

conservation and development of tropical forest resources



FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS ROME

conservation and development of tropical forest resources

based on

**fao/unep/unesco expert meeting on tropical forests
rome, 12-15 january 1982**

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ABSTRACT

The 2nd Expert Meeting on Tropical Forests, jointly sponsored by UNEP, FAO and Unesco, was held at FAO Headquarters, Rome, Italy, from 12 to 15 January 1982.

The session was attended by 34 experts from 21 countries (Australia, Congo, Denmark, France, Federal Republic of Germany, Honduras, India, Indonesia, Japan, Malaysia, Mexico, Netherlands, Nigeria, Norway, Peru, Philippines, Senegal, Sweden, Tanzania, U.K. and U.S.A.) and from nine international governmental and non-governmental organisations (European Economic Commission; Economic and Social Commission for Asia and the Pacific; International Council for Research in Agro-forestry; International Union of Biological Sciences; International Union for the Conservation of Nature and Natural Resources; International Union of Forestry Research Organisations; United Nations Conference on Trade and Development; United Nations University and the World Bank), in addition to members from the three co-sponsoring organisations.

This paper assembles the main documents related to this important meeting, viz.: the report of the meeting as approved by the participants, the discussion paper "Harmonizing International Action in Support of National Efforts for Tropical Forest Resources Management" and its supplement "International Activities in the Field of Tropical Forestry".

The discussions highlighted the main cause for the continued destruction of the world's tropical forests which, basically, is the increasing demand for agricultural land to supply the needs of rapidly growing populations.

The recommendations of the meeting, amongst other things, call for the harmonisation of the programmes of the international organisations in the field of tropical forestry development and conservation and closer coordination between agricultural and forestry activities.

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FOREWORD

In view of the growing economic, social and environmental importance of tropical forest cover to the world as a whole, there is an urgent need for harmonizing national and international efforts to conserve and rationalize the management and utilization of tropical forest resources. A Meeting of Experts on Tropical Forests was organized in 1980 by UNEP, in cooperation with FAO and Unesco (Nairobi, 25 February - 1 March 1980). That meeting highlighted various fields of action at national and international levels and proposed to the Executive Director of UNEP to recommend its Governing Council to agree to convene a second small expert meeting that should formulate a programme for integrated and coordinated initiatives in Tropical Forest Management. Such a meeting was held in Rome on 12-15 January 1982 at which, inter alia, a discussion paper drafted by FAO with contributions from UNEP and Unesco was considered.

This meeting underlined the importance of tropical forests for the well-being of local populations, for national socio-economic development, and for the global conservation of genetic diversity. It noted the worldwide concern at the rapid destruction of tropical forest cover currently taking place and recommended appropriate action at the national and international levels.

Considering the importance of the material brought forward at the meeting and the resulting conclusions and recommendations, it has been decided to consolidate and publish the set of documents from the meeting so that it can be made available to governments, organizations and individuals concerned with, or interested in, the subject.

FAO is indebted to Mr. F. Barrientos, the consultant who prepared the first draft of the discussion paper, and to Unesco and UNEP as the two other cosponsoring agencies. Thanks are also due to the experts who attended the meeting and who, through their contributions, added to the value of this paper.

It is hoped that this publication will heighten awareness of the problem, convince decision makers of the need for concerted action to manage the Tropical Forests and enhance the coordination of national and international activities in this field.



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Head of the Forestry Department

GLOSSARY

Without making any claim to universally accepted definitions, the meanings of certain terms and expressions used frequently in this paper are given below. Certain other terms are defined in appropriate sections of the text (see in particular Sections 1.1, 2.2, 3.2.1).

- a) Conservation: Management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations, while maintaining its potential to meeting needs and aspirations of future generations.
- b) Forest Resources Management: Within a broad, interdisciplinary connotation, this expression embraces the environmental, productive and social functions of forests and takes into account the complete system formed by a) the forest, its resources and functions; b) the population, its needs and contributions to the system; and c) the enterprise as the system's dynamic factor. Forest resources management is meant to consist of the planning, execution and monitoring in space and time of the actions necessary to enable the forest resources under management, to provide the desired yield of goods and services with due consideration to the renewable and systemic² nature of the resources and to the need to maintain their potentials.
- c) Shifting Cultivation: This expression broadly designates the agricultural system under which crops are cultivated for a few years on cleared plots in forest areas, after which these plots are abandoned and other pieces of land are cultivated. Cyclical shifting cultivation involves a rotation as the abandoned plots are re-cultivated after their fertility is judged to be restored under the cover of natural vegetation regrowth. However, re-cultivation may take place sooner if other land is not available for cultivation (accelerated shifting cultivation). Shifting cultivation can be an environmentally sound form of forest land use, particularly when population density is sufficiently low.³
- d) Immediate Population: Population living on, or near forest areas and depending directly on them for their livelihood. It may comprise aboriginal groups as well as long-time settlers, nomads, or recent immigrants. Forest resources management does not involve or concern exclusively the immediate population, but must consider it with particular care.

1/ World Conservation Strategy (IUCN, 1980. Publication supported by UNEP and WWF, with the cooperation of FAO and Unesco).

2/ It should be noted that "forest management" is often used with a narrower meaning, referring only to timber tree management and silvicultural treatments.

3/ This definition was proposed by FAO in connection with the discussion paper. One expert (R.A.A. Oldeman) presented a more detailed definition including suggestions as to maximum population density, production cycle, length of fallow and size of individual fields.

- e) Enterprise: A public, private or mixed agency that performs economic functions (production of goods and/or services) and enjoys considerable autonomy in decision making.
- f) National Policy: Government policy-making includes the setting of objectives and providing of the means for implementation (legislation, organizational set-up and human, material and financial resources).
- g) Public Administration: The aggregate of activities for implementing government policy and programmes. Usually includes also the administrative and technical mechanism to which specific tasks and powers are assigned to plan, organize, direct, coordinate, control and at least in part, execute such activities (e.g. the Public Forestry Administration).

CHAPTER I

REPORT OF THE MEETING

1. ORGANIZATIONAL MATTERS

1.1 Introduction

1. The 2nd Expert Meeting on Tropical Forests, jointly sponsored by UNEP, FAO and Unesco, was held at FAO Headquarters, Rome, Italy, from 12 to 15 January 1982.

2. The session was attended by 34 experts from 21 countries (Australia, Congo, Denmark, France, Federal Republic of Germany, Honduras, India, Indonesia, Japan, Malaysia, Mexico, Netherlands, Nigeria, Norway, Peru, Philippines, Senegal, Sweden, Tanzania, UK and USA) and from nine international governmental and non-governmental organizations (European Economic Commission; Economic and Social Commission for Asia and the Pacific; International Council for Research in Agroforestry; International Union of Biological Sciences; International Union for the Conservation of Nature and Natural Resources; International Union of Forestry Research Organizations; United Nations Conference on Trade and Development; United Nations University and the World Bank), in addition to members from the three co-sponsoring organizations (see Annex 1 for list of participants).

1.2 Opening of Meeting

3. The session was opened by J. Prats Llauradó, Director, Forest Resources Division, FAO, on behalf of the Director-General of FAO.

1.3 Adoption of Agenda

4. The provisional agenda was adopted (see Annex 2).

1.4 Opening Addresses

5. The opening addresses were delivered by M.A. Flores Rodas, Assistant Director-General, Forestry Department; R. Olembo, Director, Environmental Management Service, UNEP; and F. di Castri, Director, Division of Ecological Sciences, Unesco.

1.5 Election of Officers

6. The meeting unanimously elected as Chairman, M. Jabil, Director General of Forestry, Forest Department, Malaysia; as first Vice-Chairman, O. Cedeno Sánchez, Director General, National Forest Research Institute, Mexico; as second Vice-Chairman, R. Oldeman, Professor of Silviculture, University of Wageningen, the Netherlands; and as Rapporteur, El Hadji Sene, Directeur des Eaux et Forêts, Senegal.

7. The meeting appointed D. Joslyn, Chief, Forestry Division, AID, USA, O. Solbrig, Representative, IUBS, and B. Zentilli, Regional Officer, IUCN, to the drafting committee.

2. PRESENTATION OF AND COMMENTS ON THE DISCUSSION PAPER

2.1 General Presentation

8. In presenting the discussion paper, J. Prats Llauradó mentioned that it had been prepared by FAO in cooperation with UNEP and Unesco and that it takes into account comments made by governments and international organizations on the recommendations of the First Meeting of Experts on Tropical Forests held in Nairobi from 25 February to 1 March 1980, as well as the findings of three recently held meetings viz: the UN Conference on New and Renewable Sources of Energy, the XVII IUFRO Congress and the MAB Conference Exhibit, "Ecology in Practice".

9. He presented the general approach of the discussion paper and stressed the sovereignty of States over their tropical forest resources, the essential role of immediate populations in the management of tropical forest resources, the inclusion in the discussion paper of forests and woodlands of the drier tropics, as well as those of humid areas, and the need to focus action on areas described as "critical".

10. He recalled that the 30 elements in the discussion paper are proposed as activities at the international level in support of ongoing and/or planned national efforts.

11. Participants acknowledged the discussion paper as a comprehensive and useful basis for the meeting; major points stressed were:

- the need to recognize the importance of forest management in the drier zones, without underestimating the importance of management of humid tropical forest resources;
- the need to understand the basic factors and forces that underlie man's activities which lead to the destruction and degradation of forest resources;
- the need to arrive at practical solutions in those areas listed in Chapter 3 as requiring special attention, among which mangrove ecosystems and bamboo forests should be included;
- the need to develop authoritative economic data on the intangible benefits and on the very numerous products other than wood accruing from tropical forests;
- the importance of reviewing the results of both successful and unsuccessful forest management systems in order to draw up guidelines for wise management.

2.2 Presentation and Discussion of Chapter 1 (Discussion Paper)

12. J.P. Lanly presented Chapter 1 reviewing the present state and trends in areas of tropical forests at global and regional levels, based on the results of the recently completed FAO/UNEP Tropical Forest Resources Assessment Project carried out in the framework of the Global Environment Monitoring System (GEMS). This was followed by a review of population/forest relations in the three regions and of their repercussions on the tropical forest resources.

13. Participants acknowledged the FAO/UNEP study as a most important one, typical of those expected from UN organizations and particularly useful for the purpose of this meeting. It was stressed that such assessments at regional and global levels should be repeated at regular intervals, e.g. of five years, as envisaged by GEMS.

14. Regional and international cooperation through UN agencies to assist Member Countries in the application of the recent techniques of monitoring and inventorying to improve the quality of information at national level as a basis for planning was suggested. Mention was made in this respect of the FAO/UNEP Pilot Project on Tropical Forest Cover Monitoring, carried out in the late 70s in three countries of West Africa, which resulted in the development of appropriate methodology and of national capabilities.

15. Suggestion was also made to extend the scope of these assessment studies so as to include genetic resources and non-timber products (e.g. wildlife, protein resources, etc.) and their rational utilization, and further refine the classifications used.

16. The secretariat indicated that extension on the assessment work to cover other countries and other parameters was already under consideration and that the computerization of the project results has already begun.

17. In spite of a lower growth rate of agricultural populations compared with that of total populations in tropical countries, the needs for food and energy in these countries will exert an increasing pressure on their forest resources. An effective response to these pressures must include actions on conservation, management and reforestation, as well as additional research into alternative land use systems. It was pointed out also that the changing relations between man and forest needed to be studied further, taking a dynamic and historical perspective.

2.3 Presentation and Discussion of Chapter 2 and Corresponding Elements (Chapter 4, Elements 1-8) (Discussion Paper)

18. In presenting this Chapter, F. Barrientos reviewed the eight main prerequisites for the management of tropical forest resources, namely (i) land use policy, forest policy and forest legislation; (ii) progress of rural communities; (iii) institutional development; (iv) education, training and extension; (v) research; (vi) raising of awareness; (vii) surveys and assessments; and (viii) information collection and dissemination. He referred also to the corresponding elements for action in Chapter 4.

19. He emphasised that significant progress has been achieved during the last thirty years in the various fields (notably in institutional development, forestry education and training at different levels, resources inventory and research), and that this progress should serve as a starting point for greater effort.

20. The meeting endorsed the contents of this Chapter and agreed that the eight main prerequisites described in the paper adequately covered the subject. It stressed the need to accord due importance to all tropical forest types including mangroves, in view of their importance and present vulnerability.

21. Many experts insisted on the crucial importance of raising the level of awareness of those groups whose decisions or activities have a bearing on the management of tropical forest resources, in particular through the effective use by international and national organizations of mass media, brochures directed to decision-makers, and by incorporating aspects of forestry in school curricula.

22. There was considerable discussion on the various types and levels of forestry research and it was agreed that they are complementary and should continue in a coordinated way. Several experts insisted on the need for research to provide early results which are applicable to ongoing forest activities and for managers to provide researchers with orientation and priorities.

23. Better knowledge of the tropical forest ecosystems for improved forest management was stressed by several experts. In this respect attention was drawn to the importance of a systems-oriented approach to forestry research.

24. It was also stressed that cooperation at all levels between research institutions should be reinforced through existing organizations, such as IUFRO and the MAB programme of Unesco. Information was provided on the status of the World Bank/FAO study "Strengthening Forest Research in Developing Countries". Positive responses have been received from leading centres in developing country forest research with respect to their proposals for expanding twinning arrangements. Also donor agencies had readily collaborated in providing data on the current status of financial support to forestry and forest research. Follow-up action could be discussed at the FAO Committee on Forestry Meeting in May 1982.

25. It was recognized that ways must be found to disseminate research findings faster and more systematically to those involved in forest management.

26. Training and education at all levels were recognized as essential prerequisites for the strengthening of forestry institutions and the implementation of forest management programmes. Mention was made of the importance of training the staff of forestry institutions in business management.

27. A suggestion was made to use regional bodies to assist in the formulation and harmonization of national forest policies, as is done by the ASEAN countries (Association of South-East Asian Nations).

28. The concept of local "forest prosperity centres" as presented in the document was discussed and examples were given of similar schemes, such as rural development programmes in the Philippines that include the manufacture and trade of forest products by communities ("cottage industries"). The concept of such "forest prosperity centres" would fit within the general FAO policy of "Forestry for Local Community Development".

29. The need was stressed for a closer involvement of local communities in the management of forest resources. The role of incentives in this context was highlighted.

2.4 Presentation and Discussion of Chapter 3 and Corresponding Elements (Chapter 4, Elements 9-30) (Discussion Paper)

30. F. Barrientos outlined the chapter in which considerations on land-use planning and means of tropical forest resources management are followed by an analysis of forest management issues in the various types of "critical areas". Reference was made to the corresponding action elements in Chapter 4.
31. He stressed that even though the knowledge necessary for the optimum management of tropical forests is still limited, it is possible to manage forest resources effectively if this is done in a cautious way.
32. The demands on forested land for agricultural use were seen by the meeting as the main source of difficulty within many countries for maintaining an adequate level of national forest resources. Several participants suggested that the establishment by law of a permanent forest estate was a necessary prerequisite for conserving tropical forests.
33. Agroforestry was seen as a means of accommodating conflicting demands for land. It was considered to be an appropriate method of land management under certain physical and socio-economic conditions, but it was recognized that more research is needed.
34. In matters of land-use planning, the difficulties faced by forestry in obtaining adequate recognition by decision-makers and planners, and the lack of communication between foresters and those responsible for the agricultural sector, were seen as two major obstacles to giving sufficient importance to forestry objectives.
35. Various ways of addressing the issues related to shifting cultivation were mentioned, such as converting to settled agriculture those shifting cultivators prepared to do so, and respecting shifting cultivation where it is based on cultural background and where land is capable of supporting it.
36. It was pointed out that growing demand for wood as a source of energy is putting considerable pressure on wooded lands, particularly in drier areas, and in those with high population densities, especially around cities. The success of fuelwood programmes was seen as dependent on the development of suitable technical means and the participation of local populations.
37. It was pointed out that there is little knowledge concerning wildlife resources, that there was an immediate need for wildlife surveys in many parts of the world, and that the management of wildlife resources should form an integral part of forest management programmes.
38. It was stated that environmental impact assessments commensurate to the importance of forestry development projects should be carried out prior to implementing such projects, and in this respect mention was made of the urgent need for guidelines for the preparation of these assessments.
39. Adjustment of the demand from the consuming countries for tropical commercial timber species to their regeneration potential was proposed as a means to slow down their rapid depletion. In this respect an appeal was made for support for the programme on tropical timber trade that is being negotiated by governments under the UNCTAD Integrated Programme for Commodities.

40. Attention was drawn to the need for socio-economic studies which would identify and quantify not only the costs and benefits to the various groups involved in or affected by activities of tropical forest management, in particular their effects on the immediate populations, but also the corresponding major risks and uncertainty factors.

41. It was stated that projects related to the management of tropical forests should be accompanied and supported, where appropriate, by research and monitoring activities promoting the acquisition of knowledge and development of research ability founded in the practical realities.

42. It was stated that, in view of the importance of tropical forests as a reservoir of genetic resources, there is an urgent need to establish a worldwide network of protected areas covering representative tropical forest ecosystems.

2.5 Presentation and Discussion of Chapter 4 (Discussion Paper)

43. J. Prats Llauradó presented the chapter which covers the aspect of harmonizing international action in support of national efforts. He referred to the supplement to the discussion paper outlining international activities in the field of tropical forestry and discussed the nature of the sections of Chapter 4, emphasizing the important interrelationship between forest and man; also stressing that countries must have a clear picture of their needs.

44. The meeting drew attention to the political need for immediate short-term benefits which may lead to decisions endangering the future. The need to consider the associated role of tropical agriculture and actions to reduce human pressure on the forest was emphasized.

45. In view of the complexity of allocating priorities to the 30 elements, a matrix approach was proposed and an example provided for discussion. A five-member Working Group was established, whose terms of reference were to further elaborate the matrix. The meeting agreed to the concept of the matrix approach (see Annex 4).

46. The Working Group presented their proposal for the matrix, emphasizing the complexity of the problem and indicating how the various action elements could be arranged in relation to the major situations requiring such actions.

47. The meeting examined several changes which were incorporated in the final form of the matrix.

48. Among criteria proposed for setting priorities within the matrix were numbers of immediate population involved, degree and urgency of potential danger and problems of global importance.

49. The meeting recognized that it would be difficult to agree on using the matrix to establish a general set of priorities in view of differing national needs and conditions. However, its use as a tool was suggested in order to assist in identifying national and global priorities.

50. The importance of identifying critical areas in such a manner as to interest government ministers and effectively compete for funds was stressed.

51. The meeting confirmed its general agreement with the aims and objectives contained in Chapter 4 of the discussion paper and the usefulness of the matrix approach as indicated in paragraph 49.

3. PRESENTATION AND DISCUSSION OF THE SUPPLEMENT TO THE DISCUSSION PAPER

52. In his introduction of the supplement, J. Frats Llauradó pointed out that it had been produced as a provisional guide to current international activity in the field of management of tropical forests, and that it was open to amendments, additions and comments as to its usefulness.

53. The meeting acknowledged the usefulness of the information provided for improving concerted action in this field. Various participants proposed some corrections and suggestions for continued use of this type of information.

4. RECOMMENDATIONS

4.1 General Considerations, Harmonization and Coordination

54. The meeting of experts recognized the vital importance of the world's tropical forests for the well-being of local populations, for national socio-economic development, and for the conservation of genetic diversity. It noted the worldwide concern at the rapid destruction currently taking place.

55. The meeting also recognized a need to increase awareness at local, national and global levels of the threats to the importance of tropical resources through the production of a variety of information and educational materials.

56. It further recognized that high priority should be given to the socio-economic aspects of tropical forest management activities, particularly to alleviate poverty of rural populations, while giving due consideration to other groups and future generations and to risk and uncertainty factors.

57. The meeting of experts recommended that international organizations, including FAO, UNEP, Unesco and other appropriate agencies, should fully coordinate and harmonize their activities in the development of programmes for tropical forests. In this respect the meeting welcomed the establishment of the System-wide Medium Term Environment Programme (SWMTEP) as an appropriate mechanism in the furtherance of this coordination and harmonization and as a tool for rational utilization of resources.

58. The meeting drew attention to the very close connection between the state of agriculture and the pressure exerted on tropical forests. It recommended that activities in agriculture and forestry should be closely coordinated and that all actions implemented for improvement and management of tropical forests should be accompanied by actions aiming at solving agricultural problems so as to lessen constraints and stresses due to poverty, lack of land and food of nearby populations, which can be detrimental to any form of conservation and wise use of tropical forests.

4.2 Actions at National Level

59. The meeting recommended that:

- national efforts be started, and supported, aiming at informing and educating the general public, promoting a better knowledge base for policy-makers, and encouraging dialogue between governmental and non-governmental agencies responsible for the development of tropical areas and related forest resources;
- tropical countries be assisted in the elaboration and implementation of national development and research programmes and management plans for forest resources development and conservation;
- in so doing, tropical countries would define their priorities, upon which only they can decide, taking into account in a balanced manner long-term and short-term efforts resulting from the forest resources development process and the various beneficiaries, viz: immediate populations, national populations and regional and international communities;
- existing capabilities in education and research be strengthened and applied as balanced inputs in forest resources development projects, so as to quickly improve skills, knowledge and methods in the management of tropical forests.

4.3 Actions at International Level

60. The great effort required on the part of governments to undertake large-scale tropical forest resources management should stimulate increased international cooperation since the results obtained will not only benefit the countries concerned but the community of nations as a whole. This effort should be developed and undertaken with due respect to the inalienable sovereignty of the countries for the utilization of tropical forests and other natural resources of their territories. The efficiency of this cooperation could be improved by harmonizing, coordinating and increasing multilateral and bilateral efforts in accordance with established priorities and urgencies, avoiding gaps and duplication.

61. It is essential that countries which possess tropical forests participate as protagonists in this concerted international action on tropical forests, calling, where appropriate, on the support of relevant United Nations specialized agencies, international institutions, international banks, non-governmental organizations and bilateral assistance programmes. Considering that many institutions and bodies are interested and involved in the problem of tropical forestry, the meeting concluded that a coordinated approach and mechanism are clearly desirable.

62. The meeting considered arrangements for continuing review of international action on tropical forestry. It recommended that the possibility be explored for the existing FAO Committee on Forest Development in the Tropics (referred to below as the "Committee") to assume this responsibility. It was noted that this would require consideration of (i) the status of the Committee currently relating only to FAO, (ii) the terms of reference of the Committee, and (iii) the membership. The Committee in its new form should relate to FAO, UNEP and Unesco, include the review function in its terms of reference, and draw participants from Member Countries and pertinent governmental and non-governmental international organizations.

63. The meeting agreed that the steps for the launching of activities at international level should include the following:

- 1) elaboration of a plan including the goals, scope and content of each specific activity;
- 2) definition of activities for the next five or ten years: projects and priorities;
- 3) identification of the national centres and institutions which would participate in the activity;
- 4) determination of a network of participating regional and international centres and institutions;
- 5) quantification of the activity (personnel, means and resources) and distribution of responsibilities;
- 6) convening of ad hoc working groups, as appropriate, for carrying out the above task in relation to proposals involving groups of related activities.

64. The meeting recommended support to existing important activities of global and regional scope in the field of tropical forest resources management, notably:

- the Global Environment Monitoring System (GEMS) and in particular the global tropical forest resources assessment programme and the tropical forest cover monitoring programme;
- the Unesco MAB Programme, in particular the network of integrated pilot projects of research, training and demonstration, with special emphasis on the tropical areas not yet covered by the first phase of these activities;
- the tropical timber component of the UNCTAD Integrated Programme for Commodities;
- the FAO/UNEP/Unesco/IUCN effort towards the establishment of an adequate network of representative protected samples of tropical forest ecosystems.

65. The meeting recommended the refinement of the matrix approach with a view to improving its applicability by both tropical countries and international organizations.

4.4 Financing

66. The recommended activities would, if implemented in their entirety, require high financial inputs, including small-scale funding, as well as the financing of large-scale projects. In view of this the meeting recognized that a re-organized Committee on Forest Development in the Tropics could play a major role in sensitizing donor countries and agencies to activities located in critical areas and to international programmes proposed for support in paragraph 64. In so doing, the Committee should seek the participation of international banks such as the World Bank and regional banks, as well as bilateral sources.

4.5 Information

67. The meeting recommended that the information contained in Supplement to the Discussion Paper be regularly published in order to help the Committee in promoting and guiding financing, as well as assisting donor agencies to avoid duplication and increase cooperation. This should include a list of the countries in which the donor agencies sponsor projects.

CHAPTER II

D I S C U S S I O N P A P E R

Harmonizing international action
in support of national efforts for
TROPICAL FOREST RESOURCES MANAGEMENT

1. THE SITUATION IN TROPICAL FORESTS

1.1 The forests

1. The information about tropical forests given in this section is taken from a study completed in 1981 by FAO with the financial assistance of UNEP in the framework of the Global Environment Monitoring System (GEMS).

1.1.1 Methodological characteristics of the FAO/UNEP Tropical Forest Resources Assessment Project

2. This study consisted essentially in the organization, interpretation and treatment, country by country, of the great mass of collected data, within a single, simple framework of classifications and concepts. In 13 of the 76 countries studied, interpretation of satellite images has supplied a certain amount of supplementary surface data. These have been treated together with information from other sources. A dialogue has been established with the forestry institutions of the countries involved, which have been invited to review the first draft of the report. In three countries (Burma, India, Peru) most of the work was carried out directly by national institutions following the same methodology as that used for the other countries.

3. The results of the survey, country by country, cover principally:

- the extent, reported at the end of 1980 and forecast up to the end of 1985, of different woody formations classified according to their type (closed broad-leaved, open broadleaved or forest-grassland formations, coniferous forests, bamboo forests and shrub formations), to their alteration by agriculture (forests or forest fallow), their productive capacity, management and logging;
- the growing stock of closed and productive open tree formations (at the end of 1980);
- the extent, reported at the end of 1980 and forecast up to the end of 1985, of forest plantations classified as "industrial" and "non-industrial", by species type and by age classes;
- the rates of deforestation of tree formations from 1976 to 1980 and from 1981 to 1985 (estimated) and the transfer of areas from category to category due principally to logging, management and the establishment of protected reserves.

4. All these results for each of the countries, as well as the appropriate analyses and commentaries are contained in "country briefs". They are grouped by subregions and the three main tropical regions (technical reports 1, 2 and 3) and finally for the whole of the tropics (technical report 4).

5. The 76 countries studied are listed in ANNEX 6 by regions and subregions. With the exception of the tropical part of Australia and the Arabian Peninsula, and of the tropical fringes of Argentina and China, they represent more than 97% of the countries situated wholly or mainly in the tropics or under tropical climatic influence. The countries not covered are essentially islands or archipelagos of relatively small area (mainly in the Caribbean and the Pacific).

1.1.2 Situation of natural woody vegetation in 1980

a) Areas of woody vegetation

6. Table 1 gives, in broad categories, the areas of all vegetative formations, whether altered or not by exploitation and agriculture, in which the woody component, tree or shrub, covers more than 10% of the ground.

Table 1 - Areas of natural woody vegetation estimated at end 1980
(in thousand ha)

Region	Tree formations					Fallows of:			Total
	Closed	Open	All	%	% (land)	closed tree form.	open tree form.	Shrub form.	
Tropical America (23 countries)	678650	217000	895650	46.28	53.32	108600	61650	145900	1211800
Tropical Africa (37 countries)	216650	486450	703100	36.33	32.11	61650	104300	442750	1311800
Tropical Asia (16 countries)	305500	30950	336450	17.39	35.61	69250	4000	35500	445200
Total (76 countries)	1200800	734400	1935200	100.00	40.20	239500	169950	624150	2968800

7. Closed tree formations (or forests) - particularly the broadleaved - are those which by their different strata and their undergrowth cover a large part of, or all, the ground and which, in general, do not have a continuous herbaceous stratum (except in certain coniferous forests). Open tree formations on the other hand are those in which the canopy is generally less closed. These are essentially mixed broadleaved forest-grassland formations (the American "cerrado" and "chaco", the African woodlands, wooded and tree savannas).

8. Fallows of closed or open tree formations correspond to the mosaics of secondary woody vegetation produced by the clearing of these formations by shifting cultivation. Patches of forest not yet cleared and the cultivated plots themselves are in general included in this category.

b) Areas of closed and open tree formations

9. Two thousand million hectares are covered by tree formations unaltered by agriculture in the 76 tropical countries studied, representing a global forest cover of 40%. Tropical America is the most heavily forested region of the three, with 53% of forest cover. The figure is considerably lower in the two other regions (32% and 36% respectively in tropical Africa and Asia).

c) Area of closed forests

10. The 1,200 million hectares of closed tree formations are divided up as follows: 96.6% broadleaved forests, 2.9% coniferous forests and 0.5% bamboo forests. Tables 2 and 3 show the regional distribution of the closed broadleaved and coniferous forests respectively.

11. The term productive forest is used to describe forests whose characteristics, those of the terrain and the regulations applicable to their use, allow the production of wood for industry. Described as unproductive for legal reasons are those forests in which logging is forbidden (essentially those situated within national parks or equivalent reserves). Intensively managed productive forests are those where rules governing logging are applied in a strict and controlled way and where silvicultural and protective measures are adopted. Undisturbed not managed productive forests are those which have not been logged-over or cleared in the last 60 to 80 years and are therefore "primary" or "old secondary" forests where the species and terrain would permit logging. The great majority of the unproductive forests are also "primary" or "old secondary" forests, so that the total area of these is greater than that of the undisturbed not managed productive forests.

1) Broadleaved forests

12. The 23 countries of tropical America contain more than 56% of the broadleaved tree formations of the whole 76 countries studied, which cover a total area of 1,160 million hectares. The 10 countries and territories of tropical South America (Bolivia, Brazil, Colombia, Ecuador, Guyana, French Guyana, Paraguay, Peru, Suriname and Venezuela) have more than 52%. A quarter of the closed broadleaved forests are found in the 16 countries of tropical Asia and only 18% in tropical Africa.

