IICA

Consultant Final Report
IICA/EMBRAPA-PROCENSUL II

FOREST GENETIC RESOURCES CONSERVATION, BRAZIL
(Second edition, revised)

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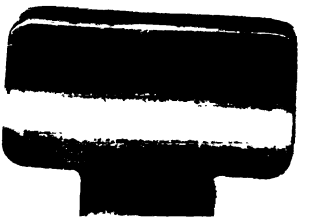

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(Second edition, revised)

Consultant Final Report .
IICA/EMBRAPA-PROCENSUL II

Laurence Roche

Brasília, abril de 1989

INSTITUTO INTERAMERICANO DE COOPERAÇÃO PARA A AGRICULTURA
EMPRESA BRASILEIRA DE PESQUISA AGROPECUARIA

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APRESENTAÇÃO

A reprodução e difusão dos Relatórios de Consultores, no âmbito restrito das Diretorias das Unidades do Sistema Nacional de Pesquisa Agropecuária, vinculado à EMBRAPA, tem como objetivo principal o de divulgar as atividades desenvolvidas pelos consultores e as opiniões e recomendações geradas sobre os problemas de interesse para a pesquisa agropecuária.

As atividades de consultoría são realizadas no âmbito do Projeto de Desenvolvimento da Pesquisa Agrtopecuária e Difusão de Tecnologia na Região Centro-Sul do Brasil - PROCENSUL II, financiado parcialmente pelo Banco Interamericano de Desenvolvimento - BID e a EMBRAPA conforme os contratos de Empréstimo 139/IC-BR e 760/SF-BR, assinados em 14 de mar)o de 1985 entre o Governo Brasileiro e o BID.

As opiniões dos consultores são inteiramente pessoais e não refletem, necessariamente, o ponto de vista do IICA ou da EMBRAPA.

A coordenação dos Contratos IICA/EMBRAPA agradeceria receber comentários sobre estes relatórios.

Horacio A. Stagno
Coordenador Contratos IICA/EMBRAPA

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During the period in Brazil the work was greatly facilitated by J. Silva, Head CENARGEN and J.A. de Silva, who provided technical assistance and transport, and opportunities for visits to forest areas. The author is particularly grateful to E.J. Leite for his patient interpretation, and to both him and A. Gripp for their excellent company during the time spent in the field.

Prior to travelling to Brazil, assistance from the following people and Institutions is gratefully acknowledged: C. Palmberg, Forestry Department, FAO, Rome; V.H. Heywood, IUCN Conservation Monitoring Centre, Royal Botanic Gardens, Kew, London; R. Harley, Royal Botanic Gardens, Kew, London; O.H. MacBryde, IUCN-SI Latin American Plants Project, Smithsonian Institution, Washington D.C.; J. Burley and T. Whitmore, Oxford Forestry Institute, Oxford.

Sumário

O relatório segue o modelo recomendado pelo Instituto Interamericano de Cooperacão em Agricultura (IICA) sendo concernente ao trabalho de pesquisa em conservacão de recursos genéticos florestais atualmente desenvolvidos no CENARGEN, Brasilia. Avaliando este programa no contexto das atuais linhas em exploracão florestal, conversão, conservacão e pesquisa no Brasil; um número de sugestões e recomendacões são feitas. Trabalhos em ambos tipos de conservacão, in situ e ex situ devem em uma primeira instância serem confinados a um pequeno número de espécies selecionadas em base de convencionados critérios, tais como:

(i) Distribuicão ecológica restrita
(ii) Baixa densidade de populacão
(iii) Baixa capacidade de regeneracão
(iv) Altamente explorada para madeira, alimento au óleos, gomas, resinas, etc.
(v) Silvicultura desconhecida e nenhuma plantacão estabelecida
(vi) Habitats vulneraveis ou ameacados de extincão.

Uma vez selecionadas, todos os membros do grupo devem trabalhar nestas espécies. Enfase deve ser dado para a preparacão de mapas de distribuicão e todos os dados devem serem transferidos para o computador do CENARGEN. Ligacões com centros de monitoriamento de conservacão a nivel regional, nacional e internacional são sugeridos. Tambem é recomendado ser feita uma aplicacão formal para incorporar este trabalho no programa global da FAO em conservacão de recursos genéticos florestais.

As seguintes áreas de pesquisas são recomendadas para as espécies selecionadas, ambas in situ e ex situ.

(i) O ciclo reprodutivo
(ii) Sistemas de melhoramento
(iii) Tecnologia de sementes (colheita, armazenamento, tratamento e testes)
(iv) Propagação vegetativa
(v) Potencial silvicultural
(vi) Testes de procedência

Maior trienamento e educação a nível de pósgraduação é recomendado para os membros recentemente contratados da unidade do CENARGEN concernente com conservação de recursos genéticos florestais.

Summary

The report follows the format recommended by the Inter-American Institute for Cooperation on Agriculture (IICA) and is concerned with research work on forest genetic resources conservation currently being developed within CENARGEN, Brazilia. Following an appraisal of this programme, and in the context of current trends in forest exploitation, conversion, conservation and research in Brazil, a number of suggestions and recommendations are given. Work on both in situ and ex situ conservation should in the first instance be confined to a small number of species selected on the basis of agreed criteria such as:

(i) Restricted ecological distribution
(ii) Low population density
(iii) Low capacity for regeneration
(iv) Heavily exploited for either wood, food or exudate
(v) Silviculture not known and no plantations established
(vi) Endangered or vulnerable habitat.

Once selected, all members of the group should work on these species. Emphasis should be given to the preparation of distribution maps and all data transferred to CENARGEN computer facilities. Links with national, regional and international conservation monitoring centres are suggested, and it is recommended that a formal application be made to incorporate this work in the FAO global programme on forest genetics resources conservation.

The following research areas are recommended for both *in situ* and *ex situ* target species:

(i) The reproductive cycle
(ii) Breeding systems
(iii) Seed technology (harvesting, storage, treatment and testing)
(iv) Vegetative propagation
(v) Silvicultural potential
(vi) Provenance Trials

Further training and education at a postgraduate level is recommended for the young, recently appointed members of the CENARGEN unit concerned with forest genetic resources conservation.

REPORT ON THREE WEEKS CONSULTANCY IN

FOREST GENETICS RESOURCES CONSERVATION, BRAZIL (IICA/EMBRAPA)

JUNE 24 TO JULY 14 1987

BY

LAURENCE ROCHE [1]

The format of this report follows that attached to the job description forwarded to L. Roche by the IICA Office, Brazilia, on 15 May 1987. Names of Institutions and Agencies referred to (acronyms) or having other relevance to the work of forest genetic resources conservation, are given fully in Appendix 1 with some explanatory notes.

1. CONTRACTING AGENCY: Inter-American Institute for Cooperation on Agriculture (IICA)

2. NAME: Laurence Roche

3. PROJECT: Strengthening agriculture research and technology diffusion

4. ACTIVITY: Biotechnology and Genetic Resources Centre, CENARGEN

5. OBJECTIVE: To advise the Head and Scientific Staff of CENARGEN on Forest Genetics Resources Conservation.

6. PERIOD: June 24 to July 15, 1987

7. DUTY STATION: CENARGEN, Brazilia

8. INSTITUTIONS ASSISTED: CENARGEN, Forest Genetics Resources Conservation Group

9. COOPERATING STAFF:

J.A. Da Silva	Coordinator of Programme in Forest Genetic Resources Conservation
A. Gripp	Genetic Reserves Research
E.J. Leite	Genetic Reserves Research
D.A.M. Netto	Tree Seed Research
A.C.M. Brasileiro	Vegetative Propagation Research
L. Skorupa	Medicinal Plants Research
P.A. Pinheiro	Biochemical Variation and Biometry Research

---

[1] Professor of Forestry & Head School of Agricultural and Forest Sciences, University College of North Wales, Bangor, Gwynedd LL57 2UW. U.K.

