.I.D. plan for Morocco in the future. The purpose of the project is to produce some definite recommendations that will culminate in on-the-ground implementation projects.

Ecological Impacts

Because there is little on-the-ground donor activity in Morocco, there are few ecological impacts to document. However, the potential impacts are substantial, pending the implementation of various ongoing and proposed research projects. Morocco is presently a storage house of information, not yet extracted. There are approximately 60 arboreta, some

dating back 60 years. These contain a number of species that have not been grown commercially. The information has not been summarized. Hence, no data on yields, species adaptability, seeds, diseases, insects, genetics, etc., have been generated.

The eucalyptus plantations supplying Morocco's only pulp mill pose a negative ecological impact. A major problem is that nothing grows under the canopy, hence grazing capacity is lost. In one of the arboreta visited, however, several eucalyptus species grew amidst rich vegetation, some of which would certainly be edible for livestock. This suggests the need for research to determine the compatibility of different eucalyptus and grass species to satisfy both wood fiber production and grazing objectives.

In the extreme dry areas of Morocco where trees generally do not grow, the ecological impacts of on-the-ground activities are likely to be positive. The animals graze on whatever minimal vegetation is available, but they are generally in poor condition and often do not make it through the hot, dry summer months. To offer some relief the Moroccan Forest Service has initiated several experimental cactus plantations, particularly on steep hillsides. Cactus is one of the few plants that will grow in these areas. The purpose is to provide additional livestock feed to maintain the animals during the most difficult months. The cactus, a spineless variety, is not highly nutritional, but is an adequate supplementary feed.

Constraints, Successes, and Failures

The constraints to forestry development in Morocco are reflections of the problems, particularly the forest/grazing interaction. As more range land is being converted to agriculture in response to increasing demands for food, the grazing pressure in the forests increases causing trampling, soil compaction, and other damage. On the other hand, grazing capacity in the forest is diminishing as the oak is replaced by a eucalyptus species (for pulp) which permits no other edible vegetation underneath. It is clear that the number of animals greatly exceeds the available grazing capacity, on the range as well as in the forests.

Constraints are also evident within the Moroccan Forest Service. This agency is a properly trained and spirited organization, apparently free from graft and corruption, but has a shortage of qualified personnel when compared to the needs. Scientists are few and far between, have little opportunity to interact professionally with peers, and lack well-equipped laboratories. Consequently, the level of performance falls far short of potential.

Approximately 70 percent of the eucalyptus wood harvested for the pulp mill is, by law, sold at a fixed price. Private individuals bid for the available timber and make their profits, if any, from the 30 percent volume they can sell on the open market. This volume consists of thin

branches and tops sold as fuelwood and medium-sized materials used as polewood in construction. The harvesting is carried out by families who move from site to site. They are paid by volume and wages are generally low because of the fixed pulp mill price constraint. A more freely fluctuating pulpwood price could substantially improve the economic well-being of the people directly dependent on forests for their livelihoods.

Documentation of successes and failures of donor activities is premature, except for FAO's education and training efforts. The FAO project, deemed highly successful, created the 4-year school of forestry at Salle in 1968. This professional school employs ten faculty members and has approximately 50 students. The students are committed to work 8 years for the Forest Service after graduation.

The success of this FAO project is evident in the level of technical and managerial competence of the graduates. The major problem, however, is that the school does not have the capacity to graduate as many people as is required to do an adequate job of managing the resources. Training capacity should be expanded but because of pressing needs in all sectors of the economy, this appears to be of lesser priority for Moroccan funding. Instead, the donor community has an opportunity to meet this challenge.

Nepal

The forest resource of Nepal once consisted of timbered slopes with alder, pine, and rosewood being represented. The original forest was sufficient to prevent floods and soil loss, and to supply the people with all the forest products and benefits they needed. However, first in the hills and more recently in the Terai region (low altitude hills and valleys), poor land use and resource management coupled with increasing population densities destroyed the delicate balance. To correct this is the challenge before Nepalese land managers today.

Forestry Problems and Activities

Nepalese forestry involves a variety of resource management matters: acute shortage of fuelwood, soil erosion and watershed management problems, clearing luxuriant forest for farmland, and stress on native fauna populations. Disastrous floods in downstream Bangladesh have their origins in Nepalese land use patterns.

In the hills (middle altitudes) where most of Nepal's people live, forested slopes have been denuded and fuelwood is very scarce. Dried dung is used for fuel where wood is unavailable, thus depriving crops of needed nutrients. Most buildings are brick, the manufacture of which

requires enormous amounts of fuelwood. Denuded slopes result in uncontrolled runoff, floods, and intense erosion, in effect reducing the land's carrying capacity while population pressures grow.

To alleviate population pressures the government turned to the Terai region, an area of low altitude, deep rich soils, luxuriant forests, and malaria. A program to control malaria and to resettle farmers resulted in about 80,000 hectares given to farmers from the hills. Another 235,000 hectares or so was illegally taken by landless farmers, some of whom were from nearby India. As a result, the once-forested area has become a highly productive agricultural area, at the expense of a much needed forest resource. Agricultural soils should be used for agriculture; however some of the Terai forests were cut even though they were on fragile forest soils. Continued pressure on the Terai will result in a loss of productivity.

Nepal was once rich in wildlife. This resource is being deprived of its life support system by rampant deforestation. More endangered species will be needing protection in the future.

Some plantation programs have begun to slow erosion, control runoff, and provide fuelwood, but these measures so far are meager compared to the need.

The number of donor agencies involved in forestry (and other) activities is both greatly in excess of this nation's ability to respond, and barely adequate to meet the urgent need of immediate remedial action.

One unique aspect of donor activity in Nepal was the extent of cooperation and communication between donors. This is commendable, and should be a more common practice in other nations.

Ecological Impacts

The entire Nepalese forestry scene is fraught with negative ecological implications, except that the plantation programs are designed both to serve human needs and heal the landscape. The hill country requires immediate protective vegetative cover in key spots to prevent erosion and control runoff. The Terai needs political control and planned land use lest it be converted into a zone much less productive than its potential. The wildlife must receive protective attention before the habitat is totally destroyed. Donor activity, it seems, offers opportunity to prevent or cure negative ecologic impact, rather than cause more. Care must be taken however, because poorly planned programs could certainly lead to greater damage.

One caveat was pointed out by donors in Nepal. If plantation programs are to be carried out on a large scale, they will conflict with the planting of crops, since the seasons coincide. Perhaps a food-for-work program would partially resolve this.

Constraints, Successes, and Failures

The donor community and the government of Nepal are, in unison, committed to solving the deforestation problem. This is a recent emphasis and several large-scale rural development projects with heavy emphasis on forestry are now scheduled for implementation. In addition, donors have several ongoing forestry projects and the Nepalese have also increased their battle against deforestation. The Panchayat Forest concept, by which villages are by law given a 124-hectare area to reforest, is the vehicle used to carry out reforestation efforts.

In contrast with donors in many other developing countries, the Nepal donor community has achieved a high level of cooperation. They seem to recognize each other's strengths and weaknesses, and divide the technical assistance tasks accordingly. In most donor and Nepalese forestry activities, the common denominator is "community forestry." This means that the local community must be intimately involved in all facets of the project, no matter how trivial. Unless such cooperation is secured, the project is likely to fail. Donor projects are not identified as such among the villagers. The local people are the ones who implement the projects. More importantly, they are allowed to make mistakes in the process which are valuable learning experiences.

Community involvement in reforestation efforts is a slow process but appears to be the only workable solution. Too often donors in other countries design projects and carry them out without much regard for involving the local people. This leads to temporary solutions at best, rather than a stable system based on community conviction.

While the donors seem to act together, there are some annoying constraints. In a physical sense offices are scattered about the city, phones do not work well, vehicles are either out of commission or simply not available--all of which makes smooth coordination of efforts difficult. From a power structure point of view the decision-making is far too centralized. Even trivial matters are decided by the "higher-ups," which results in frustrating delays in carrying out the tasks at hand. At the village level the success or failure of any forestry effort seems to depend on the person in charge, his personality, and ability to mobilize the villagers.

Forestry activities in Nepal are best discussed in terms of potential successes. The donor community has gone through a lengthy learning process that has culminated in a high degree of cooperation among the donors and the Forest Service. While ongoing forestry activities in Nepal intimately involve the communities, with apparent success, the projects in the pipeline, now ready for implementation, are much larger in scope and dollar magnitude. Of specific interest is the A.I.D. RCUP (resource conservation and utilization project) which is apparently carefully designed along community forestry principles. Potentially, therefore, RCUP may be highly successful in terms of accomplishing stated objectives. However, A.I.D. must accept a much slower pace of progress than what

they are perhaps used to in other countries. The difference lies in the potential for long-run benefits, which is probably higher when community forestry principles are adopted than when they are not.

Panama

Forestry needs in Panama vary with population density. In the more wild, less populated areas, including the Darien, the forestry challenge is rational use of the existing primary forest. This is of course one of the major challenges to foresters in the tropics wherever there is any primary forest remaining. Pressure is great to "develop" the Darien, i.e. to fell the forest. Much of this pressure is from the Colombian side of the border, in order to build the remaining link of the Pan-Am Highway. Panama is not very eager to do this. One issue at stake deals with cattle diseases not not yet found in Panama, and Panamanian cattlemen oppose the road.

Forestry in the more densely populated areas of Panama addresses a series of needs, only some of which are being met. Large areas of land have been deforested, farmed, and are now idle. Using known plantation and watershed management techniques, they could again support healthy forests productive of both wood and water. Since large parts of Panama have a prolonged dry season, the water harvest may become more important than the wood. The wood component may serve chiefly to meet fuel requirements in rural areas.

Forestry Problems and Activities

About 5,000 hectares of conifers have been planted during the last 10 years. A paper mill has been proposed that would be feasible, based upon the FPL project for A.I.D. on utilization of mixed hardwoods, with a stronger plantation program, and a stronger Forest Service. Most planting is done by the government's renewable natural resources program (RENARE), of which the Forest Service is a part. The electrical power agency is now considering its own plantations for woody biofuels.

National and international interests consider the Canal Zone to be Panama's most critical forestry problem. It is, however, a socio-economic and political problem. Given a free hand and the necessary support, Panama's foresters could easily resolve the technical part of the problem. Briefly, the watershed around Lakes Alajuela and Gatún (which feed the canal the fresh water necessary for its operation) is being denuded by landless people who want to farm it. This results in a great deal of erosion which silts the lakes and the central canal, reducing the depth of the canal and the capacity of water storage of the lakes. Dredging operations now close the canal for several days at a time, but even this cannot keep up with siltation. If the people were offered a more attractive alternative and the watershed were given the

protection it needs, nature would quickly heal the wounds and regulate runoff without much need for human (i.e. RENARE) intervention. But RENARE has been ordered to solve the problem without relocating people.

Ecological Impacts

A.I.D. has a major natural resources project in Panama that has strengthened RENARE activities in forestry. The investment is in line with the critical need.

Management of the Darien is as important as management of the Canal Zone. Constructing roads into the area, whether for logging or for any other reason, will indubitably result in squatter populations of SHAG farmers along the roads. They will fell the forest, burn it, farm for 2 to 3 years, then move to other forest land. This is the classic, pantropical pattern. Only in those areas of deep rich soils (and there are rumors of such soils in parts of the Darien) will stable agriculture be possible, making SHAG unnecessary. But land tenure customs in Latin America usually lead to SHAG around the fringes of permanent agriculture.

One reason Panama is less than eager to extend the Pan-Am Highway to the border is that it would lead to an influx of large numbers of Colombian SHAG farmers. Population pressure and the local economy induce emigration from Colombia, as Venezuela has discovered. Another reason against building the highway is the likely result of pests migrating north and south. Presently the Darien is a massive blockade, preventing or impeding transmigration of many diseases and problematic insects. Once a highway is open to commerce and daily traffic, the barrier will be lost.