13. Unproductive closed broadleaved forests, whether for physical reasons (stand and terrain conditions) or for legal reasons, are proportionally more extensive in tropical Asia than in the two other regions. This reflects, on the one hand, that lowland forests have been alienated to different land uses to a greater extent in this region because of a higher population density, (134 inhabitants per km² as against less than 20 in the two other regions) and, on the other, that the creation of reserves for other purposes than wood production is more advanced there.

14. Undisturbed productive closed broadleaved forests, that is to say those more than 60 to 80 years old and untouched by logging, cover a total area of nearly 670 million hectares, of which 68% are in tropical America (65% in the 10 countries and territories of tropical South America), 18% in tropical Africa (nearly 17% in the Congo-Cameroon area alone) and only 14% in tropical Asia.

15. The proportion of logged-over productive closed broadleaved forest (managed or not) is by far the greatest in tropical Asia (49% of the productive closed broadleaved forests), and only reaches 27% in tropical Africa and 10% in tropical America.

16. The intensively managed closed broadleaved forests of the entire 76 countries represent only 4.4% of the productive closed broadleaved forests. 78% of these are concentrated in one country, India, and only 8 other countries (1 in America, 4 in Africa and 3 in Asia) have their closed broadleaved forests under intensive management at a scale other than experimental.

17. One category of closed broadleaved forest deserves special attention owing to the nature of the products and, above all, the services which it provides. This is the mangrove forest which unfortunately for the most part is suffering from a process of degradation and elimination, in particular by over-exploitation for fuelwood and timber and for the extraction of tannin. Their total area in the 76 countries studied is estimated at about 15.5 million hectares, of which 5.8 million hectares are in tropical America, 3.4 million hectares in tropical Africa and 6.3 million hectares in tropical Asia.

Table 2 - Areas of used broad leaved forests
in thousand ha.

Region	Productive				Unproductive			All		Forest fallow
	not managed undisturbed	logged over	managed	total	for physical reasons	for legal reasons	total	Total	%	
Tropical America (23 countries)	453000	53500	6	506500	133550	13900	147450	653950	56,36	99350
Tropical Africa (37 countries)	118200	41850	1700	161750	43650	9000	52650	214400	18,48	61650
Tropical Asia (16 countries)	97250	58400	36200	191850	83600	16450	100050	291900	25,16	67250
Total (76 countries)	668450	153750	37900	860100	260800	39350	300150	1160250	100,00	228250

Table 3 - Areas of coniferous forest
(in thousand ha)

Region	Productive				Unproductive			All		Forest fallow
	not managed undisturbed	logged over	managed	total	for physical reasons	for legal reasons	total	Total	%	
Tropical America (23 countries)	1500	13150	500	15150	9400	150	9550	24700	72.19	9300
Tropical Africa (37 countries)	300	300		600	450	100	550	1150	3.27	
Tropical Asia (16 countries)	1750	950	2900	5600	1700	1100	2800	8400	24.54	950
Total (76 countries)	3550	14400	3400	21350	11550	1350	12900	34250	100.00	10250

11) Coniferous forests

18. Simply stated, three-quarters of the 34 million hectares of coniferous forests in the 76 countries studied are to be found in Latin America and the remaining quarter in Asia, with only limited areas in East Africa. It is important to point out, however, that about 70% (24.5 million hectares) of these coniferous forests are found in the sub-temperate part of some of the countries studied (central and northern Mexico, southern Brazil, Himalayan region). The strictly tropical coniferous forests, notably the tropical pine forests of Mexico, Central America and the Caribbean, the stands of Podocarpus in the Andes and Africa and those of Pinus merkusii and P. kesiya in Southeast Asia add up to about 9.8 million hectares or nearly 30% of the coniferous forests of the 76 countries.

19. The distribution between productive and unproductive forests in tropical America and Asia is about the same, in the order of 65% for the former forests and 35% for the latter. About 13% of Asian coniferous forests are found in national parks or equivalent reserves while these scarcely exist in tropical America.

20. Undisturbed productive forests amount to only one-sixth of the productive forests (this proportion is four and a half times greater for the closed broadleaved forests). Only 10% of the productive coniferous forests of tropical America are undisturbed, as compared with nearly a third in tropical Asia.

21. Sixteen percent of the productive coniferous forests are under intensive management, a considerably greater proportion than that of the closed broadleaved forests. They are to be found, above all, in India and, to a lesser extent, in Honduras, Nicaragua, Cuba and Kenya.

d) Growing stock of closed forests and productive open forests

22. Taking as a measure of the growing stock the gross bole volume over bark of trees of more than 10 cm in diameter, the figures in Table 4 are obtained.

Table 4 - Total gross volumes of growing stock of closed forests and productive open forests
(in million m³)

	Broadleaved forests				Coniferous forests		
	closed produc.	unproduc.	total	open produc.	produc.	unproduc.	total
Tropical America (23 countries)	71 450	12 200	89 650	7 750	1 200	650	1 850
Tropical Africa (37 countries)	38 750	6 150	44 900	4 700	50	50	100
Tropical Asia (16 countries)	30 650	13 100	43 750	400	850	250	1 100
Total (76 countries)	146 850	31 450	178 300	12 850	2 100	950	3 050

23. The gross volumes per hectare of undisturbed productive closed broadleaved forests are on average of the order of 155 m³ in tropical America, 255 m³ in tropical Africa and 215 m³ in tropical Asia; the volumes for the coniferous forests in the three regions are roughly equal, in the order of 175 m³/ha. These figures should be interpreted with caution since each of them covers a large number of very different types of forests.

1.1.3 Logging

24. The volume of timber extracted every year from the productive broadleaved forest formations of the 76 countries is presently estimated at about 135 million m³ and at 17 million m³ for the coniferous forests. Sixty-five percent of hardwood logs are extracted from the undisturbed productive closed forests (4.3 million ha logged-over every year). The rest comes from the relogging of already exploited forests and, to a lesser extent, from managed closed forests and from productive open forests. In the case of coniferous forests, 15% only is extracted from undisturbed stands.

25. Logging in the closed broadleaved forests of America and Africa is highly selective, where 8 and 13 m³ of logs are extracted per hectare respectively. In the Dipterocarp forests of Southeast Asia, logging is much more intensive (between 40 and 100 m³ of logs extracted per hectare) since the proportion of commercialized species is much higher than in other mixed tropical broadleaved forests. For the whole of tropical Asia, the average volume harvested per hectare in the undisturbed closed broadleaved forests is about 37 m³, harvesting being less intensive in the non-Dipterocarp Asian broadleaved forests.

26. The extraction of hardwood logs is presently growing at a rate of 4.6% a year in tropical America, of 1.1% in tropical Africa and of 2.9% in tropical Asia, or at a rate of 3.0% worldwide.

1.1.4 Ownership

27. The pattern of forest ownership varies considerably from country to country. The distribution of forest areas according to types of ownership is on the whole fairly imprecise, all the more so as the types of ownership themselves are often ill-defined. For instance, in tropical America state property lands or "baldio" lands are the general rule in most countries, with exceptions such as Haiti and El Salvador where nearly all forests are privately owned, Paraguay, where only a third of the forests are publicly owned, and Mexico, where half the forests are communally owned or under the "ejidal" system.

28. In tropical Africa the symbiosis between customary rights and written laws introduced by colonial administrations occurred in different ways. In anglophone countries (for example Ghana, Nigeria, Malawi) a large proportion of the forests was handed over to the traditional communities and forest reserves were created with their consent. In francophone Africa, all the forests were made state property, with the local communities enjoying numerous usage rights, and this situation has generally continued up to the present despite sporadic attempts at change. The socialist African regimes, in particular Ethiopia and former Portuguese territories, have nationalized all their forest lands. Private ownership of forests is very rare in tropical Africa except in certain English-speaking countries (such as Botswana and Namibia).

29. In tropical Asia 80 to 90% of forest areas are state property, this proportion having grown progressively in the last 30 years. In the Philippines certain forests are defined as alienable and disposable and transferred to the Bureau of Lands. Some communal forests exist in Nepal and in Pakistan. In Papua-New Guinea nearly all the forests belong to tribes and clans. A few private forests still remain in tropical Asia, often widely scattered and in the process of alienation to other uses.

1.1.5 Deforestation

30. In the FAO/UNEP assessment the term deforestation denotes the total clearing of natural tree formations (closed and open) for agriculture (including shifting cultivation)^{1/} and other uses.

31. Table 5 gives figures for annual deforestation by region and the corresponding rates for closed and open tree formations during the period from 1981 to 1985.

Table 5 - Average annual deforestation rates during period 1981-85
Closed and open tree formations
(in thousand ha)

Region	Closed forests			All		Open forests		All tree formations	
	undis- turbed	productive exploited and managed	unpro- duc.	in '000 ha	in %	in '000 ha	in %	in '000 ha	in %
Tropical America (23 countries)	1 299 (79)	1 867 (142)	1 173 (88)	4 339 (309)	0.64	1 272	0.59	5 611	0.63
Tropical Africa (37 countries)	226 (1)	1 032 (4)	73 (2)	1 331 (7)	0.61	2 345	0.48	3 676	0.52
Tropical Asia (16 countries)	395 (7)	1 278 (17)	153 (6)	1 826 (30)	0.60	190	0.61	2 016	0.60
Total (76 countries)	1 920 (87)	4 177 (163)	1 399 (96)	7 469 (346)	0.62	3 807	0.52	11 303	0.58

N.B. The figures in parentheses show the part of the total deforestation corresponding to coniferous forests. The difference between the figure in parentheses and that immediately above it is practically equivalent to the deforestation of closed broad-leaved formations, since bamboo forests only account for 0.3% of total deforestation.

^{1/} Clearing of natural tree formations (not previously altered by agriculture) for shifting cultivation is also included in deforestation although there is a regrowth of a secondary woody vegetation ("forest fallow").

32. These figures for deforestation compared with those for the preceding five year period (1976-80), show that the clearing of the whole of the closed forests increases by about 3%, from 7.3 to 7.5 million hectares. This increase essentially occurs in tropical America where the deforested area increases by about 1% every year, whereas it is levelling off in absolute values in the other regions.

33. Information about the clearing of the closed forests in three main regions is given below. The rates of deforestation refer to the period 1981-85, unless otherwise indicated.

a) Tropical America

34. Clearing of closed forests is highest in absolute and relative terms in tropical America. Coniferous forest areas are being cleared twice as fast as closed broadleaved forests since the annual rate for 1980 for the former is 1.25% against 0.60% for the latter. All types of coniferous forests are threatened, the situation in the Araucaria forests in the south of Brazil being particularly critical.

35. Shifting cultivation, notably in the closed broadleaved forests of Mexico, Central America and the Andean countries, is responsible for about 35% of deforestation in this region. A secondary woody vegetation rapidly occupies the ground when it is provisionally abandoned by agriculture, and its different forms constitute what have been called in this study "forest fallows". Another form of non-permanent agriculture is also a significant factor of deforestation. It is that practised on hilly terrain, causing, after some years, soil degradation and erosion; when the farmers abandon the land to continue their migration onto forest lands not yet affected by agriculture, no actual forest fallow takes place. This process leaves behind lands that are more or less eroded and not covered again by secondary woody vegetation. This is happening in particular on the eastern slopes of the Andes where a line of deforestation moves down the slopes of the Sierra towards the Amazon basin.

36. The development of ranching is another important deforestation factor in tropical America. Other contributors to deforestation - such as permanent agriculture, flooding by lakes for hydro-electric dams (Brazil, Paraguay, Suriname), the development of infrastructure, urbanization, forest plantations in closed forests - are of secondary importance in the reduction of natural forest areas.

37. Only a small proportion of deforestation is really planned. Institutes for colonization, agrarian reform and regional development are only responsible for a small fraction of the clearings.

38. Contrary to what happens in tropical Africa and Asia, logging does not contribute significantly to the migration of farmers as a result of new road infrastructure. Logging is often less mechanized in tropical America than in the two other regions and rarely gives rise to the development of a good road network.

b) Tropical Africa

39. More than 700 000 hectares of closed forest, that is to say 54% of the total deforestation in the 37 countries studied, are cleared each year in the 9 countries of West Africa. The annual rates of clearing for the closed broadleaved forests and for the productive closed broadleaved forests are respectively 4.0% and 6.0% for the whole of West Africa. In Central Africa the situation is not of immediate concern: the Congo-Cameroon block is reduced by 350 000 hectares a year, or only 0.2% of the total area and 0.25% of the area of productive forests. The areas of closed forest cleared annually in East Africa and Madagascar amount to some 260 000 hectares a year, i.e. an annual deforestation rate of 1% (and 1.65% for productive closed forests).

40. Shifting agriculture is by far the most important cause of deforestation as it is responsible for about 70% of deforestation in this region. Especially in the last 20 years, population growth and the development of the logging infrastructure have combined to produce the clearing of vast areas in many countries of West Africa.

41. Other factors - permanent agriculture, dams, infrastructure, urbanization, forest plantations within the closed forest, savannization - each contribute only a small part to deforestation.

c) Tropical Asia

42. It is estimated that during the period 1981-85 annual deforestation will be greatest in insular Southeast Asia (950 000 hectares) and continental Southeast Asia (357 000 hectares). The highest annual rates are found in this last sub-region (0.87%) and in the Indo-Chinese peninsula (0.77%). The forest zones the least threatened at this time are in Indian states where shifting cultivation is not widespread, and in Pakistan, parts of Burma, Kampuchea, the Indonesian province of Irian Jaya and Papua New Guinea.

43. In this region also, shifting cultivation - especially that which follows the front line of forest exploitation in the countries of insular Southeast Asia - appears to be the principal contributor to deforestation (about 49% of deforestation). This form of agriculture is practised all over the region, either in its traditional form by communities living in the highlands ("kaingin" in the Philippines, "jhum" in Bangladesh, "chena" in Sri Lanka, "chancar leu" in Kampuchea, "ray" in Lao, etc.) or by peasants ("squatters") driven from the plains by lack of land and work (Philippines and the northeastern states of India). Other migrations of landless peasants have also contributed to the deforestation, such as the influx of people from the mountains of Nepal into the plains of "Terai" or the influx of refugees into Thailand.

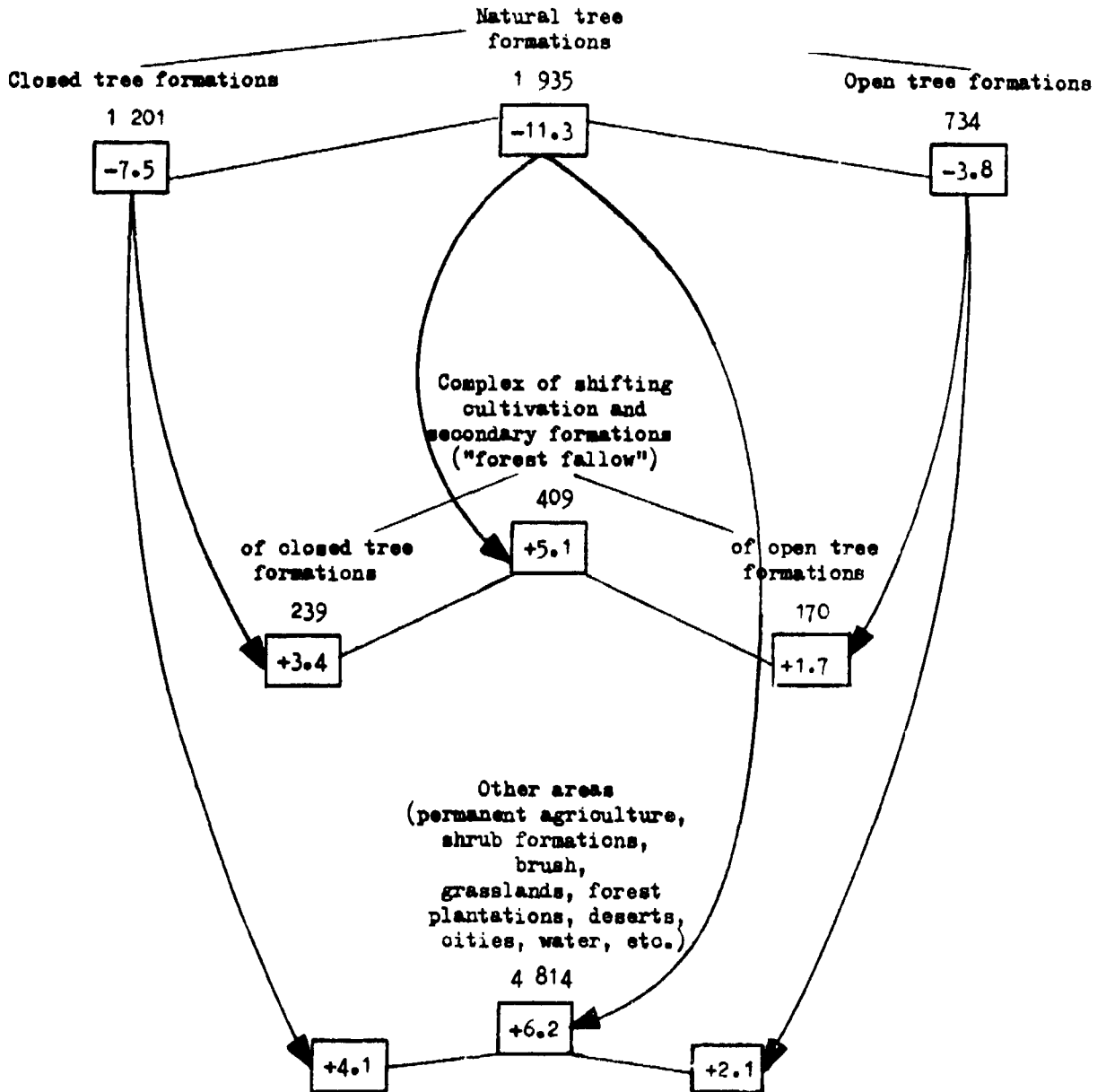
44. Planned colonization is more developed in tropical Asia than in the other two regions. Perhaps the most typical example is that of Peninsular Malaysia where there are large programmes of conversion of lowland forests into plantations for palm oil and rubber. Transmigration in Indonesia is organized by the government to reduce population pressure in Java and encourage the colonization of the outer islands, in particular Sumatra and Kalimantan. The big Mahaweli irrigation project in Sri Lanka should convert 260 000 hectares of forest to agriculture in the next few years. In Nepal, colonization programmes involved 3 000 families between 1973 and 1978.

45. The process of "savannization" is especially apparent where a reduction of the duration of forest fallows combined with repeated fires gives rise to a predominantly grassy vegetation. A typical case is that of Imperata cylindrica savannas in Southeast Asia where the woody component, if any, rarely passes the shrub stage due to frequent fires.

1.1.6 Plantations

46. Forest plantations studied in the FAO/UNEP assessment include those intended to produce wood for industry ("industrial plantations") and those intended to produce wood for fuel and for domestic uses, or for protection ("non-industrial plantations"). By plantation is meant a forest stand artificially established by afforestation on lands which had no forest cover before or whose forest cover was fundamentally different from the plantation which replaces it (artificial regeneration of forests being accounted for under the concept of "intensively managed productive forests" and the areas for 1980 shown in Tables 2 and 3). Table 6 shows the net areas of plantations existing in 1980 and the annual rate of effective afforestation projected for the period 1981-85.

Fig. 1 - Simplified diagram of global deforestation



N.B.: The diagram above gives a schematic picture of the situation, for all 76 countries, of the forest areas in 1980 and the annual shifts (indicated with arrows) for the period 1981-85 brought about by deforestation. All figures are in million hectares. The areas in 1980 are given first while the annual area changes are given in a box below (with the - sign for a reduction and the + sign for an addition).

Table 6 - Areas of tree plantations at the end of 1980 and annual rates of plantation projected for 1981-85 (in thousand ha)

Region	Hardwood species				Softwood species		All species	
	other than fast-growing		fast-growing		area 1980	annual rate (1981-85)	area 1980	annual rate (1981-85)
	area 1980	annual rate (1981-85)	area 1980	annual rate (1981-85)				
Tropical America (23 countries)	548 (419)	50 (39)	2451 (1583)	312 (207)	1621 (50)	173 (6)	4620 (2052)	535 (252)
Tropical Africa (37 countries)	588 (294)	47 (23)	645 (483)	50 (36)	547 (6)	29 (3)	780 (783)	126 (62)
Tropical Asia (16 countries)	1976 (163)	90 (25)	2303 (1220)	237 (147)	832 (226)	111 (38)	5111 (1609)	438 (205)
Total (76 countries)	3112 (876)	187 (87)	5399 (3286)	599 (385)	3000 (282)	313 (47)	11511 (4444)	1099 (519)

N.B. The figures in parentheses are for non-industrial plantations and are included in the total plantation figures.

47. The annual rates of plantation in the table above compared with those of deforestation in Table 5, show that the plantation/deforestation ratio, which one could call "replacement ratio", is 1:10.5 (1 hectare planted for 10.5 hectares of closed or open forest cleared) for tropical America, 1:29 for tropical Africa and 1:4.5 for tropical Asia. Excluding Brazil, the ratio for tropical America becomes 1:36. Ratios referred to closed forests only are: 1:8 in tropical America (including Brazil), 1:33 in tropical America (excluding Brazil), 1:11 in tropical Africa and 1:4 in tropical Asia.

1.2 Population-Forests relationships

48. Tropical forest lands and forest resources are being subjected to increasing direct and indirect pressures due to accelerated growth of human populations, coupled with increasing per capita demand for goods and services from these lands and resources.

49. A comprehensive discussion of the varied and complex relationships between population and tropical forests is not intended here, but reference must be made to the immediate relationships between forests and their neighbouring populations, and to certain implications of these relationships. This can be appreciated adequately only by carefully studying firstly, the populations that live near forests and depend directly on them for goods and services needed today, and secondly, the conflict of interests that often exists between these populations and the society at large which considers the forests mainly as agents of environmental protection, as sources of raw material for industry, and as resources for tomorrow.

50. The fact that the behaviour of populations that live near forests directly affects the future condition of these forests is reflected today in the ecological damage associated with the spread of accelerated shifting cultivation, the fuelwood crisis, overgrazing, forest fires and the combinations of these and other causes of forest degradation.

51. Shifting cultivation has been dealt with briefly in Section 1.1. The following figures give an idea of the extent of this practice: forest fallow resulting from shifting cultivation practised in recent times occupy an area equivalent to 28.5% of the area of remaining closed tropical forests in Africa, this percentage being 16.0% and 22.7% respectively in America and Asia. Millions of people depend on this form of land use which, with reduced fallow periods due to population pressure, tends to contribute more and more to forest degradation.

52. Excessive wood removals of fuelwood and charcoal mostly for domestic use result in degradation, above all of open forest formations. Studies carried out by FAO on the fuelwood situation^{2/} show that three-fourths of the population in developing countries - 2000 million people - depend on fuelwood and other traditional fuels for their daily energy needs. 100 million people are living in such scarcity situations that they cannot obtain sufficient supplies to meet their daily energy needs; a further 1000 million rural dwellers suffer increasing shortages and can meet their minimum needs only at the expense of exhausting available resources. The developing world as a whole suffers a deficit of 400 million m³ of fuelwood to supply the minimum needs of people depending on this fuel.

53. In Africa to the south of the Sahara, the most serious shortage affects populations in mountain and island areas (35.7 million inhabitants) and in arid and semi-arid zones (13.1 million), while large deficits in savanna zones involve the largest group of populations (131.4 million). In Asia acute scarcity situations prevail in mountain areas, especially in the Himalayas (29 million inhabitants), while there is a major deficit in the plains of the south, especially in the Indo-Gangetic plain (297 million) and in the plains and islands of southeast Asia (412 million). In Latin America, the most critical shortages affect the Andean high plateau (2 million people), while there is a deficit in populated semi-arid zones and in areas of the Andes (143 million). This provides a clear picture of the magnitude of the dependence on fuelwood, of the acuteness of growing fuelwood shortages and of the environmental damage that will ensue unless corrective measures are applied in time. If current trends were to remain unchecked some 2000 million people would suffer a fuelwood deficit by the year 2000.

54. Overgrazing is another important cause of degradation of tropical tree formations, particularly open formations. This problem is particularly acute in the African savannas and in parts of India where forests are often the only places that livestock can graze. The foliage of certain trees is also a prime source of forage often consumed beyond tolerable limits directly by the livestock, or gathered for them by the herdsmen. An indirect cause of degradation of open forests is the lighting of fires by herdsmen to hasten the regrowth of grass and to eliminate livestock parasites.

1/ In Section 1.1 shifting cultivation is indicated as a cause of "deforestation" in accordance with the specific meaning given in that section to this term (see paragraph 30). This does not mean that shifting cultivation normally leads to permanent clearing of forest lands, since in many cases natural vegetation regrowth follows the abandonment of cultivated plots.

2/ "Map of the Fuelwood Situation in the Developing Countries" (with explanatory note), FAO, Rome, 1981.

55. Fires are probably the most important agent of degradation in open broadleaved forests and coniferous forests, particularly because these fires are rarely controlled and spread easily. Spontaneous fires are rare, the vast majority being lit for grazing, clearing, hunting, to obtain secondary products, etc.

56. These agents of degradation often combine their effects so that it is difficult to evaluate their influence separately. Experiments involving the protection of areas of degraded savannas in Africa, carried out in the 1950's, showed good prospects of regenerating woody vegetation if protected for several years. Adequate control of fire, grazing and woodcutting would greatly help preserve and bring to good use the immense productive potential of the 735 million hectares of the world's open tropical forests.

57. Numerous causes of forest degradation exist which are not related to the behaviour of immediate populations: diseases and insects (for example, the attack of Dendroctonus in the pine forests of Mexico and Central America), natural disasters (cyclones in the Caribbean, Central America and Southeast Asia), war damage and indiscriminate logging.

58. The highly selective logging practised in mixed closed broadleaved forests, particularly in tropical America and Africa, cannot be considered a significant contributor to degradation. In contrast, indiscriminate logging of pure, or almost pure, broadleaved forests (e.g. those of edaphic origin) and of certain coniferous and dipterocarp forests causes these stands lasting and sometimes irreversible damage including absence of regeneration of certain exploited species, erosion and landslides, the absence of regrowth of vegetation on bare areas (see also 3.2.5).

59. Consideration of the agents of forest degradation would have little meaning if the socio-economic factors underlying them were not taken into account. For instance, a major cause of deforestation today is the fact that under present socio-economic conditions and levels of technology and inputs, new forest areas need to be brought under agriculture to compensate for the low productivity per land unit of certain forms of agriculture.

60. Logically, within each country highly different situations may arise from one area to another. In order to fully understand the problems involved and to arrive at correct solutions, population aspects of each particular area should be studied in the same depth and at the same time as land and natural resources aspects. To provide a general context for this it would be useful to examine the population situation, its dynamics and trends in tropical countries, so as to learn where problems of population pressures on the land in general, and on forest land and resources in particular, already exist, and anticipate where new problems may arise or where existing problems may become exacerbated. At world and regional levels little has been done in this respect, at least at a level that could stand comparison with the FAO/UNEP work on tropical resources summarized in Section 1.1. However, the figures given in Table 7 may provide a preliminary indication, by region and subregion, of existing or potential pressures on arable lands and on forest lands and resources. Hopefully, this will draw attention to and encourage studies on this important subject.

61. Various agents of forest degradation mentioned in this section have been repeatedly cited as examples of unbalanced relationships between populations and forests. But this imbalance cannot be confined to the forests and their immediate populations. The effects of population over forests and vice versa involve society as a whole. They can often be traced over long distances, within and across national boundaries, if one considers, for example, the impact of the flow of wood trade on the forests or the influence of forested areas in a watershed on the corresponding rivers.

Table 7 - Population densities (in 1980) in tropical regions and sub-regions

Sub-regions/Regions	Total population				Agricultural population			
	Density per hectare of total area	Density per hectare of arable land ^{1/}	Density per hectare of forest area not altered by agriculture	Annual growth rate %	Density per hectare of total area	Density per hectare of arable land ^{1/}	Density per hectare of forest area not altered by agriculture	Annual growth rate %
Central America and Mexico	0.37	2.85	1.38	3.31	0.15	1.16	0.55	1.31
CARICOM	0.17	4.67	0.22	1.54	0.03	0.99	0.04	-1.26
Other Caribbean	0.50	2.35	0.84	1.95	0.22	1.01	0.36	0.69
Tropical South Latin America	0.15	3.07	0.26	2.84	0.05	0.84	0.09	0.81
TROPICAL AMERICA	0.19	2.96	0.36	2.89	0.07	0.95	0.13	0.93
Northern Savanna Region	0.07	1.76	0.68	2.65	0.06	1.48	0.56	1.99
West Africa	0.54	2.71	2.04	3.19	0.31	1.59	1.17	1.81
Central Africa	0.09	2.26	0.14	2.60	0.07	1.65	0.10	1.88
East Africa and Madagascar	0.17	2.61	0.69	2.95	0.13	2.05	0.54	2.23
Tropical South Africa	0.01	0.85	0.04	2.81	0.01	0.54	0.02	1.68
TROPICAL AFRICA	0.16	2.46	0.49	2.95	0.11	1.76	0.34	2.09
South Asia	2.00	4.19	13.45	2.46	1.29	2.76	8.72	1.57
Continental Southeast Asia	0.70	2.91	1.74	2.71	0.46	1.94	1.14	1.84
Insular Southeast Asia	0.85	6.68	1.47	2.55	0.47	3.79	0.81	1.22
Centrally Planned Tropical Asia	0.86	6.03	1.78	2.28	0.61	4.37	1.27	1.49
Papua New Guinea	0.07	8.15	0.08	2.54	0.05	6.77	0.07	2.08
TROPICAL ASIA	1.34	4.42	3.75	2.48	0.85	2.86	2.39	1.53
Total 76 countries	0.40	3.62	1.00	2.63	0.24	2.19	0.60	1.58

^{1/} including land under permanent crops (coffee, cocoa, etc.) but excluding the forest fallows of shifting cultivation.