10. PERSONNEL INTERVIEWED FOR THE DEVELOPMENT OF ACTIVITIES:

CENARGEN:

J. Silva .. .. Head

H.M. Rocha .. .. Head (Technical)
D.G. Giacometti .. .. Researcher

R.A. Mendes .. .. Researcher

E. Lleras Perez .. .. Researcher

I.B.D.F

P.L. Viana .. .. Director
Department of Forest Economics and Inventory

A.T.B. Quintão .. .. Director
Department of National Parks and Equivalent Reserves

F.A.O.

F.S. De Andrade .. .. Assistant to Representative

I.I.C.A.

H. Stagno .. .. Coordinator
IICA/EMBRAPA Contracts

FUNATURA

M.T.J. Padua .. .. President,
Formerly Director of Department of National
Parks and Equivalent Reserves, I.B.D.F.

11. ACTIVITIES DEVELOPED:

Prior to coming to Brazil the consultant completed a desk study on forestry and forest conservation in Brazil generally but particularly in regard to the duties and responsibilities outlined in the job description. This involved the following activities:

(i) An assessment of reports and articles on tree species endemism and species distribution

(ii) An assessment of reports and articles on deforestation

(iii) An assessment of reports and articles on national parks and other protected areas.

(iv) Discussions with personnel of Kew Gardens, London, who are conducting research on Brazilian flora including field investigations in Brazil.

(v) Discussions with the IUCN Conservation Monitoring Centre, Kew, London, concerning endangered tree species and ecosystems in Brazil.

(vi) Correspondence with IUCN-SI Latin American Plants Project.

(vii) Correspondence with WWF Gland, Switzerland (Plants Section)

(viii) Discussions with personnel in FAO Forestry Department, Rome, who are concerned with forest genetic resources conservation in Brazil.

(ix) A meeting with Brazilian postgraduate students in forestry and forest ecology in the Oxford Forestry Institute to discuss the general problem of genetic resources conservation in Brazil.

While in Brazil, activities were principally directed to the assessment of research and development programmes in forestry and conservation, public and private sectors, which have a bearing on the programme of the CENARGEN group concerned with forest genetics resources conservation, and the duties and responsibilities of the consultant in regard to that programme. The details of these activities are as follows:

JUNE

25 Discussions with Head of CENARGEN and Staff concerned with forest genetic resources conservation.

26 Visit to IICA office and office of Funatura. Discussions with President of Funatura.

27 Studied documents and reports related to Brazilian forestry.

28(Sun) Rest

29 Visited IBDF Headquarters and had discussions with the Heads of Departments of National Parks and Equivalent Reserves, and Forest Economics and Inventory.

30 Discussions at office of CENARGEN(a.m.) and field visit to gallery forest. Discussion of problems of <u>in situ</u> conservation of forest genetic resources.

JULY

1 Discussions at office of CENARGEN and meeting with ecologist from University of Brazilia. Assessment of vegetative propagation programme. Inspection of research facilities.

2 Discussions at office of CENARGEN and assessment of forest seed technology programme. Inspection of seed storage and testing facilities. Visit to computer centre (a.m.). Visit to gallery forest containing Astronium, a heavily exploited tree species. Discussion of problems of in situ conservation of forest genetic resources.

3 Discussions at CENARGEN and inspection of medicinal plant programme. Visited nursery (a.m.). Assessment of documentation and dealing with administrative matters related to visit to Atlantic Coast Forest.

4 Writing draft report on consultancy.

5 Writing draft report on consultancy.

6-10 Travel to protected Atlantic Coast Forest in the states of Minais Gerais and Espirito Santo, and field assessment and discussions on in situ conservation problems.

11 Preparation of final draft of report.

12(Sun) Preparation of seminar on Forest Genetics Resources Conservation

13 Gave seminar on Forest Genetic Resources Conservation.

14 Completion of final draft of report.

12. RESULTS OF THESE ACTIVITIES:

The consultant spent a period of three weeks in Brazil. In relation to the scope and complexity of the problems of forest genetic resources conservation in the country this is a very short period indeed.

Nevertheless, as a consequence of the programme organized for him by CENARGEN the consultant was able to visit a considerable number of people who gave important information and documentation freely, and who also took time for discussions on the general problem.

In addition, the field visits which allowed the consultant to see the problems of forest genetic resources directly, proved most worthwhile, particularly in regard to discussions on in situ conservation.

Finally, the seminar on Forest Genetic Resources Conservation, held under the auspices of CENARGEN on 13 July allowed a further exchange of ideas on the subject between the consultant and workers in this field from other institutions in Brazil, including universities, forest research institutes, industry, and the Jari River project.

The principal result, therefore, of the activities, described in Section 11 is that they have greatly assisted the consultant in drawing conclusions and in making recommendations.

As well as drawing on his experience of forestry and forest conservation and management in other countries, the consultant has drawn freely on the work of many distinguished scientists both Brazilian and non-Brazilian who have worked and published in this field. The work of the international organizations, which are referred to in Section 11 above, has also been of very considerable help.

For these reasons, and despite the fact that the period of the consultancy has been short, these conclusions and recommendations are presented here with some degree of confidence in their validity.

13. CONCLUSIONS

Conclusions are both general and specific. The general conclusions refer to the overall programme of the unit, and the specific conclusions refer to its details.

13.1 GENERAL CONCLUSIONS:-

(i) The establishment within CENARGEN of a unit concerned with research in forest genetic resources conservation is a most significant and heartening development. It is a measure of the growing awareness of the importance of forest conservation and management generally in the country.

(ii) The unit is well placed to avail of the experience, expertise, methods and resources of the scientists working with agricultural material within CENARGEN. This is a considerable advantage.

(iii) Although in its early phase of development the unit has already established good working relations with relevant institutions in other parts of the country.

(iv) The research programme of the unit is in general well structured and realistically related to problems of forest genetic resources conservation in Brazil.

(v) The physical resources available to the unit appear to be adequate. The Library, however, does appear to be deficient in forestry texts and journals particularly as they relate to the mandate of the unit. For example, the FAO document entitled "A Guide to in situ conservation of the genetic resources of tropical woody species", which is in both Spanish and English is not in the Library and hence not available to the young researchers referred to in (vi) below.

(vi) A significant number of the staff of the unit are recent graduates in forestry and do not have formal postgraduate experience in the complex and rapidly expanding fields for which they are responsible, e.g. in vegetative propagation, seed technology, genecology, and conservation methodologies. This is unusual and poses real problems for the satisfactory development of the unit's research programme.

(vii) The young researchers referred to are impressive, enthusiastic and potentially very capable in regard to the research responsibilities they have been given. Furthermore, they obviously have had a good training and education at the B.Sc. level. However, there is some indication that they do not have access to recent developments in their respective subjects, particularly in regard to overseas work.

13.2 SPECIFIC CONCLUSIONS:-

(i) It is not yet clear within the unit what are the appropriate target species, what are the criteria for selecting such species, and what are the criteria for the order of priority of the work programme generally.

(ii) This lack of certainty concerning target species and criteria for selecting them has resulted in different elements of the research programme developing around a miscellany of woody species, including palms, rather than the entire programme being directed to a small number of carefully selected key species.

(iii) The replies to the questionnaire on vulnerable tree species which was forwarded to a number of agencies throughout Brazil do not provide a reliable guide for ordering research priorities. The questionnaire and replies received fulfil a complementary but different function.

(iv) No system of classification of vulnerability is used and replies to that section of the questionnaire dealing with availability of seed do not give reliable information on the conservation status of the species. This is more accurately determined from information on rarity, distribution maps, population density, endemism, endangered habitats and degree and kind of exploitation.

(v) The questionnaire does not seek information on population density of the species, i.e. average number of stems per hectare, and forest inventory data, which may be available from IBDF and the private sector, are not sought. Yet such data is essential in decisions about target species, and in planning conservation strategies for these species.