Future management decisions by the Panamanian government regarding the Darien will no doubt involve donor agencies whether for new colonies, road building, or national park establishment. A National Park is proposed to formalize a managed barrier. This idea has the backing of the Panamanian government. Decisions to develop the area will have wide-ranging impacts and should not be carried out until those impacts are well understood and evaluated. Indigenous tribal populations will certainly suffer from any attempts to develop the Darien. Hoof and mouth disease would certainly harm Panama's cattle industry.

The Panama Canal is considered to be the nation's prime resource and is even more important to the international community. The watershed in question is in a high rainfall zone, rainfall which is needed if the canal is to operate optimally. But mismanagement of the watershed, i.e. allowing families to farm parcels of land by primitive techniques, is endangering the canal resource, as well as hydroelectric output and water for irrigation, by causing siltation. Proper management is not a technical challenge but a political one.

Constraints, Successes, and Failures

In the case of the Canal the governmental decision makers have told RENARE, and the donor agencies, that the problem must be solved without relocating the squatters now on the watershed. These farmers are the root of the problem, and without relocation, a solution may not be possible. The Panamanian government probably has resources of its own to offer acceptable alternatives to these farmers, after which RENARE could carry out the relatively simple task of managing the watershed. In spite of the international interest in the problem, it requires a local, political solution. The government has already decided to not let newcomers get established in the Zone. Now is time to make generous offers to the few who are already there.

In the case of the Darien, one of the principal constraints is that foresters do not know how to manage natural tropical mixed forest for sustained yield of wood products. Foresters and politicians have also been unable to cope with the problem of landless farmers taking over land that should be managed for uses other than SHAG. These constraints are indeed formidable, and a pantropic challenge to foresters.

RENARE has carried out plantation programs and watershed management activities in the past, both in the Canal Zone and other parts of the country. It is a new agency with young, energetic professionals who will soon be joined by a cadre of new graduates. With occasional guidance and support from donors, RENARE can probably perform its function rather well. Its 5,000-hectare pine plantation program at La Yeguada, in cooperation with FAO, is a major accomplishment. There are about 4,000 hectares of Caribbean pine planted, and they aim for about 8,000 more. The watershed is being covered with productive vegetation, lumber and log fiber will be produced, and the farmers in the area (about 2,600 families) are being stabilized. The FAO Food for Work program provides the incentive to farmers for planting pines. With more support, RENARE could repeat that program on several sites around the Republic. But it may not be able to overcome the constraints imposed on it by landless farmers, and by the difficulties of managing a mixed forest on a sustained basis. Few Forest Services in the tropics have succeeded with either. Hopefully this new talent will help strengthen RENARE's Forest Service component.

Papua New Guinea

The forest resources of Papua New Guinea are much more extensive than those of Indonesia, Malaysia, and the Philippines. Of a total land area of 46.5 million hectares, more than 40 million hectares are forested. However, 25 million hectares are classified as either inaccessible or not suitable for commercial exploitation. They have too low stocking density, too small average diameter at breast height, or they include too many unknown or lesser value species. The remaining 15 million

hectares are classified as operable forest area. In contrast with the forests of Indonesia, Malaysia, and the Philippines, the forests of Papua New Guinea are extremely varied in species composition with relatively low stocking densities and yields for all species. There are also fewer dipterocarps in Papua New Guinea.

At the end of 1977 there were 90 timber operations under permits and licenses, logging a combined area of 812,250 hectares. In 1977 the Papua New Guinea Government acquired the timber rights for an additional 98,000 hectares. The natives, rather than the Government, own the standing timber. The Government acquires timber rights from the tribal leaders. Timber rights do not include the right to reforest. This requires a whole new negotiation between the Government and the tribal leaders. This made the total timber rights area purchased by the Government equal to 2.4 million hectares. At the end of 1977 there were 60 sawmills of various sizes with a combined throughput capacity of about 493,000 cubic meters. There were in addition three veneer mills, one plywood mill, and one chip mill. Sawnwood, veneer, and plywood are all for domestic consumption. Chips and logs are exported.

The export of forest products in 1977 realized a value of over $31 million, or 4.1 percent of Papua New Guinea's export earnings. Japan was the largest importer, taking 70 percent, followed by Australia with 23 percent. The total log harvest in 1977 was 1.1 million cubic meters with 36 percent being exported as logs, 24 percent being exported as wood chips, and 5 percent being exported as sawn timber. The remaining 35 percent was used for the domestic market.

Forestry Problems and Activities

The major problems preventing forestry development stem from the nature of the resource and infrastructural inadequacies. The forests are markedly heterogeneous and few areas demonstrate single species or, even, genus dominance. Species diversity is paralleled by differences in timber quality, appearance, and log size; the vast majority of species are unknown in international markets. Merchantable volumes per unit area are much lower than in Malaysian, Indonesian, and Philippine dipterocarp forests and only during periods of apparent supply shortage in the international market have the Papua New Guinea resources attracted much attention. Domestic markets for forest products are restricted by the small population within the monetary economy and disparities in its distribution.

In 1979, over $3 million of Australian aid was earmarked for use in forestry activities. Shown in Appendix I is a list of 22 forestry projects being carried out in 1979 by the Papua New Guinea Office of Forests. Some of these projects are also being supported by other donors or related agencies. Bilateral aid from New Zealand is being used for the establishment and construction of the Timber Industry Training Center at Lae.

While not a donor agency, the Japan Overseas Afforestation Association (JOAA) is supporting reforestation with plantation trees of various species. The major species are Eucalyptus deglupta, Albizia falcateria, Gmelina arborea, Pinus carbaea, and Pinus merkusii.

Ecological Impacts

The aforementioned activities of New Zealand and JOAA have not yet had a significant positive or negative ecological impact on the forests of Papua New Guinea. Over the long run, however, the plantation trials of JOAA might have a significant effect because large-scale plantations may be based on their results. Knowing which species will succeed and those that will not is valuable information. Fortunately, the JOAA does publish its results. The ecological impact of Australia's aid is tied to the projects initiated and carried out by the Office of Forests of Papua New Guinea. An evaluation of its program was beyond the scope of this study and is therefore not included.

Constraints, Successes, and Failures

Infrastructural constraints include complex land tenure systems, the shortage of competent, educated, and trained indigenous personnel, and the reliance on expensive expatriate technology and expertise.

The major constraint on donor activities is the requirement that any activity must be part of the overall program initiated and developed by the Papua New Guinea Office of Forests. The Office of Forests strongly prefers to have undirected aid which it then can use as it sees fit without any outside interference.

Forestry activities of most bilateral and multilateral donor agencies of the world have been small. Perhaps the large amount of undirected aid given each year by Australia to Papua New Guinea may have discouraged others from being more involved. However, one Australian forestry project is of major significance because of its scale and its continuing effect on both forestry development and the evolving policies of the Papua New Guinea government. In this project, an agreement was signed with the Honshu Paper Company Ltd. of Japan in 1971 for harvesting a forest area near Madang, and an operating company, JANT Pty., Ltd. was formed. Chip mill construction began in May 1973, and the official opening was in June 1974. Production objectives called for chip exports to reach 407,000 dry tons per year by 1977 and veneer output to start in 1975, reaching 24,000 cubic meters by 1977.

The sole purchaser of both chips and veneer was to be the Honshu Paper Company. JANT was also required under the original agreement to carry out a pulp and paper feasibility study by 1977. At full production as planned, the total available pulpwood volume was expected to be cut out

over a period of 20 years and to be replaced in perpetuity by a reforestation program based on fast-growing eucalypts with a 10- to 15-year rotation.

Production of wood chips reached a maximum of 289,000 tons in 1976 and fell off to 126,000 tons in 1977. Even at these low production rates, the forest area is being harvested at nearly twice the projected rate. Stocking density (cubic meters per hectare) is lower than anticipated and waste is high because of relatively small-diameter trees. Furthermore, postharvest land development has proven to be nearly impossible for either agriculture or reforestation. This has been caused mainly by the complicated land tenure system and the lack of financing for reforestation. Apart from the provision of employment (about 1,500 jobs) the venture has had very little developmental impact, and the wisdom of similar ventures is now being questioned by both Australia and Papua New Guinea.

The export wood chip plant in Madang can be viewed as both a success and a failure. The success is from the viewpoint of the Honshu Paper Company because they are receiving and using wood chips. The failure is in having only a small economic impact on PNG, because the full plan of further processing facilities such as a sawmill, veneer mill, and a pulpmill in PNG have not been realized, because they are harvesting twice the area to get only half the projected wood supply, and because of the negative ecological impact of not reforesting immediately after cutting. Reforestation has been delayed because of the need for the PNG Government to negotiate with the leaders of the local tribes for reforestation rights. Reforestation rights were not included in cutting rights as they perhaps should have been. Financing in reforestation is also lacking as the PNG Government cannot force JANT to reforest because this was not included in the original agreement. This plant is also of particular interest since it is the only large-scale plant in the world processing mixed tropical hardwoods entirely for export.

In Papua New Guinea there is a growing realization that, with minimal population pressures on the lowland rainforests, there is little to be lost by retaining the forests intact. In time the value of resource will increase substantially. Government policies in Papua New Guinea now support smaller scale, indigenous enterprises, and have moved away from the large-scale export-oriented ventures.

Paraguay

Paraguay is a simple country from the point of view of topography and vegetation. The nation is divided into two sections, the western Chaco and eastern Paraguay. The Chaco is a flat region with a very low population density. The rainfall varies little, being drier toward the west and more moist in the eastern Chaco. This massive savanna contains a rich forest resource of slow-growing trees containing hard and heavy

woods. This forest is a major resource to the country but should not be considered a renewable resource until additional research is done. In areas where the forest is cut, grazing constitutes the principal land use. Grazing is sustainable on this basis, but normally it is not sustained.

Forests cover much of eastern Paraguay and are composed of very valuable cabinet wood species. The Parana valley along the Brazilian border possibly has the richest hardwood forest in the western hemisphere in terms of value per hectare of standing timber. This forest is rapidly being felled, partly to harvest the wood and partly for agriculture. Mechanized farming will be the principal land use in the future on the Paraguay side of the river. This use is not sustainable.

Paraguay's most pressing problem is the uncontrolled rapid depletion of what used to be a very substantial forest reserve. Paraguay's exports of lumber amounted to $26 million in 1975. About one half of the harvested logs are processed into lumber.

In November 1973 a law was initiated by the Government that created the National Forestry Service under the Ministry of Agriculture and Livestock which provided for the protection and development of renewable natural resources of the country. It is interesting to note, however, that in a 3-year period the original cadre of 28 professionals in the Forest Service has been reduced substantially. There has been an exodus of half of the personnel and they have not been replaced. Reasons for leaving are that the pay is low and the agency is not considered to be practicing logical forestry.

Forestry Problems and Activities

FAO has been trying for years to build a strong effective Forest Service in Paraguay. This effort has not met with much success. There are few trained Paraguayan foresters. Chile, in a bilateral agreement with Paraguay, is involved in the training of Paraguayan foresters. Other Paraguayans have studied forestry in Argentina, Brazil, and the United States. The Swiss have recently set up a forestry technician school in eastern Paraguay and are now involved in forestry research jointly with the Paraguayan Forest Service.

The Canadians, through a Andean Pact Project, are supporting wood technology studies to broaden the marketable species base. The Japanese have recently become involved in forestry activities to some extent. Plantation efforts are being carried out on species marketable in Japan, including Paulownia.

The Peace Corps has been working with the Forest Service in establishing and managing National Parks. Brazil and Argentina have joint projects with Paraguay to expand the hydroelectric output of the region.

Ecological Impacts

The destruction of the mixed hardwood forests of eastern Paraguay is causing considerable negative ecological impact. The soils are agricultural in nature, being alluvial, deep, and well-drained. However, total destruction of the forest leads to wind erosion and a dramatic drop in the water table. Conversion of the area to agriculture, while leaving 30 to 50 percent of the forest intact, would probably alleviate these two problems. In some areas 90 percent of the forest is already felled.

Constraints, Successes, and Failures

One constraint to donor agencies in Paraguay is the lack of local professional forestry talent. Another is the local Forest Service, which is a weak and ineffective organization. There is no formal training in forestry at the professional level in Paraguay except for a recent effort to begin a forestry program at the University in the capitol city.