The figures in this table are taken from the report of the FAO/UNEP Tropical Forest Resources Assessment project, except those on arable land which are taken from the 1979 edition of the FAO Production Yearbook and refer to 1978.

62. This underlines the need in many cases for massive transfers of resources within society to pay for environmental and other benefits to be obtained from the halting of destructive practices in tropical forest areas. This is why in Chapter 2 the point is made that the future of tropical forest resources and their management depend on overall national policies, including land use, rural development, energy and trade policies. Political leaders should understand these problems more fully and assist the populations concerned not only in gaining more knowledge and experience with regard to the potentials of forests to serve their wellbeing, but also through appropriate institutional and financial measures by which real benefits are obtained from the introduction of sound conservation and production practices.

2. REQUISITES FOR THE MANAGEMENT OF TROPICAL FOREST RESOURCES

1. Discussing the requisites that must be met in order to manage the tropical forest resources without mentioning the advances made, could be interpreted as ignorance of the true situation. However, analysing the situation of every region and in every country would be outside the scope of this paper.
2. At the international level there has been significant advance in tropical forest resources management during the last thirty years which reflects the progress achieved in institutional development (including forest policy, legislation and administration), forest education and training at different levels and resources inventory and research. This is encouraging, although still very insufficient, and should serve as a starting point for far greater efforts.
3. The nature of land ownership and tenure in tropical forests has been briefly described in Chapter 1 (1.1.4). This institutional factor plays a major role in facilitating or constraining tropical forest resources management and should be given preferential attention in socio-economic and land use policies. For example, it is often difficult to reconcile the needs of private ownership with that of the national community, particularly in relation to the protective and social roles of forests. On the other hand, state ownership of forests when combined with remoteness of the state's administrative machinery and absence of development activity in these forests, may result in a situation in which the immediate population does not appreciate the forests, and the local institutions tend to disclaim any obligation towards the forests. It is, therefore, worthwhile analysing the nature of forest ownership and the rights of tenure and usage which will best allow the participation of local institutions, communities and private enterprises in tropical forest management.

2.1 Land use policy, forest policy and forest legislation

4. The first requisite for proper management of tropical forest resources is that every government must have sufficient political will to conserve and treat the tropical forests as a natural renewable resource in the context of a national land use policy. Major issues affecting tropical forest lands such as reducing pressure on them through more efficient use of existing agricultural land and transferring forest lands to agricultural and/or other uses, or vice versa, can only be resolved in that overall context, keeping in mind the interdependency and complementarity of agriculture and forestry, rather than considering them as conflicting forms of land use.
5. Tropical forest resources management must be included in the framework of rural development and be in harmony with national socio-economic development policy. The protective (or environmental), social and productive functions of the forests should be given their due in that policy, according to each country's broad development options. This should include careful consideration of the responsibility for protecting the range of genetic resources that the tropical forests contain.
6. Within the basic objectives of land use and forest policies, most situations will require that priority attention be given to the following:

- a) Urgently improving the standard of living of the poor populations in and around the forests, associating them in productive (including industrial) activities based on the tropical forest resources (this should apply particularly to critical areas).
- b) Maintaining the environmental integrity and benefits of the tropical forests, with special attention given to mountain watersheds.
- c) Increasing the socio-economic benefits of the tropical forests for the national community through integrated resources management.
- d) Reducing as quickly as possible actions leading to deforestation and degradation of tropical forests.

7. It is, therefore, suggested that the governments of the countries possessing tropical forest resources consider whether they need to define or redefine their land use and forest policies, in view of present circumstances and enact, if necessary, suitable legislation. It should be noted in this respect that legislation is an important tool for bringing about and encouraging social attitudes and behaviour that conform with the values and objectives underlying policy, and producing effects consistent with that policy. Forest laws, like any other laws, must be viewed as something dynamic and positive rather than restrictive or coercive. Their adequacy must be judged according to the efficiency of the means brought into play in order to induce social behaviour favouring the implementation of forest policy.

2.2 Progress of rural communities

8. In the tropical countries, people living in or near the forest (immediate populations) are usually part of the poorest sectors. Governments should try, therefore, to find alternatives in the management of tropical forest resources to raise the standard of living of these immediate populations. The future of forests usually depends on a practical demonstration of their capacity to raise people's standard of living and maintain it in a permanent way. This emphasizes the key importance of the social component of tropical forest resources management. Planning and management, furthermore, should take into account the populations' experience and culture, their habits and customs and their family and social structures, in order to respect their traditional values, adapting government action to the local reality.

9. In certain cases, the practical execution of management could be based on projects involving "forest prosperity centres" appropriate to the characteristics of the populations and forests concerned. These centres would essentially consist of a forest area in which a set of integrated activities would be carried out, ranging from production (silvicultural treatments, afforestation, reforestation, agroforestry, cultivation of food and medicinal plants, wildlife and fish management, apiculture, etc.) to utilization (logging, agricultural crops, hunting, fishing, harvesting of fruits, seeds, barks, latex, fuelwood, etc.) to transport and industry (sawmills, boards and cellulose industries, plants for energy production and distillation industries) and to trade (local, national or foreign). These integrated activities would be, in effect, components of multiple use forest resources management, contributing to the stability of the ecosystem.

10. In many cases it would be best if people felt more bound to the forest either through individual or common ownership, and it is necessary that the population take

active part in the activities concerning them, at the planning stage as well as during their execution.

11. In short, governments should manage tropical forest resources with the triple objective of: a) social welfare; b) contribution to national development; and c) environmental protection. The establishment of "forestry prosperity centres" through the assignment of forest areas to groups of families who live in or near them, could be considered for that purpose, among other systems. These centres, with a high technical and social input, would require at the beginning a large concentration of diversified knowledge and resources to create development models, especially applicable to critical areas.

2.3 Institutional development

12. The tropical forests' contribution to the welfare of the immediate population, rural development and national socio-economic development and the forests' role in protecting the environment depend on the existence of an appropriate institutional framework, including both the public and private sectors. The public sector basically requires an appropriate national institution (the public forest administration) to be charged with the management of forest resources, closely linked to, and coordinated with the remaining institutions which carry related responsibilities. The planning of land use, the establishment and strengthening of infrastructure and services, the management and utilization of natural resources and the development based on them, require a multi-sectoral approach with the participation of multi-disciplinary teams.

13. Rural organizations should play a leading role as protagonists of forestry development. Moreover, public and private enterprises can and should contribute to attaining economic and social objectives, by adapting themselves to the natural and social conditions. As far as the public forestry administrations are concerned, their technical capacity, flexibility of operation, links with other organizations and public image and reputation are important factors in the successful execution of their functions as principal executors of forest policy and forest legislation.

14. The education and training of forestry professionals (as dealt with separately) can be considered to fall within the same framework, the aim being to provide sufficient knowledge and skills to deal with the problems of tropical forest management, including the prior planning of land use. The education of other professionals, particularly those working in the fields of agronomy and animal husbandry, should also contain elements of knowledge concerning the natural environment, the tropical forest resources and the need for their management.

15. Although progress has been achieved, there is still a lack of well developed institutions in many tropical countries. It is this institutional weakness that has made it difficult to check the processes of desertification and forest destruction and to develop forest potentialities. On the other hand, existing examples of good management, practised by competent forest institutions, are proof of the important role that the public forestry administrations can play.

16. Therefore, every country should analyse its institutional situation with regard to the tropical forests and take measures:

- a) to ensure the efficient functioning of an institutional framework, with public and private sector;
- b) to ensure that the Public Forestry Administration, as the institution with main responsibility for tropical forest resources management, enjoys suitable standing within the country's institutional structure;
- c) to supply the Public Forestry Administration with the necessary powers for strong development in the field and swift executive action;
- d) to guarantee coordination and harmony among the institutions having to do with tropical forest resources and with the populations concerned, establishing clear lines of responsibility and authority; and
- e) to amplify and reinforce the Public Forestry Administration field units, starting with areas of the highest priority, i.e. the most conflictive or critical, at the same time setting a target period (e.g. 10-15 years) by which such field units should have attained full operational maturity.

17. Given the importance of attaining full institutional development adapted to local conditions, the measures suggested should be based on assessments of the availability of national personnel, means, knowledge and experience, in order to implement them. If necessary, international cooperation should be sought in the early stages.

2.4 Education, training and extension

18. Tropical forest resources management is greatly dependent on the attitudes of the general public and the availability of skilled professionals, technicians and workers. Many developing countries in the tropics have established forestry schools that now produce substantial numbers of graduate foresters. The programmes of these schools need to be developed and strengthened in the following areas:

- a) Extension and public education

19. The general public and especially those who live near or are dependent for their living on the tropical forests should be informed about the values and the need for protection and appropriate use of this important resource. This information can be given as part of the government's general environmental education programme, through community meetings, or through the mass media such as radio, television and newspapers, or by the people themselves through their many communal organizations such as cooperatives, youth groups, religious groups and community management committees. It is usually a combination of these approaches that is most effective in obtaining the development of positive attitudes towards the forests and the human environment as a whole.

20. As a direct complement of the extension programme, primary and secondary school students should be taught the values, functions, necessity for, and characteristics of rational management of tropical forest resources. These programmes should be continuous, establishing goals at each major level of the general education system and should form a coherent and progressive teaching programme. Teaching staff must be suitably trained for this work. Textbooks, audio-visual aids and many other new teaching materials must also be made available if these programmes are to be taught effectively.

b) Professional education

21. Because of rapid advances in forestry technology and the recent reorientation of traditional forestry goals it is becoming even more important to modernize present curricula. This means that today's instructors must identify the current and foreseeable problems that will face their graduates and reorient the study programmes accordingly. One other important step that should be taken to meet the changes taking place in forestry today is to develop continuing education programmes for practising foresters. Such programmes should be given by universities, research institutes, national forest services and private enterprises, and may take many forms, i.e. seminars, formal courses, on-the-job training and study tours.

c) Technical education

22. A strong effort should be made to increase the number of technicians available for implementation of practical activities in the protection, management, and conversion of tropical forest resources. These technicians will have to come from many fields, viz: forestry, agriculture, zoology, ecology, anthropology, wildlife management, land management and other related fields. Bearing this in mind, actions that would help increase the number of technicians available are: 1) strengthening the existing technical schools, while reorienting, where necessary, curricula to deal more with the specific problems of the tropics; 2) creating new schools where none exist; and 3) re-training practising technicians to fit them better for their jobs.

d) Training

23. The principal goal here should be to train the employed or self-employed forest workers. Training should be done with a view to increasing the efficiency, productivity, and safety of the worker, while at the same time showing him how his job can be done without causing damage or destruction to the forest in which he works. Training of this kind can be done by private enterprises and vocational training centres. However, if such entities do not function well or are reluctant to become involved, the national forest service should organize and implement such programmes.

24. It is important to remember that all extension, education, and training programmes must be supportive of national forest policies. This is best achieved if training of the professionals, technicians and workers involved is done in their own country. However, it is often advisable to resort to training at foreign centres at graduate level or for specialities that are not available in the country because of technical and/or financial constraints. The establishment of regional training centres to carry out this type of training has many advantages and should be seriously considered. An important point concerning the above is that they should be conducted with emphasis on the tropical forest resources and the people living in the critical areas mentioned in this document. Failure to do this could mean the permanent loss of these resources.

25. In conclusion, it is suggested that, to stimulate public support and satisfy the manpower needs of tropical forestry programmes, governments devote the next five years (1982-86) to the reinforcement of extension, education, and training programmes.

2.5 Research

26. Given the very complexity and wealth of tropical forest ecosystems, which give shelter to between 40 and 50 percent of the species that exist on our planet, science still has a long way to go before it can claim full knowledge of these species, their behaviour and the complex interrelations of the system as a whole. This is no reason, however, to delay taking action; tropical forests and their dependent populations require action and there is already abundant experience and knowledge that can prove useful. Moreover, forest resources management is characterized by its gradual approach which can be continually improved on the basis of past results.
27. Tropical forests presently under management plans - 40 million hectares in the Indian subcontinent, 1.7 million ha in Africa and 0.5 million ha in America, excluding national parks and similar reserves - constitute an important source of experience. The results obtained by different silvicultural treatments form a vast store of knowledge on which to base new efforts in the management of tropical forest resources. Further study and research will add to this store of knowledge and will, in turn, improve applied techniques. Successive up-datings of management plans are tools for following up, evaluating and adjusting the initial plans. Consequently, it can be said that with the knowledge of tropical forest ecosystems already available and the experience derived from their treatment, judicious forms of management of tropical forest can be introduced, as long as research supports their different stages of development and options are kept open wherever possible.
28. Progress achieved in recent decades in many fields of science and technology has led to a closer understanding of the dynamics of ecosystems and related phenomena, such as water balance and soil evolution, erosion problems and geochemical cycles. There has been notable progress in inventory techniques, methods of land classification and evaluation, management of watersheds, soil protection techniques against wind and water erosion, as well as in afforestation and reforestation methods. There have also been advances in agro-forestry techniques. There are now ways to improve shifting cultivation and systems for transforming it into permanent agriculture under certain environmental conditions. Considerable progress has been made in methods of logging, machinery and equipment. Fuller utilization of forest produce has become possible through industrial advances, particularly the development of board and pulp industries and those that produce energy from wood wastes and residues.
29. Nevertheless, large gaps in knowledge still remain and scientific and technological advances in the field of tropical forests are an absolute necessity. These advances should include ecological, social, cultural and economic aspects in a balanced way. It is important, therefore, to coordinate, expand and reinforce relevant research efforts, particularly those directed to the fields with most marked gaps in knowledge and with most urgent needs for action. In situations of special urgency it may be adequate to resort to "expeditious research" in trying to find acceptable answers in the short term, without waiting for the best possible answers to existing problems. This type of situation would occur especially in the critical zones.
30. Integrated ecological research should serve as a basis for a better understanding of the functioning of tropical forest ecosystems, so that the fullest benefit compatible with their conservation can be derived from forest resources management. The relations of climate-water-soil-vegetation and the relations of ecosystems-niche-species should be basic subjects for ecological studies. Research on the different types of tropical forests should be closely associated with that on soils and agriculture.

31. A recent analysis ^Y of the research needs in the developing world with specific reference to the tropical zones, determined the indicative listing of research priorities which is given in ANNEX 7. Research priorities pertinent to various means of application of tropical forest resources management and to various types of tropical forest land use are suggested in Chapter 3, through appropriate references to ANNEX 7. Reference should also be made to the section on research needs included in each Chapter of the Unesco/UNEP/FAO publication "Tropical forest ecosystems" (Unesco, Paris 1978).

32. At the XVII Congress of the International Union of Forestry Research Organizations IUFRO (Kyoto, Japan, 6-12 September 1981) there was a clear consensus that the activities needed to increase forestry contributions to rural development in tropical and other developing countries presently lacked sufficient research, notably as concerns inter-dependencies between forestry and agriculture, energy and conservation. Special emphasis was laid on the lack of the socio-economic research needed in order to make forestry relevant to rural people and to involve them in forestry activities.

33. With regard to forestry research priorities in developing countries, the Congress adopted the following recommendations:

- a) Additional research is required to maximise the contribution of forestry to rural development (emphasizing the role of forests and trees in agriculture), to energy production and use, and to forest conservation.
- b) Governments, multilateral international agencies and bilateral donors should review their forestry policies and support the efforts of the World Bank and FAO in generating strategies for the expansion of research and its redirection towards currently perceived needs.
- c) IUFRO itself should examine its own structure in the light of such needs and consider modifying its organization to take full account of changing emphases in forestry.
- d) Governments, aid agencies and IUFRO should examine ways and means of generating additional funding needed for strengthening research related to forest resources in developing countries with the primary emphasis on improving the capability of national institutions.
- e) Governments, aid agencies and IUFRO should consider the need for, objectives of, and organization of alternative institutional arrangements for supporting national research institutions.

2.6 Raising of awareness

34. As indicated in 2.4, it is of utmost importance to ensure that the general public, specifically interested groups and selected individuals are well informed about the tropical forests. Information of the public, directed to raise awareness, is closely related to education and extension but deserves separate attention.

^Y "Forestry Research Needs in Developing Countries - Time for a Reappraisal ?" - World Bank/FAO, 1981. Prepared and presented by FAO and the World Bank at the XVII Congress of the International Union of Forestry Research Organizations - IUFRO - (Kyoto, Japan, 6-12 September 1981)

2.6.1 The public

35. The general public should be made aware of the benefits derived from the tropical forests when they are carefully managed and of the damage caused by their destruction or deterioration. For this purpose the tropical countries should design public information programmes for implementation through regular information channels, such as publications, pamphlets and audio-visual methods (television, radio, newspapers, pictures). Certain programmes should be directed at the general public and based on the reality in each country. Particular attention should also be paid to directing other programmes at special segments of the public, such as the populations living in critical zones. Suitable visits for the public should be organized (for example for rural leaders) to successful field activities.

2.6.2 Policy-makers

36. Lectures, meetings and round-table discussions on tropical forests should be organized for those who make decisions affecting the forest sector, rural development and land use planning. These activities, combined with suitable publications, should illustrate the links between forestry and rural development and convey information about the contribution of the forests to environmental protection and to socio-economic welfare in general.

37. The favourable results obtained in certain cases in tropical forest resources management and their benefits should be presented and interpreted in an attractive and detailed form through organized visits and publications for policy-makers. Such visits and publications should also include examples of schemes that have failed, giving information on, and deriving positive consequences from, the causes of such failures.

2.6.3 Government agencies

38. In order that the points of view of those responsible for the development of tropical zones may be better reconciled, it is advisable to stimulate a dialogue between the members of multi-disciplinary teams, so as to analyse the available alternatives and select the best ones with full awareness of their environmental, economic and social effects. Courses and meetings should be organized, in which the natural, economic and social parameters and the impact of each development alternative can be discussed. The organization of these meetings with the consequent feedback of knowledge from the participants could be an effective way of working towards the rational management of tropical forest resources. Agronomists, agricultural extension officers, rural sociologists and economists, among others, should participate in these meetings, together with foresters.

2.6.4 Private enterprises

39. The enterprises involved in wood harvesting, processing, transport and trade depend on the quality and continuity of raw material supply. The practices of private enterprises could be improved on the basis of a better knowledge of the tropical forest resources and of the consequences of inadequate management. In order to put this into practice, it is suggested that the governments of countries possessing tropical forest resources, design and carry out a national awareness programme concerning these resources. This programme should be fully developed within a given period - for example three years - and be kept up-to-date. It should include activities specifically directed at:
a) policy-makers; b) those in charge of the development of tropical zones in different

governmental organizations; c) the rural people living in or near forests; d) private enterprises; e) journalists and others working in mass communication; and f) the general public.

2.7 Surveys and assessments

40. A better knowledge of tropical forests implies better information about their potentials, extension, composition, and about their evolution, including notably their rate of transformation to other uses. This is obtained, ideally, by means of national inventories of appropriate design and quality and monitoring systems providing continuously, or at least periodically, up-to-date information about the tropical forest ecosystems which consider all components (e.g. soils, flora and fauna, including fish and micro-organisms) and their evolution with time.

41. The design and execution of these comprehensive inventories should:

- 1) be based on a clear definition of national land use and forest policy goals;
- 2) take into account the many possible uses of the forest resources;
- 3) allocate special priority and urgency to the tropical forest zones in critical situations;
- 4) take into account relevant socio-economic parameters such as those related to the income, goods and services that the forest may supply to the immediate populations;
- 5) include pertinent parameters for determining environmental impacts;
- 6) obtain the necessary data for planned forest utilization, for programming of silvicultural treatments and for other purposes such as conservation of genetic resources, wildlife, etc.;
- 7) provide data about forest biomass in view of cellulose and energy production;
- 8) provide information necessary for an evaluation of the capability of the land;
- 9) be designed according to the priorities set for the data to be provided and executed with adequate care by suitably qualified and dedicated staff.

42. The surveys should use the most appropriate data collection methods (remote sensing, photointerpretation, field sampling) and processing methods. The interpretation of the results should permit their evaluation and comparison at an international level.

43. Continuous forest inventories and monitoring activities should permit detection of changes related to both the forest resources and the immediate populations for the further analysis of their interrelationship and the causes of change. The information obtained through these inventories and monitoring activities should be processed as quickly as possible and presented in forms that are suitable for use by both planners and managers. Forest utilization enterprises should cooperate in the design and implementation of these studies in order to obtain data valid for both the users and the owners of the forests.

44. Priority should be given by Public Forestry Administrations to the survey and monitoring of critical forest areas, especially to mountain watersheds with high population pressure and to those zones in which uncontrolled deforestation or forest degradation take place.

45. It will take some time before the results of these national forest inventory and monitoring activities can be easily added up to constitute a uniform picture of the situation and evolution of forest resources at regional and global levels. In the meantime the FAO/UNEP tropical forest resource assessment programme should enlarge and update continuously the first data base obtained for 1980, which has been briefly presented in section 1.1.

2.8 Information collection and dissemination

46. In many countries, vast quantities of information on the tropical forests and related research remain unpublished and unavailable, due to lack of funds and other essential resources. Even when such information is published, it is not circulated widely either within or outside the country of origin; yet, to be of value, the information must reach a number of identifiable but quite separate users, such as research workers, forest managers, politicians, the mass media, the general public and the international forestry community. This implies that the same information has to be presented in several different forms in order to encourage understanding and rational development of the tropical forests. Therefore, it would be appropriate for the international forestry community to improve the collection, storage, updating, retrieval and dissemination of such information. It is necessary, in this connection, to distinguish between information of a permanent nature, which should be stored and made readily available as a basis for research and development, and information of a temporary nature, such as that concerning product marketing, which should be in a form appropriate for rapid dissemination.

47. For the first purpose, a network of information centres about tropical forests should be developed within the existing AGRIS and CARIS systems. It is suggested that this network make use of information on tropical forests now lying dormant in the files of existing national, regional and international organizations and agencies. Translation of papers into the main international languages should be encouraged and abstracts be made for wider use of those not being translated.

48. It is suggested, therefore, that at least one centre be selected and developed at the national level to collect, store and disseminate information about tropical forests and to collaborate with the regional and international centres responsible for these operations in their respective areas. At a regional level the organizations for multi-lateral and bilateral assistance should help to strengthen the regional information centres on tropical forests. At a world level a network of information centres should be built up. Appropriate international organizations, together with existing forest information centres such as the Commonwealth Forestry Institute of Oxford, could be the principal organizations in charge of establishing the network and distributing responsibilities. Adequate resources should be assigned for their operation. For that purpose, an international project should be set up to collect, within a period of five years, all information available about tropical forests and to publish the most important facts at least in English, French and Spanish.

3. ACTIONS FOR THE MANAGEMENT OF TROPICAL FOREST RESOURCES

1. The management of tropical forest resources aims at optimizing land use, in particular by linking forestry and agriculture, often under complex natural and socio-economic circumstances. Its means of application differ from those developed for the management of forest resources in temperate zones. Emphasis is, therefore, given in this Chapter to land use planning and to certain means of application of forest resources management particularly relevant today to tropical countries, such as agroforestry, wildlife management and others.

2. The management of tropical forest resources should rest on a stratification of the forest areas based on a classification of land use capability and then proceed to organizing and conducting practical activities. When dealing with the practical application of forest resources management in sections 3.2 and 3.3, an analysis is made of the objectives and main components of management as they apply in particular to certain types of critical areas which have been identified. Relevant research subjects for each type of critical area are also indicated, mainly by references to ANNEX 7.

3.1 Land use planning

3. As population increases and with it the concurrent need to accelerate food production, some existing tropical forest lands will have to give way to agricultural crop development. However, indiscriminate and unplanned clearing without acknowledging land suitability should be brought under control. Land use planning should help to identify areas suitable for permanent agriculture and should also provide, as indicated above, a general stratification of forest land based on established principles. An important purpose of this would be the determination of critical areas such as those discussed in 3.3.1 below, to be earmarked for priority action.

4. The characteristics of tropical soils, commonly of very low natural fertility, together with the climate, strongly limit the possibilities of agriculture and livestock development and generally make forestry in its various forms a rational and desirable land use option in the areas covered today by tropical forest. Unless heavy expenditure is applied, only a small proportion of these areas appears suitable for permanent agriculture. Forestry can and should be a viable land use option also for many tropical areas that are treeless today. In both cases it is necessary to ensure that forestry use options contribute sufficiently to the welfare of the immediate population and to rural and national development. The greater the demand for land, the greater should be the urgency and importance attached to land use planning.

5. Decisions regarding land use rest on a number of political, social, economic and physical factors, but systematic land classification factually based on the physical characteristics of the land, interpreted in terms of management objectives, should serve as a foundation for decisions on its final use. Land use classification involving a multi-disciplinary input will help to avoid clearing unsuitable land for agriculture or livestock.

6. The criteria for land use classification are normally based on the soil types, topography, climate, flora, fauna and other characteristics. Until now most of the methods used for land classification have been too slow, detailed and expensive, based on rather cumbersome procedures. Bearing in mind that the most important aspect of a land classification is its application, the present situation in tropical forests requires speedy methods with simple and economical techniques that permit a rapid classification at the local and national levels. In fact, this has already been done in several tropical countries.

7. Land use classification based on physical criteria but taking into account conflicting social and other demands, is most urgent in the critical zones, with threatened resources and needy populations. For the general purposes of tropical forest resources management the following broad land use groups can be considered:

- 1) lands to be devoted permanently to agriculture;
- 2) critical areas, namely: a) mountain watersheds; b) forest areas in zones with dearth of firewood; c) forest areas in zones with dearth of agricultural land; d) eroded forest areas; e) forests over-exploited for wood production; f) forest areas inhabited by aboriginal populations requiring particular government attention; g) remote forests of recent or impending accessibility; h) forest areas in small islands;
- 3) protected areas;
- 4) natural forests mainly for production;
- 5) natural forests mainly for protection;
- 6) areas set aside for man-made forests;
- 7) remote forests.

8. These broad groups take into account not only the inherent potential use of the land, but also the pressure weighing on it, so that management can be carried out according to the nature and magnitude of the problems, giving special priority to the critical areas.

9. It is suggested that tropical countries undertake and/or improve land use classification of their forest lands applying rapid, pragmatic methods and carrying out a broad zoning as a first approximation, taking into account social demands and then proceeding to programme identification for critical areas.

3.2 Forest resources management and its means of application

10. The difficult task of managing tropical forest resources can be facilitated by the long experience acquired in various forms of treatment of tropical forests, including both technical and traditional experience. Nevertheless, systematic research, which is a component of responsible management, should continue to give more guidance on the best methods and treatments to apply.

11. The emphasis in forest resources management will vary according to ecological and socio-economic conditions and will change as those conditions change which, in turn will influence the benefits to be gained from the resource. Having studied the forest ecosystem and having determined the products and services to be obtained from it, the management of tropical forest resources will turn to the actual means of application. These may include conventional techniques and treatments as well as other techniques, such as agroforestry. Analysis is made below of a number of such means of application that are relevant to tropical conditions. In addition, in keeping with the broad concept of forest resources management adopted in this paper, the harvesting, transport, industrial processing and marketing of forest products are also considered.

3.2.1 Agroforestry

12. For the purpose of this paper agroforestry is identified as the combination of agricultural crops with the development of natural or man-made forest, including the breeding of domesticated or wild animals, to supply needs of the local population for food. The "taungya" system and similar methods, the silvopastoral and agri-silvopastoral systems and the growing of forest trees for multiple use are included. Agroforestry thus provides a diversified output of forest and agricultural products.

13. The practice of intercropping, the growing of plants for food, fodder and fuel, managed forest grazing, the production of wildlife and fish are all components of agroforestry in the widest sense and are important tools of tropical forest resources management. The establishment and use of trees and woodlots within areas previously cleared for cultivation and grazing, the important role of trees in providing shade and soil protection combined with the production of wood, fruits, etc., can be considered as falling within the realm of agroforestry.

14. Agroforestry is based on the traditional experience existing in many tropical zones, but it requires development, based on research. ANNEX 7 (Sections (i), (ii) (C)) provides an indication of research priorities in this respect. Considering the potential of agroforestry to help the subsistence of the rural poor in tropical zones, and at the same time to contribute to the objectives of forest resources management, it is suggested that pilot programmes be developed at a national level, designed to show the productivity and stability of various agrisilvicultural systems.

3.2.2 Wood-based energy production

15. The growing demand for wood for energy production and its growing scarcity in many tropical zones of the world exert a strong pressure on the forests in some tropical areas. As described in Section 1.2, this situation is particularly prevalent in the drier tropics with open forest formations and a high population/land capacity ratio. The production of fuelwood should, therefore be given high priority for social as well as productive reasons, as an objective of forest resources management. As already mentioned, the study and map prepared by FAO on the situation of the developing countries with regard to fuelwood illustrate the requirements and availability of the resource at global and regional levels, paving the way for detailed work at the national level.

16. The fuelwood crisis has highlighted only certain aspects of the role of forestry in supplying energy. Also outside the drier regions, wood energy production is or can be a true objective of tropical forest resources management, among other objectives, and often complementing them. The development of special programmes for wood-based energy production and use requires research and development activities. Priorities in this respect are indicated in ANNEX 7 (Sections (i) (A), (B) 15 and (ii)). At a national level better information should be obtained concerning the present and future requirements of wood for energy, keeping in mind national energy plans. The capacity of many tropical developing countries to evolve and apply energy systems based on wood should be improved. It is essential that forestry institutions in these countries turn their attention to this field of activity. (See also paragraph 48).

3.2.3 Alternatives to shifting cultivation

17. As indicated earlier, a search for alternatives to most present systems of shifting cultivation is necessary. Shifting cultivation could continue as practised at present in remote zones with small populations (some areas of the Amazon, certain mountains in the southeast of Asia and parts of the Congo river) but in most other areas new systems must be evolved to improve or replace it. This is a major task of forest resources management in tropical areas and, in some of these, the first to be tackled.

18. Improved methods of shifting cultivation (in lightly populated zones) include the corridor system, the introduction of new crop varieties and new cultivation systems, introduction of tree crops, conservation farming techniques, conservation structures, improvement of the fallow with selected species, notably leguminous species, etc. An intermediate solution is the semi-permanent cultivation that requires relatively fertile soils or the frequent application of manure, a carefully managed sequence of crop/fallow rotation and short periods under herbaceous fodder for grazing.