(vi) The proforma used for collecting data from marked trees in protected areas is unnecessarily detailed. Much of the phenotypic data collected can perform no useful function. This form needs simplifying and should be extended to include information on pollen and fruit vectors.

(vii) The computer centre within CENARGEN is not used by the unit and there is no clear and fully agreed system of storage and retrieval of information collected, and the collation and synthesis of this information in reports and articles.

14. SUGGESTIONS AND TECHNICAL RECOMMENDATIONS TO MEET THE OBJECTIVES OF THE PROGRAMME

14.1 Introduction

The document referred to under general conclusions 13.1(v) and entitled "A Guide to in situ conservation of the genetic resources of tropical woody species" was written by L. Roche and M. Dourojeanni, formerly Director of the Peruvian Forestry Service and currently, Dean of the Faculty of Forestry, Universidade Nacional Agrária, La Molina, Peru.

The guide, published in French, Spanish and English by the FAO, is intended to provide guidelines for research and development in this field, and contains references to a significant body of literature on the subject which should help in making relevant acquisitions for the Library.

Three FAO pilot projects in forest genetics resources conservation have been established in Peru, Malaysia and Cameroon with the objective of applying the guidelines of the document. A description of the status of forest genetics resources conservation for each country is contained in the document, together with lists of potential pilot projects.

The consultant is leaving a copy of the guide (in English) with the CENARGEN unit concerned with the conservation of forest genetic resources. He will ensure that a Spanish version will be sent in due course.

In making suggestions and recommendations, therefore, a knowledge of the guide and its contents is assumed, and for this reason its contents will not be referred to in detail in this section.

14.2 Background

There are a number of important general considerations and facts which have influenced suggestions and recommendations listed in this section, and it is necessary to review these in

some detail if the suggestions and recommendations are to be seen in proper perspective.

Since the publication in the sixties of the theory of island biography, there have been many published papers which deal with the implications of the theory in conservation practice. The theory has been developed primarily on the basis of studies of bird populations on islands, and its basic tenet is that there is a close and predictable relationship between size of a conserved habitat and the number of species present in the habitat.

There is some indication that this theory looms larger than it ought within the CENARGEN unit concerned with conservation, and that research in this field will yield all embracing solutions to the problems of forest genetic conservation in Brazil. This I doubt.

The theory and its accompanying literature, for example the important text entitled "Forest Island Dynamics in Man Dominated Landscapes" (Burgess et al eds. 1981) are undoubtedly of importance to the CENARGEN unit. It would, however, be misleading to suggest that the results of such studies can provide criteria at national level in sufficient quality and quantity and in sufficient time to influence significantly the course of conservation legislation in Brazil at the present time. Other research and development activities listed in 14.3, 14.4 and 14.5 have, in my view, greater priority. The following facts are presented in support of this view.

Brazil's forests, despite massive clearing for agriculture, still cover vast areas. There are various sources of information and data on forested areas and on deforestation rates which cannot be considered reasonably accurate. However, of these various sources, it is likely that the Forest Resources Study by the Food and Agricultural Organization, completed with the cooperation of IBDF, is the most reliable (FAO 1981).

Apart from global statistics on Brazilian forest resources, two main sources of information were used for the study. These are RADAMBRAZIL data for Amazonia and the small scale vegetation mapping 1 to 5 million carried out by the French Institute "Carte International du Tapis Vegetale" (CITV) under the auspices of UNESCO for the rest of the country.

The study for Brazil is given in considerable detail and should be consulted for further information. For the purposes of this report only the following data are referred to:

Area of closed high forest	:	349,480,000 ha
Coniferous forest	:	720,000 ha
Savannah woodlands (Cerrados)	:	266,000,000 ha
Annual deforestation	:	2,500,000 ha

Of the forest destruction that has taken place todate, the most serious loss, in terms of forest genetic resources, concerns the Atlantic Coast Forest. It is estimated that this once great, and possibly unique forest resource, is now reduced to between 2 and 5% of its original distribution. Furthermore, there is ample evidence that residual ecosystems both outside and even inside some protected areas, continue to be exploited and converted to agriculture.

There are 29 National Parks and Biological reserves some of which are representative of Atlantic Coast Forest. The total area of these is 12,000,000 ha and there are plans for the further extension of this system of protected areas. The total area legally constituted as National Forest is one million ha, and there are plans for gazetting a further two million ha. The potential of the legally constituted national forest estate (category eight of the IUCN classification) for genetic resources conservation is very considerable. For this reason, and because it does not feature in the CENARGEN unit's perception of the general problem, it is referred to in some detail below.

There are ten categories of protected areas recognised by the International Union for the Conservation of Nature and Natural Resources (IUCN). These ten categories have been rated on a scale 1 to 5 according to their effectiveness for forest genetic resources conservation; a rating of one being the least effective and five the most. These ten categories and their respective ratings are given in Table 1 (Roche & Dourajeanni 1984).

The objective of presenting this table is to emphasise the potential of the National Forest Estate that is category eight, a managed resource area, in forest genetic resources conservation. It has a rating of 24, one of the highest in the table. In many countries the area of National Gazetted Forest, that is category eight, is by far the largest of the IUCN categories of protected areas. It is protected insofar as it must remain under forest, though managed for production purposes.

In regard to the size and use of its National Forest, legally constituted as category eight, Brazil is very much an exception, not only in the tropical world but the world as a whole. Without doubt it has a lower percentage of its land mass in this category than most countries of the world if not the lowest.

Outside Amazonia the total area is quite negligible being only 53,000 ha distributed over fourteen reserves in the South, Southeast and Northeast of the country. In Amazonia the areas are as follows:

Caxiuanã	-	200,000 ha
Tapajos	-	600,000 ha
Jamari	-	200,000 ha

TABLE 1

Evaluation of protected area categories (as defined by IUCN 1983) for forest genetic resource conservation and management

Categories		Representativity of ecological genetic diversity	Representativity of rare or endangered species	Area as percentage of the national territory	Acceptance and present applications in the tropics	Effective conservation status	Possibilities of effective management	Total
I	Strict Nature Reserve	4	5	1	3	5	1	19
II	National Park	5	4	4	5	5	2	25
III	Natural Monument	1	2	1	2	3	1	10
IV	Managed Nature Reserve	3	3	3	5	5	4	23
V	Protected Landscape	1	1	1	1	1	5	10
VI	Resource Reserve	3	3	3	4	1	3	17
VII	Anthropological Reserve	2	2	3	4	1	4	16
VIII	Managed Resource Area	3	3	5	5	3	5	24
IX	Biosphere Reserve	2	3	1	2	3	3	14
X	World Heritage Site	1	2	1	2	5	1	12

Thus, total area of the legally constituted forest estate designated for management in perpetuity is very little more than one million ha. This is less, for example, than a fifth of the permanent Forest Estate of Peninsular Malaysia which is close to five million ha out of a total area (Peninsular Malaysia) of a little more than thirteen million ha. Thus the Permanent Forest Estate of Peninsular Malaysia is approximately 38% of the land mass. The principal criteria for the establishment of a permanent national forest estate of this size in Malaysia are (i) economic (ii) the existence of management regimes based on applied research and field experience.

In addition, Malaysia has incorporated a system of strict natural reserves varying in size from 200 to 2,000 ha within its National Forest Estate. These Reserves are not logged and since they are surrounded by managed forest they are not ecological islands. The location, size and shape of such Reserves within the Gazetted National Forest Estate are important considerations for CENARGEN now, for example at Tapajos, and in the future.

Since Brazil has a land mass of 8,511,965 km^2 its Permanent Forest Estate of one million ha gives a percentage figure so small as to be hardly measurable. If National Parks are included, the figure is 0.015%.