Occasional attempts to develop plantation forestry in Paraguay have failed. There has been no research and no strong attempt to get forestry under way. Across the river in Argentina and Brazil exist some of the world's most successful pine plantations. The soil and ecological conditions on the Paraguay side of the river are identical and plantations could support a major wood pulp and sawmilling industry based on pine.

Past donor activity has been directed at a hardwood sawmilling industry which is highly inefficient. More wood is lost than is used. Studies conducted 30 years ago indicate an extremely high percentage of the wood was lost in harvesting and processing and recent studies indicate this is still true.

Peru

Forestry in Perú, like the nation itself, is tripartite. The western, coastal fringe is one of the driest places on earth. There is less than 1 inch of rainfall per year. Only in the north do trees (Prosopis) invade the desert sands and they depend on subterranean water flowing from the perpetual snows of Andean glaciers.

The eastern half of the nation is very humid and forms part of the upper Amazon basin, mostly an inaccessible tropical wet lowland mixed forest. The third is the highland region. Here most forest has long ago been felled, and agriculture or grazing is the predominant land use with occasional eucalypt plantations.

Forestry Problems and Activities

There is forestry activity in all three regions. In the humid eastern lowland most forestry activity is simply exploitation of standing primary forest. Large industries have developed, based on a relatively broad spectrum of species (60-70 of the several hundred present). Such material is harvested along the rivers, which form the only transport network in the region. Other forestry activity here includes the establishment and extensive management of rather large, wild and isolated National Parks. Some plantation forestry has begun, both experimentally and on a pilot scale. Colonization projects are usually directed at the humid eastern region.

In the highlands a delicate balance between climate, geomorphology, and vegetation has long since been destroyed by generations of farmers, with several results. The rainfall pattern includes a long dry season and one of torrential rains. Combined with extremely steep slopes, unstable soils, and a vegetative cover that was once forest but is now burned-over shrub, this leads to uncontrolled run-off half the year. The other half year involves drought, accentuated by reduced plant cover.

Heavy erosion (among the worst in South America), high-risk agriculture, and a lack of wood for fuel and construction are other common resultant features in this region. For several years the only fruitful response to this challenge has been the planting of Eucalyptus globulus, which has helped remedy at least some of these problems.

Along the coast there is very little forestry activity, other than urban trees which are watered manually or by subterranean streams. High populations are settled along the coast, but only where glacial melt-water streams reach the ocean. However, the following effort of the Perú Forest Service is of interest:

Faced with vast areas of totally unproductive desert, and high population pressures as villagers in the highlands flee to crowded coastal cities, the Forest Service set up a pilot project to increase the carrying capacity of the desert. By this increase, farmers could be resettled on areas which previously had, in effect, zero population.

The project planted Prosopis in areas of shifting sand dunes in the desert near Piura, and successfully turned 1,000 hectares of sand into an oasis producing 6 to 7 tons/hectare of high-protein cattle feed. Water used was less than 10 percent of that needed for agricultural crops (3,000 m^3 of water/ha/yr vs. 10,000 to 40,000). The water for irrigation does not come from rainfall, but from glacial melt. Families are now being settled there. They receive 2 hectares per family, and raise crops of watermelons, cowpeas, pigeon peas, and honey. They harvest firewood and animal feed from the Prosopis. Plans exist to extend this to about 25,000 hectares, but outside funding will likely be needed.

An alternative land use would be intensive culture of cotton or corn, but this would require on the order of 12,000 cubic meter per hectare per year of irrigation water. Given local water supplies, very few hectares could be planted, and the social benefit would be much less.

Ecological Impacts

In the eastern humid region the harvesting of trees for wood has little impact on the forest, except for a serious depletion of the gene pools of harvested species. Serious as this is, it pales when compared to the impact of two other common activities, namely colonization and road building. These two activities lead large numbers of SHAG farmers to areas totally inappropriate for farming. In rare cases colonies are being set up on areas with deep, rich soils well suited for long-term stable agriculture. The roads leading to the colony, passing through areas with less-appropriate soils, are settled SHAG-fashion, causing destruction along the way. Any donor working on road building or colonization projects in previously undisturbed areas should be aware beforehand that these projects often produce more destruction than benefit.

In the highlands tremendous ecological impacts have been caused over the centuries, partly by the natural mountain-building process, but largely by human activity. Future donor activity should be aimed at two goals: First, to alleviate poverty and human needs in the regions (on an ecologically sound, stable, long-term basis). Second, to heal those parts of the landscape that can be brought back to productivity for present and future generations (increase the carrying capacity of the ruined landscape).

There may be some question as to whether plantations of Eucalyptus globulus are the best alternative from an ecological point of view. They may not be; but until a proven alternative solution is developed which will be at least equally productive, the eucalypt must continue to be used. Its contribution to the well-being of highland peoples, from Colombia to Chile, cannot be overestimated. If a disease or insect were to wipe out these plantations overnight, the loss and hardship thus caused would be enormous; for this reason, species trials (already under way by the Perú Forest Service) are justified. However, this eucalypt has proven highly adapted to the region and has been there for nearly 100 years: The likelihood of massive losses by insects or diseases, unless imported, is extremely low.

Along the coast, massive areas of barren land will forever remain that way. It is not an endangered ecosystem likely to be made extinct by forestry activity. If small areas are irrigated and made productive, the impact can be considered positive from all points of view. Care must be taken however in establishing dams, canals and other waterflow interruptions necessary in irrigation projects, as improper establishment may have unnecessary and undesirable effects upstream and downstream.

Constraints, Successes, and Failures

A.I.D. presently is involved in a food-for-work program to establish forest plantations. It is administered by the Peru Forest Service, and is quite successful. Many donors apparently do not have this kind of option. In a nation with high unemployment, high inflation, and large numbers of the population operating outside of the cash economy, it appears to be an ideal incentive to involve local communities in needed development projects. One question: Is it of greater benefit to the recipient nation to have food purchased locally or purchased outside the country? The answer might vary from one country to the next. Local purchase would provide a needed stimulation for the local economy, but might upset the local markets and prices.

The Forest Service's efforts with the desert near Piura, carried out without any outside help, constitute a major accomplishment. This project should be studied, copied, and supported by donors.

The reforestation by use of food for work, has nicely accomplished important objectives. Care, however, must be exercised. In the past such food distribution programs have failed due to the use of nontraditional foods. Even in poverty-stricken areas, traditional people will not consume nontraditional foods.

A Forest Service program to save the vicuña from extinction has had good success. It received support from donor agencies (IUCN, WWF, and Germany), but much of its success was due to the dynamic head of the Forest Service, Dr. Marc Dourojeanni. He is also responsible for the success of the Piura desert planting program and the food-for-work program. In the 6-7 years while he was head of the Forest Service (he recently retired to return to the university), Dr. Dourojeanni built the agency (known as the Direccion General Forestal y de Fauna) into an important decision-making guardian of the nation's resources. He also brought in well-trained, experienced professionals, upon whose shoulders falls the task to continue the tradition of quality work that he started. The point to be made here is: Successes are nearly always based on the efforts of one key individual, whether donors are involved or not. That key individual is usually a local person. Donor successes do not usually occur without such an individual.

Philippines

The Philippines contain extensive forest resources and the forest industry is very important to the economy. Out of a total area of over 30 million hectares, there is an estimated 10.2 million hectares of productive forest land. Only about 3.9 million hectares is of old-growth dipterocarps, and much of this is inaccessible and in remote areas. Wood is harvested under licenses issued by the Government. Licenses are generally issued for 25 years with renewal for another 25 years based

on performance. The area limit for one entity is 100,000 hectares, with a few exceptions based on special permission from the President. In 1977 there were 376 timber licenses covering almost all of the productive forest area of the Philippines. The total log harvest in 1977 was about 13.7 million cubic meters and was used to supply 341 sawmills, 62 plywood mills, 23 veneer mills, 15 wood-based panel plants, and 3 pulpmills and papermills. The export of forest products in 1977 as logs, lumber, veneer, plywood, and woodcraft items had a total value of $287 million.

In 1977, 26 percent of the logs cut were exported, 29 percent of the lumber produced was exported, 42 percent of the plywood produced was exported, and 27 percent of the veneer produced was exported. As late as 1975, 87 percent of the logs harvested was exported. This was prior to full implementation of the Presidential ban on log exports.

Forestry Problems and Activities

The main emphasis in forest development policy has been on extraction operations and the development of the log, timber, and plywood export industry. There can be no doubt that these policies were successful in establishing this industry, which had been primarily exploitive. Reforestation did not accompany this exploitive removal of forest cover, and vast areas of denuded lands now exist. Increasing population pressures have also contributed to the deforestation problem by having more land set aside for permanent agriculture, and by extending the forest areas under shifting cultivation to more difficult topography. The vast denuded lands in the Philippines, coupled with typhoons and heavy rains, have led to problems such as flooding, landslides, siltation of reservoirs, and loss of valuable topsoil.

In the Philippines, as in many developing countries having a forest resource base, laws, rules, and regulations have been fairly adequate to control the volume cut and prevent wanton destruction of the forest. However, these laws, rules, and regulations are rarely enforced because of inadequate budgets, shortage of enforcement personnel, or corruption.

As shown in Appendix I, the United States is providing bilateral forestry aid for one ongoing project and has another proposed project. The ongoing project began in 1979 and is for the establishment of a pilot plant to utilize ipil-ipil trees for energy generation. The pilot plant is intended to determine the feasibility of putting up similar plants in places where marginal lands are available. The $2.5 million budget for construction is part of a $8.0 million loan and grant package earmarked for use in developing nonconventional energy sources. The proposed project is for promoting the creation and strengthening of hillside community organizations and farmer associations in the uplands and to develop and test agroforestry techniques in a wide variety of circumstances. The funding for this project would be about $2.3 million.

Finland, through the ILO, provided bilateral aid for an evaluation of labor-intensive and traditional logging and harvesting techniques in contrast to the newer, high-technology and less labor-intensive techniques used in the developed world. This project was completed in 1977.

Sweden, through the FAO, has an ongoing project with a funding of nearly $2 million for the establishment of a Center for Forestry Education, Research, and Development for the Asia-Pacific Region. This center is located at the University of the Philippines at Los Baños.

Japan has two ongoing forestry projects in the Philippines. The first, started in 1976 and continuing today, is aimed at the development of various techniques for successful afforestation of the open grassland and other denuded land of nearly 50,000 hectares in the Pantabangan area, one of the most important watersheds in the Philippines. Funding for this project is at $1.5 million, with Japan providing half and the Philippines half. The second Japanese project, which started in 1978, is for the establishment of a forestry training center at Pantabangan. Japan is providing $3.5 million toward this project.

Between 1975 and 1978 Germany provided bilateral aid to the Philippines in the form of technical assistance for two projects. The first project for $397,000 was aimed at improving the management of the dipterocarp forests of Mindanao through changing of the low-production rain forests into plantations of fast-growing species. The second project for $173,000 was for supplying a German advisor to the Bureau of Forest Development to help coordinate forestry planning, promote forestry legislation, and collect forestry statistics.

The FAO is a significant contributor of forestry aid to the Philippines. One project completed in 1977 was for demonstration and training in forest range and watershed management. This project had a total funding of $865,500 provided by UNDP. Two ongoing FAO projects are being funded by UNDP. The first, with a funding of $1.6 million, is for training and research in multiple-use forest management. Much of this aid is directed at training the staff and providing equipment for the Philippine Forest Research Institute at Los Baños. The second FAO/UNDP project with a funding of $515,000 is an extension of the previous project. The FAO alone is also financing two smaller projects. The first, with a funding of $35,000, is to provide technical assistance in the preparatory phase of a forestry inventory of the Philippines. The second is for coconut palm tree research and development. Funding for this second project is unknown.

The Development Bank of the Philippines (DBP) has loan money available for the replacement of overmature rubber trees in the so-called rubber belt along the south side of Mindanao. This project has only just begun.