19. Agricultural research and extension have a key role to play in investigating into and implementing alternatives to short rotation shifting cultivation, including its substitution with permanent agriculture. Generally, interrupting the natural recycling of nutrients by removing the forest cover requires the use of costly artificial fertilizer to maintain soil fertility. Some experiments have given good results using a minimum of ploughing, mulching and improving soils with vegetal wastes and practising polycultures, but, at the present time, permanent tree crops seem to provide the most satisfactory solution, as trees recycle their own nutrients. Tree plantations (e.g. African oil palm) or plantations for wood production seem, therefore, to provide a viable alternative to shifting agriculture when combined with integrated land use for food production. Such combined systems should be capable of supplying the current demand for food and for wood in appropriate areas. Research priorities are indicated in ANNEX 7 (Sections (i) (A), (i) (B) 1-6, (ii) (A) and (iii) (A) 2-3).

20. It is not enough to devise systems that are acceptable technically, socially and economically. Wide extension work and the provision of real incentives and market outlets are also necessary if a way of life formerly based on nomadic agriculture is to be replaced with another of a more stable type. Governments should try to encourage the establishment of alternatives to shifting cultivation by supplying technical assistance and incentives, giving priority to critical areas.

3.2.4 Wildlife management

21. As one component of the whole ecosystem, wildlife is also the concern of forest management. Furthermore, the human dependence on wildlife for proteins (up to 100 percent in the humid tropics) gives a special importance to knowledge of the fauna, its distribution and possible systems for its management.

22. There is little information about wildlife in the humid tropical forests. It is well known, however, that significant alterations in the forest decrease some fauna populations, due to habitat destruction, while others benefit and thrive with the transformation of the primary forest. This indicates the possibility of devising treatments that combine the improvement of plant production with the improvement of animal production. As there are no domestic animals specifically derived from wildlife and suited to life in the humid tropics, it is necessary to deepen knowledge of the wild species of fauna, above all, of the small mammals and fish, their distribution and behaviour, and of the effect on them of silvicultural treatments. On the basis of this knowledge it will be possible to design and test techniques of wildlife management within the context of the multiple use of the forest. At the other end of the tropical ecosystems, the savannas are suitable for domestic animals. In these areas the large wild mammals are more important as a tourist attraction than as a source of protein. Studies of wildlife are much easier here than in the humid forest.

23. Until now attention devoted to wildlife and its management in the tropical forests has been insufficient, especially in the humid forests. Forest resources management, focusing on the relationship between the forest and the local population, should give a higher priority to the fauna, including fish, as a source of protein and income for the population. It is suggested that countries devote attention to studies concerning wildlife and its management (see research priorities in ANNEX 7 (Sections (i) (D) and (iii) (B) 1-5).

3.2.5 Harvesting and transport of products

24. Harvesting and transport of forest products constitute a tool in forest management. However, if these activities are conducted without taking account of resource management criteria, they may become instead serious obstacles to obtaining natural regeneration and protecting the forest. For example, the intense exploitation of some tropical forests (e.g. the dipterocarp forests) using heavy machinery, compacts the soil and severely disturbs the ecosystem; some forest roads designed and established exclusively for economy of exploitation, become agents of soil erosion, while the great volume of unused residues in the harvesting of certain tropical forests results in unnecessary waste. (The possible effect of forest roads in promoting uncontrolled spontaneous agriculture is also discussed in 3.3.1 g).

25. All this indicates the necessity of paying attention to four subjects of particular importance: i) the design and use of machinery that does not excessively disturb the ecosystem (especially the soil); ii) the design and establishment of forest roads consistent with conservation criteria; iii) the adoption of measures to counteract the effect of the forest roads on the expansion of uncontrolled spontaneous agriculture and iv) the reduction of waste. The headings in ANNEX 7 Sections (ii) (C) 1-3 and (iii) (D) indicate certain relevant areas of research.

3.2.6 Industrial development

26. In many developing countries the tropical forest resources can be made a major factor of socio-economic development. This greatly depends on the forest industries and their socio-economic impact.

27. Suitable industrialization, using appropriate technology and institutional measures designed to supply domestic and export needs, can make it possible to attain full utilization of the potential output from the forests. A more favourable attitude towards conservation is also promoted in this way. Obstacles to the desired industrialization include the following:

- (a) insufficient knowledge of the potential that forest industries offer for rural and national development;
- (b) scarcity of qualified personnel at all levels, of business skills and of appropriate managerial and business attitudes;
- (c) insufficient utilization of wood of lesser known species;
- (d) lack of technologies appropriate to local conditions;
- (e) lack of domestic markets of sufficient size to attain an economic scale of operation;
- (f) inadequate infrastructure and services;
- (g) lack of outlets for residues giving rise to lack of integrated use and higher costs.

28. National efforts should be directed to overcoming these obstacles in particular by broadening local capabilities through training of qualified personnel in different managerial and industrial activities and through encouragement of local entrepreneurship.

29. The maximum use of the species already known, with the consequent reduction of waste and the utilization of new species, are significant factors in the fulfilment of forest resources management objectives. Certain research priorities in this respect are indicated in ANNEX 7 (sections (ii) (C) 1-4, (iii) (D) 2, (E) 2 and (iv) (B)).

30. In most tropical countries with substantial forest potential, governments should encourage the creation of local enterprises in order to facilitate the practical achievement of forest resources management through growing industrialization in the producing countries. Cooperation between exporting and importing countries based on mutual trust for projects involving shared benefits and risks (joint ventures) could be advantageous and in the difficult initial stages, when great technical and commercial problems can be encountered, it may be worth guaranteeing a minimum profitability to some foreign enterprises possessing the necessary know-how and the commercial channels to carry out projects which would further the national interest.

3.2.7 Marketing

31. Marketing directly influences all activities along the chain connecting producers and consumers of tropical products. The influence may vary greatly, depending on the type of forests and the way they are managed, on the state of processing facilities, on the role which the production and use of tropical forest products plays in rural and national development, and on the acceptance these products find in importing countries.

32. The basic objectives of marketing in relation to tropical forest resources management are widely recognized and can be summarized as follows:

- (a) to promote the fuller use of forest products in direct support of sound forest management practices;
- (b) to expand and optimise the application of timber and other materials from tropical forests in accordance with their respective properties.

Both objectives aim at improving economic returns from the resource and at supporting the important and increasing role which tropical forest products should play.

33. International work has concentrated, so far, on tropical timber marketing, emphasizing the improvement of market information, market research and development and the technical promotion of lesser used wood species within the framework of product research and development (see ANNEX 7 (section (iii) (E))). In the past, the most common forest utilization practice has been to exploit only very few species, resulting in practices of selective felling. This method removes the most valuable species from the breeding population, with a consequent impoverishment of the species and genetic resources of the forest. Countries possessing extensive tropical forest resources are naturally the most interested in reversing this trend.

34. There is a need to fully study the forest ecosystems, determine the utility of their components and their industrial potential, and promote them on national and world markets. Ideally, the development of large forest units (100 000 ha and more) should be promoted, comprising integrated industrial complexes capable of transforming most of the raw material that sound management will allow and with sufficient commercial outlets to absorb the production. Logically, the complete chain moves if the last link, the commercial one, "pulls" on the ensemble. Forest resources management would be made easier to the extent that necessary treatments and silvicultural measures would become economically possible because the resulting products could be sold.

35. The above concept would facilitate the rational harvesting of tropical forests concurrently with the resulting benefits of local and national socio-economic development. Of further benefit would be the demonstration of the direct economic utility of the forests to the nation and the immediate population. Developing countries should continue to promote forest products. Firstly, by stimulating the multiple use of the forest by the immediate communities; secondly, by promoting the domestic consumption of forest products, and thirdly, by encouraging the export of finished forest products and seeking to harmonize interests with importer countries. These three product outlets complement one another and can help to resolve the marketing problems experienced at present.

3.3. Priorities in forest resources management

3.3.1 Critical areas

36. Included in this group are those types of tropical forest areas, already indicated in 3.1, that are being deforested or degraded, or are threatened by these processes to an extent and/or in a manner that will be disastrous environmentally and/or socially. Logically, a specific area could fit into more than one of these types

For example, a mountain watershed which is eroded and also has an acute deficit of fuelwood. A given area could be included in several of the categories listed below, requiring the combined use of the management tools applicable to the corresponding types.

a) Mountain watersheds

37. Rural populations occupy mountain zones for various reasons:

- because they have been there from time immemorial as long-time settlers, nomadic occupants or shifting cultivators;
- because land hunger has moved them in from overpopulated and/or depleted areas;
- because they are refugees, due to natural catastrophes or social and political conflicts or forced emigration;
- because they are a floating population without work in search of subsistence.

38. When the effects of the land use practices of these populations under given socio-ecological, cultural and technological conditions surpass certain environmental thresholds, they damage the natural resources with a progressive destruction of ecosystems, causing soil erosion, reduced infiltration and increased run-off. The effect of this deterioration of the mountain watersheds is reflected in the areas situated down-stream, which suffer from floods, droughts, river channel shifting and silting in reservoirs and waterways.

39. The main objective of the management of mountain watersheds is to ensure sustained yield of the forest, soil and water resources and to adjust human practices to the requirements of environmental conservation. Meeting these requirements is beneficial for the mountain populations themselves and indispensable to preserve the timing, quantity and quality of the water regime and to protect the goods and services in the down-stream area which are dependent on or may be affected by the behaviour of the watershed. To this end it is often necessary to modify the land use pattern and to introduce management systems which are compatible with the conservation restrictions. Restoration work is often needed (afforestation, gully plugging and torrent control, landslide stabilization) and resettlement of population may be required. But in most cases the mountain population can be stabilized by introducing (a) permanent crops, (b) terracing for the establishment of forest trees and other conservation farming practices, (c) agro-forestry, (d) exploitation of minor forest products, (e) breeding of wildlife species in captivity, and (f) other activities such as handicrafts and cottage industries which may diversify the mountain economy, thus releasing the pressure on the land.

40. In many tropical mountain watersheds, the forest is or has been the predominant ecosystem and the management of watersheds is by and large a specific case of forest resources management. Watershed management should start with an inventory of the watershed resources, the goods and services to be protected down-stream and a study of the population and its needs. It should result in the formulation of integrated plans.

41. Research priorities intended to meet the needs of mountain watershed management are indicated in ANNEX 7 (Sections (i) (A), (i) (C) 1-7 and (iii) (A). Among them, the comparative study of erosion on lands under various uses is worth mentioning. The use of run-off plots and of representative and experimental watersheds to determine watershed behaviour and to test various biological and mechanical techniques for soil and

water conservation are usual methods to determine hazards and to define advisable conservation techniques. Other research subjects are the evaluation of the effects in market economy terms and the role of incentives. Subsidies and other types of incentive schemes are essential for the involvement of the local population in conservation work. But the rates of cost sharing for conservation practices should vary according to the benefit, to the farmer, to the local community and to downstream interests.

42. Considering the catastrophic effects that can be observed in tropical mountain areas as a consequence of the elimination of the vegetative cover and the wrong use of the soil, it would be desirable for governments to identify and allocate high management priority to mountain watersheds suffering from degradation problems or that may be threatened with them in the near future. It is suggested that they draw up management plans for such watersheds in close relationship with the development plans of downstream areas and that they strictly apply the measures foreseen in such plans including the necessary personnel and means. The participation of the population in the planning and development of watershed protection measures is essential to guarantee the results.

43. The international community should increase its efforts in favour of the management of watersheds, considering that the vegetation cover of such watersheds is not only an element for production but principally a means of protection.

b) Forest areas in zones with dearth of firewood

44. Characteristics of these zones include: destruction or degradation of the forests as a consequence of the excessive extraction of firewood, high population to land-potential ratio, generally open tree formations and advancing desert.

45. In these critical areas programmes should be developed in order to simultaneously: (a) produce fuelwood and other products in the quantities that are required; (b) involve rural communities in work in the forest, improving rural employment and income opportunities; (c) fight against erosion and desertification.

46. The principal specific components of these programmes would be: restoring of natural vegetation; afforestation with native or exotic species, generally suitable for treatment as coppice forest; regulation of grazing; efficient conversion and use of wood-based energy; substitution of traditional shifting cultivation with other alternatives; fighting wind and water erosion.

47. Relevant research priorities are indicated in ANNEX 7 (Section (i)(A),(B) 9-11, 15; Section (ii) (A)-(E); Section (iv) (A)). One of the research lines being developed for the inception and promotion of these programmes is the better utilization of existing genetic resources through the collection, evaluation, selection and improvement of species suitable for raising the standard of living of rural communities in arid and semi-arid zones. This work has already begun with the species Acacia, Eucalyptus and Prosopis.

48. In view of the gravity of the problems national programmes for this particular type of critical area deserve urgent attention and could be readily implemented, because projects are relatively simple, can be carried out using techniques that are known and can be easily put into practice by local populations. The action programmes recommended with regard to fuelwood and charcoal by the UN Conference on New and Renewable Sources of Energy (Nairobi, Kenya, 10-21 August 1981) are given below:

- Assess and evaluate forest resources in order to estimate their present and future sustainable yield of fuelwood, to identify deficit areas and areas in which reforestation is both urgent and practicable.
- Intensify and/or establish basic and applied research on more productive species.

- Support and promote work aimed at improving the efficiency of stoves and cooking utensils, develop low cost stoves and promote their widespread use, taking into account social and cultural acceptability.
- Improve preprocessing of fuels, including those presently wasted, such as twigs, branches and dry leaves, for use in direct combustion and other processes and improve the conversion and efficiency of charcoal making.
- Develop promising fuelwood and charcoal substitutes or supplements utilizing other new and renewable sources of energy.
- Increase and/or establish reforestation and afforestation programmes with selected and tested species.
- Promote and support programmes, projects and activities to establish large-scale plantations including afforestation in deficit areas and woodlots, establish distribution, control and pricing policies, and improve conversion and utilization technologies (charcoal production and gasification, kilns, ovens).

c) Forest areas in zones with dearth of agricultural land

49. Excessive population pressure on a natural environment that is unsuitable for the intensive type of agriculture required to support it ultimately results in the forest's destruction from the use of fire for land clearing, exhaustion of soils through short rotations, clear cutting of vegetation and, in dry zones, overgrazing. Factors contributing to land hunger are poverty, shortage of food and landless local or immigrant populations.

50. The measures to be adopted in these critical areas would often be designed initially to increase food production and to generate employment, but may include combinations of the various components of management mentioned under 3.2. In many cases agroforestry (3.2.1), the production of wood for energy (3.2.2) and the application of alternatives to shifting cultivation (3.2.3) will be particularly relevant.

51. It is important that developing countries undertake specific projects directed towards these critical areas with the aim of creating stable activities that contribute to maintaining adequate standards of living in the local communities and the conservation and development of forest resources. Such projects are not easy to implement and should be based on the know-how of countries with experience in the multiple use of tropical forest in areas subject to high population pressure. TCDO¹ projects or networks of projects with an important component of applied research should also be considered, concentrating means and resources to obtain results applicable in groups of countries with similar conditions. Relevant research priorities are indicated in ANNEX 7 (Section (1) (A) and B; Section (11) (A) 2 and 3).

d) Eroded forest areas

52. The principal characteristic of these areas is the deteriorated state of the forest resources. The main objective in these areas should be to restore the ecosystem in order to recover its protective and productive functions. Restoration/rehabilitation work is a source of employment until the forest resources can provide continuous opportunities for work.

53. Afforestation is the most important factor in the rehabilitation of these critical areas and would often be suitably carried out through the creation of communal forests, with participation and assistance of the public forestry administrations, providing regular work in forestry. The participation of communities in the ownership of the forest does not exclude an initial remuneration for afforestation work, in order to improve the income of the population from the start of operations. Such participation could be the best guarantee for the conservation of the forests that are created. Other activities such as agroforestry, wood-based energy production, etc., could be promoted, depending on the national and socio-economic conditions in the area. When the man-made forests are ready for harvesting, industrial development should be encouraged.

54. Research priorities are indicated in ANNEX 7 (Sections (i), (ii) (A) and (iii)(A)), including work on the genetic material to be used in afforestation (native or exotic species) on soil preparation and plantation methods and on silvicultural techniques. Social considerations should play an important role in the design and evaluation of the above programmes and this should be supported by research.

e) Forests over-exploited for wood production

55. Over-exploited areas result from lack of control and/or management. Excessive harvesting and inappropriate logging methods can severely damage forest stands and result in proportionally heavy waste. This gives rise to a degraded resource which is further depleted through clearing and short-term cultivation by uncontrolled spontaneous settlers.

56. First of all, such wasteful practices should be halted. Rehabilitation work can be undertaken through the application of appropriate silvicultural treatments involving as much as possible the immediate population. Incentives provided through opportunities for agrisilviculture and employment in rehabilitation work and future harvesting may win the support of this population. The type and application of the silvicultural treatments for the improvement and rehabilitation of these forest stands will become important subjects for research, together with those on management. Certain research priorities are indicated in ANNEX 7 (Section (ii) (B) 2; Section (iii) (A) 4-5, (C) 1-4 and (D)).

f) Forest areas inhabited by aboriginal populations requiring particular government attention

57. Several tropical countries have special policies concerning the aboriginal populations that live in the forest. In certain cases these forests are protected for the sake of such populations, but in other cases their integrity and the way of life of their inhabitants are threatened by conventional development. It is therefore important to clearly define these areas or reserves upon which such populations depend and take urgent measures according to the objectives of national policies in this respect (see ANNEX 7, Research priorities, Sections (i) (A) 1-2, (D) 3; (iii) (A) 3 and (B) 4). It may be necessary to enact appropriate legislation, undertake management planning and create buffer zones for the protection of these critical areas.

g) Remote forests of recent or impending accessibility

58. Certain development projects not necessarily related to forestry include the opening up of remote forests as a consequence of road or railway building. Experience shows that this often results in the destruction of forests within the spheres of influence of these new access possibilities. These negative effects can be avoided by designing land use through capability classification of appropriate areas ahead of development, clearly defining the forests to be set aside for continued production and/or protection. Regrettably, critical areas have resulted from this lack of planning, while other areas are now threatened by impending uncontrolled development of access. Priority should be given to rehabilitating forest areas already degraded and to ensuring that new projects will help to develop rationally the relatively undisturbed tropical forest resources affected by them.

59. Consideration should be given in the management of these critical areas, to the rapid application of measures selected from those appropriate to remote undisturbed forests (3.3.6) and silvicultural treatments, or other measures for natural productive forests (3.3.3), as well as over exploited forests (3.3.1 e).

60. It is suggested that governments pay particular attention to the tropical forest areas that are affected by new communication routes, making anticipatory land capability classifications and implementing forest management where appropriate. In those forests already affected, restoration measures should be undertaken through natural or artificial regeneration. Agroforestry activities, wildlife management and other related activities should be promoted.

h) Forest areas in small islands

61. The problems resulting from the relationship between forests and their immediate populations can be particularly serious in small islands, due to the forced isolation and limitation of resources on which an increasing population is living. Therefore, measures should be applied appropriately, selected from those discussed for the critical areas already considered. The population's awareness of the value of the forests and their resources should be obtained through a good public relations and interpretation service, directing management objectives towards the multiple use of the forest for the benefit of as many rural people as possible, thus ensuring the stability of the resources.

62. It is suggested that the activities of developing countries related to tropical forest resources in small insular environments should receive international support with the development of model projects where the specific problems of these critical areas and their best solutions can be investigated (see ANNEX 7, Research priorities (Sections (1) (A) (B)(iii) (A) 1-3, (B) and (C)).

3.3.2 Protected areas

63. The areas so classified are those of particular interest, due to their great ecological variety, the richness of their fauna, their scientific aesthetic and recreative values, or due to the unique or outstandingly representative sample of the natural ecosystems they represent, because they contain important genetic resources that may be in danger of destruction or extinction.

64. The objectives of the establishment and management of these reserves may include: (a) the protection of their values for the use of present and future generations (national parks that are opened with restrictions to tourists), (b) the conservation of ecosystems and genetic resources (strict nature reserves normally situated within national parks or nature conservation reserves), (c) Unesco/MAB Biosphere Reserves, the functions of which are those of research, education and training, in accordance with internationally accepted criteria. In protected areas, the objective of resource preservation will prevail over all others (productive or social development) although, in some cases, (e.g. national parks and managed resource areas) the generated tourist activity can produce important social benefits.

65. National parks and equivalent reserves ^{1/}should be placed under a master plan directed towards the management of their natural resources, including the inventory of resources and values of the protected area (after land capability classification), interpretation for visitors, route planning, the development of infrastructure and services, studies to be performed periodically (with special attention to the impact of the visitors) and the treatment of the buffer zone surrounding the park.

66. The management of "strict nature reserves" and "nature conservation reserves" for the conservation of genetic resources should generate a permanent flow of information about such resources and their future potential. It should serve as a basis for studies aiming at the rational management of natural ecosystems. It may require some maintenance of species in sub-climax stages that could disappear if natural succession were allowed to progress unhindered.

67. The main purpose of the biosphere reserves established under the auspices of the MAB Programme Project No.8 is to deepen the knowledge of tropical forest ecosystems through research and to spread and apply the knowledge obtained. One of the main results should be the training of national personnel in the different fields of research.

68. In view of the importance of the function of protected areas in tropical countries, especially for the future of mankind, it would be advisable for each nation to carry out systematic studies of the tropical forest areas in order to determine the areas that should be established as national parks or equivalent areas, strict nature reserves and nature conservation reserves, in accordance with the categories drawn up by IUCN^{2/}

69. The international community, which stands to benefit from the protection of these resources, should define various assistance and financing arrangements so that the developing countries responsible for this protection and conservation can be supported in taking the necessary measures. (See ANNEX 7, Research priorities Section (iii) (B)).

3.3.3 Natural forests mainly for production

70. This group comprises the forests primarily destined to produce raw materials - normally wood - lying outside the zones in which the needs of the immediate population must be given relatively high priority. In most cases the reason for this is the very low density of population in these forests and in the neighbouring areas.

71. Since the production of wood is the main objective, the heterogeneity of tropical forests in their natural state may lead to their conversion to a more homogeneous or even artificial forest, bearing in mind the full ecological implications of this. Treatment options to be considered cover the range of mono- or polycyclic silvicultural/harvesting systems already known and, in many cases, already applied to tropical forests, resulting in stands of uneven or more or less even-aged composition. These may involve, when necessary, the artificial enrichment of poorly

^{1/} In 1975, 62 countries with territories in tropical or subtropical zones had established 460 national parks or equivalent reserves, which include a low representation of lowland humid tropical forest. Unesco's MAB programme contemplates the establishment of a net of biosphere reserves until now comprising 5 in Africa, 5 in America and 7 in Asia, within the tropical zones.

^{2/} Categories, Objectives and Criteria for Protected Areas - IUCN, 1978. A final report prepared by the Committee on Criteria and Nomenclature, Commission on National Parks and Protected Areas.

stocked stands. The utilization of the rapid and spontaneously growing secondary species is another important consideration, together with the option of creating man-made forests of fast-growing timber trees whose wood may be of lower unit value than that of natural tree species, but whose volume increments are far higher.

72. As indicated in 3.2.7, the methods used to manage tropical forests for wood production will largely depend on the marketing of the products. In any case, methods should be simple and flexible and be supported by constant research so that the treatment is fitted to the requirements of the stand. Experience should improve this type of management of tropical forest resources and should rapidly provide each country with a sustained supply of wood equivalent to those volumes that at present are harvested without management or control.

73. The design and execution of a good harvesting and transport system (3.2.5), industrial development (3.2.6) and marketing (3.2.7) will be essential tools of management. Units large enough to supply integrated industries and develop domestic and foreign markets for the different products obtained will facilitate the success of the management and the fulfilling of its objectives.

74. Lines for research are suggested in ANNEX 7 (Section (iii) (A)-(E)). It is important to concentrate on deepening knowledge about the structure of the forest and perfecting regeneration and timber stand improvement treatments, as well as evaluating the response of the stand to different harvesting methods. In this way, better guide lines can be established for a tropical silviculture adapted to each situation. It should be stressed that the management plan and its revisions are the best framework in which to carry out an appropriate research programme.

75. The execution of a complete programme for the management of forest resources for wood production will involve a great effort by the countries with tropical forests. It will require, above all, sufficient qualified personnel and the mobilization of considerable means and resources. It is suggested that governments should aim at bringing under management all the tropical forests destined principally to produce wood within a period no longer than 15 years.

3.3.4 Natural forests mainly for protection

76. Land-use capability classification will help determine the forest areas intended primarily for protection purposes. Their selection will conform with topographic characteristics (including slope), soil structure, climatic factors such as rainfall and prevailing winds, and evidence of desertification problems. Management should give priority to environment protection, but production functions compatible with this should not be neglected. The management that appears best theoretically is not always possible, due to lack of personnel and means. In many cases it will be limited to protecting the forest against external disturbances. If these come from the immediate population, it will be necessary to include in the management measures that can enlist the support of the population, so as to meet management objectives. Management may thus have to involve substantial transfers of resources from society into the area set aside for protection in order to pay for the functions it performs. Once again, a management system is required which can deal properly with forest-population relationships, as the only practical way to achieve stable environmental protection.

77. Bearing in mind the important function performed by protective forests in defending and protecting soil and water resources and influencing climatic conditions, governments should take measures for the conservation of these forests. These measures should satisfy the needs of the immediate population without threatening the conservation of the forest. (See ANNEX 7, Research priorities (Sections (i) (A) and (C), (iii) (A) and (B)).

3.3.5 Areas set aside for man-made forests

78. The growing global demand for wood as raw material for industry, the increasing need for wood in developing countries themselves, and the new perspectives for its use for energy enhance the economic role of the many tropical areas suitable for the establishment of man-made forests of fast growing tree species. Because of their high productivity, such forests can alleviate pressures on natural forest resources and better provide for population needs.

79. The planning and management of man-made forests should consider both the foreseeable national and world demand for these products and the social demands of the immediate populations. The conditions already mentioned in connection with eroded forest areas (3.3.1 d) should be taken into account for afforestation programmes. The immediate populations should participate in the ownership of man-made forests and take part in the related rights and responsibilities. They should also participate in the industrial developments based upon afforestation schemes. Possible contracts should be studied that would permit afforestation programmes to be set up with capital from countries importing forest products. The participation in these contracts of the rural communities concerned, together with national or foreign enterprises, should be promoted.

80. Site evaluation, species selection, the production of selected genetic material, methods of soil preparation and plantation and subsequent maintenance and protection will be the main techniques to apply, supported by relevant research and experience. The social component will also be important in order to understand the population's needs and attitudes and obtain their agreement for the programmes and their participation. In a second stage, other components will be involved, e.g. harvesting and transport, industrial development and marketing.

81. It would be desirable if each tropical country were to study and implement afforestation programmes with a social as well as a productive bias aimed at both raising the rural population's standard of living and supplying wood for internal use and/or for export. (See ANNEX 7, Research priorities (Sections (i)(A), (iii)(A)2 and (iv)(A) and (B)).

82. International cooperation should promote the adoption of adequate specialized technology including the selection of genetic material, logging systems, transport of small-sized products and industrial conversion of raw material.

3.3.6 Remote forests

83. In certain tropical countries there are vast, as yet unused forest areas which are not likely to be opened up in the near future. These forests exert a protective and environmental function of great value and will contribute significantly to future production.

84. The actions to be taken in these forests should concentrate initially on the control and monitoring of their state and evolution in order to avoid their disturbance, and on the study of their resources, with a view to keeping management options open for possible future development, such as the construction of communications, the building of reservoirs, or the establishment of transmigration schemes. (See ANNEX 7 Research priorities (Section (iii) (A) and (B)). The monitoring of these forests could benefit from international cooperation in the use of remote sensing systems, through such programmes as GEMS.

4. HARMONIZING INTERNATIONAL ACTION IN SUPPORT OF NATIONAL EFFORTS ON TROPICAL FOREST RESOURCES MANAGEMENT

1. An attempt to harmonize international action should logically start by taking into consideration the international activities which have been and are currently being developed in the relevant fields. This should facilitate suitable coordination of the capabilities involved to obtain optimum efficiency in accordance with the mandates and objectives of each organization concerned and the wishes and strengths of each collaborating country. Therefore, this chapter starts with a summary of past and present international action in tropical forestry, with particular reference to international agencies.

2. Besides being harmonized, international action could be substantially reinforced, in particular through a more active participation of bilateral assistance programmes, especially of countries already active in this field. It is felt that the description of elements in 4.2.5 below and their combinations, could serve as a framework to encourage adequate bilateral assistance in appropriate fields.

4.1 A summary of past and present international action^{1/}

3. The continuous shrinking of the tropical forest area has caused worldwide concern. Most important is the growing, urgent awareness of the countries possessing tropical forest resources of the need to manage them well. This is increasingly reflected in the multilateral and bilateral arrangements these countries are entering into in search of technical, scientific and financial support to their own efforts towards managing these resources.

4. Concerned international organizations are giving growing attention to tropical forests, increasing their efforts to learn more about them and striving to become better acquainted with relevant techniques and ways to integrate these resources into rural and general socio-economic development. International banks are becoming more oriented towards financing a wider range of forestry projects in tropical zones. Bilateral and multilateral aid programmes of developed countries are including activities related to tropical forests to an increasing degree.

5. International work carried out so far covers a wide field. However, in many cases outstanding results have not been achieved. The reason for this is often that the basic requisites such as the proper definition and development of land use and forest policies, legislation and institutions and the training of adequate numbers of staff were not provided for at the beginning. The requirements are so multifarious that it will not be enough to coordinate efforts better but it will also be necessary to increase resources and means considerably.

^{1/} A more detailed description of past and present international cooperative activities in the field of tropical forestry promoted by UN agencies, international organizations, and bilateral arrangements will be presented in a supplement to the present document.