It will be seen, therefore, that decisions to increase the area of the Permanent Forest Estate could radically change for the better the prospects for in situ conservation of forest genetic resources. Such decisions to-date have been made on socio-economic and political criteria and to a lesser extent on scientific and technical criteria.

The scope for increasing the area of Permanent Forest Estate is enormous, and, putting aside questions of conservation, it is the view of the consultant that this is likely to occur in Brazil, given the increased economic justification for

management in perpetuity of multispecific tropical high forest ecosystems (see Leslie 1987) and the extraordinarily small area of Permanent Forest Estate presently legally protected. In addition, it is increasingly clear that management regimes now being developed elsewhere (Thang 1987) for such ecosystems are applicable in Brazil and are already being applied experimentally at Tapajos and in the Linharis Reserve of the Atlantic Coast Forest. Such considerations should have a bearing on work of the small unit within CENARGEN concerned with the conservation of forest genetic resources.

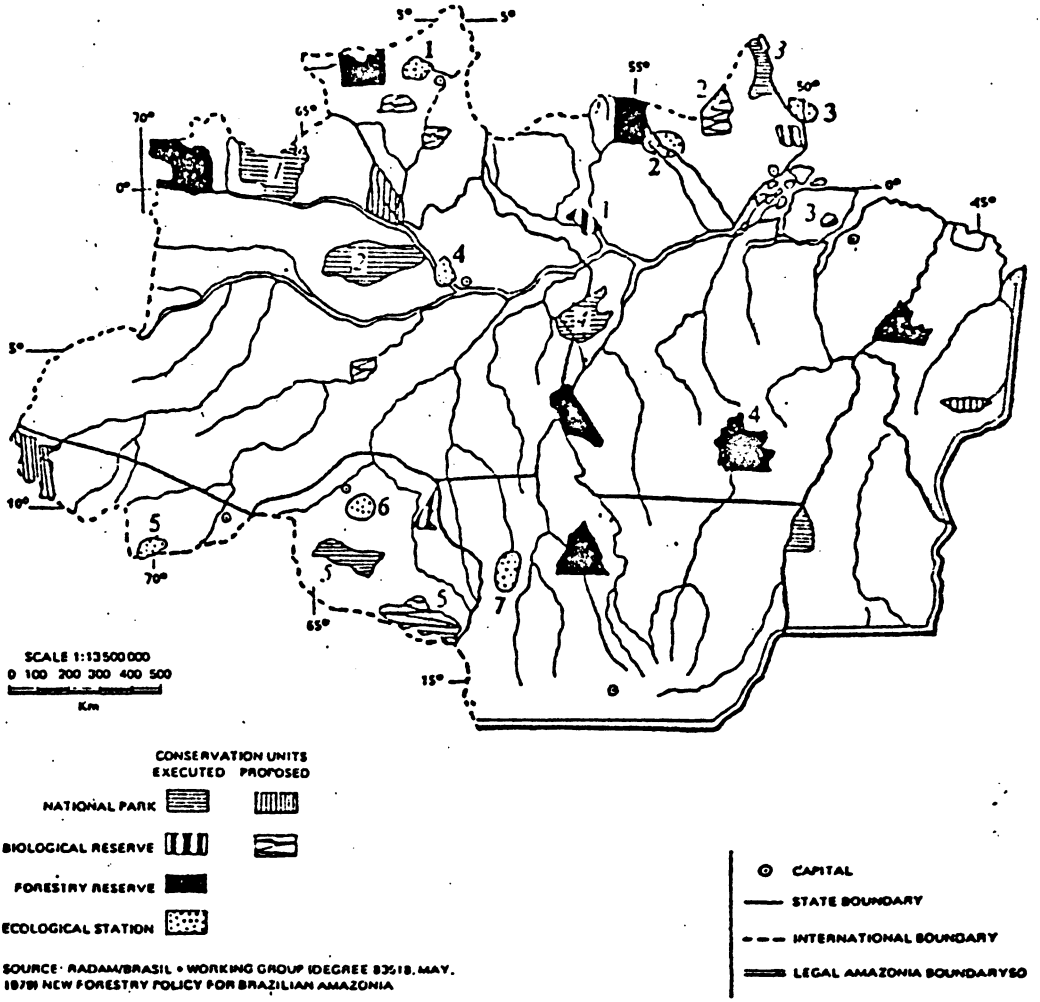
It should be pointed out that the figures concerning Brazil's Permanent Forest Estate given above were obtained directly from the headquarters of IBDF, Brazilia. Yet other figures have been published and these, together with their source, are given in Fig. 1 and Table 2. It was not possible to reconcile these apparently contradictory figures during the three week period the author spent in Brazil.

In the light of these facts questions of minimum population size, minimum area, buffer zones and edge effects are likely to prove of academic interest in the short run. In the long run, however, they cannot be ignored and answers to them must be sought in regard to the conservation of species in the fragmented, residual habitats of the Atlantic Coast Forest and other areas of the nation with residual forest types surrounded by agriculture and ecologically isolated.

Since these questions are discussed in some detail in Chapter 2 of the Roche and Dourojeanni document already referred to. they will not be further discussed in this report. It is sufficient to point out that there is a general consensus that a breeding population of 200 - 500 individuals will not only conserve a species but sustain its evolutionary development. On this assumption Ashton (1981) has estimated that an area of 2,000 ha in species-rich Borneo would be sufficient to sustain the needs of primates and other large fruit vectors, and thus the integrity of the ecosystem.

Fig 1. Sketch map showing the positions of preserved areas in the Brazilian Amazon.

(Prepared by Prof. José Candido Melo Carvalho and Almirante Ibsen de Gusmão Camara and published in De Oliveira 1983).



IBDF
NATIONAL PARKS
1 Pico da Neblina
2 Jaú
3 Caiu Orange
4 Tapajos
5 Paacas Novos

IBDF
BIOLOGICAL RESERVES
1 Rio Trombetas
2 Ouanaque
3 Marajó
4 Xingu
5 Guaporé
? Jara
? Lago Piratuba

SEMA
ECOLOGICAL STATIONS
1 Maracá-Roraima
2 Jari
3 Maracá-Amapá
4 Anavilhanas
5 Rio Acre
6 Rondonia
7 Iquê

TABLE 2. Preserved areas in the Brazilian Amazon*
(De Oliveira Costa 1983)

	Year founded	Area (ha)
IBDF National Parks		
Pico da Neblina	1979	2 200 200
Jau	1980	2 272 000
Cabo Orange	1980	619 000
Tapajos	1974	1 000 000
Pascas Novos	1980	765 000
Total		6 856 000
IBDF Biological Reserves		
Rio Trombetas	1979	385 000
Jaru	1979	268 150
Lago Piratuba	1980	500 000
Total		1 153 150
Diapaque		
Marajo		
Xingu		
Guapore		
IBDF National Forests		
Gurupi	1961	1 674 000
Gorotire	1961	1 843 000
Mundurucania	1961	1 377 000
Parima	1961	1 756 000
Rio Negro	1961	3 790 000
Pedras Negras	1961	1 761 000
Jaru	1961	1 085 000
Juruena	1961	1 808 000
Total		15 094 000
SEMA Ecological Stations		
Maraca Roraima	1977	92 000
Anavilhanas	1977	350 000
Iquê	1977	480 000
Total		922 000
Maraca Amapa		
Rio Acre		
Rondonia		
Jari		
Total		24 025 000

*Total area of the Brazilian Amazon = 4 800 000 km^2; total area of preserved areas = 240 250 km^2 (5%).

Given the size of the remaining forest estate without adequate legal protection, the vast scope, complexity and urgency of the problem, and estimated rates on annual deforestation outlined above, a national programme of in situ conservation in National Parks and other protected areas, including National Forests, must be the first and formost means of ensuring the conservation in perpetuity of a full range of habitats and species representative of the national heritage of flora and fauna.