The World Bank, through the Development Bank of the Philippines and the Paper Industries Corporation of the Philippines (PICOP), has been deeply

involved with agroforestry sinc This agroforestry project is
often cited as an excellent exa a successful forestry project.

Ecological Impacts

Donor activities have not had much impact on reducing the effects of shifting agriculture, decreasing the rate of commercial logging, or increasing the rate of reforestation. The most positive effects are in the area of institution building through staff training, purchase of equipment, and providing aid for the construction of facilities. Donor aid for these activities was well spent in that the Philippines now have adequate staff and facilities for professional forestry education and for conducting forestry and forest products research. The College of Forestry at the University of the Philippines at Los Baños, the Forest Research Institute, and the Forest Products Research and Industries Development Commission are all well known as the Asia-Pacific regional centers of excellence.

The World Bank project, being carried out through the Development Bank of the Philippines and the Paper Industries Corporation of the Philippines (PICOP), has had a positive ecological impact in the area around the PICOP mill site in Bislig. Because of the success of this project, similar projects are being implemented in other areas of the Philippines.

Constraints, Successes, and Failures

Perhaps the largest single internal constraint against forest development in the Philippines is the lack of a firm and consistent commitment by the central government. For example, the Bureau of Forest Development (BFD) was established in 1975 by Presidential Decree No. 705 and combined the former Bureau of Forestry, the Reforestation Administration, and the Parks and Wildlife Office into one central agency. As such, it had jurisdiction over all Government forest lands including watershed reservations. Showing dissatisfaction with the stewardship of the BFD, Presidential Decree 1515, issued in 1978, transferred jurisdiction over all watersheds to the Ministry of Energy. These watersheds contain over 70 percent of the forested land in the Philippines.

There are proposals to transfer all rural pasturelands from the BFD to the Bureau of Animal Industry, to transfer mangrove areas from the BFD to the Bureau of Fisheries, and the National Parks to the Ministry of Human Settlements. Thus the functions of the BFD would be eliminated. This inconsistence, lack of commitment, and corruption in the responsible Government agencies greatly diffuses the effectiveness of any long-range forest development projects conducted or supported by the donor agencies.

As in most developing countries, donor activities in the forestry sector must fit into the overall development plans of the Philippines which,

in this case, are developed by the National Economic Development Authority (NEDA). There is no constraint by NEDA that donor activity be in the form of undirected aid. Thus NEDA is open to suggestion and can be convinced to approve worthwhile projects initiated by the donor agencies themselves.

Most of the donor forestry activities have had only limited success. However, aid given to institution building and training of personnel at the University of the Philippines of Los Banos, Forest Research Institute, and Forest Products Research and Industrial Development Commission has provided the Philippines with excellent facilities and trained staff. Unfortunately, transferring the expertise of these teaching and research organizations to the agencies responsible for administration of forest lands has been very weak. Selective cutting has not been successful, rules and regulations are not enforced, corruption abounds, reforestation is far behind needs, the numbers of staff and budget are inadequate, SHAG is expanding, the rural people are not involved with reforestation efforts, and the benefits of the log, timber, and plywood industries do not reach the rural population. For the most part, welfare of the rural poor has not been improved by the forestry activities of either the Government agencies or the donor activities.

An exception to this is the PICOP-IBRD-DBP agroforestry project in Mindanao. PICOP started the agroforestry project in 1968 with the broad objective of encouraging private landowners within reach of their millsite to develop tree farms on the marginal portions of their lands. Landowners were urged to utilize only portions suited for agriculture for growing food crops and to use the rest of the land to assure a continuous supply of Albizia falcateria pulpwood. The general scheme of development was that private landowners were approached by PICOP foresters and agriculturists to explain the objective. Once convinced, the tree farmer was taught how to prepare the planting site, what spacing to use, how to plant the seedlings, and how to care for the tree farms. The farmer was also taught farming techniques and was advised to interplant food crops while the trees were still young to obtain extra return during the unproductive time of the tree farm. Up to 1970 PICOP conducted its campaign to convince private landowners of the beneficial effects expected from tree farming. In 1971 the project gained full momentum and by the end of 1977 there were 3,319 tree farmers with a total of 8,962,000 seedlings planted on 15,540 hectares.

Convinced that tree farming, as exemplified by the PICOP experience, is indeed a viable investment, the IBRD in 1972 loaned to the DBP $2 million to be channeled specifically for tree farm development within 100 kilometers of the PICOP millsite.

In 1977 the IBRD made a $8 million loan to the DBP, which added another $7.2 million, to expand the tree farming concept used at PICOP to other areas of the Philippines, and to include other industries and other species. Other companies now participating are the Rustan Pulp and Paper Mills, Davao Timber Corporation, Mabuhay Agro-Forestry Corporation,

Virginia Tobacco Growers, General Milling Corporation, and the Mandawe Manufacturing Industries Corporation. Undoubtedly, the success of the PICOP project and the expanded project is primarily due to securing the cooperation of the local people who were destroying the forests. These include the shifting cultivators and so-called squatters who so often present formidable social problems.

Ecologically, the PICOP agroforestry project has been a success because it has virtually eliminated deforestation caused by SHAG. Most of the former SHAG operators are now participating in the project. In the long run, however, a monoculture of Albizia falcateria or any other species faces the risk of total loss due to insects and disease. This has not yet happened. Such risk is lower with very fast-growing species as this one is.

Thailand

Thailand's forest resource is a richer one than that of most other nations. Mostly tropical mixed hardwoods, this forest is heavily stocked with teak, dipterocarps, and other valuable, highly marketable species. Pine is also abundant. Climatic and edaphic conditions favor fast regeneration also. A strong forestry tradition in the Royal Forest Department is another plus. There are, however, some serious problems.

Forestry Problems and Activities

According to FAO, about 100,000 hectares of forests are destroyed annually in Thailand. Based on estimates for other nations studied, this is probably an accurate figure. SHAG is responsible for most of this deforestation, but in Thailand illicit cutting of the highly valuable teak is also a factor (teak is a natural monoculture).

FAO recommended an immense reforestation program to counteract this annual loss of forest, and this program was begun by the two main forestry institutions of Thailand: The Royal Forest Department (RFD) and the Forest Industry Organization (FIO). Another serious agent of deforestation, namely fire, was added to the list, because plantations are more susceptible to fire than is the natural forest.

The FIO effort is unique and combines the benefits of the Burmese taungya system and Mexico's forest ejido system. Because landless people and nomadic SHAG farmers are destroying forests, the FIO project aims to set up "forest villages" in deforested areas, with volunteers to reside and work in these settlements. The FIO provides schools, electricity, water, and some other necessities, and organizes an agri-silviculture (more specifically taungya) venture whereby teak seedlings (stumps) are planted along with rice, yams, corn, and other crops. Each family is given a unit of land (1.6 ha) to farm each year in this fashion. Those who want

to plant more land can do so, and receive a cash bonus. Once the crops are harvested from a 1.6 hectares unit, the teak is then well established. Further cropping can be done if the young trees are cared for in the process. The intent is that the main activity of the village will be forestry, in perpetuity. Villagers are encouraged to engage in any activity that will make the village a viable enterprise (restaurant, general store, and charcoal manufacture).

This approach, if fires can be controlled, will help greatly to reestablish the forest resource in Thailand. Some 48 villages are already established, each with a maximum of 100 families. The approach will not, however, solve the problem of landless, migrant populations, since 4,800 families is barely a drop in the bucket. As a remedial forestry program it has promise; as a social forestry program, it is only a start and by itself may not accomplish much.

Ecological Impacts

Since the FIO's massive plantation effort involves a native species, one which grows naturally in monocultures, this attempt to replace the native forest will be of interest to all students of tropical forestry with an environmental frame of reference. It will also be of interest to those concerned with wood production. Many feel that production of slow-growing valuable hardwoods cannot be justified economically, and it is doubtful that the FIO effort will ever be "in the black". One major problem is the anticipated 60-year rotation. Surely before the 60 years is up, one of three things will happen. The utilization people may justify marketing of 30- to 40-year-old teak, the silviculturists may decide to change to short-rotation species such as eucalypts, or the decision makers (whether the RFD or the nomadic farmers) may force new land-use patterns on the reforested area. Sixty years is simply too long to wait when the man/land ratio is so high, and climbing higher. The population will double, perhaps triple, during the 60-year rotation.

If combined with a strong social forestry or community forestry program that serves the needs of much greater numbers of rural people, the FIO program will have a greater chance of success.

Constraints, Successes, and Failures

The constraints to forestry development in Thailand are along the same lines as several of those outlined earlier. There are elements of graft and corruption, non-cooperation by squatters and local residents, SHAG, and others (political insurgency, frozen Royal Forestry Department budget and time limits, and hunger on the part of the rural population). Despite these problems, however, the village forestry effort sponsored by FIO is potentially workable. It involves the local people through incentive structures and the system seems to show some promise. Before it can be applied on a larger scale, however, several problems must be

addressed. One of these is that, under the present structure, large areas of land must be set aside for 60 years, much of which would not be used for 40 to 50 years. This is simply impossible because of the squatter problems. Temporary utilization of the land allocated to the village forest must take place prior to planting if the project is to succeed.

CHAPTER 5.--CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Forest-related problems in developing countries are far worse than ongoing A.I.D. forestry programs indicate. A.I.D. has not, until recently, given high priority to forestry problems. This lack of concern and involvement is a major roadblock to an A.I.D. program against deforestation. However, A.I.D. has recently hired four foresters, which is a step in the right direction. A minimum of 40 foresters is a realistic goal to accelerate solutions to problems.

2. A number of projects sponsored by A.I.D. and other donors are contributing to deforestation, or will fail for lack of ecological concerns. Road building, hydroelectric, colonization, and industrial forest harvest projects are potential deforestation causes.

3. Donor agencies operating in the same country, often in the same subject area, tend not to communicate with each other (a notable exception is Nepal). This leads to duplication of effort or failure to learn from the mistakes and successes of others.

4. In cases where donor projects involve forestry components, decisions are often based on politics rather than need. This is not unique to forestry problems, but leads to patchwork demonstrations which do little to solve the problem.

5. Forestry projects often are imposed on local residents rather than based on community involvement. If long-term projects are to escape vandalism or "help-yourself" harvest, local residents and the local political structure must be involved and must feel that some of their needs are being met by that involvement. Many donor projects have failed due to "lack of cooperation" by local residents.

6. Donor organizations often exhibit little acceptance or understanding of the value systems, cultures, and traditions of recipient countries in their design and implementation of forestry projects.

7. The causes of deforestation are principally shifting agriculture (SHAG)* and the shortage of fuelwood. Industrial timber harvest by itself is not a serious cause of deforestation in most developing countries, except that SHAG farmers often invade an area after the loggers have left. Fire and the invasion of weeds that impede forest

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* SHAG can be the most appropriate land use for tropical forest areas. But when the person:land ratio gets too high (as much of the tropical world today), SHAG practices lead to hunger and devastation of the resource base.

regeneration often follow SHAG. Fuelwood shortages generally occur in drier regions or highland areas, especially where population densities are unusually high.

8. The problem of deforestation varies greatly from one nation to the next, and even between different regions within a nation. The depletion of fuelwood in dry zones, the SHAG system, conversion of forests to pastures in response to increased beef quotas, increased petroleum costs that lead to greater use of wood fuel, colonization projects, and the rare discovery of good agricultural soil covered by forest, all lead to destruction of the forest cover.

9. Many nations have large areas of devastated land which could be restored to productive status by remedial forestry programs. By thus raising the carrying capacity of such land, rural families can then be relocated successfully.

10. Action programs are most needed. The problems and their solutions are already well understood in most cases and further study is often superfluous. Donor agencies have been filling file drawers with reports for years, the results of which are rarely implemented. Once a good action program is underway, R&D-type studies can be carried out to resolve the problems that arise.

11. Agroforestry activities are not being supported by donor agencies to the extent that they should be.

12. Establishing an energy farm to produce fuelwood is a relatively easy matter, yet few donors have taken up the challenge. The need is acute in many areas. In those areas where economic and biologic conditions are favorable, increased donor fuelwood activity is warranted. The possibilities for energy entrepreneurs have largely been overlooked.