6. FAO, as the lead agency amongst international organizations in the field of forestry, has through its mandate and by its experience, provided substantial direction and support to the developing countries during the last 35 years, in strengthening institutions, including forest services, forestry research centres, forestry schools and training centres. FAO's activities have also covered inventories - particularly those carried out in priority areas of tropical forests - the improvement of logging techniques, product utilization, and industrial development, as well as work related to national parks, wildlife and watershed management. Special attention is being given by FAO to the social orientation of forestry, following the principles and plan of action of the World Conference on Agrarian Reform and Rural Development (WCARRD), which are reflected in the "Forestry Strategy for Development" approved by the Conference of FAO in 1979.

7. FAO also pays attention to the design of appropriate forest industries for developing countries and to the acute problem of fuelwood shortages, and to the production of energy from forest biomass. The contribution of forests towards improving the natural environment is, as is traditional in forestry, a main thrust of FAO's Forestry Department. The importance of FAO's field activities in implementing these policies must be stressed (more than 167 field projects in 1981 in connection with tropical forests). These projects provide direct support to most tropical countries in activities ranging from wildlife management to forest industries, with special emphasis on enhancing the self-reliance of the countries themselves and their institutions.

8. Unesco's foremost activity with respect to tropical forests comes under the Man and the Biosphere Programme (MAB) carried out by the Division of Ecological Sciences. The main effort centres on Man and the Biosphere (MAB) Project No.1. (Ecological Effects of Increasing Human Activities on Tropical and Sub-tropical Forest Ecosystems), with a network of some 20 integrated pilot research projects and some 90 research projects overall. In addition, 37 biosphere reserves are located in the tropics and are the sites of at least two dozen additional research projects under MAB Project No.8^{1/}. This programme maintains close collaboration with FAO. The training and research and the strengthening of research centres are priority activities of the MAB Programme.

9. UNEP has been entrusted by the UN General Assembly with the role of catalysing and coordinating environmental action within the UN system. The action plan arising out of the Stockholm Conference (1972) addresses the interrelated activities of environmental assessment, environmental management, and supporting measures.

10. UNEP's budget, mainly comprising the Environmental Fund, composed of voluntary contributions, is used selectively to promote action on the most critical aspects of the current environmental crisis. The monitoring of the changing state of the environment concentrates on those ecosystems which are basic to survival, under the concept of managing natural, renewable resources for optimal yield. Forest ecosystems have been, and are being, allocated high priority. UNEP has drawn attention to the need for integrated, coordinated efforts in correct resource conservation and use, in order to develop priority actions to reverse the deteriorating ecological situation in the tropics. It is within this framework that the first Expert Meeting on Tropical Forests was held (1980) and the holding of the second meeting was recommended. UNEP, furthermore, has promoted important events on the subject of environment which are related to tropical forests, such as the UN Conference on Desertification (1977). UNEP cooperates closely with FAO on various projects dealing with the monitoring of tropical forest cover, conservation of forest genetic resources and inventory and evaluation of tropical forest resources.

1/ "Conservation of natural areas and the genetic material they contain, embracing the concept of Biosphere Reserves".

11. UNCTAD, through its Integrated Programme of Commodities, shows an interest in tropical timbers, and thus in tropical forests, their management and development, as well as related research. It is hoped that an international arrangement on tropical timber under the Common Fund for Commodities will help countries in their activities in this field in close collaboration with FAO.
12. UNDP plays a leading role in the UN system for the funding and servicing of field projects dealing with tropical forests. Other UN agencies also collaborating with FAO include UNIDO in integrated wood industry projects, ILO with regard to skilled worker training and WMO on the subject of forest meteorology.
13. The World Bank, since 1978, has increased the amount of loans for the forestry sector, with projects in more than 20 countries, according special priority to forestry projects oriented towards rural development, wood-based fuel production and environmental protection (mountain watersheds, arid zones). The regional banks are moving towards playing a greater role in this respect. The Interamerican and Asian Development Banks have defined a forest policy which is mainly oriented to the utilization of natural forests, the establishment of industries, infrastructures, afforestation and reforestation.
14. The World Food Programme (WFP) gives assistance to forestry activities in tropical countries amounting at present to approximately US\$ 134 million and concerning 37 operational or approved projects. These projects assist in a wide range of labour-intensive works such as reforestation, forest road construction, dune fixation, watershed management and agro-forestry.
15. IUCN is a network of governments, non-governmental organizations, scientists and other conservation experts, working together to promote the protection and sustainable use of living resources. IUCN carries out an integrated programme of activities to promote tropical forest conservation, including efforts in the areas of planning, law, education, species conservation, protected areas, and ecological research.
16. The World Wildlife Fund (WWF) is the largest international, non-governmental organization dealing with conservation in terms of fund raising and publicity. Funds are allocated to IUCN/WWF projects for the protection of endangered species and their habitats, research, promotion of new reserves and public information on species and habitats in danger of extinction.
17. Particularly since its XVI World Congress (Oslo, 1976) the International Union of Forestry Research Organizations (IUFRO) has been paying growing attention to the research needs of developing countries, mainly with respect to tropical forests and their products, both in terms of research subjects and institutional membership. The recommendations adopted in this respect by the XVII IUFRO World Congress (Kyoto, September 1981) have been quoted in Section 2.5.
18. There are several countries which have programmes for international cooperation that comprise important activities related to tropical forestry. These include: Australia; Belgium; Canada; Czechoslovakia; Denmark; the Federal Republic of Germany; Finland; France; Hungary; Japan; the Netherlands; New Zealand; Norway; Sweden; Switzerland; the United Kingdom, and the United States of America. The most important cooperative activities of these countries are carried out in the following fields: education, training and extension, research; information; inventories and evaluations; forestry for community development; management methods and techniques; agri-silviculture; shifting cultivation; afforestation, including fuelwood plantations; protected areas; wildlife management; conservation of forest genetic resources; and wood utilization.

4.2 An outline for concerted international action

19. The serious situation of the world's tropical forests, particularly in critical areas, calls for urgent action by the governments in whose territories these forests are located. The main cause of this situation is the poverty of the immediate populations. Tropical forest resource management must, therefore, include among its prime objectives that of alleviating rural poverty.

20. The great effort required on the part of governments to undertake large-scale tropical forest resources management should stimulate increased international cooperation, since the results obtained will not only benefit the countries concerned but the community of nations as a whole. The efficiency of this cooperation could be improved by harmonizing, coordinating and increasing multilateral and bilateral efforts in accordance with established priorities and urgencies, avoiding gaps and duplication. The purpose of the outline and elements for concerted action that follow, is to provide a specific basis for attempting this exercise.

4.2.1 Long-term aim

21. Recognizing the sovereignty of the countries for the utilization of tropical forests and other natural resources of their territories, the long-term aim is to contribute towards the socio-economic development and environmental protection of the countries, by assisting governments upon request:

- to conserve tropical forests and their resources;
- to realize their potentialities for socio-economic development through multiple use management; and
- to promote the welfare of the immediate populations.

4.2.2 Objectives

- 22.
- 1) To promote world-wide, well-coordinated cooperation towards tropical forest resources management.
 - 2) To improve the world-wide knowledge on tropical forest ecosystems and their interrelationship with human communities.
 - 3) To promote the advancement of techniques, technologies and other means for forest resources management.
 - 4) To assist the countries in achieving the requisites for tropical forest resources management.
 - 5) To assist the countries, through national and pluri-national projects in planning and carrying out tropical forest resources management.
 - 6) To encourage investments in tropical forest resources management.

4.2.3 Characteristics

- 23.
- 1) To harmonize, coordinate, and encourage the international cooperation activities.
 - 2) To identify critical areas and to give priority to them as the most urgent problems, carrying out simultaneously other medium and long-term activities.

- 3) To promote regional actions and projects that could be adapted to various countries or similar areas.
- 4) To strengthen existing programmes and projects devoted to tropical forests.
- 5) To ensure that direction and guidance are provided by the governments of the countries in whose territories tropical forests are found, as well as cooperating governments. This could be arranged through a high level intergovernmental mechanism, charged with overall responsibilities including planning, monitoring and evaluation. The existing FAO Committee on Forest Development in the Tropics would be able to discharge these responsibilities if suitably restructured.
- 6) To provide assistance and/or advice on request.

4.2.4 Content and structure

24. The primary structure of the proposal for concerted international action is based on 30 elements following the sequence established in Chapters 2 and 3, which allows for suitable combinations to deal with the variety of problems in forest formations occurring within both tropics. Of the 30 elements, 1 to 8 are intended to help fulfil the requisites for tropical forest resources management. Elements 9 and 10 are aimed at improving and applying available knowledge concerning land use planning (9) and about methods and techniques of tropical forest resources management (10). The seven elements which follow (11 to 17) are intended to develop and improve the means of application of tropical forest resources management. Elements 18 to 25 deal with eight identified types of critical areas, with the double aim of arresting forest destruction or depletion and combating poverty. Finally, elements 26 to 30 deal with protected areas and with production, protection, man-made and remote forests. The content and justification of all elements are dealt with through appropriate cross-references to Chapters 2 and 3.

25. The means and capabilities developed and strengthened through the first seventeen elements would be applied in the remaining elements which refer to forest resources management in specific situations. The application and testing of these means and capabilities would allow for their continued improvement through accumulation of experience.

26. The programme would enlist the cooperation of a group of national institutions in countries having tropical forests (e.g. public forestry administrations, universities, research institutes, extension services), international agencies and organizations (UNEP, FAO, Unesco, IUCN, IUFRO, etc.) and national institutions and organizations of countries carrying out international cooperation programmes.

27. Most activities would be developed within a set of projects (related to individual countries or groups of countries) which would cover a network of tropical forest areas. In this network the concept of forest resources management and its means of application would be applied, the knowledge and techniques would be improved (basic and applied research and practical training) and the requisites would be strengthened. However, the main purpose of the projects carried out in critical areas would be to urgently solve existing problems.

4.2.5 Summary of elements

28. Element 1 - Land use policy, forest policy and legislation

- a) Purpose: To assist countries in defining or re-defining national policies on tropical forests and in drafting related land use legislation
- b) Justification and content: (see 2.1)
- c) International cooperation: technical assistance
- d) Implementation: Advice to the responsible institutions, comparative studies, publications
- e) Duration: First stage - 5 years.

29. Element 2 - Progress of rural communities

- a) Purpose: To assist countries in designing and/or implementing projects and/or project components in support of rural development based on forest resources and/or potentials, with special priority to critical areas
- b) Justification and content: (see 2.2)
- c) International cooperation: Technical, financial and food assistance
- d) Implementation: Advice to the responsible institutions and support to pilot and demonstration projects
- e) Duration: First stage - 10 years.

30. Element 3 - Institutional development

- a) Purpose: To assist countries in strengthening the capability of the national forestry institutions for tropical forest resources management and other institutions responsible for rural development, particularly with reference to critical areas
- b) Justification and content: (see 2.3)
- c) International cooperation: Technical assistance, pre-investment projects
- d) Implementation: Advice to responsible institutions and support to pilot and demonstration projects
- e) Duration: First stage - 10 years.

31. Element 4 - Education, training and extension

- a) Purpose: To assist countries in developing environmental education programmes for the public; in training of professionals and technicians responsible for tropical forest resources management; in project planning and implementation and in organizing and

managing forestry extension services in tropical forest areas, using appropriate and advanced techniques of communication

- b) Justification and content: (see 2.4)
- c) International cooperation: Technical assistance, pre-investment projects, means and equipment, fellowships, financing of courses, seminars and study tours
- d) Implementation: Advice and assistance to responsible national institutions and to regional and international centres
- e) Duration: First stage - 10 years.

32. Element 5 - Research

- a) Purpose: To assist countries in the elaboration of national research programmes concerning natural and man-made tropical forests, the interdependencies between forestry, agriculture, energy and conservation and the socio-economic aspects of the involvement of rural populations in forestry activities; in strengthening research institutes; in training research personnel; and in planning and executing basic and applied research projects and in disseminating research results
- b) Justification and content: (see 2.5)
- c) International cooperation: Scientific and technical assistance, pre-investment projects, means, equipment, financing of activities
- d) Implementation: Advice and financial assistance to universities, public forestry administrations and national, regional and international research centres, with particular reference to areas where tropical forest resources management and its instruments are applied, including the MAB reserves
- e) Duration: First stage - 10 years.

33. Element 6 - Raising of awareness

- a) Purpose: To assist national efforts aimed at informing and educating the general public and selected segments of it; at promoting a better knowledge base for policy-makers; at encouraging dialogue between governmental or non-governmental agencies responsible for the development of tropical areas; and at ensuring conscious participation of private companies in matters concerning the conservation and management of tropical forest resources
- b) Justification and content: (see 2.6)
- c) International cooperation: Technical assistance, means, audio-visual equipment, conferences and exhibitions

- d) Implementation: Assistance to responsible institutions, provision of special facilities for congresses and exhibitions and to the communities in towns and villages
- e) Duration: First stage - 5 years.

34. Element 7 - Surveys and assessments

- a) Purpose: To assist countries so as to improve the quality, scale, methods and relevance of inventory and monitoring of tropical forest resources including those of gene resources, wildlife and fisheries and to conduct relevant socio-economic studies, concerning in particular the immediate populations; and in carrying out the inventory, monitoring and socio-economic surveying of critical areas
- b) Justification and content: (see 2.7)
- c) International cooperation: Technical assistance, pre-investment projects, equipment and financing of activities
- d) Implementation: Assistance to responsible institutions and support to projects in critical areas
- e) Duration: First stage - 5 years.

35. Element 8 - Information collection and dissemination

- a) Purpose: To collect, store and disseminate the information available worldwide on tropical forest resources and their management and to assist countries in developing their capabilities in this field
- b) Justification and content: (see 2.3)
- c) International cooperation: Technical assistance and equipment
- d) Implementation: Coordination of, and assistance to national, regional and international centres to be selected for this purpose
- e) Duration: First stage - 5 years.

36. Element 9 - Land use planning

- a) Purpose: To develop speedy methods of classifying tropical forest lands in accordance with their capabilities and to assist countries in the application of appropriate criteria and methods for urgent zoning of critical areas, including those with important genetic resources in danger of extinction
- b) Justification and content: (see 3.1)
- c) International cooperation: Technical assistance, pre-investment projects

- d) **Implementation:** Assistance in allocating special priority to the critical areas
- e) **Duration:** First stage - 5 years.

37. Element 10 - Forest resources management

- a) **Purpose:** To assist countries in improving forest management methods and silvicultural techniques to be applied in the tropical forests, taking into consideration the complete interacting system of forest, population and enterprises and assisting the countries in applying them to particular forest and social situations
- b) **Justification and content:** (see 3.2)
- c) **International cooperation:** Technical assistance, pre-investment projects
- d) **Implementation:** Advice and assistance through a network of national and regional model projects
- e) **Duration:** First stage - 10 years.

38. Element 11 - Agroforestry

- a) **Purpose:** To identify, select and develop various agroforestry crops, techniques and practices and to assist the countries in their application or use, giving special priority to the critical areas
- b) **Justification and content:** (see 3.2.1)
- c) **International cooperation:** Technical and scientific assistance, pre-investment projects
- d) **Implementation:** Assistance to a network of national and regional projects and activities of research and demonstration
- e) **Duration:** First stage - 10 years.

39. Element 12 - Wood-based energy production

- a) **Purpose:** To improve energy production from forest biomass, including harvesting, transport, distribution and conversion systems, for both domestic and industrial use with particular reference to forest industries and to assist countries in determining and/or implementing forestry-related aspects of their national energy policies
- b) **Justification and content:** (see 3.2.2)
- c) **International cooperation:** Research, technical assistance, pre-investment projects, equipment

- d) **Implementation:** Expert assistance to responsible institutions and to a network of national and regional model projects
- e) **Duration:** First stage - 10 years.

40. Element 13 - Alternatives to shifting cultivation

- a) **Purpose:** To conduct research on and identify solutions for shifting cultivation, either by improvement of existing systems, by conversion to semi-permanent or permanent agriculture or by use of agroforestry systems and to assist the countries in the practical application of identified alternatives
- b) **Justification and content:** (see 3.2.3)
- c) **International cooperation:** Technical and scientific assistance, pilot demonstrations and pre-investment projects
- d) **Implementation:** Assistance to responsible institutions, particularly through a network of national and regional projects and through research and demonstration activities
- e) **Duration:** First stage - 10 years.

41. Element 14 - Wildlife management

- a) **Purpose:** To accelerate technical and scientific progress in the management of wildlife and its habitat as major resources in their own right, as components of the tropical forest resources and as a facet of multiple-use management of these resources and to assist countries in the practical application of accepted principles and tested techniques
- b) **Justification and content:** (see 3.2.4)
- c) **International cooperation:** Technical and scientific assistance, pilot demonstrations and pre-investment projects
- d) **Implementation:** Expert assistance to responsible institutions and to a network of national and regional projects and activities (study, research and demonstration)
- e) **Duration:** First stage - 10 years.

42. Element 15 - Harvesting and transport of products

- a) **Purpose:** To conduct studies and to assist countries in designing and adapting logging machinery and systems including the layout of forest roads, in accordance with conservation criteria; and in reducing the wastage and residues of logging operations
- b) **Justification and content:** (see 3.2.5)
- c) **International cooperation:** Technical assistance, pre-investment projects, equipment and machinery

- d) Implementation: Assistance to responsible institutions and a network of national and regional projects and demonstration activities
- e) Duration: First stage - 10 years.

43. Element 16 - Industrial development

- a) Purpose: To assist countries in promoting industrial development, based on the tropical forests; in improving business skills and attitudes; in applying the appropriate technologies; in promoting the use of a maximum number of species; in minimizing waste of residues; in favouring the production and consumption of wood-based energy; and in encouraging the cooperation of public institutions, rural institutions and enterprises for these purposes
- b) Justification and content: (see 3.2.6)
- c) International cooperation: Technical assistance, training courses, design of industries with appropriate technology as well as integrated industries
- d) Implementation: Support for research and studies, advice and financial assistance to responsible institutions in feasibility studies and in creating industrial model projects; support for study tours and for training centres, at a national and regional level
- e) Duration: First stage - 10 years.

44. Element 17 - Marketing

- a) Purpose: To assist countries in enhancing the multiple use of forests and the identification and consumption of its many and varied products by the local communities; in stimulating the national consumption of wood-based and other forest products and the export of manufactured and processed forest products
- b) Justification and content: (see 3.2.7)
- c) International cooperation: Technical and financial assistance; agreements between producer and importer countries with aid for the establishment of mixed enterprises; incentive for the commercialization of new species
- d) Implementation: Assistance to national institutions dealing with timber trade, public enterprises responsible for processing, local distribution and for export; and the conducting of relevant international studies
- e) Duration: First stage - 10 years.

45. Element 18 - Mountain watersheds

- a) **Purpose:** To assist countries in the identification of watersheds requiring urgent treatment, in the planning and execution of watershed management and in the carrying out of studies and research on erosion control and increased filtration, including the multiple-use implications of these actions; to encourage and support technical cooperation among countries whose territories include parts of watersheds of large rivers
- b) **Justification and content:** (see 3.3.1 (a))
- c) **International cooperation:** Technical and scientific assistance, training of personnel and financing
- d) **Implementation:** Assistance to public forest administrations and other services in those watersheds where specific projects will be developed at a national and regional level
- e) **Duration:** First stage - 10 years.

46. Element 19 - Forest areas in zones with dearth of firewood

- a) **Purpose:** To assist countries in determining the critical areas of firewood deficit and in the formulation and execution of afforestation and/or multiple-use management plans, including socio-economic aspects; conduct relevant studies and research concerning production as well as conversion to energy of wood
- b) **Justification and content:** (see 3.3.1 (b))
- c) **International cooperation:** Technical and scientific assistance, training of personnel and financing
- d) **Implementation:** Advice and practical assistance to those areas with a firewood deficit, through national projects giving special priority to firewood and charcoal production
- e) **Duration:** First stage - 10 years.

47. Element 20 - Forest areas in zones with dearth of agricultural land

- a) **Purpose:** To assist countries in the identification of those critical areas resulting from the dearth of agricultural lands, in the formulation and execution of management plans for their amelioration (by applying the appropriate means and instruments, especially agri-silviculture and forest industrialization) and in the studies and research activities to be carried out in those areas
- b) **Justification and content:** (see 3.3.1 (c))
- c) **International cooperation:** Technical and scientific assistance, training of personnel and financing

- d) **Implementation:** Advice and assistance to the same areas, through national and regional projects
- e) **Duration:** First stage - 5 years.

48. Element 21 - Eroded forest areas

- a) **Purpose:** To assist countries in the identification of eroded areas and the determination of the seriousness of the problems, establishing priorities for their rehabilitation, in the formulation and execution of integrated forest management plans (by the application of appropriate means and instruments, especially with regard to afforestation or other rehabilitation techniques); and also in carrying out studies and research covering erosion control measures and integrated land use
- b) **Justification and content:** (see 3.3.1 (d))
- c) **International cooperation:** Technical and scientific assistance, training of personnel and financing
- d) **Implementation:** Advice and practical assistance towards rehabilitating eroded areas, through national and regional projects
- e) **Duration:** First stage - 10 years.

49. Element 22 - Forests over-exploited for wood production

- a) **Purpose:** To assist countries in the management of over-exploited tropical forests to restore their productive and protective capacity and their contribution to social progress, including the formulation and execution of management plans involving appropriate cultural treatments and agroforestry; in conducting studies and research with particular emphasis on the silvics of productive tropical tree species, silvicultural systems and integrated land use options consistent with the restoration of productive forest cover
- b) **Justification and content:** (see 3.3.1 (e))
- c) **International cooperation:** Technical and scientific assistance, training of personnel and financing
- d) **Implementation:** Advice and assistance to areas of over-exploited forest areas through national and regional projects
- e) **Duration:** First stage - 10 years.

50. Element 23 - Forest areas inhabited by aboriginal populations requiring particular government attention

- a) **Purpose:** To assist countries in their efforts to preserve threatened forest areas where the welfare of human populations may be endangered; in the identification of such areas and the formulation and execution of appropriate management plans consistent with relevant national policies for those populations and areas; and in conducting relevant studies and research

- b) Justification and content: (see 3.3.1 (f))
- c) International cooperation: Scientific and technical assistance, training of personnel and financing
- d) Implementation: Advice and assistance to responsible national institutions
- e) Duration: First stage - 10 years

51. Element 24 - Remote forests of recent or impending accessibility

- a) Purpose: To assist countries in the management and restoration of tropical forests located on areas under the influence of roads recently constructed, or to be constructed in the near future, including preliminary land use capability classification and the formulation and execution of management plans (with particular provision for silvi-cultural treatments, agro-forestry and alternatives to shifting cultivation, and the rational design of human settlements)
- b) Justification and content: (see 3.3.1 (g))
- c) International cooperation: Technical and financial assistance
- d) Implementation: Advice and assistance to those forest areas under the influence of new communication systems through national projects
- e) Duration: First stage - 10 years

52. Element 25 - Forest areas in small islands

- a) Purpose: To assist countries in the formulation and execution of management plans in the tropical forests in small islands, dealing with the critical situation arising from increasing population pressure; also, in conducting studies and research on specific problems in these areas
- b) Justification and content: (see 3.3.1 (h))
- c) International cooperation: Technical and scientific assistance, pre-investment studies, training of personnel and financing
- d) Implementation: Advice and assistance to deal with critical areas, and management of tropical forests in small islands, through national and regional projects
- e) Duration: First stage - 10 years

53. Element 26 - Protected areas

- a) To assist countries in identifying areas to be reserved as national parks or their equivalent, strict nature reserves or biosphere reserves; in formulating and implementing management plans for those areas; in carrying out studies and research on the ecosystems involved; and in protecting representative samples with important genetic resources

- b) Justification and content: (see 3.3.2)
- c) International cooperation: Technical and scientific assistance; means and equipment, training courses for researchers, technicians and guards; and financing of activities
- d) Implementation: Advice to the institutes responsible for the national parks and other reserves, research centres in charge of studies and scientific works, and research centres participating in MAB programmes; assisting activities in the protected areas
- e) Duration: First stage - 10 years.

54. Element 27 - Natural forests mainly for production

- a) Purpose: To assist countries in the formulation and execution of management plans for tropical forests destined principally for timber production (giving particular emphasis to regulation of cut and silvicultural treatments, logging and transport systems, industrial development and commercialization); and in conducting studies and research, particularly on botany, silvics of natural species, their characteristics and their conversion into useful products
- b) Justification and content: (see 3.3.3)
- c) International cooperation: Technical assistance, pre-investment studies, training of personnel and financing
- d) Implementation: Advice on, and practical assistance to the above-mentioned productive forests through national and regional projects
- e) Duration: First stage - 10 years.

55. Element 28 - Natural forests mainly for protection

- a) Purpose: To assist countries in the delimitation of those areas where tropical forests play a mainly protective role; in the formulation and execution of plans for their management and in carrying out studies and research with particular emphasis on their environmental benefits which are difficult to quantify at present
- b) Justification and content: (see 3.3.4)
- c) International cooperation: Technical assistance, studies, training of personnel and project financing
- d) Implementation: Advice and assistance to areas of protective forests through national and regional projects
- e) Duration: First stage - 10 years.

56. Element 29 - Areas set aside for man-made forests

- a) Purpose: To assist countries in identifying those areas best suited for the establishment of man-made forests; in planning and executing afforestation programmes and projects with combined productive and social objectives and subsequent forest industry projects; and in conducting studies and research with emphasis on increased productivity through improved techniques of propagation, establishment, management and processing
- b) Justification and content: (see 3.3.5)
- c) International cooperation: Technical assistance, training of personnel and financing
- d) Implementation: Advice and assistance to afforestation, management and industrialization schemes, through national projects
- e) Duration: First stage - 10 years.

57. Element 30 - Remote forests

- a) Purpose: To assist countries in the control and monitoring of the situation of the remote forests and the study of their resources for their future management
- b) Justification and content: (see 3.3.6)
- c) International cooperation: Studies and monitoring through international systems of remote sensing
- d) Implementation: Advice and assistance through international projects such as the Global Environment Monitoring System (GEMS)
- e) Duration - 10 years.

4.2.6 Implementation arrangements

58. It is essential that countries which possess tropical forests participate as protagonists in this concerted international action on tropical forests, calling, where appropriate, on the support of relevant United Nations specialized agencies, international institutions, international banks, non-governmental organizations and bilateral assistance programmes. With so many institutions and bodies interested and involved in the problems of tropical forestry, a coordinated approach and mechanism are clearly desirable.

59. For the general backstopping of such concerted international action, it would be reasonable to rely primarily on an organization such as FAO in which all countries possessing tropical forest resources, as well as those countries willing to contribute to the cooperative action on tropical forests, are represented on an equal basis. It would appear appropriate to establish a mechanism through which UNEP, FAO and Unesco could coordinate their own efforts and those of other organizations and bilateral schemes. The existing FAO Committee on Forest Development in the Tropics, if re-organized as necessary, might provide the nucleus for such a mechanism. The creation of a new body to strengthen the capacity of participating organizations to deal with tropical forests appears to be unnecessary.

60. Future international action could be based on a series of proposals arising out of the grouping of the elements already described. The following steps are suggested for the launching of activities:

- 1) Elaboration of a plan including the goals, scope and content of each specific activity.
- 2) Definition of activities for the next five or ten years: projects and priorities
- 3) Identification of the national centres and institutions which would participate in the activity
- 4) Determination of a network of participating regional and international centres and institutions
- 5) Quantification of the activity (personnel, means and resources) and distribution of responsibilities
- 6) Convening of ad hoc working groups, as appropriate, for carrying out the above tasks in relation to proposals involving groups of related activities.

4.2.7 Financing

61. The wide ranging set of activities envisaged requires high financial inputs. It is clear that forests are being destroyed and that rural poverty, the major stimulating factor in this destructive process, is increasing. This is a matter of international concern.

62. A positive international attitude backing a concrete, coordinated and flexible set of proposed activities could possibly encourage the mobilization of adequate resources from international banks such as the World Bank, regional banks and bilateral sources. The new criteria adopted by several of these banks for the financing of forestry projects open a better perspective for the future. If political decisions to promote the management of tropical forest resources were adopted and converted into action by the developing countries, the international community might provide much greater financial assistance than it has in the past.

List of Participants

ANNEX 1

1. Experts from participating countries

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ANNEX 2

AGENDA

1. Opening statements
2. Adoption of Agenda
3. Election of officers
4. The state of tropical forest resources (presentation and discussion based on the findings of the FAO/UNEP Tropical Forest Resources Assessment Project)
5. Discussion of proposals for concerted international action in support of national efforts for tropical forest resources management (based on discussion paper FO/MISC/81/25)
6. Adoption of conclusions and recommendations

Address by

M.A. Flores Rodas
Assistant Director-General
Forestry Department
FAO

On behalf of the Director-General of FAO, Mr. Edouard Saouma, I have pleasure in welcoming you to our headquarters in Rome.

As you know, this second Expert Meeting on Tropical Forests is sponsored jointly by UNEP, Unesco and FAO.

It gives me particular pleasure to welcome the representatives of our sister agencies.

Other organizations and your Governments have also done much to try and ensure that this Meeting, which we are hosting here in FAO, will be as successful as we all hope.

During the past decade alarming views have been expressed regarding disappearance of the tropical forests and consequent degradation of the human environment.

Statements and counter-statements have been made about the speed with which these forests are disappearing, the effect on the amount of oxygen available, which countries have suffered the greatest or the least losses, the action or inaction of one or other government, etc.

It is therefore very gratifying to have finally been able to obtain, as the result of a joint effort by FAO and UNEP, an idea of the extent of present losses of tropical forests that is as accurate as the state of the art permits.

We can now affirm that about 7.5 million hectares of dense tropical forest are lost annually. This figure and all the other data obtained by the FAO/UNEP project provides us with one of the bases for planning work on the tropical forests. But we must recognize in all humility that these data alone do not explain either the dynamics or the basic causes of the disappearance of tropical forests.

It is much more important to understand these causes and to tackle the problem at its roots. I am convinced that among the main causes are the inequalities and institutional weaknesses within our societies.