Such a programme has, in recent years, been given some momentum in Brazil and it is suggested that the unit's principal function is to provide information to the agency responsible for this programme (IBDF in the first instance) on vulnerable and endangered forest genetic resources, and also to other agencies of government and the private sector.

Ex situ conservation must be considered a last resort following failure to ensure in situ conservation measures. However, it is emphasised that this does not mean that ex situ conservation is of secondary importance.

Despite the vast areas of natural forest, forestry research and development in Brazil has traditionally been concerned almost exclusively with the plantation technology of exotic species, particularly eucalyptus species. Thus the CENARGEN unit cannot draw on a body of research concerned with native species, and its work with these species will not to any significant degree duplicate forest research activities being conducted at Curitiba or elsewhere in the country.

Virtually all native tree species in Brazil are still in the wild state. Within species genetic variation (genecologic variation), where it exists and where it is expressed phenotypically, is known only to local people who have traditionally used the species and given names in the vernacular to its varieties. A programme of ex situ conservation, properly structured, is essentially concerned

with the first phases of the silviculture and domestication of the species. If the nation is to utilize fully the genetic resources of its economic tree species, then ex situ research and development is essential. It is in this context that work related to ex situ conservation assumes its considerable importance.

Because of the relative newness of forestry research work on native species in Brazil, and because so little has been done in this field by the forestry profession to-date, the list of species that could be considered target species for in situ and ex situ conservation research is enormous. Therefore, since the work must be brought within the capability of the CENARGEN unit, there is a need to decide on criteria for choice of target species, and to apply these criteria in the first instance, to a very small number of species. The principal objective for these species would be to develop as soon as possible standard and effective procedures which can then be applied progressively to other species as time passes. Criteria pertaining to choice of tree species should be relatively easy to obtain and should be applied to species for both in situ and ex situ conservation action. Once the species are chosen, all members of the unit should direct their research activities to these same target species.

It is against this background that the following suggestions and recommendations are made under the headings of in situ conservation, ex situ conservation, and training and education.

14.3 In situ conservation:-

(i) A small number of target species should be selected from the lists of species requiring attention now available to the unit; for example the units own list compiled from replies to the questionnaire, the Dubois list, the latest FAO list for Brazil (Appendix I, page 26) compiled by the advisory panel on forest genetic resources, and any other source of information on the subject including inventory data, and Flora Neotropica.

(ii) It is suggested that the number of target species should, for the time being, be no more than five. The target species should be selected on the basis of the following criteria:-

(i) restricted ecological distribution
(ii) low population densities
(iii) low capacity for regeneration
(iv) heavily exploited for either wood e.g. Ucuuba (Virola surinamensis), food e.g. Brazilnut (Bertholletia excelsa), exudate e.g. Rosewood (Aniba rosaeodora) or Massaranduba (Manilkara huberi).
(v) silviculture not known and no plantations established
(vi) endangered or vulnerable habitat

(iii) Inventory data on population density and distribution from whatever source should be obtained and transferred to the CENARGEN computer. Flora neotropica and related botanical literature should be consulted and in due course distribution maps prepared (Figs. 1 and 2).

(iv) An assessment should then be made of the extent to which the genetic resources of the species are contained in existing national parks and protected areas.

(v) Where in situ conservation is shown to be inadequate, recommendations should be made, and criteria provided to appropriate authorities, particularly to the Department of National Parks and Equivalent Reserves of IBDF, for the establishment and management of in situ reserves of the species or extension of existing reserves.

(vi) With the cooperation of the protecting authority, permanent sample plots should be established in selected protected areas to assess the biology and ecology of the species, in particular its reproductive cycle and successional status in the stand.

(vii) Proposals for the establishment of a national conservation data centre are well advanced. There are already conservation data centres in Costa Rica, Columbia, Porto Rico and Peru.

Negotiations and agreements are underway in nine other Latin American countries, including Brazil, to establish 12 new conservation data centres over the next two years.

(viii) It is suggested that the unit for forest genetic resources conservation should in due course make contact with the national centre, and the centres in nearby countries, particularly that in Peru which has a special interest in forest genetic resources. It would also be advantageous to have contact with the IUCN-SI Latin American plants project at the Smithsonian Institution in Washington, and the IUCN Conservation Monitoring Centre at Kew, London.

(ix) FAO supports a global project in in situ conservation in Peru, Malaysia and Cameroon. It is recommended that consideration be given by CENARGEN to making a formal request to participate in this programme.

(x) Plants are not respecters of political boundaries and it is suggested that multilateral linkages will result in a flow of information which will advance the objectives of the unit.

14.4 Ex situ conservation

As already indicated ex situ conservation action if properly structured will, in a Brazilian context, be concerned with the early phases of the domestication and silviculture of the target species.

Forestry is a very recent profession in Brazil, and since the establishment of the first university degree in forestry in the sixties, activity has been directed overwhelmingly to plantation establishment of exotic species particularly Eucalypts and pines. There is, therefore, negligible information on the biology of native economic tree species and their silvicultural potential.

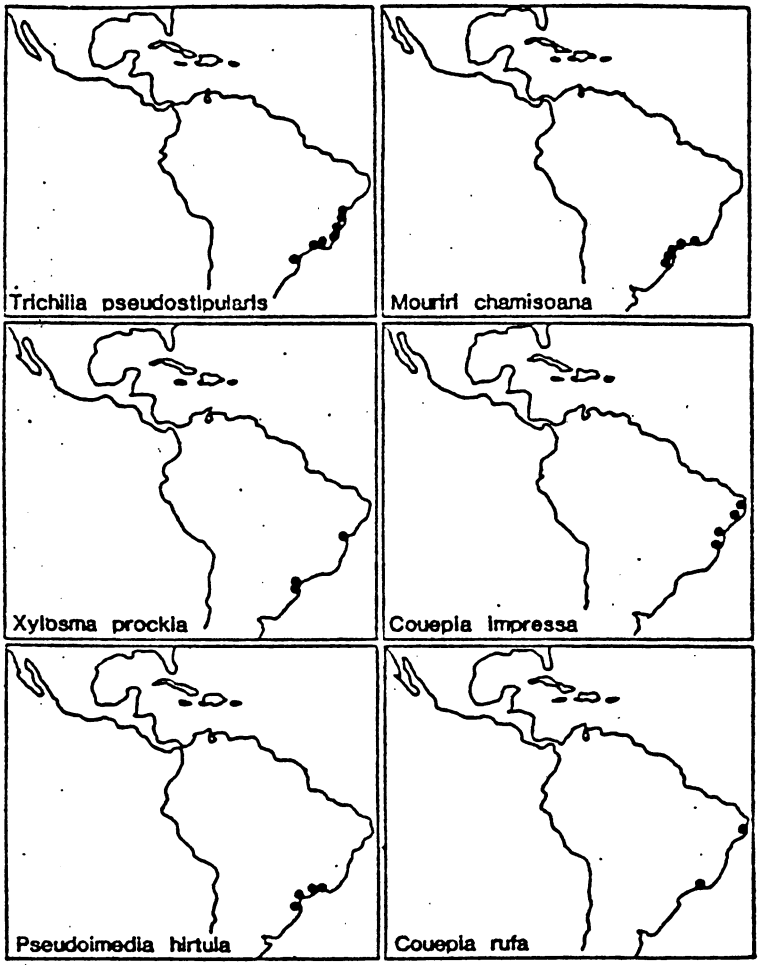


Fig. 2

Some tree species endemic to the coastal forest of eastern Brazil. All examples from FLORA NEOTROPICA (Mori et al 1981)

