

<b>AGENCY FOR INTERNATIONAL DEVELOPMENT</b> <b>PROJECT DATA SHEET</b>	<b>1. TRANSACTION CODE</b> <input type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete	Amendment Number _____ <b>DOCUMENT CODE</b> 3
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<b>2. COUNTRY/ENTITY</b> Africa Regional	<b>3. PROJECT NUMBER</b> 698-0435.05
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<b>4. BUREAU/OFFICE</b> AFR	<input type="checkbox"/> 06	<b>5. PROJECT TITLE (maximum 40 characters)</b> SAAR - F/Fred
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<b>6. PROJECT ASSISTANCE COMPLETION DATE (FACD)</b> MM DD YY 09/30/91	<b>7. ESTIMATED DATE OF OBLIGATION</b> (Under "E." below, enter 1, 2, 3, or 4) A. Initial FY <input type="checkbox"/> 8 <input type="checkbox"/> 6    B. Quarter <input type="checkbox"/> 4    C. Final FY <input type="checkbox"/> 8 <input type="checkbox"/> 6
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8. COSTS (\$000 OR EQUIVALENT \$1 = )						
A. FUNDING SOURCE	FIRST FY 86			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total	300	-	300	300	-	300
(Grant)	( 300 )	( - )	( 300 )	( 300 )	( - )	( 300 )
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S.						
1. S&T Bureau	2,400	-	2,400	2,400	-	2,400
2. Africa Missions	1,300 *	-	1,300 *	1,300 *	-	1,300 *
Host Country						
Other Donor(s)						
<b>TOTALS</b>	4,000	-	4,000	4,000	-	4,000

9. SCHEDULE OF AID FUNDING (\$000)									
A. APPRO- PRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) FNX	230	160		-	-	3,600	-	3,600	-
(2) SCX	741	871		-	-	400	-	400	-
(3)									
(4)									
<b>TOTALS</b>				-	-	4,000	-	4,000	-

<b>10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)</b>	<b>11. SECONDARY PURPOSE CODE</b>
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<b>12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)</b> A. Code B. Amount	R/AG 4,000
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**13. PROJECT PURPOSE (maximum 480 characters)**

To help improve sustainable agricultural productivity in Africa through greater adoption of agroforestry technologies compatible with local land-use conditions, thereby increasing national capability for food self-sufficiency.

\*\$1,300,000 is subject to mission buy-ins.

<b>14. SCHEDULED EVALUATIONS</b> Interim MM YY MM YY Final MM YY	<b>15. SOURCE/ORIGIN OF GOODS AND SERVICES</b> <input type="checkbox"/> 000 <input type="checkbox"/> 941 <input type="checkbox"/> Local <input type="checkbox"/> Other (Specify) _____
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**16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a \_\_\_\_\_ page FF Amendment.)**

<b>17. APPROVED BY</b>	Signature Keith Sherper <i>Keith W. Sherper</i> Title Director, AFR/TR	<b>18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION</b> MM DD YY 09/18/86
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AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON, D.C. 20523

SUBPROJECT AUTHORIZATION

Entity: Africa Regional  
Project Name: Strengthening Africa Agricultural Research  
Project Number: 698-0435  
Subproject Name: Forestry/Fuelwood Research and Development  
Subproject Number: 698-0435.05

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Forestry/Fuelwood Research and Development Subproject under the Strengthening Africa Agricultural Research Project for Africa, involving planned obligations of not to exceed \$300,000 in grant funds over a one-year period from the date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the subproject. Except as A.I.D. may otherwise agree in writing, the planned life of the subproject is five years from the date of initial obligation.

2. The subproject will consist of assistance to the International Council for Research in Agroforestry to help to improve sustainable agricultural productivity through greater adoption of agroforestry technologies compatible with local land-use conditions, thereby increasing national capability for food self-sufficiency in Africa. The subproject is the vehicle for participation by the Africa Bureau, Office of Technical Resources, in the larger Forestry/Fuelwood Research and Development Project (A.I.D. Project No. 936-5547). That project consists of furnishing technical assistance, training, research grants, and equipment for the following purposes:

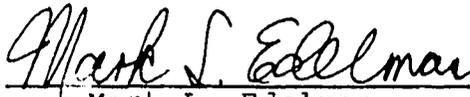
(A) Research Planning and Management: promote development of country specific national fuelwood/forestry plans and programs and strengthen key host-country institutions to carry out national forestry/fuelwood research and development plans;

(B) Network Development and Research: improve research methods and information management; develop and monitor agreed upon collaborative research programs; conduct workshops and conferences; purchase commodities essential to research management and support publications of results; supply expertise to host countries to assist in project design and management; undertake fuelwood research assessments, appraisals and evaluations, and behavioral, institutional and human resource evaluations.