Unless these are redressed, the forest will continue to disappear and forestry will be unable to make the contribution to development of which it is potentially capable.

Conservation of the tropical forests and other connected resources can only be justified if it is agreed that if consumption is postponed this will be in order to ensure future well-being.

Some professionals have tried to rationalize such concepts, but there is still a need for a set of strict criteria for justifying and assessing the choice between immediate and longer-term benefits.

For example: why should people deprive themselves of the economic benefits obtained at the expense of exhausting the forest resource during their own lifetimes? Particularly if they have neither ownership rights over the forest land nor any guarantee that the deferred benefits will be reaped by their own children.

There are still some professionals who consider the mass of the people as enemies of the forest.

They identify shifting cultivators as the villains in the process of tropical deforestation.

This is due to our tendency to concentrate on the effects rather than the causes of shifting cultivation.

It can be shown that these cultivators are not born destroyers. Their main concern is to satisfy the basic needs of their families.

Who has the right to ignore these needs?

Because of their extreme dependence on the land, the increasing population pressure, the type of technology available to them and the urban/rural imbalances that still prevail, millions of shifting cultivators have been consigned to oblivion by the main currents in society.

Many of them are witnesses to the fact that their forests, in which they are born, live and die, are being exploited by other people who remove the best and do not allow them to share in the fruits of development, which takes place elsewhere.

Another element usually stigmatized as responsible for the disappearance of the tropical forests is industry.

Forest production and processing per se do not destroy the forest.

On the contrary, industrialization, when conducted carefully, contributes to sound management and conservation of the tropical forests.

Probably a new conception of what is meant by production is necessary.

The productive capacity of the forest is not confined solely to the processing of timber and of a few gums and resins. There are many other examples of forest production and processing activities, such as the production of food, skins and hides from wildlife, and the rural energy derived from fuelwood.

These and many other types of forest industries are important elements in the rural economy on which so many activities, occupations and ways of life depend.

Failure to recognize this will set the inhabitants of the forest and other rural communities against a forest management scheme and make them, at the least, apathetic as regards the future of the forest itself.

These are a few of the ideas that must be given serious consideration by all those concerned with the real conservation of the tropical forests.

If we consider that people are the central element in the use of natural resources and that the ultimate objective is their well-being in harmony with the environment, then biological and physical analyses alone are not sufficient to understand the problem.

Economic, political and social parameters must also be taken into account. This is the challenge before us if we want to tackle seriously the big fundamental issues involved in orienting tropical forest management towards development. Only then shall we be able to contribute to a judicious conservation of the tropical forests.

In studying and using the forests all the various components of the forest ecosystem must be taken into account, to ensure mutual harmony and adaptation between them.

The interacting components of this complex system are so finely balanced and inter-related that a change in one produces changes in the whole system.

The handling of such complex systems probably requires new methodologies.

Instead of confining our attention to isolated aspects, we must adopt a comprehensive approach that will enable us to deal with the inter-relations and inter-dependencies between the factors involved, including human objectives and attitudes.

This implies that, although foresters must make every effort to help alleviate rural poverty, they alone cannot resolve the problem.

It is essential to integrate forestry activities and the other sectors involved in rural development to enable full advantage to be taken of their natural complementarity.

Forest strategies must be incorporated as one of the many components of multi-disciplinary development programmes aimed at alleviating poverty and changing the social system.

Public forestry administrations alone cannot cope with all these multiple aspects of forestry activities.

The administrative organization, even if adequately decentralized, cannot substitute for direct participation by the rural people; it cannot predict their future, nor reflect their wishes.

Without this voluntary participation, it is impossible to ensure that sound forest management decisions are taken or that forestry plays its full social role.

These are some of the thoughts I wanted to put before you. The essence of my remarks is that conservation of the tropical forest is synonymous with rational forest management based on an integral approach and geared towards the well-being of the people.

Finally, we must keep it very clear in our minds that although the planning and implementation of forest management strategies is a sovereign right and responsibility of individual countries, it is important that the governments concerned cooperate, at global, regional and sub-regional level, to harmonize action to protect the tropical forest resources through their rational use for social, economic and environmental purposes.

In this connection the international community must not only express its concern at the possible reduction in tropical forest resources, but also accept and assume the responsibilities necessary for their conservation.

FAO, through its statutory forestry bodies, particularly the Committee on Forest Development in the Tropics, the Regional Forestry Commissions and the Committee on Forestry, helps the various member countries to harmonize their individual and collective activities to improve and rationalize management of the tropical forests.

FAO is also ready to increase its cooperation with other organizations in this area of work.

Your presence here today is the result of our joint work with UNEP and Unesco.

I shall follow all your discussions with great interest and await your advice, particularly on the fourth chapter of the working document submitted for your consideration.

I wish you great success in the difficult and arduous task you have before you, and a happy stay in Rome.

Address by

R. Olemba
Environmental Management Service
UNEP

Distinguished representatives of the Director General of FAO; representatives of the UN and Specialized Agencies; distinguished scientists and colleagues; Ladies and Gentlemen:

It is my pleasure and privilege to welcome you all to this Second Meeting of Experts on Tropical Forests on behalf of the Executive Director of the United Nations Development Programme, Dr. Mostafa K. Tolba. He asked me to greet you all very warmly and to express his deep regret for not being able to join you at this meeting. As many of you know, he has a deep personal and lasting interest in the subject of this meeting, and he was an active participant at the First Meeting held in Nairobi in February 1980. However, the many responsibilities which revolve around his international obligations as head of UNEP mean that many conflicts must occur in his schedules and, however distasteful, he must skip some of the events, even the important ones, such as the one with which you are concerned here. At the moment Dr. Tolba is on an official visit to Japan where he is discussing important issues in international cooperation in the field of the environment, amongst which is the protection and rational management of tropical forests for environmental stability and for socio-economic development. In this connection he hopes that there will emerge from this Second Experts Meeting, a scheme for active international cooperation in support of countries to implement this ecologically sound management of their tropical forest resources. Dr. Tolba has also asked me to thank most sincerely the FAO for hosting this meeting and for assisting UNEP by taking up many of the practical problems associated with the meeting.

I need not remind you of the reasons underlying the repeated demands of the Governing Council of the United Nations Environment Programme for action on tropical forests. The Experts who attended the first meeting in Nairobi in February 1980, just as many others before them, underscored the position that degradation and rapid disappearance of the earth's forest and woodland ecosystems remain one of the main items on the agenda for international cooperation in environmental matters and that action upon it is not only urgent but imperative.

Exploitation of tropical forests has been and, in an alarmingly wide majority of instances, still is spontaneous, irrational and unplanned, mainly because there still lacks appropriate and sufficient knowledge for their sound management, but also because we demonstrate little will and interest to make full use of whatever knowledge is available to plan and rationalize the proper use of tropical ecosystems.

Experts have not given sufficient attention to the real needs of the local communities who reside in difficult tropical ecosystems, and these local communities continue to struggle for existence in these ecosystems under a burden of problems provoked by rapid population growth and ever declining opportunities to sustain their living, let alone to aspire to better living from the goods and services which seem to abound in the ecosystems around them. If there is abundance and profit from tropical forests, rarely is it showered upon those who directly deserve it. And most unfortunately, examples are not rare where forests are mined for the instant profit of individuals, or of irresponsible conversion of tropical forest lands to other short-term uses which strip the ecosystems bare, leaving them impoverished and even more unable to support the populations which should rightly depend upon them.

The first meeting of the experts spent a great portion of their time restating the importance of tropical forests in providing services and goods in support of the populations, besides timber and fuelwood. These include foods, drugs, fibres and goods of many other sorts. Many species in tropical forests offer vast stores of genetic resources and germ plasm for modern agriculture, forestry, medicine and industry. By their mere existence, the tropical forests provide indispensable environmental services: they protect the soil, maintain soil fertility, regulate water flow and supply, and influence the climate not only in the tropics but also in other parts of the world. Their far-reaching benefits to the world community include speciality timbers and diverse types of raw materials for various industries. At the local level, forestry's support to agriculture enables forestry to play a prominent part in the strategies for integrated rural development.

The entire international community has awakened to the fact that, despite the manifold benefits provided by tropical forests, their depletion is in steady progress in many critical parts of the world. You have before you statistics to document this rate of loss of tropical forests and the updating of the data arising directly from the collaborative project of UNEP and FAO entitled The Tropical Forest Resources Assessment project, jointly executed by UNEP and FAO, in the framework of the Global Environmental Monitoring System (GEMS) programme and as a result of which it appears that the present rate of deforestation in the tropics is in fact considerably lower than the earlier predictions. However, even if overall, the figures are lower than earlier stated and they still remain at a level of utmost concern. The projections into the year 2000 indicate an overall deforestation in the tropics which, if allowed to continue at the present pace, will cause the loss of about 12 percent of the world's tropical forests currently in existence. In this connection, there are two important points which should not be lost sight of:

- 1) Logging, which is estimated to affect 4.3 million ha of virgin productive forests annually, may not seriously alter the form of a forest if, as is usual, it concentrates on good specimens of selected species. It does, however, disturb the forest's pristine state and, more seriously, creates in-roads into the forest which are quickly utilized by uncontrolled developers.
- 2) Although the global rates of deforestation are relatively low, there are still serious local "hot spots" in which forest is being lost at alarming rates. Many local forests, some unique habitats for special plant and animal species, will be completely gone before the turn of the century.

The misuse and over-use of the tropical forest resources which result in their depletion and destruction have their basis in the population-resource cycle. Poverty of the immediate population appears to be, in most cases, the major immediate cause. The failure to recognize the environmental benefits of forests, which are longer term, diffused, and generally not susceptible to measurement, in the face of immediate and direct benefits of material goods provided by forests, is also a powerful factor, the responsibility for which lies essentially with national decision-makers and planners. Institutional inadequacies, shortcomings in national capabilities and funds, are obstacles towards rational management of forest resources. The lack of appreciation of social challenges hamper in most cases the success of even the most sincere and technically sound incentives aiming at the development and better utilization of forest resources.

The task entrusted to this Second Meeting of Experts on Tropical Forests is to develop an action plan with the objectives of stimulating and guiding national efforts, supported externally where appropriate; to identify the most serious problems and critical areas in which populations-resources relationships are in a crisis state and by invoking available knowledge and means, to propose judicious interventions in the identified critical areas, in order to ameliorate the situation and put the socio-economic development of the areas on a permanently secure footing. Much of the preliminary work was done at the First Meeting, and we should not turn back the wheel. On reporting the recommendations of the First Meeting to the Governing Council of UNEP at its 8th Session in April 1980, the Council considered

these recommendations carefully and resolved that any proposed action plan must have the widest measure of international consensus and must take into account national interests. Consequently it instructed the Executive Director to ensure that these recommendations be circulated widely for comment by governments and competent international bodies. In pursuance of this instruction the Executive Director transmitted these recommendations to member countries of UNEP and other Governments, multilateral assistance agencies and other international, national and non-governmental organizations concerned, and requested their comments on the objectives, general framework and components of the integrated programme envisaged in these recommendations. Furthermore, he requested all these bodies to supply information on on-going and planned activities in those countries or by those organizations and their assistance in the identification of gaps in the recommendations.

The Discussion Paper in your hands carries further the analysis already contained in the papers which were available to the Nairobi meeting and details prerequisites for an internationally based action programme. The paper takes into consideration the comments and information received from the Governments and international organizations concerned, in their response to UNEP's inquiries on the recommendations of the First Experts Meeting. It benefits also from the other relevant studies which have subsequently come to light, particularly the Unesco 10th MAB Review, held in Paris in September 1981; the IUFRO Conference held in Kyoto in September 1981; the UN Conference on New and Renewable Sources of Energy held in Nairobi in August 1981 at which some lively discussion took place on research priorities in tropical forestry, in response to the stimulating paper prepared jointly by FAO and the World Bank, and the IUCN/WWF Tropical Forests Programme approved at the recent IUCN Assembly in Christchurch, New Zealand.

In the last section of the Discussion Paper several elements of concerted active international actions to support countries to implement the management of their tropical forest resources are outlined. It is UNEP's belief that, with the able guidance of our meeting, these elements can be developed into a specific, concise and realistic action plan, representing priority actions which lend themselves to international cooperation, when it is the best mechanism for finding feasible solutions to the serious and complex problems of tropical forests.

The wise management of tropical forests has to be based on the recognition of and respect for each governments' sovereign responsibility for the development of its natural resources for the well-being of populations under its national jurisdiction. However, it is hoped that each government will adopt policies to conserve and treat tropical forests as a renewable natural resource. The prerequisites for any wise utilization of tropical forests include surveys, monitoring and assessment, determination of land use and forest policies; enacting of legislation; appreciation and consideration of social aspects; strengthening of institutions; education, training and extension; research; raising of awareness and information collection and dissemination.

The importance placed by UNEP on the realization of an action plan for tropical forests has been spelled out in the Medium Term Plan of UNEP for the 1982-83 period, the overall objective of which is "the formulation and implementation of plans and policies for international action for aiding Governments in the sound management of tropical forests, including their conservation, and ensuring their wise use for the greatest benefit of mankind".

The Medium Term plan will emerge by 1984 into what is expected to be known as The System Wide Medium-Term Environment Programme (SWMEP). The first SWMEP covering 1984-89 is being developed through the joint efforts of the United Nations organizations and specialised agencies, stimulated and coordinated by UNEP, and will be the first demonstration of a programme of the UN system which is based on common objectives. The SWMEP objective for the action programme on rational use and management of tropical forests and woodlands will need to emerge from the recommendations of this Meeting. In general terms the strategy of the programme during the period should aim at:

- developing a long-term comprehensive and comparative monitoring system, giving reliable assessments in all the tropical forestry situations;
- improving world-wide knowledge of the functioning of the tropical forest ecosystem and the impact of human activities upon it with a view to coming on a permanent basis to terms with the developmental issues associated with tropical ecosystems;
- developing tropical forest ecosystem potential through environmentally sound management, which will optimize yield and sustainability;
- providing assistance to countries in achieving those requisites necessary for carrying out socio-economic development in tropical forest regions.

The deliberations and discussions in this meeting will, no doubt, guide the further development of the SWMTEP on tropical forests. UNEP and its partners in the UN system will carefully consider any comments, suggestions and proposals of the participants of this meeting with regard to the objectives, strategies or activities foreseen in the Programme.

Mr. Chairman, UNEP is committed to stimulating interests and actions in the wise management of the tropical forest resources, on a sustained basis and without losing sight of their environmental benefits, for the socio-economic development of local populations, as well as for the well-being of entire human beings inhabiting this world. We hope we can rely on the interests of concerned countries, tropical and otherwise, and on their collaboration in this effort. The achievements to date encourage us to believe that the time is now ripe to take further important steps in that direction.

In this regard, once again, Ladies and Gentlemen, the Executive Director wishes to extend his thanks to you for making your time available for the task before you and wishes to assure you that UNEP will follow the outcome of your deliberations with great interest. We wish you every success in this joint endeavour.

ANNEX 3.3

Address by

F. di Castri
Unesco

Mr. President, representatives of FAO and UNEP, representatives of other governmental and non-governmental organizations, representatives of participating countries, colleagues, I am very pleased to greet you on behalf of the Director-General of Unesco at this Second Meeting of Experts on Tropical Forestry, jointly sponsored by FAO, UNEP, and Unesco.

As you know, Unesco is active in many programmes in tropical forest regions. This activity is in large measure a result of the very strong personal and professional interest of Mr. Amadou-Mahtar M'Bow, Unesco's Director-General. A geographer by profession, he has spent much of his life in the Sahel, and he knows from personal experience many of the problems that are caused by deforestation in the tropics. Thus he has supported and encouraged the establishment of Unesco's current major project on the tropics, and we expect that our already active programmes there will accelerate.

It is entirely appropriate that this meeting be jointly sponsored by FAO, UNEP and Unesco; this sharing of responsibility is not surprising in view of our past and continuing cooperation in other areas. The State-of-Knowledge report on tropical forest ecosystems, published in 1978, of which all of you have received copies, is only one example. Soil degradation maps for Africa and the Middle East are a more recent example and there are many others. So I am happy to be here with representatives of FAO and UNEP to open this important meeting.

Each of our three organizations has an important role to play in assisting countries with the management and conservation of their tropical forest resources. In the briefest form I see Unesco's role as applied research, demonstration of results and manpower training; the role of FAO in planning, management and development; the role of UNEP in monitoring stimulation and coordination. This classification is perhaps an oversimplification; nevertheless, there are some clear differences in responsibilities among our three organizations and these are described in more detail in the supplement to the discussion paper for this meeting.

Unesco's main focus for activities related to tropical forests is its Man and the Biosphere Programme (MAB). Established in 1971, MAB grew out of the International Biological Programme (IBP) and it inherited much of Unesco's earlier concern with natural resources in tropical zones. It is now the focal point for Unesco's major project of research, training and demonstration aimed at the integrated management of humid tropical ecosystems.

MAB's approach is to encourage work at interfaces: between scientific disciplines, between scientists, decision-makers and local populations, between countries within a region, between institutions in developing and industrialized countries, between conservation and resource use, and between ecosystems in uplands and lowlands, in coastal zones, between cities and their surroundings. It is at such interfaces where many of our land use and natural resource problems must be met and solved.

MAB does this primarily through the support of pilot projects. These are based on national initiatives and they serve as focal points for integrated research and international cooperation. MAB pilot projects conduct research on land use problems of national and regional importance in order to produce scientific information in a form usable by decision-makers. Typically, they bring together

natural and social scientists in an interdisciplinary framework and they often involve decision-makers and local populations in problem identification, research planning and the conduct of research. This approach leads to results that are relevant to local problems and which are likely to be quickly applied. A key characteristic of most MAB pilot projects is their training component, to increase local scientific capacity linked directly to field research. Pilot projects often involve scientists from other countries. They may be supported by bilateral or international funds but they always have a strong national component and national financial support.

Within the humid tropics there are about 20 MAB pilot projects, rather loosely linked in a network. Our goal is to strengthen this linkage in such a way as to encourage cooperation among projects, avoid duplication of effort, aid the extrapolation of results from one site to another and to better use scarce financial resources. One result of this network approach is to multiply the effectiveness of funds provided by Unesco and cooperating bodies such as UNEP, by attracting national, bilateral and other international support to high quality research and training efforts.

A second and related MAB network includes the nearly 200 biosphere reserves that countries throughout the world have designated and agreed to protect as representative samples of principal ecosystems for the role they can play in research, monitoring, education and training, and conservation of genetic resources. Thirty seven biosphere reserves are located in the tropics and most of these contain forest land.

Although the operational phase of MAB's programme in the tropics began only five or six years ago, a variety of outputs have emerged. In published form these include the state-of-knowledge report which I have mentioned earlier, an audio-visual programme, and a descriptive brochure on MAB in the tropics, and recent special issues of Ambio and the Unesco Courier which contain articles on the MAB programme in general and tropical ecosystems in particular. About one-fifth of the X poster MAB exhibit, Ecology in Practice, is devoted to tropical forest ecosystems. This exhibit was shown in Paris in September and October, and it will be available for distribution in the spring of 1982 in English, French, Spanish, as well as without texts to allow translation into other languages. Of course, the core of the published output from the MAB programme in the tropics consists of the many research reports, journal articles, management guidelines, audio-visual and other material produced by and in the participating countries. Abstracts of many of these have recently been included in Ecology Abstracts, with a symbol identifying them with MAB.

In all of this work the MAB Programme has benefitted greatly from cooperation with UNEP, with FAO and with other organizations represented at this meeting: IUFRO (International Union of Forestry Research Organizations) UNU (United Nations University), IUCN (International Union for Conservation of Nature and Natural Resources), IUBS (International Union of Biological Sciences). In this context I would like to mention the particular relevance to this meeting of the recently announced IUBS Decade of the Tropics, which will help to focus the attention of the scientific community on some of the problems in tropical forest regions that we will be discussing this week.

As we begin our discussions I think that it is vital to keep two points in mind. The first, which is clearly recognized in the discussion paper, is that the primary responsibility for tropical forest management and conservation rests with the sovereign states where these resources are located. Thus, any international activity must be tailored to national needs, national decision, and national requests for assistance and cooperation.

Second, it is important to remember that many organizations and many professionals from a wide range of interests and disciplines have already been active for many years in attempting to manage, use and conserve tropical forests. I hope that this meeting will reflect the need to continue a broad approach to problems in tropical forest regions. No one discipline, no one organization, no one approach can be sufficient.

Thus, our task here this week is to develop a coordinated approach at the international level to assist in solving problems of management and conservation of tropical forests at the national level. Our task is certainly not to develop a new organization, institution, or secretariat for tropical forests - that we must not do. Rather, we must find ways for our existing institutions to better cooperate and to work even more closely together in the future. I assure you of the full willingness and intention of Unesco to contribute and to cooperate in such an endeavour.

Thank you, Mr. President.

ANNEX 4

MATRIX OF CRITICAL AREAS AND ACTION

INTRODUCTION

In order to facilitate the allocation of priorities of action concerning tropical forest resource management, the elements presented in the discussion paper have been grouped and organized so as to show more clearly the relation between the critical areas and the means of dealing with them. This matrix is only indicative and has to be adjusted to the actual situation in each case with respect to elements included, as well as to interactions between areas and means.

MATRIX OF CRITICAL AREAS AND ACTIONS

		Means of Action			
		Policy Insti- tution Legal	Education Training Research Information	Forest Management and Conservation	
		1. Policy 2. Progress of Rural Communities 3. Institution	4. Education 5. Research 6. Awareness 7. Surveys 8. Information	9. Land Use Planning 10. Forest Resources Management 11. Agro-Forestry 12. Wood Energy 13. Shifting Cultivation 14. Wildlife and Game Resources 15. Harvesting 16. Industry Development 17. Marketing and Trade	
Areas of Action		Numbers 1-30 refer to elements listed in 4.2.5 of discussion paper.			
Critical Areas	Mountain Areas				18
	Fireweed Deficit Areas				19
	Farmland Shortage Areas				20
	Eroded Areas				21
	Overexploited Areas				22
	Aboriginal Areas				23
	Newly Accessible Areas				24
	Small Islands				25
	Mangrove Forests				
Urban Adjacent Forests					
Other Areas of concern	Protected Areas	26			
	Production Forests	27			
	Mainly Protection Areas	28			
	Man-made Forests	29			
	Remote Areas	30			

Supplement to Discussion Paper
International Activities in the field of Tropical Forestry

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INTRODUCTION

The supplement summarises information on the past and present activities of the main international inter-governmental and non-governmental organizations and national programmes of international cooperation which provide assistance in the management of tropical forest resources and directly related fields.

The summaries are based, for the most part, on the replies by organizations and countries to UNEP's request for information of 12 August 1980, with some additions from publications and from other sources available to FAO. They may not, therefore, be complete, up-to-date or absolutely accurate. However, the types and orientation of assistance described, together with a recognition of the nature of the organizations and cooperative programmes involved should facilitate consideration of their roles in future plans for harmonized action on tropical forests. Participants are invited to provide more complete details and, if necessary, corrections, thereby improving what is presented in this document and enhancing its future value.

1. UNITED NATIONS ORGANIZATIONS AND PROGRAMMES

1.1 UNEP

UNEP was entrusted by the General Assembly of the United Nations with the role of catalyzing environmental action and its coordination within the United Nations system. This decision by the General Assembly was predicated, among other reasons, on two acknowledged facts: namely that no single agency or funds of the United Nations could tackle comprehensively the immense, complex and wide ranging problems of the environment and that no significant change in human behaviour and attitudes towards the environment would be possible without people themselves being fully committed and involved.

UNEP was thus set up with a modest fund and empowered to act on many fronts of environmental issues, initiating, stimulating, supporting, complementing and accelerating action at all levels of human society. The Environment Fund, composed of voluntary contributions, is used on a selective basis on those projects and activities which the Governing Council of UNEP deems to possess the greatest potential for influencing, in a positive and ameliorating way, the environmental crisis.

Over the last ten years of existence, the following have become routine functions of UNEP: to maintain a constant watch on the changing "state of the environment"; to analyse the trends in depth; to assess the problems using a wide range of data and techniques; and to promote "action plans" or projects leading to sound development. In the parlance of the Stockholm Action Plan, the programme addresses three inter-related actions: environmental assessment, environmental management and supporting measures. In keeping with this action-oriented approach, UNEP sees environmental action as the means of providing the tools and methodologies for the sound utilization of natural resources, combining sustainability with optimal yield. For such development to be sustainable, it must take account of the ecosystems which are the basic means of human survival.

The tropical ecosystems, their protection and rational management have always received due consideration in the terrestrial ecosystems programme of UNEP. In this respect UNEP actively cooperated with IUCN, WWF, FAO and Unesco in the preparation of the world conservation strategy where tropical forests found their appropriate place.

Other UNEP activities in the field included preparation and publication of the state of knowledge report on tropical forest ecosystems in collaboration with FAO and Unesco, development of ecological pilot projects in tropical forest areas in cooperation with Unesco, and within the framework of its Man and Biosphere (MAB) programme, organization of regional meetings on integrated eco-biological research and training activities in West Africa and South Asia, holding an international post-graduate training course on ecosystem management at the Technical University in Dresden and participation in the joint IUCN, FAO, Unesco, UNEP Programme of conservation of specific forest genetic resources.

Within the framework of the Global Environment Monitoring System (GEMS), UNEP financed with FAO a comprehensive assessment of global tropical forest resources, and the development of practical cost effective methods for tropical forest cover monitoring.

Finally, with the project for preparation of an internationally coordinated programme for the wise exploitation of tropical forests and woodlands, UNEP was responsible for the First Meeting of Experts which was held in Nairobi toward the end of February 1980 and which laid the foundations upon which this second meeting can now derive formal recommendations.

1.2 FAO

This is the most active international organization in the forestry sector. Its Forestry Department (with one Forest Resources Division and one Forest Industries Division) has always placed great importance on activities related to tropical forests. The Department's budget (Regular Programme) for 1982-83 is US\$ 14.7 million with extra-budgetary resources estimated at US\$ 60 million.

It has 62 professional employees at its Head Office in Rome and over 250 specialists working in more than 70 countries.

1.2.1 FAO Regular Programme

Within the Regular Programme, priority has always been given to forestry policy, legislation and administration. The main areas in which FAO has lent assistance at a national level include: inventories, soil and water conservation, forestry and forest management, wildlife and National Park Management and the integration of forest industries.

Among other activities included in the Regular Programme, particularly noteworthy is the attention given to the following subjects: (a) silviculture and tree improvement; (b) forestry education; (c) World Lists (forestry schools, information and documentation services, research institutes); (d) paper and pulp; (e) wood-based panel products; (f) forest products trade and marketing.

With regard to FAO's forest programmes for 1982-83, the Regular Programme includes the following four: (a) Forest Resources and Environment; (b) Forest Industries and Trade; (c) Forest Investment and Institutions; (d) Forestry for Rural Development. These are summarized below:

(a) Forest Resources and Environment

The main objectives of the Forest Resources and Environment Programme related to tropical forests are to assist member countries in the tropics in improving their capacity to assess, economically manage and, as necessary, to extend or re-establish their forest resources, bearing in mind the need for environmental protection, forest products and influences for human use and the welfare of rural populations, and the conservation of gene, natural ecosystem, wildlife, soil and water resources. For this programme there is a provision of US\$ 2.38 million for 1982-83, 16.2% of the Department's budget.

The major activities of the programme comprise:

1. The continuous updating of the Tropical Forest Resources Assessment.
2. Assistance to country programmes of forest resource inventory through improved data processing, application of new techniques based on remote sensing and methodologies for multiple use forest resource appraisal in rural, agricultural environments.
3. The promotion of integrated forest land-use projects, agro-forestry practices.
4. The promotion of improved techniques and management of man-made forests with emphasis on fuelwood production and the improvement of tree species through the application of the principles and practices of forest genetics, bearing in mind the need for the conservation of gene resources.
5. The improvement of upland conservation practices with an eye on integrated land use and the need for attention to arid zones and mountainous areas.
6. Assistance to and improvement of wildlife resource management and conservation, bearing in mind human nutritional needs in rural areas and the need for training and extension.

(b) Forest Industries and Trade

As far as tropical forests are concerned this programme aims at building up the forest industries sector of member countries in the tropics in order to maximize the contribution from forest resources to economic and social development and to raise the self-reliance of the countries concerned in the establishment, development and management of the above industries. The programme has been allocated US\$ 2.7 million for 1982-83, 18.4% of the Department's budget.

The major activities involved are:

1. Assistance to countries in identifying the possibilities of, designing and establishing appropriate forest industries and supplementing their energy needs from wood, bearing in mind possibilities for appropriate rural industries.
2. Collaboration with UNCTAD in the Integrated Programme for Commodities and assistance in expanding the use of tropical timbers, their markets and monitoring of world timber consumption.
3. Strengthening countries' capability in logging and transport through training together with the enhancement of their capacity to correctly select, economically use and maintain appropriate equipment for the above purpose, bearing in mind the need to minimize forest waste and adverse environmental impact.

(c) Forest Investment and Institutions

The objective of the Forest Investment and Institutions Programme for developing countries with tropical forests is to strengthen and improve the institutions, information and capacity for analysis in the countries involved with special regard to forest development, thereby promoting the self-reliance of developing countries to make decisions related to investment and utilization of resources.

The allocation to this programme is US\$ 4.01 million for 1982-83, 27.2% of the Department's budget.

Its activities include:

1. Assistance with training of personnel of national institutions and the introduction of new concepts such as community forestry into forestry curricula. Strengthening of institutions in their capacities to plan, implement, manage and coordinate their forestry programmes bearing in mind the aspects of forestry extension, appropriate scale forestry enterprises and research.
2. Improved coverage and dissemination of statistics and the improvement of information systems. Assistance with the development of strategies based on the above and the development of appropriate forest policies with regard to rational land use and environmental protection. Assisting improved analyses of data and planning and programming of forestry development incorporating the factor related to foreign investment and development assistance.
3. The dissemination of information through widely distributed, high quality publications and the organization of meetings with a regional and global impact.