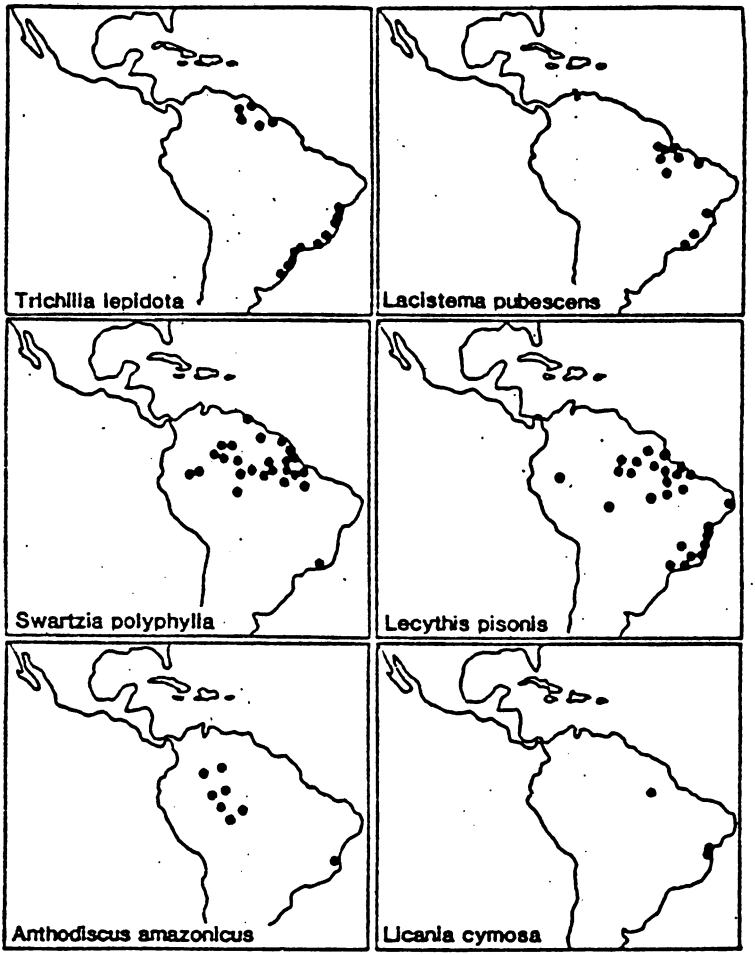


Fig. 3

Some tree species disjunct between Amazonia and the coastal forests of eastern Brazil. All examples except Lecythis pisonis from FLORA NEOTROPICA (Mori et al 1981)

Virtually all native tree species in Brazil, including most of economic importance, occur only in the wild state. There are no cultivars to speak of.

Many species may have recalcitrent seed and may not easily be propagated vegetatively. In addition the vast numbers of species involved preclude ex situ conservation in seed orchards even if it proved possible to cultivate them outside their endangered habitats.

Therefore I am in agreement with Ashton (1981) that botanic gardens and arboreta must play a major role in ex situ conservation. Their potential is often overlooked. As Ashton has pointed out at the Arnold Arboretum 15,000 individuals of 6,000 woody taxa are cultivated. He believes that on a site of 100 ha there is space for 21,000 individuals representing 6500 taxa which is probably the extent of the Malaysian tree flora.

For these reasons it is suggested that research and development in ex situ conservation should be directed to the following lines of investigation:

(i) The reproductive cycle
(ii) Breeding system
(iii) Seed technology (harvesting, storage, treatment and testing)
(iv) Vegetative propagation
(v) Silvicultural potential
(vi) Provenance trials (genecological assessment)

Already the unit is collecting seeds from marked "superior" phenotypes in a number of protected areas. It should be noted however, that the progeny of these trees selected in natural stands are unlikely in any measurable character be different from the mean of the population from which the seed was collected. This can only be obtained following provenance trials, breeding and progeny tests.

14.5 Training and Education

The FAO Tropical Forestry Action Plan for the conservation of Tropical Forest Ecosystems in Latin America (FAO 1987) draws attention to the shortage of trained staff in this field.

A recent study carried out by the FAO Commission on Plant Genetic Resources showed that only 250 professionals in 23 countries in the region have been trained in international courses and seminars in the fields of in situ and ex situ conservation over the post 16 years. At the regional and national level some universities include genetic resources conservation in their curricula. The Plan goes on to state that:

> "cover is still insufficient and there is a need to supplement on-going efforts especially with regional and national initiatives, covering the whole range of activities, from taxonomy/ecology/ biology of species and ecosystems, to their management and sustained utilization and socio-economic considerations; and with due attention to both theory and practical application of the knowledge gained".

The Plan estimates development assistance needs at 200 million dollars.

It is in this context that training and education at a postgraduate level is recommended for a number of young people currently working in the CENARGEN unit concerned with conservation of forest genetic recourses. If postgraduate training is available in Brazil then, of course, it would be preferable to pursue studies at home. If not then there is a considerable choice of possibilities for such studies abroad. A link between a Brazilian University and an overseas one, where such expertise is available, would be beneficial. Such a link might allow the research to be completed in Brazil with joint supervision from the two institutions, the student spending an agreed period in the overseas university.

Appendix I

Latest List of

Forest Genetic Resources Priorities

for Brazil compiled by the

F.A.O. Panel of Experts

Forest Genetic Resources Priorities for Brazil Compiled by the FAO Panel of Experts

COLUMN NRB	1	2	3	4	5	6	7	8	9	10	11	12	13	14
OPERATION / SPECIES	SPECIES PRIORITY RATING			EXPLORATION		EVALUATION		CONSERVATION				UTILISATION		
	INDUSTRIAL WOOD	FUEL WOOD	OTHER USES	BOTANICAL	GENECOLOGICAL	COLLECTION FOR TESTING	TESTING (PROVENANCE TRIALS)	IN SITU	COLLECTION FOR CONSERVATION	STORAGE AS SEED ETC.	EX SITU IN ARTIFICAL STANDS	USE OF BULKS SUPPLIES	INDIVIDUAL SELECTION AND BREEDING	REMARKS
ACHARAS SAPOTA	-	-	3	2	2	2	2	1	2	2	2	-	-	(E) SOME PROVENANCES (NE)
ANADENANTHERA MACROCARPA	-	3	3	2	2	2	2	1	2	2	2	-	-	(E) SOME PROVENANCES (NE,E)
ANIBA ROSEADORA	-	-	3	1	1	2	2	1	1	-	2	-	-	(E) SOME PROVENANCES (S)
ARAUCARIA ANGUSTIFOLIA	2	2	-	2	2	2	1	1	2	-	2	-	2	(E) SOME PROVENANCES (E)
ASPIDOSPERMA POLYNEURON	3	-	-	2	2	2	2	1	2	2	2	-	-	(E) SOME PROVENANCES (NE,E,S)
ASPIDOSPERMA OLIVACEUM	3	-	-	2	2	2	2	1	2	2	2	-	-	(E) SOME PROVENANCES (E)
ASPIDOSPERMA PYRIFOLIUM	-	3	3	3	3	3	3	1	3	3	3	-	-	(E) SOME PROVENANCES (NE)
ASTRONIUM FRAXINIFOLIUM	2	-	-	2	2	2	2	1	2	2	2	-	-	(E) SOME PROVENANCES (E)
ASTRONIUM GRACILE	3	-	-	2	2	2	2	1	2	2	2	-	-	(E) SOME PROVENANCES (NE,E)
ASTRONIUM URUNDEUVA	3	3	3	2	2	2	2	1	2	2	2	-	-	(E) SOME PROVENANCES (NE,E,S)
BALFOURODENDRON RIEDELIANUM	3	-	-	2	2	2	2	1	2	2	2	-	-	(E) SOME PROVENANCES (E,S)
BERTHOLLETHIA EXCELSA	2	-	3	1	1	1	1	1	2	2	2	-	-	(E) SOME PROVENANCES (AM)

1/ Abbreviations used in REMARKS: Am: Amazon Region; S: South of Brazil; E: Eastern Brazil; NE: North-Eastern Brazil
Further explanation ot species ratings are given at the end of this table (page 31)