13. Donors often negotiate only with high-ranking officials and implement programs without consulting the local people. This implies that the donor and the upper echelons of the recipient government know best what is needed, which is often false, and overlooks the fact that without local enthusiasm, a project is unlikely to succeed.

14. The pipeline, that time needed to get a project from proposal stage to on-the-ground action, often exceeds 4 years for some donors. By the time a project emerges from the pipeline the people who wrote the proposal are often no longer available. One solution would be to give missions more flexibility in on-the-spot funding to carry out small projects as the needs arise.

15. It is possible to create a negative impact by flooding the country with too much donor activity or funds. Donor organizations may implement oversized projects in countries (as in Haiti) not yet ready to comfortably absorb them into their existing political and economic structure. The country may become too dependent on the project as a

sole source of economic well-being. More often than not, when project funding has ended, the country is ill equipped to carry on because of bottlenecks in education, managerial talents, and other factors. This means that projects have not been properly designed. These factors should have been anticipated and included.

16. Projects are started but left unfinished, or not subjected to proper follow-up, due to inadequate funding beyond present budgeting commitments. Donors, especially A.I.D., often fail to recognize the long-term nature of forestry activities in their budgetary allocations. Because of the uncertainty of continued funding for forestry projects, the propensity is greater to concentrate on shorter term activities. This often leads to lack of cooperation by local people, and may even encourage sabotage of the project activities.

17. Much donor activity is often undertaken without properly involving local institutions such as schools, forest services, and political infrastructures. Without such involvement, the probability of failure is much higher.

18. In contrast to the Peace Corps and Forest Service, USDA, A.I.D. hiring procedures are centralized at the Washington Office, and are extremely complex and bureaucratic. As a result, many good candidates, eager to work for A.I.D., have tired of the hiring process, which may take the better part of a year, and turned away to work elsewhere.

19. A.I.D. mission directors are responsible for keeping expenditures within the annual budget, but are limited in the use of funds by the subjective whims of mission comptrollers. In at least one case, the director's flexibility was sharply reduced.

20. While donors may consider economic and ecological principles in the design of projects, these principles are often not taken seriously.

21. Forestry activities are too often subordinated to other project activities. Token status indicates a lack of appreciation for the scope of complete forestry involvement.

Recommendations

1. Balance long- and short-term goals.--Where hunger and malnutrition are rampant, the tendency is to plug in a short-term solution to take care of immediate needs, usually by depleting the resource capital. This will accomplish little if not done on an ecologically and economically sound basis which provides for a long-term, sustained solution. On the other extreme, forestry projects that require several decades to mature may be sound in the long run but meet so few of the immediate people-needs that they will likely fail.

2. Coordinate activities among donors, and between their efforts and national efforts.--The activities of donors are often worlds apart while the donors themselves are physically only blocks away from each other. A real impact can be made by pooling resources. A group of cooperating donors has more power than any single donor to convince the national government of a proper solution. The implication is that greater impacts could be made, but opportunities are lost.

3. Coordinate through national planning.--Donor and national efforts should follow a common plan. Detailed studies of soils, land-use capability, ecological life zones, and rainfall patterns, have been conducted in many countries, but these are not plans. These sets of data, which take several years to produce, tend to be unused. The need is for flexible, national planning guidelines. A team of experts which includes representatives of all donors and key government agencies might produce such guidelines in 6 to 12 months, without great cost, for most nations. Extreme detail is neither necessary nor useful in most developing countries.

4. Coordinate through land use planning.--Proposed donor projects are often incompatible. A land-use plan is essential for allocation of land to specific uses, i.e., so many hectares for agriculture, so much for livestock, so much for forestry, etc. A properly balanced land use plan will establish ecological constraints on the economic development of an area to ensure its long run, sustained productivity.

5. Take action, not further study.--There is a sufficient knowledge base on which to build sound action programs to resolve urgent people-needs. To acquire more knowledge, before installation of action programs, will make it harder to resolve the deforestation problem, because time is of essence.

6. Provide incentives.--Local residents, landowners, decision makers (whether government officials or SHAG farmers) and technicians are usually key persons in donor activities. Such activities must provide incentives to these local people, which is in effect buying their enthusiasm. The key people must see an obvious personal benefit in the project if it is to succeed. The types of incentives that motivate people depend upon the persons and their cultural backgrounds. To an entrepreneur a tax incentive often does it. To a priest or missionary working among the villagers, other types of incentives would be appropriate. To a technician, co-authorship of an article describing his work might do it.

7. Stress environmental values.--Conservation and environmental values are considered only minimally in many projects. This is not necessarily because of an overemphasis on economic viability, but rather because of lack of analytical refinement. The representation of environmental values in economic analyses can be improved. The economic analysis of a project will be erroneous if based only on output of food and fiber in the short run while the resource capital is being depleted. Less

money needs to be allocated to resource protection if a project is implemented on flat terrain in abundant rainfall areas, as opposed to projects in steeper or drier areas. Project yields may be the same for both areas, but the extent of damage to the resources will differ. The production capability of the resource should be evaluated at different intervals during the project life. If the production capability is lower as a result of the project, this becomes a legitimate cost to be included in the project's economic analysis.

In developing countries mistakes with the natural resources leave people nothing to fall back on. The basic ingredients necessary for survival are water, food, and environment. Increasing one must necessarily be traded off against another. Unless a proper balance between the three is maintained the long-run effects may be devastating to the local people.

8. Promote social or community forestry.--A few donors have recently turned from an emphasis on industrial forestry to one more people-oriented. The World Bank's Forestry Sector Paper (1978) and the FAO Forestry Paper No. 7 (1978) nicely summarize why this is both wise and necessary. Long-term forestry projects which do nothing to alleviate immediate needs of local people are susceptible to vandalism and invite failure. Recently missionaries in Haiti who had been promoting mahogany plantations for over 10 years switched to faster growing species for fuelwood. Desperate fuelwood shortages had resulted in people cutting valuable mahoganies at night to alleviate those shortages.

9. Combat fuelwood shortages.--Not all developing countries are faced with a lack of fuelwood, and of those that are, only a part of the nation may be affected. But where there is a fuelwood shortage, deforestation and often desertification are surely on the increase. To prevent this increase, fuel needs of the local residents must be met in a fashion acceptable to them. Traditional rural people are not likely to shift from wood-based fuel to coal or petroleum products, nor are these a good choice unless the country has its own supplies. Donors should have few technical problems with projects that produce wood for fuel, except under extreme conditions. If the local population is in desperate need of fuelwood, recently planted seedlings will be used to cook tomorrow's food. Also, if the region is extremely dry (low rainfall accentuated by man-caused desertification and porous soils), the problem can be more of a challenge.

10. Enhance extension and education programs for developing country residents.--A common donor approach is to include an extension or education component in a project. However, this component tends to be inadequate because locals, while understanding the message, often do not make the connection between the message and personal benefits. Extension and education should be combined with incentives as recommended above.

11. Implement balanced, integrated forestry projects.--Forestry must meet people-needs, and it must blend in with other enterprises that meet other people needs. The terms "agroforestry" or "agri-silviculture"

have been used to cover the effort to raise crops, trees, and animals on the same landscape in an environmentally balanced fashion. Usually rural residents in developing countries will relate to and be enthusiastic to such an approach and thus will help such donor projects succeed.

Total destruction of native vegetative cover may be too high a price to pay for high-yielding monoculture plantations. Problems might include elimination of wildlife habitat, loss of livestock browse in cases of extreme drought, poor run-off retention, and other problems inherent to monocultures.

12. Promote and support agroforestry research.--The International Council for Research in Agroforestry (ICRAF) was recently organized. To date A.I.D. has not developed the contacts nor financially supported this important organization, which offers a fresh approach to solving land-use problems in developing countries.

13. Improve talent.--Among the employees of A.I.D. few foresters, with experience in developing countries, are working in forestry capacities. Any A.I.D. forestry project, or project with a forestry component, should ideally be guided by a forester familiar with the problems, solutions, species, language, and culture inherent to the particular country. The tendency now is to have A.I.D. mission personnel, often inadequately trained in any biological science, depend on short-term consultants who also may be ill-equipped to contribute to the solution of the problem at hand. It is essential that A.I.D. hire foresters with the necessary experience without restrictions to only the U.S. talent pool at least at the regional level. The successful approach used by the A.I.D. forestry program in Nepal shows the need to have major forestry programs directed by experienced foresters.

14. Increase A.I.D. mission authority for small expenditures.--A.I.D. mission directors should be given more flexibility to carry out small project ideas as the needs arise without undue delays caused by the pipeline.

15. Review and correct previous mistakes.--A.I.D. should continue and strengthen the practice of conducting reviews of previous and existing projects to determine where follow-up action is required. Past mistakes such as dam construction with no provision for watershed protection, converting forest land to agriculture when the land was not suited to agriculture, and lack of continued support for institution building and staff training should be corrected.

16. Decentralize hiring authority.--Mission directors should be free to hire on the spot. Centralized hiring procedures require too much time to properly respond to the needs.

17. Up-date list of forestry projects.--FAO is best equipped to maintain and periodically publish an up-to-date version of Appendix I, making

it available to all donors and governments that request it. A.I.D. should explore this possibility.

18. Involve local institutions.--Local institutions such as schools, forest service, and political infrastructures should be involved in the beginning when forestry projects are being planned.

19. Promote international exchange of forestry talent.--A.I.D. should promote the exchange of forestry talent with staff and students, between the U.S. and developing countries, as well as among developing country institutions.

20. Strengthen total forestry commitment.--If A.I.D. is at all serious of being effective in the forestry area, forestry programs must be on a par with agricultural production programs. Major forestry projects must be directed by qualified and experienced foresters at both the regional and national level.

REFERENCES

1. Adeyoju, S. K.
   1976. Land tenure problems and tropical forestry development. Doc. FO: FDT/76/5(b) submitted to the Committee on Forest Development in the Tropics, 4th Session, FAO, Rome.

2. Aguirre Castillo, C.
   1977. Comportamiento inicial de Eucalyptus deglupta Blume, asociado con maíz (sistema "Taungya"), en dos espaciamientos con y sin fertilización. Tesis Mag. Sc. Turrialba, Costa Rica, UCR-CATIE. 130 p.

3. Aguirre Corral, A.
   1963. Estudio silvicultural y económico del sistema taungya en condiciones de Turrialba. Tesis Mag. Sc. Turrialba, Costa Rica, IICA. 80 p.

4. Alberty Rodriguez, R. A.
   1977. Evaluación de rendimientos y cambios físicos y químicos en suelos de ladera cultivados con maíz y frijol, con diferente cobertura viva dentro de una plantacion forestal. Tesis Mag. Sc. Turrialba, Costa Rica, UCR-CATIE. 211 p.

5. Anderson, Clarke A.
   1959. Range Improvement in Iraq (USOM-R01 Range Management Project); a Terminal Report (1957-1959). Washington, D.C., AID. 9 pp. mimeo.

6. Antonini, G. A., K. C. Ewel, and H. M. Tupper.
   1975. Population and Energy: a systems analysis of resource utilization in the Dominican Republic. University of Florida, Gainesville. 166 p.

7. Apolo, W.
   1979. Control de la escorrentía y erosión mediante sistemas silvo-pastoriles. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina, CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

8. Araquistan, R.
   1979. Uso potencial de los suelos tropicales húmedos de la Zona Atlántica de Nicaragua. 10 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina, CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

9. Argal, P.
1978. Role of Wood Energy in the Rural Economy of India. 14 pp. Paper FRC/3-8, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

10. Arnold, J.E.M., and J. H. Jongma.
1978. Fuelwood and charcoal in developing countries: an economic survey. Unasylva (FAO), Vol. 29, 118, 2-9.