(C) Global Research: develop state-of-the-art papers and other technology assessments; assist in development of research models as a basis for integrating and structuring currently available information; support use of research models to evaluate fuelwood/multi-purpose tree species as components of agroforestry or other farming systems approaches to define new research needs.

3. The subproject agreement or amendment which may be negotiated and executed by the officers to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to such essential terms and covenants and major conditions as are specified for the Forestry/Fuelwood Research and Development Project, together with such other terms and conditions as A.I.D. may deem appropriate.

Date: 7/1/86

  
Mark L. Edelman  
Assistant Administrator  
Bureau for Africa

Clearances: As shown on action memorandum

AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C. 20523

JUN 26 1986

ACTION MEMORANDUM FOR THE SENIOR ASSISTANT ADMINISTRATOR FOR SCIENCE AND TECHNOLOGY AND THE ASSISTANT ADMINISTRATOR, BUREAU FOR AFRICA

THRU: S&T/EN, Jack Vanderryn

FROM: S&T/FNR, John D. Sullivan & *(Acting for)*  
AFR/TR, Keith W. Sherper *KS*

SUBJECT: Forestry/Fuelwood Research and Development (F/FRED), 936-5547 and Strengthening African Agricultural Research, 698-0435.05 (SAAR-F/FRED)

Problem: Your approval is required for a grant of up to \$4,000,000 for a five-year project to the International Council for Research in Agroforestry (ICRAF). \$2,300,000 will be provided from the Agriculture, Rural Development and Nutrition account (S&T Bureau \$2,000,000; Africa Bureau \$300,000) and the Selected Development Activities account (S&T Bureau \$400,000). The remaining \$1,300,000 will be provided by selected African missions as buy-ins for country-specific research activities.

Background and Discussion: On June 13, 1985, the A/AID authorized a 10-year Forestry/Fuelwood Research and Development (F/FRED) project in the amount of \$32,800,000. The goal of the project, which responds directly to the Agency's designation of fuelwood as a priority research area, is to help LDCs meet their needs for fuelwood and other tree products; for improved land, water, agroforestry and human resources management; and for increased employment and income.

The F/FRED project is part of a \$40,000,000 collaboration between the S&T, Asia, Latin America and Africa Bureaus, over a ten-year period. The Asia and Near East Bureau has already authorized \$2,500,000 for the first five years of the project.

This action approves funding for the Africa Bureau's participation in the global project (No. 936-5547) and is in compliance with para 3 under Background and Discussion of the S&T memo dated May 30, 1985. The Project Paper (Attachment 3) for the global project, describes in detail the implementation in Asia, and states that the details of the AFR and LAC phases would be prepared after project activities in these regions had been discussed and agreed upon by the respective Bureaus, Regional Offices, and Missions, and that when specific project activities have been developed for Africa and LAC, they are to be submitted to the Senior Assistant Administrator for Science and Technology for approval.

The Africa Bureau has worked with S&T to develop this project and its objectives, implementation plan, and budget.

Selection of ICRAF as Assistance Recipient: In considering acceptance of ICRAF's unsolicited application, S&T/FENR considered the university community, private consulting firms, and international forestry and agriculture research institutions. No university group in the United

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States has the staff or field experience in agroforestry to carry out the objectives of this activity. Private consulting firms were not felt to be appropriate for an activity that will support an ongoing research and training project. The research institutions considered (The East-West Center in Hawaii, The Centro Agronomico Tropical de Investigacion y Enzenanza and FAO) were not selected because of their limited or different focus.

ICRAF was selected as the recipient of the cooperative agreement because of its unique nature as an international agroforestry research institution. It is totally multidisiplinary in its project planning and implementation, is situated in Africa where much of AID's agroforestry work will be carried out, is located in the same city where AID has a Regional Office (REDSO/EA) with auditing, legal, contractual, and professional forestry and agriculture personnel and has taken the leading role in agroforestry on a global basis. No other international, regional or national institution provides this unique set of qualities that are needed to deal with agroforestry research and training called for in this project.

Under the terms of the proposed Cooperative Agreement, it is planned that ICRAF, as implementor and as originator of the unsolicited application, will build on information previously derived to accomplish the following:

1. Assist in the development, establishment, and coordination of an agroforestry research network in the ecozone focusing on multipurpose woody species, and tree improvement trials for incorporation into appropriate agroforestry technologies.
2. Collaborate with, and provide technical support to, national and international research institutions in the ecozone in the development of multipurpose woody species adaptation, tree improvement trials, and agroforestry technologies.
3. Assist national and international institutions and agencies in the choice and acquisition of quality seed/plant material for multipurpose woody species as components for agroforestry research efforts.
4. Train national institution personnel to evaluate land use systems (which involves the preparation of state-of-the-art reports on agroforestry technologies to improve productivity and sustainability of production).
5. Furnish technical backstopping services for improved agroforestry systems in Kenya, Rwanda, Burundi and Uganda.