Column NER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Species / Operation	Species Priority Rating			Operational priority rating										
				Exploration		Evaluation		Conservation				Utilisation		
	Industrial Wood	Fuelwood	Other uses	Botanical	Genecological	Collection for Testing	Testing (Provenance Trials)	In situ	Collection for Conservation	Storage as Seed etc.	Ex Situ in Artificial Stands	Use of Bulk Supplies	Individual Selection and Breeding	Remarks
Bursera leptophloeos	-	2	1	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (NE)
Caesalpinea pyramidalis	-	3	3	3	3	3	3	2	3	3	3	-	-	(N, E)
C. leiostachia	2	-	-	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (S,E)
Carapa guianensis	3	-	-	2	2	2	2	2	2	2	2	-	-	(Am)
Cariniana estrellensis	1	-	-	2	2	2	2	1	1	1	2	-	-	(E) Some provenances (S, E)
C. legalis	1	-	-	2	2	2	2	1	1	1	2	-	-	(E) Some provenances (S,E)
Caryocar villosum	-	-	2	2	2	2	2	1	2	2	2		-	(E) Some provenances (NE)
Cassia excelsa	-	3	3	3	3	3	3	2	3	3	3	-	-	(NE)
Cedrela fissilis	2	-	-	2	2	2	2	1	2	2	2	-	-	Genetic improvement and resistance breeding (Ivosiovia) (S)
C. huberi	3	-	-	2	2	2	2	2	2	2	2	-	-	(Am)
C. odorata	1	-	-	1	1	2	1	1	2	1	1	-	-	For essential oils (Am)
Centrolobium robustum	2	-	-	2	2	2	2	1	1	1	2	-	-	(E) Some provenances (S, E)
Colubrina glandulosa	2	-	-	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (S)
Copaifera langesdorffii	3	-	2	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (S)

1/ Abbreviations used in Remarks: Am: Amazon Region; S: South of Brazil; E: Eastern Brazil; NE: North-Eastern Brazil.
Further explanation of species ratings are given at end of this table (page 31)

Column NER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Operation / Species	Species Priority Rating			Operational priority rating										
				Exploration		Evaluation		Conservation				Utilisation		
	Industrial Wood	Fuelwood	Other uses	Botanical	Geocological	Collection for Testing	Testing (Provenance Trials)	In situ	Collection for Conservation	Storage as Seed etc.	Ex Situ in Artificial Stand	Use of Bulk Supplies	Individual Selection and Breeding	Remarks
Cordia goeldiana	3	–	–	1	1	1	1	1	1	1	2	–	–	(Am)
C. trichotoma	3	–	–	2	2	2	2	1	2	2	2	–	–	(S)
Dalbergia cearensis	–	3	3	3	3	3	3	2	3	3	3	–	–	(NE)
D. nigra	3	–	–	2	2	2	2	1	2	2	1	–	–	(E) Some provenances (E)
Didymopanax morotoni	3	–	–	2	2	1	1	2	2	1	2	–	–	(E) Some provenances (Am)
Dipteryx alata	3	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (E)
D. odorata	3	–	–	2	2	2	2	2	2	2	2	–	–	(E)
Enterolobium contortisiliquum	3	–	–	2	2	2	2	2	2	2	2	–	–	(S)
Eschweilera leiocarpa	3	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (E)
Genipa americana	–	–	3	2	2	2	2	1	2	2	2	–	–	(E) (NE)
Glycidendron amazonicum	3	–	–	2	2	2	2	2	2	2	2	–	–	(Am)
Hymenaea stilbocarpa	3	–	3	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (E)
Ilex paraguariensis	–	–	3	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (S)
Jacaranda copaia	3	–	–	2	2	2	2	2	2	2	2	–	–	(Am)

1/ Abbreviations used in Remarks: Am: Amazon Region; S: South of Brazil; E: Eastern Brazil; NE: North-Eastern Brazil.

Column NER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Operation / Species	Species Priority Rating			Operational priority rating										
				Exploration		Evaluation		Conservation				Utilisation		
	Industrial Wood	Fuelwood	Other uses	Botanical	Geoecological	Collection for Testing	Testing (Provenance Trials)	In situ	Collection for Conservation	Storage as Seed etc.	Ex Situ in Artificial Stand	Use of Bulk Supplies	Individual Selection and Breeding	Remarks
J. macrantha	3	–	–	2	2	2	2	2	2	2	2	–	–	(S)
Joannesia princeps	3	–	3	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (E)
Lecythis pisonis	3	–	3	2	2	2	2	1	2	2	2	–	–	(E) (E)
Machaerium villosum	3	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (E)
Melanoxylon brauna	–	3	–	2	2	2	2	1	2	2	2	–	–	(E) (E, S)
Miconia cinnamomifolia	3	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (S)
Mimosa caesalpiniifolia	–	3	3	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (NE)
M. scabrella	3	3	–	2	2	2	2	–	2	2	2	–	–	(S)
M. verrucosa	–	3	3	3	3	3	3	2	2	2	2	–	–	(E) Some provenances (NE)
Mirocarpus frondosus	3	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (S)
Ocotea porosa	2	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (S)
Ocotea odorifera	2	–	3	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (S)
Paratecoma peroba	2	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (E)
Parkia platicephala	–	3	3	3	3	3	3	2	3	3	3	–	–	(NE)
Peltophorum dubium	3	–	–	2	2	2	2	2	2	2	2	–	–	(S)
Piptadenia macrocarpa	3	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (E)
P. peregrina	3	–	–	2	2	2	2	1	2	2	2	–	–	(E) Some provenances (E)

1/ Abbreviations used in Remarks: Am: Amazon Region; S: South of Brazil; E: Eastern Brazil; NE: North-Eastern Brazil

Colum NER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Operation / Species	Species Priority Rating			Operational priority rating										
				Exploration		Evaluation		Conservation				Utilisation		
	Industrial Wood	Fuelwood	Other uses	Botanical	Ecological	Collection for Testing	Testing (Provenance Trials)	In situ	Collection for Conservation	Storage as Seed etc.	Ex Situ in Artificial Stand	Use of Bulk Supplies	Individual Selection and Breeding	Remarks
Pithecolobium parvifolium	-	3	3	3	3	3	3	2	3	3	3	-	-	(E) Some provenances (E)
Platymenia foliosa	3	-	-	2	2.	2	2	1	2	2	2	-	-	(E) Some provenances (E)
Platonia insignes	-	-	3	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (Am)
Podocarpus lambertii	3	2	-	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (S)
Prunus brasiliensis	3	-	-	2	2	2	2	2	2	2	2	-	-	(S)
Pterogyne nitens	3	-	-	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (S)
Schinopsis brasiliensis	-	3	3	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (NE)
Schinus terebinthifolius	3	-	-	2	2	2	2	2	2	2	2	-	-	(S)
Schyzolobium amazonicum	3	-	-	2	2	2	2	2	2	2	2	-	-	(Am)
S. parahyba	3	-	-	2	2	2	2	2	2	2	2	-	-	(S)
Simaruba amara	3	-	-	2	2	2	2	2	2	2	2	-	-	(S)
Spondias macrocarpa	-	3	3	2	2	2	2	1	2	2	2	-	-	(E) (S)
S. purpura	-	3	3	2	2	2	2	1	2	2	2	-	-	(E)
S. tuberosa	-	3	3	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (NE)
Swietenia macrophylla	1	-	-	2	2	2	1	2	1	1	2	-	-	Breeding for resistance (Hypsipyla) (Am)

1/ Abbreviations used in Remarks: Am: Amazon Region; S: South of Brazil; E: Eastern Brazil; NE: North-Eastern Brazil