(d) Forestry for Rural Development

The objective of the Forestry for Rural Development Programme is to develop and strengthen activities of member countries related to the role of Forestry in rural development. The major components of the Programme are community forests, agro-silvo-pastoral development and fuelwood.

The programme has been allocated US\$ 2.5 million for 1982-83, 17.0% of the Department's budget for the period.

The programme's main activities are:

1. Assistance in identifying and analyzing effective rural community forestry systems and assistance to countries in their planning, implementation and extension, using appropriate means of communication. Expansion of knowledge of the various products from the forests and the conversion and use of these products at village level.
2. Promotion of better land use incorporating joint forestry and agricultural practices based on intensive studies of existing systems for both the humid and dry tropics; development of model systems and the extension of the results of these.
3. Monitoring fuelwood consumption and demand and assistance to countries in devising systems to meet their wood-based energy needs and the associated training of personnel for this purpose; coordination of follow-up activities of the UN Conference on New and Renewable Sources of Energy; related to fuelwood and charcoal.

1.2.2 The FAO Field Programme

As of September/October 1981 its field forestry programme for developing countries included 10 large scale regional projects (Forestry training, tropical forest development and research) for which it envisaged an expenditure in 1981 alone of US\$ 1.85 million in UNDP-derived funds and US\$ 0.89 million from Trust Funds (total US\$ 2.74 million).

133 large-scale national projects were operational in 1981 related to work on tropical forests, 111 of which entailed a UNDP-derived expenditure of US\$ 26.19 million (46 projects, US\$ 9.25 million in Africa; 44 projects, US\$ 12.16 in Asia; 21 projects and US\$ 4.78 million in Latin America). A further 21 of these are based on Trust Funds entailing a 1981 expenditure of US\$ 3.73 million (16 projects, US\$ 2.76 million in Africa, 2 projects US\$ 0.06 million in Asia and 3 projects US\$ 0.91 million in Latin America). 34 small-scale shorter-term national projects, either completed in 1981 or still operational entailed an expenditure in 1981 of US\$ 2.1 million (US\$ 0.69 million from TCP (FAO Technical Cooperation Programme) and US\$ 1.41 million from the Swedish Trust Fund FLGD Programme (Forestry for Local Community Development). The total 1981 expenditure on tropical forests and related subjects was therefore in the order of US\$ 34.8 million, with a major proportion of the effort being devoted toward objectives of forest management and afforestation, education, training and institution strengthening, and forest industries development. A smaller number of projects assisted forestry research, national parks, soil and water conservation and general forestry development.

It is expected that the 1982 UNDP allocations for large-scale national projects will be in the order of US\$ 24.4 million. An increase in Trust Fund allocations is being sought in order to maintain the level of activity or promote it at an even greater scale.

In relation to its field programmes in countries with tropical zones, FAO has published up to the present 693 reports (both technical and terminal) of which 206 correspond to Africa, 288 to America and 199 to Asia-Pacific, as well as 41 regional and inter-regional reports, with 8 related to Africa, 15 to America and 18 to Asia-Pacific.

The distribution of these reports by broad subject matter is the following: Forest Industries - Logging - Utilization (193); Silviculture - Management - Research (108); National Parks and Wildlife (45); Afforestation (65); Policy - Legislation - Institutions (38); Training and Education (34); Forest Inventory (71); Land Use Planning and Watersheds (39); Geneval/Forestry Development (100).

Of its regional reports, 9 refer to wildlife and wildland management, 19 to forest industries development, 4 to policy and training, and 9 to miscellaneous subjects.

1.2.3 FAO Statutory Bodies

The principal instruments used to orient the Department and governments in their forest policies are provided by Regional Forestry Commissions. Three of them (in Africa, Latin America and Asia-Pacific) are directly involved with tropical areas. Further support comes from the FAO Committee on Forest Development in the Tropics, created in 1966, and whose purpose is to "study technical, economic and social problems relating to the development of tropical forests, particularly in developing countries, having regard to production, utilization and conversion aspects, as well as to the marketing of forest products". During the five sessions held up to now, this Committee has devoted its attention primarily to the following subjects: shifting cultivation, regeneration of tropical forests, plantation silviculture, forest inventories, forest industry development, product utilization research, national parks and wildlife, training and education.

The Committee on Forestry (COFO) established in 1971, plays a decisive role in FAO's Forestry policy through the conduct of reviews on and appraisal of forestry problems of an international character, with a view to concerted action; through reviews of work programmes; advice to the Director-General on future work programmes, reviews of specific matters raised by member nations and reports to the Council. There are at present 84 member nations, 46 of which possess their own tropical forest resources.

FAO has provided the Secretariat of the last three World Forestry Congresses, which serve as international forums for the discussion of the world's major forestry problems. Tropical forests have received increasing attention at these Congresses, particularly at the last two (Buenos Aires, 1972 and Djakarta, 1978). FAO also co-sponsored the World National Parks Conference (Yellowstone, USA, 1972) and will be co-sponsoring and actively participating in the next one in Bali, Indonesia, 1982.

Other FAO Statutory Bodies and Panel of Experts involved in work related to tropical forests are:

Committee on Wood-based Panel Products (WPP)
Advisory Committee of Experts on Pulp and Paper (PAP)
Advisory Committee on Forestry Education (ACFE)
Panel of Experts on Forest Gene Resources.

1.2.4 FAO Cooperation with other Agencies

In forestry-related matters FAO cooperates closely with the United Nations and its Specialized Agencies, and with the following in particular:

UNEP (Project on tropical forest cover monitoring; Project on conservation of forest genetic resources; Forest Inventory Data Processing System; Tropical Forest Resources Assessment Project).

Unesco (MAB Programme).

UNCTAD (Joint Secretariat FAO/UNCTAD for Preparatory Meetings in Tropical Timber Trade).

UNIDO (Joint Secretariat FAO/UNIDO for Preparatory Meetings in Forest Industries).

UNDP (apart from FAO's role as Executive Agency in the majority of those forestry projects financed by UNDP, a FAO/UNDP Pulp and Paper Industries Development Programme also exists).

ILO (Training Centres for forest workers, seminars, etc., on forest logging techniques).

UN (International training course on the application of remote control techniques to tropical forestry).

CILSS and UNSO (Meeting on the Sahel Rehabilitation Programme).

FAO also has agreements related to government cooperative programmes with:

SIDA (Swedish International Development Agency), including an FAO/SIDA Forestry Programme for local community development.

DANIDA (Danish International Development Agency), NORAD (Norwegian Organization for aid to development, and with national governments (Austria, China, Finland, France, India, Italy, USA, USSR, etc.)

The Netherlands, in a programme oriented towards assisting the least developed countries to provide for the needs of their rural poor, giving particular priority to increasing the supply of fuelwood.

FAO also cooperates with other Organizations, such as:

IUCN. In FAO sub-programmes on National Parks and Wildlife Management, Forest and Wildlife Conservation, Forest Management and Forest Tree Improvement.

IUFRO. In a wide range of research subjects. Very close cooperation exists between FAO and the International Union of Forestry Research Organizations.

FAO carries out joint programmes and activities with several of the above-mentioned international bodies and government organizations. These include:

FAO's Programme on the Procurement of Forest Tree Seed (cooperating: IUCN, IUFRO and others).

World Conservation Strategy (IUCN, UNEP, WWF, Unesco).

FAO International Symposium on Forest Fertilization, 1973 (IUFRO).

World Consultation on Forest Tree Breeding, 1977 (IUFRO).

World Consultation of Forest Diseases and Insects, 1975 (IUFRO);
17th IUFRO World Congress, Kyoto, 1981.

Project promoting ecologically sound management of tropical forests (IUCN/UNEP)

1.3 Unesco

Unesco's foremost tropical forest activity is its Programme on Man and Biosphere (MAB) project No.1 The Ecological Effects of Increasing Human Activities on Tropical and Sub-Tropical Ecosystems, carried out by its Ecological Sciences Division. Other Unesco Divisions, such as the Environmental Education Division, work in fields related to the subject.

Unesco contributes to tropical forest management by supporting and coordinating national and regional efforts in environmental monitoring (especially within the international network of biosphere reserves), integrated ecological research in tropical zones, training of scientific personnel and environmental education.

For the three year period 1981-83 Unesco has set aside an annual US\$ 2 million from its Regular Programme for activities in humid tropical zones. An additional estimated US\$ 4 million from yearly extra-budgetary funds channelled through Unesco are also designated for activities in this field, while contributions from the countries involved in MAB's work in tropical zones amount to US\$ 20 million.

The main focus for MAB activities related to humid tropical forest ecosystems is provided by MAB project 1, which is concerned with the ecological effects of increasing human activities on tropical and sub-tropical forest ecosystems. A principal objective of MAB project 1 is to help develop the scientific basis for the use of natural resource and the management of ecosystems in the tropical and sub-tropical forest zones of the world. Another important aim is to promote self-reliance among countries of the humid and sub-humid tropics in research and management, and to encourage the continuing participation of the various sectors of the community in these activities.

Some 40 research projects are centred on one or more aspects of tropical forest ecosystems. They include 15 integrated projects of great regional and national importance, involving an inter-disciplinary approach and studies which have social, economic, cultural biological and physical dimensions.

Following regional and world planning phases a series of concrete projects of research, training and demonstration were launched. Several regional meetings were convened in 1974-75, in cooperation with UNEP. Available knowledge has been synthesized and methodological guidelines have been developed. A Unesco/UNEP/FAO report on available knowledge of tropical forest ecosystems was also published.

A generalized MAB field project may include natural climax ecosystems, managed ecosystems (traditional and modern systems) and human settlements. Major projects on tropical forest zones include 5 in America, 5 in Africa and 7 in Asia, which encompass integrated research studies on the dynamics of different ecosystems and the effects of human activities on them.

Other MAB activities centre, for example, on watershed management in mountainous land.

Activities already in progress are expected to give results within three to five years that can be useful in work and projects conducted by IUFRO, FAO and other organizations.

The central idea of MAB project 1 is to develop an international network of field activities that are both integrated and complementary in scope. It hopes to provide a framework whereby the knowledge and experience gained in a particular field can be transferred and tested in other countries having similar ecological conditions and socio-economic problems. It can also facilitate efficient use of scarce manpower and financial resources.

One logistic base for MAB research is provided by the network of biosphere reserves that are areas representative of the principal ecosystems of the world, protected for the role that they can play in research, monitoring of change, education and training, and conservation of genetic material. Each biosphere reserve generally has a non-manipulative core area, in combination with other areas in which measurements, research and education can be carried out.

Within MAB research activities, its quantification of forest resources is of special interest to forest management. It also examines the dynamics of ecosystems, natural forest management in protected areas and the effects of shifting cultivation, as well as alternative types of agriculture.

Unesco's international network of biosphere reserves includes approximately 30 which contain humid or dry tropical forests. These reserves vary in size from 500 to 500,000 ha, and help conserve biological resources by protecting ecosystems and species.

These reserves are also useful for long-term monitoring of selected environmental characteristics.

Technical publications, brochures, reports and audio-visual materials are used for raising awareness of the situation among the general public, politicians, government agencies and scientists. Examples of publications related to tropical forests are State of Knowledge Report on Tropical Forests Ecosystems (Unesco/UNEP/FAO); MAB Programme publications, its brochure *Man and the Humid Tropics*, and a slide tape programme of the same title.

Unesco's programme of activities for the 1981-83 period includes a notable expansion in matters related to tropical forest ecosystems through the implementation of a new Major Project of Research, Training and Demonstration aimed at the Integrated Management of Humid Tropical Ecosystems. Notwithstanding this new project, the Regular Programme of Unesco cannot fully respond to countries' demands for help in this field. It does, however, intend to continue to promote bilateral cooperation between donor countries and those with abundant tropical forest resources, using the network already established within the MAB framework that includes sites, institutions and research scientists. Another noteworthy effort is the MAB Conference and Exhibition held in Paris in October 1981, which presented an in-depth analysis of the main problems of land management and an assessment of the contributions of MAB over the past ten years in solving these problems. Moreover, the principal man-environment problems expected in the 1980s were identified, along with Unesco's role in addressing them.

Another objective of the Conference was to raise awareness at the international level of tropical forest problems; help to assess these problems, provide some guidelines for planning and management, and suggest future research needs.

The Exhibition accompanying the Conference was intended as an aid in raising awareness of these problems at national, regional and international levels. Multiple copies of the Exhibition have been made to be used at follow-up Exhibitions which will have regional or national contributions added. For example, a Regional Conference and Exhibition will be sponsored by MAB in S.E. Asia next spring, primarily on tropical forest ecosystems. Similar events will later be arranged in Latin America and tropical Africa.

1.4 UNCTAD

In 1976 the United Nations Conference on Trade and Development adopted a resolution in favour of creating an Integrated Programme for Commodities. Tropical timber is listed among the 18 products in this Programme. Five preparatory meetings on tropical timber have already been held. They have examined various methods for improving international markets, including greater stability of foreign exchange income for producing countries and greater guarantees for supplying consuming countries. Toward this end, international action should focus on four broad areas: (a) reforestation and forest management; (b) improved knowledge of world markets; (c) increased processing of timber in producing countries; (d) research and development, including greater use of lesser known species.

At the Fifth Preparatory Meeting, top priority areas in research and development were analyzed, as well as projects for international action in two major fields: (a) management and reforestation, and (b) timber utilization. It was agreed that national research institutes should be strengthened by further international support. Agreement was also reached as to the convenience of establishing cooperative research programmes on forest management among countries with similar problems.

To this end, it was suggested that the Common Fund might help in implementing the proposed projects, which are co-sponsored by producing and consuming countries. Other proposals included the creation of an intergovernmental group of experts to elaborate a list of projects, evaluate the costs involved and propose the priorities for international action at the Sixth Meeting.

At the Fifth Preparatory Meeting, the situation of international financial assistance for reforestation and forest management was also examined. It was agreed that, despite recent increases, the volume of such assistance was totally inadequate.

In sum, it is noteworthy that UNCTAD is increasingly interested in forest management and reforestation, due to the decisive role of these subjects in future international trade of tropical timber.

1.5 UNIDO

The United Nations Industrial Development Organization is charged with promoting industrialization in developing countries. Wood usually forms a point of major interest among these countries. As a result, UNIDO has numerous projects which, in cooperation with FAO, it conducts or assists on matters of lumber and its derivatives, wood panels and paper and pulp.

1.6 UNDP

Through its wide network of resident country representatives and administrative staff its effective procedures for project formulation monitoring and reporting and, above all, through its funding capability, the United Nations Development Programme (UNDP) plays a decisive role in the formulation, establishment and operation of projects dealing with forests in tropical countries. By their catalytic action, such projects are helping developing countries to evolve techniques and provide key information on problems dealing with tropical forests. A greater concentration of effort, however, is required on these problems besetting the critical areas listed previously, in order to provide leader information toward their solution and thereby furnish opportunities for large-scale intervention requiring a greater level of investment.

1.7 World Meteorological Organization (WMO)

In 1974 the WMO Commission for Agricultural Meteorology appointed a Working Group on Applications of Meteorology to Forestry. The main outcome was the convening in Ottawa in 1978 of a Symposium on Forest Meteorology, which included several subjects related to tropical forest problems. In 1979, the Commission for Agricultural Meteorology established another Working Group on the Role of Forests in the Global Balances of Carbon Dioxide, Water and Energy.

Through the publication of the Proceedings of the Symposium on Forest Meteorology, WMO members have been given a fairly clear picture of the requirements for monitoring of meteorological parameters for application in forestry.

Research problems involving climate-water-soil-forest relationships will require more detailed studies. A study of the impact of deforestation on soil and microclimate in tropical forests is also urgently needed.

While it is fully aware of the importance of the relationship between meteorological subjects and tropical forest problems, this Organization is hampered by limited means.

1.8 International Labour Organization (ILO)

The ILO has carried out many important activities in the field of training specialized workers. In the case of forestry workers, both for forest work and derived industries, training courses are usually conducted in cooperation with FAO. In Europe, there is a special Committee for Forest Work and the Training of Forestry Workers, run by the Economic Commission for Europe, along with FAO and ILO, which could prove useful as a model for other regions.

The ILO and FAO have jointly developed and organized a series of training courses for specialized workers in different regions of the world.

The ILO has an important role to play in tropical forest management through its training courses in a broad range of related specializations and this task should be carried out in close cooperation with FAO.

1.9 World Bank

In 1978 the World Bank published a Forest Sector Policy Paper which outlined a change of action in its forestry programmes, with special reference to the role of forests in rural development and environmental protection. The Bank committed itself to increase the total volume of loans to this sector, establishing the target of US\$ 500 million for the 1979-83 period, and which it has already surpassed. The Bank is also increasingly concerned about the problem of the renewable energy crisis in developing countries, as a result of deforestation. The Bank's Energy Policy Paper (1980) suggests that the Bank increase its lending for fuelwood to US\$ 1 billion for the five year period 1981-85.

Since 1978 the Bank has granted loans to forestry projects in over 20 countries. Over 60% were allocated to environmental protection programmes and provisions of fuelwood, forage, building poles and other forest products.

Especially noteworthy are the Bank's loans to rural development projects that - totally or partially - involve forestry. They constitute an excellent source of experience as to the impact of forest activities in rural development and the reaction of the population to such projects. As a result of these experiences the Bank has reached the conclusion that forest destruction can only be avoided by attacking the problem of rural poverty. Thus, the Bank's two major lending priorities are: forest activities that favour the environment (mountain watersheds; arid zones, etc.) and those that contribute toward rural development (small fuelwood forests near villages; production of posts and cut lumber; production of trees for obtaining fruit, forage and fibres; small-scale industry, etc.).

In the 1978-80 period the Bank granted loans to forestry projects in eight tropical countries, amounting to a total of US\$ 124.8 million, and four other projects were being studied in mid-1980, involving a further US\$ 56 million.

As to other rural development projects with an important forest component, including fuelwood production, 14 projects in 14 different countries have received loans amounting to over US\$ 2 million.

It is expected that the Bank will support the strengthening of national forest research capabilities in developing countries in priority subjects. This may include financial support to extend twinning arrangements .

The Bank's Forest Programme is supervised by 14 forestry experts, three of whom are employed at FAO Headquarters within the World Bank/FAO Cooperative Programme.

1.10 Regional Banks

Up to the present time, the African Development Bank has only granted one loan of US\$ 6 million for a forestry programme in Liberia.

The principal points that must be kept in mind in regard to forest financing policy in Africa are: the need for governments to give higher priority to the forestry sector in their investment programmes, the institutional weakness of the forestry sector, and the convenience of helping governments to elaborate programmes and projects.

The Interamerican Development Bank has been giving increasing attention to the forestry sector in its loans to Latin American countries. Nonetheless, the majority of these loans have gone to temperate zones. Of the 13 loans for forestry projects granted between 1962 and 1977, amounting to a total of US\$ 273.5 million, only 4, with US\$ 86.2 million, correspond to projects in tropical zones.

In its document Operational Policy: Forestry Development, the IDB reflects its willingness to finance forest projects - either public or private - in the following fields: (a) development of natural forests; (b) establishment of new plantations for industrial use; (c) establishment of industries for the utilization of natural forests and new forest plantations; (d) construction of access roads to forest zones and acquisition of equipment for logging and transport of products; (e) regeneration of natural forests or establishment of new forest plantations for multiple use (watershed production; recuperation of eroded soil; national parks, etc.)

It is preparing a meeting to examine financial perspectives in the forestry sector. Given the importance of the tropical forests in this region, hopefully the Bank will increase its support to projects involving the rational utilization of these forests.

By 1980 the Asian Development Bank had granted three loans for forestry projects in three different countries, amounting to US\$ 38 million, representing 0.5% of the total sum of loans granted up to that year.

It is evident that regional banks - either due to their lending policies or to the lack of priorities in this sphere in the countries involved - have played a very limited role in the development of tropical forests.

1.11 International Agricultural Development Fund

By 1980 this fund had granted 8 loans for a similar number of rural development projects in countries located in tropical zones (3 in Africa, 2 in America and 3 in Asia) with forest components. These loans amounted to US\$ 142.4 million.

1.12 UN Regional Economic Commissions

The Economic Commission for Africa (ECA) acts as an Executive Agency for the regional project Development and Conservation of Forest Resources, largely devoted to tropical forests. The main subjects already studied or currently under study are conservation of resources, economic parameters of timber supply and demand, role of the forest sector in national economies and the exploitation and management of non-wood forest resources. The project proposes to study the types and quantity of technical aid that should be provided during the 1982-86 period. It also intends to promote actions involving cooperation - such as extension techniques - that are basic in conservation measures. After its initial monitoring work and evaluation of vegetal cover, it hopes to warn the governments and authorities of those countries concerned as to the changes occurring and advise them on measures that should be taken to arrest such ecological damage.

A joint project - Remote control supervision of food production and fuelwood in Africa - with the UNDP has also been proposed for the 1982-86 period.

The Economic Commission for Latin America (ECLA) has devoted itself mainly to industrial development and trends in the production and consumption of wood and its derivatives, in collaboration with the Regional Office of the FAO through its Advisory Group on Forest Industries. Aid to regional groups, such as the Andean Group, has also been directed at promoting the rational utilization of forests and the development of derived industries.

The Economic Commission for Asia and the Pacific carries out no activities directly related to forests, due to its lack of extra-budgetary funds, though it is highly aware of the critical deforestation problem in the region. It is, nevertheless, examining the recommendations of the Plan of Action of the UN Conference on Desertification, as similar problems in Asia are directly related to the destruction of tropical forests.

The Economic Commission for Europe (ECE) has given special attention to the tropical hardwood that is traditionally imported to Europe, either in the form of logs or processed products such as cut lumber, plywood boards and panels. These imports play an increasingly important role in European consumption of forest products and, consequently, are an important factor in the trade and marketing of these products. The Commission's Timber Committee has given close attention to tropical wood and has conducted several studies on the subject. Its most outstanding activity, however, was the convening of a Seminar in Amsterdam in 1979, on the use of tropical woods. The conclusions of the Seminar focussed on the need to strengthen tropical silviculture research in order to guarantee future wood supply; the convenience of extending and improving inventories and monitoring of forests, of conserving large areas of tropical ecosystems; the need to improve information; the need to adopt measures for grouping species, classification by final use, wood protection, etc. The Seminar referred to the important role that UNCTAD could play in all these matters.

Given the importance of Europe in terms of relative importance of tropical wood, the ECE may prove a valuable instrument in helping to harmonize the needs and conveniences of both producing and consuming countries.

1.13 World Food Programme

At present 32 countries in tropical zones receive aid from WFP through 43 projects with forest components. Seven correspond to Latin America, with total aid of US\$ 54 million, of which US\$ 10.6 million are for the forest component; 13 projects are implemented in Western Africa for a total amount of US\$ 113.3 million, of which US\$ 35.8 million correspond to the forestry component; in East Africa 10 projects are implemented with total aid of US\$ 129.8 million, of which US\$ 55 million have been allocated for forestry activities. In the past, 14 projects were operated in Asia and the Far East, for a total amount of US\$ 91 million, including US\$ 67.3 million for the forestry component.

Total aid for these 43 projects reached US\$ 388.1 million, of which US\$ 168.7 million was reserved for forestry activities (6% for Latin America, 21% for Western Africa, 33% for Eastern Africa, 40% for Asia and the Far East). Globally these activities correspond to 43% of the total aid supplied through these projects.

The forest activities of projects receiving aid from the WFP usually consist of plantations for soil, water and general environmental protection, creation of small forests near villages, wind breaks and other forest works for rural development. In arid and semi-arid zones, forest activities emphasize environmental functions such as dune stabilization, the fight against erosion and desertification, shelter strips and wind breaks.

2. OTHER INTERNATIONAL NON-GOVERNMENTAL ORGANIZATIONS

ICRAF (International Council for Research in Agro-forestry)

ICRAF is an autonomous, non-profit, international organization, the headquarters of which is in Nairobi, Kenya. It was established by charter signed on 24 August 1978 by representatives of Guyana, Senegal, the Canadian Government and IDRC (International Development Research Centre) and operates under an agreement with the Kenyan Government signed on 21 November 1978. ICRAF is financed by voluntary contributions from donor agencies.

Objectives

To increase the social, economic and nutritional well-being of peoples in developing countries through the promotion of agro-forestry systems to achieve better land use without detriment to the environment.

Activities

ICRAF's programme of work is centred around three major activity groups:

- Development of an inter-disciplinary capacity and methodology to assess land use systems constraints and the potential for agro-forestry solutions to these constraints;
- Building up of a systematic knowledge on agro-forestry technologies and development of methods to study them; and
- Dissemination of capacities, knowledge and methods.

These activities are carried out within six programmes:

- Information Services
- Training and Education
- Agro-forestry Systems Research and Evaluation
- Agro-forestry Technology Research and Evaluation
- Field Station
- Collaboration and Special Projects.

Within each of these programmes a number of different projects are developed.

Type of Assistance

Technical assistance to countries and organizations in the conception, design and running of agro-forestry projects and systems. Provision of facilities for and promotion of seminars and workshops. Running of training courses in agro-forestry research and development techniques. Provision of information services in agro-forestry.

IUBS (International Union of Biological Sciences)

The IUBS is a non-governmental, non-profit organization, established in 1919. The membership presently consists of 50 national members, each country adhering through its Academy of Science, National Research Council, national science associations or similar organizations, and of 60 scientific members, all of which are international scientific associations, societies or commissions in the various biological disciplines. Besides the national committees it has a general assembly, an executive committee charged with carrying out the decisions of the General Assembly and several technical divisions and sections.

Objectives

To promote the study of biological sciences, to initiate, facilitate and coordinate research and other scientific activities that require international cooperation, to ensure the discussion and dissemination of the results of cooperative research.

Activities

- To promote the organization of international conferences;
- To assist in the publication of reports;
- To promote biological education for community development (through Unesco).

Types of Assistance

Through associates subsidize international conferences and workshops, and finance publication of scientific reports.

IUCN (International Union for the Conservation of Nature and Natural Resources)

The IUCN is an independent non-governmental organization with 444 voting members from 106 countries comprising 52 states, 114 government agencies and 278 non-government organizations. It has a General Assembly, a Council and a Bureau to act when the Council is not sitting. There are 6 commissions which deal with specialized subject areas. Links are maintained with a network of more than 700 scientists and professionals. It has an annual budget of around US\$ 7 million, derived from WWF (World Wildlife Fund) members and other organizations.

Objectives

To promote scientifically based action directed toward the sustainable use and conservation of natural resources, one of the most important of which are tropical forests.

Activities

- Monitoring conservation and drawing requirements to the attention of relevant organizations.
- Planning conservation action at the strategic programme and project levels. The World Conservation Strategy elaborated in 1980 with the support of WWF and UNEP and endorsed by FAO and Unesco is a major advance in this field.
- Promoting conservation action by governments, NGO's and inter-governmental bodies.
- Providing assistance and advice.

The Organization has elaborated national conservation plans for several countries, as well as guidelines for the use of forests in S.E. Asia and Latin America.

The IUCN has also launched a new Conservation for Development Programme which provides technical assistance to governments and aid organizations in the planning and evaluation of the environmental effects of development projects. The IUCN also assists governments in matters concerning National Parks and other protected areas, in conjunction with the WWF and through the medium of IUCN/WWF and IUCN/UNEP projects.

Types of Assistance

Mainly specialized technical assistance in the field of conservation.

IUFRO (International Union of Forest Research Organizations)

This international non-governmental organization is 90 years old and was reorganized into its present form in 1982. The Organization comprises a congress of one delegate per country represented. It has about 500 members (forest research institutes or stations, universities or other establishments in 91 countries) and un nearly 10 000 scientists world-wide. There is an Executive Board of 23, 6 major divisions and more than 200 subject groups, project groups or working parties. Congresses are held every 5 years, the 17th Congress being held in Kyoto in 1981.

Objectives

To promote international cooperation in scientific studies embracing the whole field of research related to forestry, including forest operations, forest products and environment.

Activities

It has more than 30 working groups specifically devoted to different aspects of research on forestry and forest products in the tropics, including agro-forestry and energy from biomass and can provide substantial technical help in this direction.

Type of Assistance

Technical assistance in coordination of research, dissemination of information, selection of institutions and individuals specialised in the related fields for cooperation and training in research; organization of seminars and specialized meetings.

OAB (Organisation Africaine du Bois)

The African Timber Organization (ATO) or Organisation Africaine du Bois (OAB) was established in 1975 in Libreville, Gabon, by 12 French and English-speaking countries spanning Africa from Liberia in the West to Madagascar in the East and possessing between them 89% of the most productive forest resources of the continent. The Organization is oriented toward promoting the productivity of its members, improving the profitability of their wood-based enterprises, while maintaining the productivity of their forest resources.

Objectives

In addition to ensuring a continuous exchange of information on and harmonization of forest economies, commercial policies, timber price levels, freight charges, markets for and market studies on African timbers, the Organization also aims at harmonizing policies of re-forestation and tropical forest resource management, as well as conducting studies on the possibilities of creating and establishing a truly African timber market.

Activities

Subsequent to the decision of the Conference of Ministers at Kinshasa in 1981, the OAB seeks the following changes in orientation and simplification of structure:

- An evaluation of the forest resources of its members, taking into account the extent of deforestation and forest degradation, as well as the need to regenerate these resources and make use of the lesser known or as yet unknown tree species of timber potential.
- A progressively increasing conversion of wood to wood products within member countries, using timbers that would otherwise have been exported in log form.
- In 1982-84 the Organization will:
 - (a) Evaluate the forestry potential of its member countries.
 - (b) Study the forest industry and forest institutional structures, together with the aspects of forest legislation, bearing in mind the potential of forest industry to assist in re-establishing the productivity of the harvested forest resources upon which it is dependent.
 - (c) Study and analyze in detail the possibility of establishing an African market for forest products.
 - (d) Evaluate the short-term and long-term wood consumption needs of its member countries in relation to their increasing populations and industrial potential.

Types of Assistance

Conduct of relevant studies, the collection and dissemination of information and recommendations for appropriate action.