11. Asian Development Bank.
1978. Sector Paper on Forestry and Forest Industries. Manila, Asian Development Bank. 78 pp.

12. Avery, Dale.
1978. Firewood in the Less Developed Countries. Paper FRC/3-2, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

13. Avila, M., M. Ruiz, D. Pezo, and A. Ruiz.
1979. The importance of the forestry component on small cattle farms of Costa Rica. 11 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina, CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

14. Baier, S., and D. J. King.
1974. Drought and the development of Sahelian economies: A case study of Hausa-Tuareg interdependence. LTC Newsletter, No. 45, Land Tenure Center, Univ. of Wisconsin, Madison.

15. Barrows, R. L.
1974. African land reform policies: the case of Sierra Leone. Wisconsin, Madison, Land Economics, 50, 4, p. 402-410.

16. Bauer, J., and H. Sanchez.
1979. Inicio de actividades agroforestales en Honduras. 2 p. En De las Salas, Gonzalo, editor. Presentado en Taller sobre Sistemas Agroforestales en América Latina, CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

17. Becerra, J.
1971. Algunas consideraciones para la ordenación de un bosque heterogéneo natural en la zona húmeda tropical. Tesis Mag. Sc. Turrialba, Costa Rica, IICA. 135 p.

18. Beer, J.
1979. The UNU/CATIE "La Suiza" agro-forestry case study. 12 p. En De las Salas, Gonzalo, editor. Presentado en Taller sobre Sistemas Agroforestales en América Latina, CATIE, Marzo 26-30, 1979. CATIE, Turrialba. 10 p.

19. Bene, J. G., H. W. Beall, and A. Côté.
1977. Trees, food and people: land management in the tropics. Ottawa, International Development Research Centre. 52 p.

20. Bene, J. G., et al.
1976. The tropical forest--overexploited and underused. Research Priorities in Tropical Forestry. Report of the Project for Identification of Tropical Research Priorities. August 1976. Revised November 1976.

21. Bermudez, M.
1979. El control de la erosión por sistemas agroforestales. 4 p. En De las Salas, Gonzalo, Editor. Presentado en Taller sobre Sistemas Agroforestales en América Latina, CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

22. Bishop, J.
1979(a). Desarrollo y transferencia de tecnología para pequeñas fincas en la región Amazónica Ecuatoriana. 8 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

23. Bishop, J.
1979(b). Producción familiar agro-porcino-forestal en el trópico húmedo hispanoamericano. 10 p. En De las Salas, Gonzalo editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina, CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

24. Bishop, J.
1979(c). Producción ganadera-forestal en el trópico húmedo hispanoamericano. 6 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

25. Bong Won Ahn.
1978. Village Forestry in Korea. 11 pp. Paper FRC/1-5, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

26. Briscoe, C.
1979. Agroforestry in Jari, Brazil. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

27. Budowski, G.
1979(a). National, bilateral and multilateral agroforestry projects in Central and South America. Conference on International Cooperation in Agroforestry, July 1979. ICRAF, Nairobi. 24 p.

28. Budowski, G.
1979(b). Sistemas agroforestales en América Latina. Simposio Internacional sobre las Ciencias Forestales y su contribución al desarrollo de la América Latina San José (Costa Rica). Conicit/Interciencia/Scitec. 5 pp.

29. Budowski, G.
1979(c). Sistemas agro-silvo-pastoriles en los trópicos húmedos. 29 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

30. Buggel, H.
1973. Basic problems of building up progressive co-operative forestry in India. Beitrage zur Tropischen Landwirtschaft und Veterinärmedizin, 11, 3, 217-236.

31. Calvacante, Paulo B.
1976. Frutas comestiveis da Amazonia. 3d. ed. Manaus, INPA. 166 p. + 5 p. of photogr.

32. Carpenter, N. R.
1976. A development approach for small farmers and the rural poor. Regional Consultation between FAO member nations and international trade union organizations in Latin America. ESH:TU/LA/76/6. FAO, Rome.

33. Carter, Meril G.
1966. Range Management Considerations for Morocco. Washington, D.C., AID. (See also Waldo Sand's December 1965 report on Forestry in Morocco.)

34. Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE), Programa de Recursos Naturales Renovables.
1979(a). Alnus acuminata con pastoreo y con pasto de corte. 4 p. En De las Salas, Gonzalo, editor. 1979a. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

35. Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE), Programa de Recursos Naturales Renovables.
1979(b). Bosque secundario manejado, Siquirres. 3 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

36. Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE), Programa de Recursos Naturales Renovables.
1979(c). Crecimiento de laurel (Cordia alliodora) en cafetales, cacaotales y potreros en la Zona Atlántica de Costa Rica. 6 p. En De las Salas, Gonzalo, editor. 1979c. Presentado en el Taller sobre Sistemas Agroforestales en Améric Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

37. Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE), Programa de Recursos Naturales Renovables.
1979(d). El uso de prácticas silvo-pastoriles en las partes altas del Valle Central de Costa Rica; Finca Las Esmeraldas. 6 p. In De las Salas, Gonzalo, editor. 1979d. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

38. Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE), Programa de Recursos Naturales Renovables.
1979(e). Proyecto UNU/CATIE "La Suiza" estudio de caso agro-silvo-pastoril. 7 p. En De las Salas, Gonzalo, editor. 1979e. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

39. Centro Agronomico Tropical de Investigacion y Ensenanza and United Nations University.
1979(f). Taller Sobre sistemas agro-forestales en América Latina. Turrialba, Costa Rica, Marzo 26-30, 1979. Organización y Conclusiones. 25 p.

40. Chavelas, J.
1979. Módulo de uso múltiple del suelo en regiones tropicales. 11 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

41. Chittenden, A. E., and F. R. Breag.
1978. Wood for Energy in Developing Countries. 5 pp. Paper FRC/3-3, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

42. Club du Sahel/CILSS.
1978. Energy in the Development Strategy of the Sahel: Situation, Perspectives, Recommendations. Paris, Club du Sahel. 155 pp.

43. Combe, J.
1979(a). Código de clasificación de las tarjetas bibliográficas. 4 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. Turrialba, Costa Rica. 10 p.

44. Combe, J.
1979(b). Conceptos sobre la investigación de técnicas agroforestales en el CATIE. 19 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

45. Combe, J., and G. Budowski.
1979. Clasificación de las técnicas agroforestales (en francés). En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

46. Combe, J., and J. J. Gewald.
1979. Guia de campo de los ensayos forestales del CATIE en Turrialba, Costa Rica. Turrialba, Costa Rica, Programa de Recursos Naturales Renovables. 357 p.

47. Cortes, H.
1976. La producción silvopastoral como una alternativa de inversión. Santiago de Chile. Universidad de Chile, Facultad de Ciencias Forestales. 22 p.

48. Cozzo, D.
1976. Tecnología de la forestación en Argentina y América Latina. Buenos Aires, Editorial Hemisferio Sur. 610 p.

49. Dabasi-Schweng, L.
1974. Economic aspects of shifting cultivation. Soils Bulletin (FAO), No. 24, 72-77.

50. Decarrett, M.
1967. La influencia de árboles leguminosos y no leguminosos sobre el forraje que crece bajo ellos. Tesis Mag. Sc. Turrialba, Costa Rica, CATIE. 34 p.

51. Deeley, D.
1979. Appropriate assistance in forestry: a message to the field on forestry. DS/ST.

52. Donaldson, Graham, et al.
1978. Forestry Sector Policy Paper. World Bank, February.

53. Douglas, J. S., and R. A. Hart.
1976. Forest farming: towards a solution to problems of world hunger and conservation. London, Robinson L. Watkins Books Ltd.

54. Dourojeanni, Marc J.
1979. Desarrollo rural integral en la Amazonia peruana con especial referencia a las actividades forestales. Seminario FAO/SIDA sobre el Papel de la Silvicultura en el Desarrollo Rural de América Latina. Oaxtepec, México 5-23 Marzo. 29 p.

55. Dourojeanni, Marc J.
1978. Pautas para el establecimiento de asentamientos rurales en los trópicos húmedos de América del Sur. Lima, Perú. 6 p. (mimeographed).

56. Dourojeanni, Marc J.
1976. Una nueva estrategia para el desarrollo de la Amazonia peruana. Revista Forestal del Perú 6(2-1):41-58.

57. Dubois, J.
1979. El papel del Programa IICA-TROPICOS en la promoción de sistemas agro-silvo-pastoriles. 7 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979.

58. Earl, D. E.
1975. Forest energy and economic development. Oxford, Clarendon Press.

59. Eckholm, Erik.
1979. Planting for the Future: Forestry for Human needs. Washington, D. C. Worldwatch Institute. 64 pp. (Worldwatch Paper 26.)

60. Eckholm, Erik P.
1976. Losing ground--environmental stress and world food prospects. W. W. Norton & Company, Inc., New York.

61. Eden, M.
1978. Ecology and development: the care of the Amazonian rain forest. The Institute of British Geographers 3(4):444-463.

62. Emmelin, L.
1978. Energy plantations--environmentally sound source of energy? In Human Environment in Sweden. Swedish Information Service, New York.

63. Enabor, E. E.
1974. Socio-economic aspects of taungya (agrisilviculture) in relation to traditional shifting cultivation in tropical developing countries. Soils Bulletin (FAO) No. 24, p 191-202.

64. Enriquez, G.
1979. Ensayo central de cultivos perennes en comparación con algunos anuales, en el CATIE, Turrialba. In Guía de campo de los ensayos forestales del CATIE en Turrialba, Costa Rica. 28 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

65. Ernst, Elizabeth.
1978. Fuel Consumption Among Rural Families in Upper Volta, West Africa. 9 pp. Paper FRC/3-1, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

66. Escalante, E., S. Benachio, and H. Reyes.
1979. Resultados preliminares en la investigación sobre sistemas de producción de Barlovento, Caucagua, Venezuela. 11 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

67. Esman, M. J.
1978. Landlessness and Near-Landlessness in Developing Countries. Ithaca, Center for International Studies, Cornell University.

68. Ewel, John J., and Louis Conde.
1978. Environmental Implications of Any-Species Utilization in the Moist Tropics. University of Florida, Gainesville. Paper presented at the Conference on Improved Utilization of Tropical Forests, Madison, Wisconsin. May, 1978.

69. Faustino, D. M., Jr.
1976. The PICOP Agro-Forestry development programme and its socio-economic impact. Proc. Ann. Symposium of Philippines For. Research Soc., Los Baños.

70. Fernandez, S.
1978. Comportamiento de Gmelina arborea asociado con maíz (Zea mays L.) y frijol (Phaseolus vulgaris L.) en dos espaciamientos. Turrialba, Costa Rica, CATIE. Tesis Mag. Sc. 125 p.

71. Flinta, C.
1960. Prácticas de plantación forestal en América Latina. Organización de las Naciones Unidas para la Agricultura y la Alimentación, Roma. 497 p.

72. Ford, L.
1979. An estimate of the yield of Cedrela odorata L. (Syn. C. mexicana Poem.) grown in association with coffee. 11 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina, CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

73. Fosbrooke, H. A.
1974. Socio-economic aspects of shifting cultivation. Soils Bulletin (FAO), No. 24, p. 72-77.

74. Fournier, L. A.
1979(a). Conflictos en el uso de la tierra en América Latina. Simposio Internacional sobre las Ciencias Forestales y su contribución al desarrollo de la América Latina. San José (Costa Rica). Conicit/Interciencia/Scitec. 12 p.

75. Fournier, L. A.
1979(b). El cultivo del jaúl (Alnus jorullensis) en fincas de café de Costa Rica. 8 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

76 Freeman, P. H.
1979. Forestry in development assistance: background paper for AID policy and programs. Washington, D.C. (Consultant for DS/ST-AID) 77 p.

77. Fuentes Flores, R.
1979. Sistemas agrícolas de producción de café en México. 25 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo, 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

78. Gill T.
1968. Shifting agriculture: new aspects of an old problem. In Report of the first session of the FAO Committee on Forest Development in the Tropics, Rome, p. 10-22.

79. Gliessman, S., and M. Amador.
1979. Ecological aspects of production of traditional agroecosystems in the humid lowland tropics of Mexico. Presented to V International Symposium of Tropical Ecology, Kuala Lumpur, Malaysia, 16-21 April. 13 p.