Species / Operation	Species Priority Rating			Operational priority rating										Remarks
				Exploration		Evaluation		Conservation				Utilisation		
	Industrial Wood	Fuelwood	Other uses	Botanical	Cytological	Collection for testing	Testing (Provenance Trials)	In situ	Collection for Conservation	Storage as Seed etc.	Ex Situ in Artificial Stand	Use of Bulk Supplies	Individual Selection and Breeding	
Syagrus coronata	-	-	3	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (NE)
Tabebuia avellanedae	3	-	3	2	2	2	2	1	2	2	2	-	-	(E) (S)
T. caraiba	3	-	-	2	2	2	2	2	2	2	2	-	-	(Am)
T. cassinoides	2	-	-	2	2	2	2	1	2	2	2	-	-	(E) (S)
T. impetiginosa	-	3	3	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (NE)
T. serratifolia	3	-	-	2	2	2	2	2	2	2	2	-	-	(Am)
Torresia cearensis	-	3	3	2	2	2	2	1	3	3	3	-	-	(NE)
Virola spp.	3	-	-	2	2	2	2	2	2	2	2	-	-	(Am)
Vochysia maxima	3	-	-	2	2	2	2	2	2	2	2	-	-	(Am)
Zeyheria tuberculosa	3	3	-	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (E)
Ziziphus joazeiro	-	3	3	2	2	2	2	1	2	2	2	-	-	(E) Some provenances (NE)

1/ Abbreviations used in Remarks: Am: Amazon Region; S: South of Brazil; E: Eastern Brazil; NE: North-Eastern Brazil

FOREST GENETIC RESOURCES PRIORITIES FOR BRAZIL

SPECIES RATINGS

SCORES The following scores are used in columns 1 - 3:

(1) highest = priority species for the end use specified.

(2) = of considerable importance for the end use specified

(3) = of some actual importance, or with a potential value, for the end use specified.

END USE The importance ratings are divided between three categories of end use, as follows:

Column 1, Industrial Wood = wood used for sawnlogs, heavy construction, chip and particle boards, pulp, etc.

Column 2, Fuelwood = firewood and wood used for the production of charcoal and energy.

Column 3, Other Uses = posts, poles, shade, shelter and land stabilization, food, fodder, medicines, honey, gums, tannins, etc.

OPERATIONAL PRIORITY RATING (Columns 4-13) Four priority ratings are used, as follows:

(1) highest = urgent action recommended; work should start (or be continued) with immediate effect

(2) = prompt action recommended

(3) = action foreseen in near future

(4) = work already started and activity adequately covered by existing schemes

Literature cited or having relevance to the objectives of the report

Literature cited or having relevance to the objectives of the report.

It should be noted that this list is by no means comprehensive. Fuller lists will be found in Roche & Dourojeanni (1984) and in Kageyama (1986). Many of the other texts listed have extensive and relevant bibliographies and for this reason have been mentioned. The purpose of the list, therefore, is to bring a body of relevant literature to the attention of the young researchers currently attached to the Forest Genetics Resources Conservation unit in CENARGEN.

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Appendix III

Institutions referred to in the report or whose work has relevance to forest genetic resources conservation.

CENARGEN - National Centre for Genetic Resources, Brazilia. A forest genetic resources unit has been established in CENARGEN which to-date has been concerned principally with agricultural and horticultural genetic resources.

CNPQ - National Council for Scientific and Technological Development. Has initiated Programa Flora which aims to accelerate the process of inventory of Brazilian flora. A computer data bank based on herbarium and library information is being established and intensive botanical collections are being made in the region. The National Science Foundation of the United States has been invited to participate in the project.

EMBRAPA - Brazilian Organization for Agricultural Research. Has established biological reserves.

FAO - Food and Agricultural Organisation of U.N.

FUNAI - National Foundation for Indian Affairs, Brazil.

FUNATURA - Fundacão Pró-Natureza (Foundation for Nature) A private foundation concerned with the promotion of conservation at a national level.

IBDF - Instituto Brasileiro de Desenvolviments Forestal; The Brazilian Institute of Forestry Development. Responsibility for national parks and protected areas.

IBPGR - International Board for Plant Genetic Resources, FAO, Rome.

IUCN - International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.

SEMA - Environmental Secretariat with responsibility for problems related to interactions of man and nature, and general environmental problems including pollution. In the process of establishing biological reserves.

SUDAM - The Superintendency for the Development of Amazonia.

UNEP - United Nations Environment Programme.

WWF - World Wildlife Fund, Gland Switzerland.

Programa II. Geração e Transferência de Tecnologia

O Programa de Geração e Transferência de Tecnologia é a resposta do IICA a dois aspectos fundamentais: (i) o reconhecimento, por parte dos países e da comunidade técnico-financeira internacional, da importância da tecnologia para o desenvolvimento produtivo do setor agropecuário; (ii) a convicção generalizada de que, para aproveitar plenamente o potencial da ciência e da tecnologia, é necessário que existam infra-estruturas institucionais capazes de desenvolver as respostas tecnológicas adequadas às condições específicas de cada país, bem como um lineamento de políticas que promova e possibilite que tais infra-estruturas sejam incorporadas aos processos produtivos.

Nesse contexto, o Programa II visa a promover e apoiar as ações dos Estados membros destinadas a aprimorar a configuração de suas políticas tecnológicas, fortalecer a organização e administração de seus sistemas de geração e transferência de tecnologia e facilitar a transferência tecnológica internacional. Desse modo será possível fazer melhor aproveitamento de todos os recursos disponíveis e uma contribuição mais eficiente e efetiva para a solução dos problemas tecnológicos da produção agropecuária, num âmbito de igualdade na distribuição dos benefícios e de conservação dos recursos naturais.

INSTITUTO INTERAMERICANO DE COOPERAÇÃO PARA A AGRICULTURA

O Instituto Interamericano de Cooperação para a Agricultura (IICA) é o organismo especializado em agricultura do Sistema Interamericano. Suas origens datam de 7 outubro de 1942, quando o Conselho Diretor da União Pan-Americana aprovou a criação do Instituto Interamericano de Ciências Agrícolas.

Fundado como uma instituição de pesquisa agronômica e de ensino; de pós-graduação para os trópicos, o IICA, respondendo às mudanças e novas necessidades do Hemisfério, converteu-se progressivamente em um organismo de cooperação técnica e fortalecimento institucional no campo da agropecuária. Essas transformações foram reconhecidas oficialmente com a ratificação, em 8 de dezembro de 1980, de uma nova convenção, que estabeleceu como fins do IICA estimular, promover e apoiar os laços de cooperação entre seus 31 Estados membros para a obtenção do desenvolvimento agrícola e do bem-estar rural.

Com um mandato amplo e flexível e com uma estrutura que permite a participação direta dos Estados membros na Junta Interamericana de Agricultura e em seu Comitê Executivo, o IICA conta com ampla presença geográfica em todos os países membros, para responder a suas necessidades de cooperação técnica.

As contribuições dos Estados membros e as relações que o IICA mantém com 12 Países Observadores, e com vários organismos internacionais, lhe permitem canalizar importantes recursos humanos e financeiros em prol do desenvolvimento agrícola do Hemisfério.

O Plano de Médio Prazo 1987-1991, documento normativo que assinala as prioridades do Instituto, enfatiza ações voltadas para a reativação do setor agropecuário como elemento central do crescimento econômico. Em vista disso, o Instituto atribui especial importância ao apoio e promoção de ações tendentes à modernização tecnológica do campo e ao fortalecimento dos processos de integração regional e sub-regional.

Para alcançar tais objetivos o IICA concentra suas atividades em cinco áreas fundamentais, a saber: Análise e Planejamento da Política Agrária; Geração e Transferência de Tecnologia; Organização e Administração para o Desenvolvimento Rural; Comercialização e Agroindústria, e Saúde Animal e Sanidade Vegetal.

Essas áreas de ação expressam, simultaneamente, as necessidades e prioridades determinadas pelos próprios Estados membros e o âmbito de trabalho em que o IICA concentra seus esforços e sua capacidade técnica, tanto sob o ponto de vista de seus recursos humanos e financeiros, como de sua relação com outros organismos internacionais.

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