WWF (World Wildlife Fund)

The WWF is the world's largest voluntary conservation organization raising funds worldwide for urgent conservation requirements.

The Organization has an elected president, a chairman, 2 vice-presidents, a treasurer and a Director-General who is based at Gland, Switzerland. There are 26 affiliates on 5 continents concentrated in those parts of the world where the greatest potential for fund raising exists.

Objectives

To promote fund raising and publicity in order to provide the means of support for basic and applied research in the fields of tropical biology, promotion of new reserves and biological parks, the maintenance of those in existence, and public information on threatened and endangered species and habits. It also aims, in 1982, to carry out an international campaign on tropical forests in order to generate additional funds to assist their conservation.

Activities

One of WWF's major functions is to finance conservation projects planned by IUCN (International Union for the Conservation of Nature) experts. The WWF was instrumental in the establishment of The 1001: A Nature Trust - a US\$ 10 million capital fund to which 1 000 men and women from over 50 countries have each contributed US\$ 10 000. The income generated from this capital fund is used to cover WWF's basic running costs.

WWF works in close coordination with FAO and UNEP, as well as IUCN, thus covering both the inter-governmental as well as the scientific and professional communities.

Types of Assistance

Raising funds for IUCN implementation and small contributions to worthy ongoing field projects.

3. NATIONAL PROGRAMMES OF INTERNATIONAL COOPERATION

Australia

Australian overseas aid is managed by ADAB (Australian Development Assistance Bureau) under the auspices of the Ministry of Foreign Affairs. Assistance is also provided by the Australian National University and the CSIRO (Commonwealth Scientific and Industrial Research Organization).

Objectives

To strengthen the capability of developing countries (mainly in the Asia-Pacific region) to manage their own tropical forest resources through the provision of technical assistance and opportunities for education and training.

Activities

Surveys of tropical forest resources have been carried out in Sarawak in order to provide information on the feasibility of proposals for industrial development.

The ANU (Australian National University) provides opportunities in graduate and post-graduate training in forestry and other shorter courses in broadly related subjects, such as tropical pastures, desertification, plant quarantine and so on, are offered by other national institutions.

Assistance in forest research is provided by the CSIRO Division of Forest Research and the CSIRO Division of Forest Products. There are also proposals for the setting up of a research centre in Australia to tackle topics related to problems in developing countries, including research into those of tropical forests.

Assistance in forest management is provided by the CSIRO in its joint Forest Tree Seed Programme with FAO, the ANU, (Australian National University) project in Nepal and various lesser aid projects in the Pacific Islands concerning forest fire fighting, wood preservation treatments, agro-forestry: cattle and forest tree plantations and indirect budget support for the running of the Papua New Guinea Forest Department.

Types of Assistance

Bilateral aid projects, allocations from the national budget assisting the administration of Papua New Guinea, technical assistance from specialists and volunteers, provision of experts to the FAO field programme and technical cooperation with the FAO Regular Programme.

Government activity directed toward tropical forests is centred in the AGCD (Agence Générale de Coopération pour le développement) and closely linked to the Ministry of Cooperation for Development. The Universities of Gembloux and Louvain also give practical assistance and technical advice to a wide variety of forestry-oriented projects in tropical countries.

Objectives

Belgian aid is oriented towards following up those objectives promulgated by WCARRD and interest is concentrated on the countries of the Andean Region, Front Line Countries in Southern Africa, the Sahel, Bangladesh and Thailand.

Activities

Belgium is financing an FAO trust fund forestry project in a Sahelian country with close support from the University of Gembloux and fellowships have been provided for forest graduate training at both universities mentioned above. The AGCD also operates a wide range of bilateral aid projects in tropical countries, including work on national parks in Zaire. The University of Liege has also been associated with the University of Zaire in joint training in Nature Conservation and Ecology.

Types of Assistance

Bilateral aid projects in tropical countries. Belgium is an important contributor of personnel to the FAO Associate Expert and FAO/UN volunteer schemes, as well as technical expertise in the FAO operated field programme.

Canada

Foreign aid from Canada originates from two main sources: multilateral assistance dealing with Canadian contributions to UNDP and international agencies and bilateral aid which is handled by CIDA. The latter prefers full operation of its projects. There is a form of trust fund cooperation with FAO and these funds are derived from CIDA itself. The IDRC (International Development Research Centre) is a separate organization concentrating on the aspects of research in developing countries.

Objectives

Canadian assistance in forestry is oriented toward forest resource management, covering inventory, harvesting, utilization of raw material, wildlife management, agro-forestry and forest protection (mainly against fire).

Activities

CIDA funds and operates a wide range of forestry-oriented undertakings in tropical countries including wildlife management and national parks, while the IDRC's major activities have included agro-forestry and research into the use of lesser known species, together with applied research on topics related to the welfare of rural populations. Meanwhile, IDRC are supporting four agro-forestry projects in West Africa and a large timber utilization project in 5 countries of the Andean Pact. The Organization also publishes a newsletter and organizes regional workshops to identify forestry problems and research priorities.

Types of Assistance

Direct funding of bilateral aid projects, some supply of funds for trust fund operation by international agencies, direct technical assistance and support, provision of personnel for their volunteer scheme: CUSO, and recruits to the FAO field programme.

Czechoslovakia

Aid in tropical forestry originates from the parastatal organization Polytechna which either undertakes work on subcontract or will recruit experts for use by international agencies on field projects.

Objectives

To provide assistance in forestry development to countries in a wide variety of fields as requested on a reimbursable basis.

Activities

Polytechna has assisted forestry development in Angola, Cuba and Mozambique, as well as the Congo, Tanzania and in Guinea. Assistance has also been provided to Viet Nam and Laos.

Types of Assistance

Recruitment of expertise and supply of technical advice on problems dealing with tropical forests. Supply of expertise to the FAO field programme.

Denmark

DANIDA (Danish International Development Agency) cooperates with FAO in various forestry projects. The Agency is based within the Ministry of Foreign Affairs and is also active in the field of bilateral aid.

Objectives

The main thrust of Danish aid to developing countries is oriented toward meeting the basic human needs of people living in countries where the average annual per capita income is US\$ 250 or less.

Activities

DANIDA provides trust funds to FAO for 55 projects of various sorts in tropical developing countries, but has its own programmes of assistance to 21 developing countries. A small proportion of the above assistance is oriented toward tropical forests.

One of its major activities is in the genetic improvement of forest tree species, the production of seed of superior genotype and the conservation of genetic resources. In conjunction with FAO it finances and runs the forest tree seed Centre at Humblebaek.

Types of Assistance

Denmark provides trust funds for 55 FAO projects, some of which are with a forestry orientation and is a major provider of personnel to the associate expert scheme. Experts for the FAO field programme are also recruited from Denmark.

Federal Republic of Germany

GTZ (German Technical Cooperation Organization - Deutschen Gesellschaft für Technische Zusammenarbeit) is the mainspring of its Federal Republic's aid to developing countries. In addition, several scientific institutes carry out work on tropical forest ecology. These are: World Forestry Institute, University of Göttingen, Heidelberg, Freiburg and Reinbeck.

Objectives

Assistance is mainly aimed at improving technical capability through training and direct technical assistance to tropical forestry.

Activities

Training in forest exploitation in Liberia, assistance to the College of African Wildlife Management in Tanzania and the Cameroon Ecole de Faune, and a wildlife and national parks project in the Ivory Coast. Assistance has also been given to forest inventory in Upper Volta, the Gambia and Benin. GTZ conducts forest aid programmes in 16 countries and provides a volunteer programme for experts working in 5 countries.

Types of Assistance

Mainly bilateral aid programmes and the provision of volunteers for direct technical assistance. The FRG also provides personnel for the FAO associate expert scheme and experts to the FAO field programme.

Finland

Finland provides assistance through its Department of International Development Cooperation under the auspices of the Ministry for Foreign Affairs.

Objectives

Finnish aid covers a wide field of activities which for forestry is oriented toward forest industries, forest tree improvement and forestry for local community development.

Activities

Finland has been a large-scale FAO trust fund donor for forest industry development in Africa and has provided bilateral aid in Honduras and Mozambique. It has also contributed funds in trust for a local community forestry project in Senegal.

Types of Assistance

Bilateral aid and multi-lateral aid through the joint Nordic programmes. Finland also supplies associate experts to the FAO field programme, as well as experts for FAO field projects.

France

France has maintained a strong interest and involvement in a wide range of forestry activity in tropical countries. The organizations which provide the assistance are FAC (Fonds d'Aide et de Coopération) which is responsible for financing bilateral projects and is under the auspices of Ministère de la Coopération, as well as Caisse Centrale de Coopération Economique, which provides loans for development projects including forestry projects, ORSTOM (Office de la Recherche Scientifique et Technique d'Outre-Mer) which conducts technical studies and provides information and advice on a wide range of subjects upon which forest development is dependent, including research and detailed studies of tropical ecosystems and finally CIPT (Centre Technique Forestier Tropical) which provides technical assistance and advice on all forestry-related matters, conducts research and development investigations and undertakes sub-contracts for a wide variety of activities, such as forest inventory, wood technology, afforestation, forest management and prefeasibility and feasibility studies. CIPT also maintains field research units in French-speaking countries of tropical Africa, French Guyana and New Caledonia. Some university groups and centres for advanced studies are also actively involved in activities related to tropical forestry such as the Institut de la Carte Internationale du Tapis Végétal in Toulouse, the Centre d'Etudes de Géographie Tropicale in Bordeaux, the Musée d'Histoire Naturelle in Paris. The general objective of French assistance on tropical forests is to assist developing countries to manage and develop their tropical forest resources.

Activities

Awareness and the dissemination of information on tropical forests is promoted by the regular publication of Bois et Forêts des Tropiques by the CIPT, a widely read and informative periodical. Technical information on a wide range of subjects is provided on request to CIPT and ORSTOM.

Opportunities for higher forestry education are provided by Centre International des Hautes Etudes Agronomiques Méditerranéennes at Montpellier and opportunities for technical training in forest industries at the Ecole Supérieure du Bois, Paris.

Research is conducted into all aspects of forest ecology, forest protection, wood technology, tropical silviculture, tropical forest botany, tropical soils, land-use planning, afforestation techniques and other topics related to the use and management of tropical forests.

In the field of forest management a wide range of bilateral aid forestry projects have been established in French-speaking tropical countries of the 3 major regions, considerable attention being given to forest inventories afforestation/forest management and forest industries development. Direct technical assistance to forestry institutions in tropical countries is provided by a volunteer scheme and technical advisers.

Types of Assistance

Financing national projects, technical assistance in all aspects of forest development and management, volunteers for technical assistance, sub-contracting specific project activities, bilateral aid projects and the provision of experts to the FAO field programme.

Japan

Japan supplies its technical assistance through JICA (Japanese International Cooperation Agency), as well as technical assistance in research through TARC (Tropical Agriculture Research Centre), which is under the auspices of the Ministry of Agriculture, Forestry and Fisheries.

Objectives

JICA aims at assisting forestry activities in developing countries in order to contribute to their economic development and social welfare.

Activities

Research into tropical forests and their problems is an outstanding activity of TARC and covers investigation and analyses of the climatic and edaphic characteristics of tropical forests and the physiological characteristics and wood properties of their principal tree species. Other work covers aspects of silvics, natural regeneration, artificial forest establishment and tropical forest pathology.

Work on management is handled by JICA which has 2 afforestation projects in Southeast Asia and projects on forest development and agro-forestry in Latin America.

Types of Assistance

Japanese Government sponsored technical assistance, a subsidized cooperation programme, supply of volunteers and, recently, FAO associate experts, bilateral aid projects and the supply of experts.

Netherlands

The Directorate of International Technical Assistance under the auspices of the Ministry of Foreign Affairs and the Directorate of Agriculture and Fisheries are involved in the provision of aid to developing countries. Aid is provided both through bilateral channels and by means of funds in trust placed at the disposal of international agencies.

Objectives

Netherlands aid places high emphasis on the aspects of forestry for rural energy and the function of forest tree crops in providing for the needs of rural people.

Activities

Surveys: There are land use planning/management and forest inventory projects in Southeast Asia and Africa

Research

Research into tropical forests is being conducted in Surinam and Indonesia. Information on tropical forests is being collected and distributed in Indonesia.

Management

Work on multiple use forestry and agro-forestry in Indonesia; 7 bilateral projects on community and industrial forestry in Africa and 1 in Latin America; work on forest botany of forests in Indonesia and the Ivory Coast; 2 projects on wood for energy purposes in Kenya and the Sahel and cooperation with FAO through trust funds.

Education

Courses are convened on aerial photo interpretation at the ITC, Delft, together with courses on inventories, land use, soil studies, environmental protection and analyses of remote sensing data. Training programmes have been organized in conjunction with the Indonesian Forest Research Institute. Work is also to be conducted under a Secretariat for Land Evaluation in Forestry under the auspices of IUFRO, ISSS (International Society of Soil Science), FAO, UNEP and UNIDO.

Types of Assistance

Bilateral aid projects, trust fund donations, training facilities, the provision of FAO associate experts and experts to the FAO field programme.

New Zealand

New Zealand aid toward tropical forestry is organized by the Ministry of Foreign Affairs (External Aid Division) Development Programme, with additional support from universities, the Forest Research Institute, the New Zealand Forestry Training Centre and the Timber Industry Training Centre. Aid is generally confined to Southeast Asia and the Pacific Islands areas.

Objectives

The main objectives of the above aid is to emphasize public education with regard to conservation of natural resources and to promote the integrated, multi-purpose use of the resource.

Activities

New Zealand has assisted the Pacific Islands in assessing the potential and extent of their natural forest resources. In the field of forest land management cooperative aid includes assistance in land use planning, multi-use forest management, assistance in managing national parks in mountainous areas (Nepal and Peru).

The Forest Research Institute has provided assistance with studies on the properties of indigenous timbers and timber preservation techniques and published bibliographies on this. Research has been conducted on agro-forestry and grazing in plantations. Opportunities for training are offered at New Zealand universities, and forestry training schools and timber industry schools have been set up in other countries of the region.

Types of Assistance

Regional and bilateral aid projects, together with technical assistance and participation in the Colombo Plan. New Zealand also provides assistance through a volunteer scheme, together with experts for the FAO field programme.

Norway

NORAD (Norwegian Agency for International Development) is the main organ for provision of assistance to developing countries.

Objectives

Norway gives priority to national-based rather than regional aid, emphasizing assistance to the present groups of populations in the least developed, poorest countries.

Activities

Practical assistance is given in the conduct of a number of feasibility studies and some forest research. Norwegian development assistance is concentrated in 5 African and 4 Asian countries, allowing the countries to decide their own priorities in line with their own development plans. Assistance is also provided in the management of African national parks and wildlife reserves and training in Africa in the management of protected areas.

Types of Assistance

Bilateral aid programmes in forestry and rural development, participation in the joint Nordic Programme, associate experts and expertise for the FAO Field Programme.

Sweden

SIDA (Swedish International Development Agency) is the main source of Swedish assistance to tropical forestry, although some technical assistance is also provided by the Swedish University of Agricultural Science.

Objectives

The Organization encourages a programme approach oriented toward education, training, institution strengthening and local community forestry, placing emphasis on the follow-up to the objectives of WCARRD.

Activities

SIDA actively participates in many multilateral and bilateral aid projects in tropical forestry including FLCD (Forestry for Local Community Development), arid zone afforestation in the Sahel, forestry education in the Philippines, a pulp and paper project in Viet Nam and a forestry project in Bangladesh. Opportunities are also offered for undergraduate and post-graduate studies in forestry in Sweden.

Types of Assistance

Multilateral and bilateral aid projects, donations of trust funds to FAO for use in forestry projects, a provider of associate experts and experts to the FAO Field Programme.

Switzerland

Switzerland provides funds and assistance to FAO under the Switzerland cooperative programme. It also provides assistance to developing countries through links with CATIE (Centro Agronómico Tropical de Investigación y Enseñanza) and ICRAF.

Objectives

Practical aid directed toward the least privileged and poorest rural populations with emphasis on the cost-effectiveness of the assistance given.

Activities

Research into the impact of traditional agriculture on humid tropical forest in Peruvian Amazonia and management of higher altitude forests in Rwanda, together with conservation and rational management of Amazonian tropical forest resources in Peru. Considerable weight given to consideration of ecological factors and their influence on forest management decisions. Training of forest technicians has also been conducted in Africa, Mali and Madagascar.

Types of Assistance

Bilateral assistance. provision of FAO/UN volunteers, associate experts and experts to the FAO Field Programme.

United Kingdom

Assistance by the UK to tropical forestry is derived from a number of sources: the CFI (Commonwealth Forestry Institute) and its Unit of Tropical Silviculture (UTS), the CSC (Commonwealth Science Council), the TPI (Tropical Products Institute) and the ODA (Overseas Development Administration) which is itself part of the Ministry of Overseas Development.

Objectives

The objectives of assistance cover a wide field of endeavours but could be said to be directed mainly toward promoting the most efficient sustained management and use of tropical forests through technical assistance and research.

Activities

1. Research into tropical forests is an important aspect of UK assistance and receives strong support from the CFI in silviculture, forest ecology, forest genetics, species introduction, seed supply, forest management and data processing. The CSC also coordinates research programmes with a greater technological and industries bias in such fields as afforestation, renewable energy and energy resource assessment.
2. A continuous flow of information on tropical forests is maintained through the publication of its Commonwealth Forestry Review, Forestry Abstracts and the Forest Products Abstracts, the latter two of which are published by the Commonwealth Forestry Bureau and Forestry Library. Other publications and monographs on species, manuals for sampling and experimentation and the development of computer programmes are also produced by the CFI. The periodically held Commonwealth Forestry Conference, which has already held 11 sessions, is another source of distribution and exchange of information and ideas.
3. Assistance in the management and use of forest resources is also provided in the fields of land use capability classification, forest utilization and rational use of resources, renewable energy production and reforestation of marginal lands through CSC. The TPI covers assistance in such aspects as timber processing, preservation, storage, transport, quality control, marketing and utilization, together with the development of expertise and equipment for the use of energy from biomass. The organization has also worked on producer gas, improved charcoal production and energy from vegetal wastes derived by anaerobic fermentation and has issued numerous publications on these subjects.
4. Education in tropical forestry and related subjects is provided by:
University of Oxford: undergraduate, post-graduate and intensive short-term courses either in the UK or provided on request in the countries concerned. Future work will also encompass Development of Forest Activities in Rural Communities, Extension Work in Rural Forests, Diagnosis and Control of Forest Pests and Diseases, and Nature Conservation and Wildlife Management.
5. Tropical Products Institute: Overseas Training Courses in tropical forest topics. Timber trade is an important consideration to the UK which participates in UNCTAD's efforts to establish an integrated programme for commodities.

Types of Assistance

Bilateral projects, volunteers, direct technical assistance, participation in the Colombe Plan and the provision of experts to the FAO Field Programme.

United States of America

Presidential interest in and support for the subject of tropical forests as reflected in the President's message in 1979 on the state of the environment, prompted a wide range of activities by government and non-government organizations. The major thrust and expense of these being supported by federal government agencies.

Objectives

The report to the President by the US Interagency Task Force (May 1980) indicated that the USA considered that it has a vital stake in the sound management of its own limited tropical forest resources and that its national, governmental and non-governmental efforts harmonized and combined with those of other nations, can assist in decelerating the present rapid disappearance and destruction of tropical forest cover through emphasizing, demonstrating and making use of the short-term and long-term economic and social benefits obtainable from tropical forests.

Activities

1. National and world attention has been drawn to the increasingly critical situation in tropical forests through the Presidential environmental message of 2 August 1979 which prompted the production of The World's Tropical Forests - A Policy, Strategy and Programme for the United States, by the US Interagency Task Force, together with the Global 2000 Report to the President and Entering the 21st Century; and Global Future: Time to Act, by the Council of Environmental Quality and the Department of State respectively. Other committees and organizations oriented toward this objective include:

- The Committee for the Year 2000, focussing government attention on selected long-term problems and assisted by a group comprising more than 30 private environmental organizations.
- The US Industrial Tropical Forest Committee.
- The Smithsonian Institute.
- The Agency for International Development.
- The Society of American Foresters.

The US also provides a wide media coverage supported by information from the USDA and other organizations.

2. Surveys. The following appraisals of problems are being undertaken:

- NASA (National Aeronautics and Space Administration): extension of remote sensing techniques to tropical forests and the launching of the Landsat "D" satellite to obtain finer spectral and spatial resolution of ground data. The integration of remote sensing data with traditional forest survey data in combination with the St. Regis Paper Company.
- USDA (US Department of Agriculture): development of methodology for tropical forest inventory.
- Smithsonian Institute: image analysis and graphic facility for ecological studies based on Landsat satellite digital information.
- USDI (US Department of the Interior): the US Geological Survey has recently published a selected bibliography of remote sensing applications for tropical and sub-tropical vegetation.

3. Research on tropical forests is being conducted as follows:

- NSF (National Science Foundation): basic research on tropical forest ecosystems, anthropology, human ecology and support to the National Academy of Science and the MAB (Man and the Biosphere) programme in tropical science.

- USDA: Institute of Tropical Forestry, Puerto Rico.
Institute of Pacific Islands Forestry, Hawaii.
Production of Ethanol from Wood in collaboration with Brazil.
- NASA: research into the applications of remote sensing.
- USDI: Fish and Wildlife Service: research into endangered or threatened flora and fauna, together with surveys of vertebrate groups on Southeast Asia and tropical Mexico.
- Smithsonian Institute: Smithsonian Tropical Research Institute, National Zoo and Museum of Natural History.
- US/MAB Committee/Directorate on Tropical Forests: provision of research grants.
- NAS (National Academy of Science): Committee on Research Priorities in Tropical Biology (Conversion of Tropical Moist Forests).

4. Information on Tropical Forests:

- USDA: bibliography on uses of tropical woods.
- USAID: environmental profiles on 40 countries, including a component on tropical forests.
- USDI: National Park Service: a system for collecting, storing and disseminating reference material.
- NSF (National Science Foundation): base-line information for forest inventories and management.

5. The Management of tropical forest resources is tackled as follows:

- USDA, Forest Service: forest management and land use plans, Puerto Rico.
- USDI, National Park Service: updating management plans for all national parks, preserves, monuments and historical parks containing tropical forests and provides technical assistance to countries in the planning and management of parks and protected areas in tropical forests.
- USDA and USDI: activity in establishing biosphere reserves under MAB projects, in particular that of the Tropical Biosphere Reserve in Puerto Rico.
- USDI, Fish and Wildlife Service: manages 8 national wildlife refuges containing tropical forests.
- Peace Corps: placing increasing emphasis on community forestry.
- CAMCORE, North Carolina University, a group of US industries and a number of tropical forest countries: cooperative action dedicated to the conservation of tropical gene pools.
- US Industry: pioneer work on plantation forestry in the tropics.
- USAID: establishment of community woodlots to supply fuelwood, agro-forestry to rehabilitate degraded forests and watersheds.
- Private Institutions (particularly universities): work on alternatives to shifting cultivation.

6. Activities directed toward education, training and extension:

- USDA, Forest Service: training through the Institute of Tropical Forestry.
- OTS (Organization of Tropical Studies): 27 universities have pooled resources, grants, faculty and students to conduct research in tropical forestry; meanwhile, 1 200 graduates and post-graduates are receiving training in tropical ecology and related fields.

- USAID: demonstration projects on various aspects of tropical forest use, management, protection and re-establishment. It is also conducting an inventory of training facilities and programmes in tropical Latin America.
 - USDI, National Park, Fish and Wildlife Services: support training programmes for wild land and national park managers from tropical countries.
7. As far as the aspects of trade in tropical forest products is concerned, the USA participates in UNCTAD's efforts to establish an integrated programme for commodities related to the above.
 8. The types of assistance provided to countries can range from bilateral aid projects, in some instances sub-contracting agencies such as FAO, the provision of opportunities for education and training and direct technical assistance through the Peace Corps and USAID, together with the provision of experts for the FAO Field Programme.

Tropical America (23)

- Central America and Mexico (7): Costa Rica, El Salvador, Guatemala,
Honduras, Mexico, Nicaragua, Panama
- CARICOM (4): Belize, Guyana, Jamaica, Trinidad and Tobago
- Other Caribbean (5): Cuba, Dominican Republic, French Guyana,
Haiti, Suriname
- Tropical South Latin America (7): Bolivia, Brasil, Colombia, Ecuador, Paraguay,
Peru, Venezuela

Tropical Africa (37)

- Northern Savanna Region (6): Chad, Gambia, Mali, Niger, Senegal,
Upper Volta
- West Africa (9): Benin, Ghana, Guinea, Guinea-Bissau,
Ivory Coast, Liberia, Nigeria, Sierra Leone,
Togo
- Central Africa (7): Angola, Cameroon, Central African Republic,
Congo, Equatorial Guinea, Gabon, Zaire
- East Africa and Madagascar (13): Burundi, Ethiopia, Kenya, Madagascar,
Malawi, Mozambique, Rwanda, Somalia, Sudan,
Tanzania, Uganda, Zambia, Zimbabwe
- Tropical South Africa (2): Botswana, Namibia

Tropical Asia (16)

- South Asia (6): Bangladesh, Bhutan, India, Nepal, Pakistan,
Sri Lanka
- Continental Southeast Asia (2): Burma, Thailand
- Insular Southeast Asia (4): Brunei, Indonesia, Malaysia, Philippines
- Centrally planned tropical Asia (3): Kampuchea, Lao, Viet Nam
- (Oceania): Papua New Guinea

Indicative listing of research priorities to meet developing countries' needs in forestry

This is an 'indicative' and 'non-comprehensive' listing of research priorities. The topics identified are given as examples of the likely main areas of concern in the coming decade and are quoted from the World Bank/FAO, 1981, paper: "Forestry Research Needs in Developing Countries - Time for a Reappraisal?" presented at the XVII IUFRO Congress (Kyoto, Japan, 6-12 September 1981).

(i) Forestry in relation to agriculture and rural development

(A) Sociological and institutional research

1. Knowledge of the natural environment by forest societies
2. Data on the infrastructure of human societies in the forests
3. Determination of perceived role of trees and forests in rural welfare
4. Origin and solution of conflicts for land
5. Determination of acceptability and response to innovative systems
6. Definition and testing of incentives to incorporate trees
7. Guidelines for project preparation
8. Extension methods
9. Institutional aspects
10. Economic returns from alternative farming systems incorporating trees

(B) Farming systems using trees

1. Effects and systems of intercropping, including animals; identification of potential agro-forest combinations
2. Mycorrhizal and other microbiological relations
3. Mulching effects on soil chemistry and structure
4. Impact on soil fertility of burning manure and crop residues
5. Ground preparation (especially arid and degraded sites)
6. Soil nutrients (especially nitrogen and phosphorus, salinity)
7. Moisture relations
8. Irrigation
9. Sand dune stabilization
10. Shelterbelts
11. Choice of species and provenance
12. Seed collection, storage, testing, zonation, certification
13. Silvicultural treatment (coppicing, pollarding)
14. Vegetative propagation
15. Potential of tree breeding

(C) Watersheds (catchments) and range management

1. Farming systems appropriate for upland areas
2. Alternatives for fodder production on and off farms
3. Improvement of alpine pasture lands
4. Impact of land use on water yield, quality and timing
5. Impact on stream flow patterns of shifting cultivation
6. Cost and effectiveness of watershed management
7. Determination of run-off rates and sediment yield
8. Carrying capacity and grazing control to maximize range production
9. Least cost approaches to range improvement
10. Improvement of savannah range lands
11. Improvement of arid zone range lands

(D) Wildlife in relation to rural welfare

1. Ecological monitoring of animal habitats
2. Animal population dynamics
3. Socioeconomic aspects of the place of animal products in rural life

(ii) Forestry in relation to energy production and use

(A) Silviculture of biomass/fuelwood species and systems

1. Choice of species and provenance
2. Tree breeding
3. Seed research
4. Vegetative propagation, tissue culture, cell genetics
5. Ground preparation methods
6. Silvicultural methods
7. Pests and diseases
8. Fire control systems
9. Effect of repeated cropping on soil

(B) Yield, harvesting and properties

1. Yield assessment
2. Harvesting and transport methods
3. Density and calorific value
4. Chemical content

(C) Industrial research related to village technology

1. Improved stove and crematorium design
2. Improved fuelwood and charcoal preparation methods
3. Small-scale crop processors, generators, wood preservation
4. Use of residues

(D) Comparison with alternative fuels (social, technical and economic efficiency)

(E) Wood-based derivatives

1. Pyrolysis
2. Gasification
3. Pelletization
4. Methanol, ethanol and liquid fuel technology

(iii) Management and conservation of existing resources (mainly natural forests)

(A) Resource survey

1. Land use planning methods
2. Soil and land use survey and evaluation
3. Land mapping according to the ecological potential to sustain population.
4. Monitoring changes of forest area
5. Inventories of accessible natural forest

ANNEX 7

(B) Conservation

1. Methods to identify and quantify unique biotic associations
2. Methods to conserve genetic resources and ecosystems
3. Monitoring changes within ecosystems and species
4. Policy and legal aspects of conservation
5. Underlying ecological and biological processes

(C) Silvicultural systems for natural forests

1. Biological limitations to the transformation of tropical forest ecosystems
2. Impact of different types of utilization
3. Natural regeneration
4. Artificial enrichment

(D) Whole tree use

1. Harvesting
2. Utilization
3. Effects on site

(E) Use and marketing of secondary species

1. Inventory
2. Properties
3. Information and market intelligence

(F) Wood preservation

(iv) Industrial forestry

(A) Silviculture and management

1. Choice of species and provenance
2. Seed collection, storage, testing, zonation, certification
3. Vegetative propagation, tissue culture, cell genetics
4. Treebreeding
5. Ground preparation
6. Spacing, weeding, thinning, pruning
7. Fertilization and soil nutrients
8. Mycorrhizal and microbial relations
9. Integrated pest management
10. Fire control systems

(B) Wood properties

1. Anatomical
2. Chemical
3. Physical/mechanical
4. Pulp, paper, boards
5. Composites

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