80. Goodland, R., H. S. Irwin, and G. Tillman.
1977. Ecological development for Amazonia. Ciencia e Cultura 30(3):275-289.

81. Goor, A. Y., and C. W. Barney.
1976. Forest tree planting in arid zones, 2d ed. The Ronald Press, New York, 504 p.

82. Haufe, Helmut R. H.
1979. Técnicas agroforestales para el desarrollo de comunidades rurales en América Latina. Seminario FAO/SIDA sobre el Papel de la Silvicultura en el Desarrollo Rural de América Latina. Oaxtepec, México 5-23 Marzo. 19 p.

83. Haufe, H. R.
1973. The Sunchon method. A method to demonstrate quick and attractive fuel and wood production in forest lands with heavy erosion hazards in the Dongjin Gang Watershed. FAO FO/ROK/67/523. Project report 2, Seoul, 54 p.

84. Herfindahl, Orris C.
Natural Resource Information for Economic Development. A study sponsored by the Latin American Institute for Economic and Social Planning and Resources for the Future, Inc. Published for Resources for the Future, Inc., by the John Hopkins Press, Baltimore, Md.

85. Holdridge, L. R.
1947. Determination of World Plant Formations from Simple Climatic Data. Science 105 (2727):367-368.

86. Inter-American Development Bank.
1979. Financing forest-based development in Latin America: issues and bank policy. Washington. 17 p. + Appendices.

87. Johnson, P., and R. Morales.
1972. A review of Cordia alliodora (Ruiz & Pav.) Oken. Turrialba 22(2):210-220.

88. Jennings, P., y B. A. Ferreirar.
1979. Recursor energéticos de basques secos en la Repl. Dominicana. Centro de Investigaciones Económicas y Alimenticias. Institute Superior de Agricultura. Santiago, R.D.

89. Kenya Forest Department.
1967. Taungya in Kenya: The "Shamba System". Doc. of FAO World Symposium on Man-made Forests. Vol. 2, Rome.

90. King, K.F.S.
1977. Forests for people: a challenge in world affairs. Proceedings Society of American Foresters 1977 Annual Meeting. Albuquerque. pp. 29-33.

91. King, K.F.S.
1975. Putting the emphasis on tropical forestry. Unasylva (FOA), Vol. 27, 110, p. 30-35.

92. King, K.F.S.
1968. Agrisilviculture (The Taungya System) Bulletin No. 1, Department of Forestry--University of Ibadan, 109 p.

93. King, K.F.S., and M. T. Chandler.
1978. The wasted lands. ICRAF. Nairobi. 35 p.

94. Kio, P. R.
1972. Shifting cultivation and multiple use of forest land in Nigeria. Commonwealth Forestry Review 51, 2, No. 148, p. 144-148.

95. Lanly, J. P.
"Regression de la Forêt Dense en Côte d'Ivoire," Bois et Forêts des Tropiques, September/October 1969.

96. Lanly, J. P., and J. Clement.
1979. Present and future forest and plantation areas in the tropics. FAO, Rome Italy.

97. Leguizamo, A.
1979. Sistemas agroforestales en ejecución en el Bajo Calima, Colombia. 10 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

98. Lojan, L.
1979. Sistemas agro-silvo-pastoriles en el sur del Ecuador. 6 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

99. Mabonga-Mwisaka, Josh.
1978. Wood Energy and Rural Communities in Zambia. Paper FRC/3-9, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

100. MacDaniels, L. H., and A. S. Lieberman.
1979. Tree crops: a neglected source of food and forage from marginal lands. Bioscience 29(3):173-175.

101. Magne, J.
1979. Comportamiento de Terminalia ivorensis asociado con cultivos agrícolas maíz y/o frijol en su primera fase de crecimiento utilizando pseudo-estaca y plantón como materiales de trasplante. Tesis Mag. Sc. Turrialba, Costa Rica, UCR-CATIE.

102. Ministerio De Agricultura y Ganaderia.
1971. El jaúl (Alnus jorullensis). San José, Costa Rica, M.A.G. 12 p.

103. Muñoz, M.
1975. Comportamiento inicial del laurel (Cordia alliodora) (Ruiz & Pav.) Oken plantado en asocio con maíz (Zea mays) bajo dos niveles de fertilización. Tesis Mag. Sc. Turrialba, Costa Rica, CATIE. 78 p.

104. Murphy, H. E.
1979. Brazil achieves forest development breakthrough with tax incentives. Forest Farmer 38(3):6-7.

105. Murray, Gerald F.
1978. Hillside Units, Wage Labor, and Rural Haitian Land Tenure; A Proposal for the Organization of Erosion Control Projects. Port-au-Prince, AID. 41 pp.

106. Muthoo, M. K.
1978. Forest Energy and the Brazilian Socio-Economy, with Special Reference to Fuelwood. Paper FRC/3-5, presented at the 8th World Forestry Congress, Jakarta. October, 1978. 14 pp.

107. National Academy of Sciences.
1979. Tropical Legumes: Resources for the Future. Washington, D.C., National Academy of Sciences. 331 p.

108. National Academy of Sciences.
1977. Leucaena: Promising forage and tree crop for the tropics. Washington, D.C. NAS, 115 p.

109. National Academy of Sciences.
1976. Energy for rural development, renewable resources and alternative technologies for developing countries. Report of an Ad Hoc Panel of the Advisory Committee on Technology Inn vation. Board on Science and Technology for International Development.

110. National Academy of Sciences.
1975. Underexploited tropical plants with promising economic value. Washington, D.C., NAS, 189 p.

111. Nations, J. D., and R. B. Nigh.
1978. Cattle, cash, food and forest; the destruction of the American tropics and the Lacandon Maya alternative. Culture and Agriculture N° 6:1-5.

112. Nelson, Michael.
1973. Development of tropical lands. Published for Resources for the Future, Inc., by the Johns Hopkins University Press, Baltimore.

113. Ohlsson, Bo.
1978. A Case Study from Tiro, Ethiopia. 5 pp. Paper FRC/1-8, Supplement, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

114. Oughton, G. A.
1974. Notes on some current measures aimed at the solution of shifting cultivation-induced problems in the highlands of northern Thailand with particular reference to forestry and rural employment. FAO/SWE/TF 126. Annex to Report of FAO/ILO/SIDA Consultation on Employment in Forestry, Rome.

115. Peck, R.
1977. Sistemas agro-silvo-pastoriles como una alternativa para la reforestación de los trópicos americanos. In 2° Seminario Nacional de Plantaciones Forestales, Venezuela. CONIF, Bogotá. 9 p.

116. Peck, R.
1976a. Agro-silviculture, as developed in the Pacific coastal lowlands of Colombia. Manuscript. 6 p.

117. Peck, R.
1976b. Evaluación de tres sistemas de establecimiento de bosques artificiales en el litoral pacífico de Colombia. Manuscrito 16 p.

118. Peck, R.
1976c. Selección de especies aptas para el establecimiento de bosques artificiales en tierra firme del litoral pacífico de Colombia. Manuscrito. 24 p.

119. Permanent Interstate Committee for Drought Control in the Sahel.
1976. Role of forestry in a rehabilitation programme for the Sahel. Final Report on the CILSS/UNSO/FAO Consultation, Ouagadougou, 53 p.

120. Persson R.
1977. Forest Resources of Africa (Stockholm: Royal College of Forestry).

121. Persson R.
1974. World Forest Resources: Review of the World's Forest Resources in the Early 1970's (Stockholm: Skogshogsholm).

122. Pimentel, D., L. E. Hurd, A. C. Bellotti, M. J. Forester, I. N. Oka, O. D. Sholes, and R. J. Whitman.
1973. Food production and the energy crisis. Science 182:443-449.

123. Pimentel, D., E. C. Terhune, R. Dyson-Hudson, S. Rochereau, R. Samis, E. A. Smith, D. Denman, D. Reifschneider, and M. Shepard.
1976. Land degradation: effects on food and energy resources. Science 194:149-155.

124. Poulsen, Gunnar.
1978. Man and Tree in Tropical Africa: Three Essays on the Role of Trees in the African Environment. Ottawa, International Development Research Center. 31 pp.

125. Prentice, W.
1979. Rehabilitación de tierras cansadas en la Alta Amazonia Ecuatoriana. 24 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

126. Rios, R.
1979. Desarrollo de sistemas integrales de producción agrícola, pecuaria y forestal, una necesidad en el Trópico Peruano. 24 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

127. Rocha, J.A.N.
1977. Erosión de suelos de pendientes cultivadas con maíz y frijol con diferentes grados de cobertura viva dentro de una plantación forestal. Tesis Mag. Sc. Turrialba, Costa Rica, UCR-CATIE. 182 p.

128. Roche, L.
1973. The practice of agri-silviculture in the tropics with special reference to Nigeria. FAO Regional Seminar on Shifting Cultivation and Soil Conservation in Africa, University of Ibadan, 29 p.

129. Romanini, C.
1976. Ecotécnicas para el tópico húmedo, con especial referencia a México y América Latina. México, CECODES y PNUMA. 184 p.

130. Samapuddhi, K.
1975. Thailand's forest villages. Unasylva (FAO), Vol. 27, 107, p. 20-23.

131. Sandahl, Lars.
1978. The Role of Peasant Associations in Forestry Development in Ethiopia. 15 pp. Paper FRC/1-8, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

132. Sanger, Clyde.
1977. Trees for People: An Account of the Forestry Research Program Supported by the International Development Research Center. Ottawa, IDRC. 52 pp.

'33. Sartorius, Peter, and Hans Henle.
1968. Forestry and Economic Development (New York: Praeger, 1968).

134. Schmidt, D. R.
1973. Anthropological and ecological considerations regarding the transition of shifting cultivation in the tropics. African Soils, 18, 2, p. 59-68.

135. Segokgo, S. K.
1976. Water Rights and Land Control in Arid Areas. New York, United Nations. 7 pp. (E/Conf. 70/TP 73).

136. Shah, S. A.
1978. People's Participation in Forestry for Community Development in India. 5pp. Paper FRC/1-14, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

137. Singh, J., and H. S. Randey.
1975. Eucalyptus in extension forestry programmes of the agricultural state of Punjab. Indian Forester. 101, 2, p. 116-126.

138. Smith, C.
1973. Planned shifting cultivation. A case study of shifting cultivation on regional development in northern Tanzania, Frankfurt a.M., Zeitschrift für Ausländische Landwirtschaft. 12, 1, p. 22-39.

139. Smith, J. R.
1953. Tree Crops: A Permanent Agriculture. Devin-Adair, New York.

140. Sommer, Adrian.
1976. "Attempt at an Assessment of the World's Tropical Forests," Unasylva, Vol. 28, Nos. 112/113.

142. Spears, John S.
1978. "Wood as an Energy Source: The Situation in the Developing World," presented to the 103d Annual Meeting of the American Forestry Association, Hot Springs, Arkansas, October 8, 1978; Club du Sahel, Energy in the Development Strategies of the Sahel (Paris: October 1978).

142. Thiesenhusen, William C.
1976. Broad Land Farming: An International Dimension. Madison, Wisconsin, The Land Tenure Center. (LTC No. 109). 15 pp.

143. United Nations.
1977. United Nations Conference on Desertification, Roundup, Plan of Action, and Resolutions.

144. United Nations, Food and Agriculture Organization.
In Press. Forest plantations for rehabilitating eroded lands by D. A. Harcharik and S. H. Kunkle. FAO Conservation Guide 4, Rome.

145. United Nations, Food and Agriculture Organization.
1979. Forestry for rural communities. FAO Forestry Dep. 56 p.

146. United Nations, Food and Agriculture Organization.
1978. Forestry for Local Community Development. Rome: Food and Agricultural Organization. 114 pp. (FAO Forestry Paper No. 7).

147. United Nations, Food and Agriculture Organization.
1977(a). Conservation in arid and semi-arid zones. FAO Conservation Guide No. 3, Rome, 125 p.

148. United Nations, Food and Agriculture Organization.
1977(b). Forestry for Local Community Development in Asia and the Far East. Secretariat Note. Asia-Pacific Forestry Commission. Tenth Session. Katmandu.

149. United Nations, Food and Agriculture Organization.
1977(c). Guidelines for the development of less favorable environment areas. A comprehensive integrated watershed development approach. AGS/MIS/77/2, Rome, 22 p.

150. United Nations, Food and Agriculture Organization.
1977(d). Guidelines for watershed management. FAO Conservation Guide No. 1, Rome, 293 p.

151. United Nations, Food and Agriculture Organization.
1977(e). Guidelines for Watershed Management. Protection of cultivated slopes; terracing steep slopes in humid regions by T. C. Sheng. FAO Conservation Guide 1, Rome, p. 147-171.

152. United Nations, Food and Agriculture Organization.
1977(f). Savanna Afforestation in Africa. Irrigated plantations by J. K. Jackson. FOR:TF-RAF 95 (DEN), Rome, p. 168-172.

153. United Nations, Food and Agriculture Organization.
1977(g). Savanna Afforestation in Africa. Shelterbelts and environmental forestry by J. C. Delwaulle. FOR:TF-RAF 95 (DEN), Rome, p. 173-180.

154. United Nations, Food and Agriculture Organization.
1977(h). Savanna Afforestation in Africa. Species, techniques and problems of the semi-arid zones--the Sahel. FOR:TF-RAF 95 (DEN), Rome, p. 160-167.

155. United Nations, Food and Agriculture Organization.
1976(i). MaeSa integrated watershed and forest land use (Chiang Mai), Thailand. Draft Interim Report. FO:DP/THA/72/008, Rome.

156. United Nations, Food and Agriculture Organization.
1976(a). Perspective Study on Agricultural Development in the Sahelian Countries, 1975-1990. PS/SAH/76/ESP/1/E, Rome.

157. United Nations, Food and Agriculture Organization.
1976(b). Upper Solo Watershed Management and Upland Development, Indonesia. Termination Report. AG:DP/INS/72/006, Rome.

158. United Nations, Food and Agriculture Organization.
1974. Case Study of Forest Village Systems in Northern Thailand. Faculty of Social Science. Chiang Mai University. FAO/SWE/TF 126. Annex to Report of the FAO/ILO/SIDA Consultation on Employment in Forestry, Rome.

159. United Nations, Food and Agriculture Organization.
1974. Sahelian Zone. Survey of the problems. FAO/SWE/TF 117, Rome.

160. United Nations, Food and Agriculture Organization.
1974. Shifting Cultivation and Soil Conservation in Africa. Papers presented at the FAO/SIDA/ARCN Regional Seminar on Shifting Cultivation and Soil Conservation in Africa (Ibadan, Nigeria 2-21, July 1973). Soils Bulletin (FAO), No. 24, Rome, 248 p.

161. United Nations, Food and Agriculture Organization.
1974. Tree planting practices in African savannas. FAO Forestry Development Paper No. 19.

162. United Nations, Food and Agriculture Organization.
1971. Shifting cultivation in Latin America by R. F. Watters. FAO Forestry Development Paper No. 17, Rome, 305 p.

163. United Nations, Food and Agriculture Organization.
1970(a). Manual de Extension by F. Sanchez Narvaez. FO:SF/ECU 18. Informe técnico 2, Quito, 115 p.

164. United Nations, Food and Agriculture Organization.
1970(b). Shifting agriculture in tropical forests. In Report of the second session of the FAO Committee on Forest Development in the Tropics. Rome, p. 12-25.

165. United Nations, Food and Agriculture Organization.
1961. Improvement of fuelwood cooking stoves and economy in fuelwood consumption by H. Singer. Report No. TA 1315, Rome, 23 p.

166. United Nations, Food and Agriculture Organization.
1959. Fuelwood in Pakistan by T. Hussain. FAO Forestry Occasional Paper No. 7, FAO/59/10/7200, Rome, 29 p.

167. United Nations, Food and Agriculture Organization.
1959. Tree planting practices in temperate Asia, Burma--India--Pakistan. FAO Forestry Development Paper No. 14.

168. United Nations, Food and Agriculture Organization.
1958. Choice of tree species. FAO Forestry Development Paper No. 13, Rome.

169. United Nations, Food and Agriculture Organization.
1957. Hanunóv agriculture in the Philippines by A. C. Conklin. FAO Forestry Development Paper No. 12, Rome, 210 p.

170. United Nations, Food and Agriculture Organization.
1957. Tree planting practices in tropical Asia. FAO Forestry Development Paper No. 11, Rome.

171. United Nations, Food and Agriculture Organization.
1956. L'agriculture nomade. Vol. 1 Congo belge et Côte d'Ivoire par G. Tondeur et B. Bergeror-Campagne. FAO Forestry Development Paper No. 9, Rome, 232 p.

172. United Nations, Food and Agriculture Organization.
1956. Tree planting practices in tropical Africa. FAO Forestry Development Paper No. 8, Rome.

173. U.S. Department of Agriculture.
1978. Papers for Conference on Improved Utilization of Tropical Forests. (Madison, Wisconsin, May 1978.) Washington, D.C., USDA For. Serv. 442 pp.

174. U.S. Department of State, Agency for International Development.
1978(a). Agricultural Development Policy Paper. Washington, D.C., Agency for International Development. 64 pp.

175. U.S. Department of State, Agnecy for International Development.
1978(b). Panama project paper: watershed management. AID/LAC/OIO. Washington, D.C. 71 p. and Annexes.

176. U.S. Department of State, Agency for International Development.
1978(c). Proceedings of the U.S. Strategy Conference on Tropical Deforestation. 78 p.

177. U.S. Department of State, Agency for International Development.
1972. Forestry in Developing Countries: Potentials, Constraints, and Opportunities (Preliminary Servey). Office of Science and Technology, Technical Assistance Bureau AID, Washington, D.C. 74 pp.

178. U.S. Department of State, Agency for International Development.
1968. Program Evaluation Report 69/1, Project No. 664-11-120-018, Watershed Planning and Management. Washington, D.C., AID. 7 pp. mimeo.

179. U.S. Interagency Task Force on Tropical Forests.
1980. The World's Tropical Forests. A U.S. Policy Strategy and Program Framework. Report to the President.

180. Valdivia, S.
1979. Assentamiento y desarrollo rural en las zonas erizas de la Costa Norte del Perú. 21 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

181. Van Dillewijn, F. J.
1976. Forestry: Upper Solo Watershed Management and Upland Development, Indonesia. Draft Expert Termination Report, Rome.

182. Vega, L.
1979. Comparación de la rentabilidad de las plantaciones regulares con el modelo de agro-silvicultura en Surinam. 18 p. En De las Salas, Gonzalo, editor. Presentado en el Taller sobre Sistemas Agroforestales en América Latina. CATIE, Marzo 26-30, 1979. CATIE, Turrialba, Costa Rica. 10 p.

183. Verduzco, J.
1976. Protección Forestal. México, Patena, A.C. 369 p.

184. Villegas, Carmen.
Compiler 1978. Bibliografía sobre plantas de interés económico para la región amazónica. Turrialba, Costa Rica, CIDIA. 167 p. (IICA Documentación e Información Agrícola N° 26).

185. Villegas, Carmen.
Editor 1976. Simposio Internacional sobre plantas de interés económico de la Flora Amazónica. Belém Brasil, Mayo 29-Junio 2, 1972. Programa IICA, Trópicos, Turrialba, Costa Rica. 292 p.

186. Villegas, C., and L. Coto.
1979. Bibliografía forestal de América Tropical. CATIE, Turrialba, CIDIA, Biblioteca y Terminal de Servicios. 277 p. (IICA Documentación e Información Agrícola N° 69).

187. Vogt, William.
1948. Road to Survival New York: William Sloane.

188. Weber, Fred, and M. Dulansey.
1978. Midpoint Evaluation: Chad Reforestation Project. Washington, D.C., Consultants in Development. 52 pp. + appendices.

189. West, Patrick C.
1978. Some Sociological Aspects of Forestry Community Development Projects in Developing Countries. 7 pp. Paper FRC/1-4, presented at the 8th World Forestry Congress, Jakarta. October, 1978.

190. Westoby, Jack C.
1978. "Forest Industries for Socio-Economic Development," presented to the 8th World Forestry Congress, Jakarta, October 16-28, 1978.

191. White, G. F., and M. K. Tolba.
1979. Statement of global life-support systems. Environmental Conservation 6(2):88.

192. Whittaker, R. H.
1970. Communities and ecosystems. New York. MacMillan.

193. Wilken, G. C.
1977. Integrating forest and small-scale farm systems in Middle America. Agro-ecosystems 3:291-302.

194. Wixon, Calvin.
1959. Range Management in the Sudan: An Interim Report. (December 1958--September 1959.) Washington, D.C., AID. 24 pp.

195. Woodwell, G. M., et al.
1977. "The Biota and the World Carbon Budget," Science, January 13, 1978; National Academy of Sciences, Energy and Climate (Washington, D.C.).

196. World Bank.
1979. Review of Bank-Financed Forestry Activity, FY 79. 24 pp.

197. World Bank.
1978. Forestry Sector Policy Paper. Washington, D.C., World Bank. 64 pp.

198. Yerena, F., H. M. Ferreiro, R. Elliott, R. Godoy, and T. R. Preston.
1978. Digestibilidad de Ramon (Brosimum alicastrum), Leucaena leucocephala, Pasto Buffel (Cenchus ciliare) y pulpa y bagazo de henequín (Agave fourcroydes). Producción Animal Tropical 3:70-73.

199. Zevallos, A. C., and P. de T. Alvim.
1967. Effect of the shade tree Erythrina glauca on certain edaphological factors relating to the yield of Cacao trees. Turrialba 17(3):330-336.

GLOSSARY

Afforest.--To promote new tree growth on lands not previously covered with forests.

Boreal.--A high latitude zone, cooler than temperate but warmer than sub-polar. For example, the coniferous belt extending from Newfoundland to Alaska.

Ejido System.--A production system unique to Mexico designed to distribute underused land to peasant workers on a basis of "it's yours as long as you use it well." Administratively it is similar to cooperatives.

Exotic.--Nonnative or foreign species introduced to a continent or geographic region from outside its natural range.

High-Grading.--Practice of harvesting valuable tree species or individual tree specimens and leaving a preponderance of less desirable species or specimens for growing stock.

Monoculture.--Natural or artificial propagation of large stands of a single species.

Nursery Establishment.--Provision of facilities, labor, and supplies for quantity production of seedlings.

Paramo.--An alpine type of vegetation, or the sparsely vegetated land, in high Andean mountains.

Plantation Establishment.--Provision of intensively cultured tree stands by site preparation, planting at regular spacings and using other cultural practices such as irrigation and fertilization.

Reforest.--To promote new tree growth where the original forest has been decimated by overcutting or fire.

Roundwood.--Wood from the main tree stem normally harvested for uses such as lumber, veneer, and pulp.

Run-Off.--Precipitation which is not absorbed directly into the soil or evaporated but drains from the forest floor as surface water.

Run-Off Retention.--That portion of the surface water which remains in the forest watershed as opposed to being drained from the site or is slowed appreciably in its movement.

Seedling.--Small trees grown from seeds in a nursery and made available for transplanting. Generally speaking, any tree that originates from a seed is called a seedling, in contrast with those originating as a sprout, a root sucker, or from a cutting. In applied forestry, the term is restricted to such trees under 6 feet in height, while in forest-nursery practice, a seedling is a tree that is grown from seed and is treated to develop a better root system.

Sustained Productivity.--Status attained as a result of forest management to maintain a predictable growth over the long term.

Taungya System.--Form of agroforestry first used in Burma in 1856, in which food crops are grown intermingled with trees in a plantation until the canopy closes over and causes too much shade for crops to grow.

Terai.--The lower altitude slopes and valleys of Nepal.

Watershed Protection.--Use of managed forest growth and other techniques to prevent run-off and erosion so as to retain maximum amounts of water in the managed area.

Wildlife Protection.--Management of forests to provide a favorable environment and food supply for native fauna, particularly threatened and endangered species.

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