The expected outputs at the end of the 5-year period are:

- a. Establishment of multipurpose woody species/agroforestry technology intercountry research networks involving at least four participating countries;
- b. Identification of superior species and strains of multipurpose woody species to be used in agroforestry systems;

- c. Increased production of genetically improved seed/plant material for 5-10 selected multipurpose woody species;
- d. Training of in-country agroforestry technical groups needed to implement the collaborative research in each of the cooperating countries; and
- e. Identification of location or country-specific agroforestry research problems.

Financial Summary: This project provides direct budgetary support to ICRAF in the amount of up to \$4,000,000. It is planned that \$2,400,000 will be provided by the S&T Bureau and \$300,000 by the Africa Bureau. The remaining \$1,300,000 is subject to mission buy-ins. The funds will be used to finance, in part, the costs of ICRAF's headquarters management and administration, technical assistance, training, and research grants. The project budget summary and first year funding are as follows:

S&T and Africa Bureau Contribution

Line Items	YEAR I		ALL YEARS	
	S & T	AFR Bur	S & T	AFR Bur
1) ICRAF Program Coordinators	50.0	0	150.0	0
2) Mobilization/Organizational Country Visits	25.0	0	25.0	0
3) AFR Networking Workshop	36.0	0	36.0	0
4) Country-specific Land-use Analysis	0	11.2	0	11.2
5) Priorities Identification Workshop	40.55	0	40.55	0
6) Training Course - Multi-Purpose Tree Species	0	0	46.0	0
7) Network Strengthening in-country operational costs & Technical Assistance	40.0	30.0	200.0	175.0
8) Information Exchange reports and publications	0	0	40.0	0
9) Annual Network Meeting	0	0	64.0	0
10) Research Coordination				
- Research Coordinator	50.0	0	450.0	0
- Improved Seed/Plant Material Generation	0	0	300.0	0
- Research Equipment & Supplies	61.5	0	61.5	14.5
11) Evaluations	0	0		
12) Contingency	100.0	0	300.0	0
Subtotal	403.1	41.2	1753.0	
13) Inflation (5%)	0	0	140.0	31.0
14) Overhead (27%)	108.8	11.3	507.0	68.3
TOTAL	511.9	52.5	2400.0	300.0

Responsible Officers: The responsible project officers are:

- 1. S&T Bureau : Dr. Ian Morrison
- 2. Africa Bureau: Mr. Arlan McSwain

CONGRESSIONAL NOTIFICATION: The CN for the SAAR project expired on May 14, 1986.

PAYMENT VERIFICATION: Funds will be provided to ICRAF using the periodic advance payment method.

Recommendation:

1. To The Senior Assistant Administrator for S&T:

That you sign below to indicate your approval of project activities to be undertaken by the Africa Bureau under the F/FRED project (No. 936-5547).

DATE: 6/30/86

N. C. Brady  
 N. C. Brady  
 Senior Assistant Administrator  
 for Science & Technology

2. To The Assistant Administrator for Africa:

That you sign the attached subproject authorization to: (1) authorize an Africa Bureau contribution of \$300,000 from the SAAR project in support of the worldwide F/FRED project and (2) indicate your approval of the selection of ICRAF as assistance recipient. It is also planned that up to \$1,300,000 will be provided by selected African missions as buy-ins for country-specific research activities.

Attachments:

- 1. PP - F/FRED
- 2. Global Project Authorization
- 3. Unsolicited Application from ICRAF

Clearance:

DAA/S&T:DBrennan	<u>DB</u>	Date: <u>30 June 86</u>
S&T/PO:GGower	<u>GG</u>	Date: <u>25 June 86</u>
AFR/TR/ARD:AMcSwain	<u>AM</u>	Date: <u>6/19/86</u>
AFR/TR/PRO:WSherwin(draft)		Date: <u>6/12/86</u>
AFR/DP/PAB:Creeves	<u>CC</u>	Date: <u>6/17/86</u>
AFR/PD/CCWA:CShorter(draft)		Date: <u>6/12/86</u>
GC/AFR:BBryant	<u>BB</u>	Date: <u>6/20/86</u>
GC/CP:STisa(draft)		Date: <u>6/13/86</u>
DAA/AFR:ARLove	<u>AR</u>	Date: <u>7/1/86</u>

S&T/FENR:IMorrison/  
 AFR/TR/SDP:TMCatterson/MLSebsibe:6/2/86:5409P

MORISON  
SLT/FR

SENIOR ASSISTANT ADMINISTRATOR

MAY 30 1985

ACTION MEMORANDUM FOR THE ADMINISTRATOR

THRU : AA/PPC, Richard Derham |S|  
FROM : S&T, N. C. Brady /a/ Dennis Brennan  
SUBJECT: Approval for Project 936-5547 Forestry/Fuelwood  
Research and Development (F/FRED)

Action: Your approval is requested to authorize a new ten year project, at a total cost of \$32.8 million. This project will be grant funded at \$24.55 million from the 103 account and \$8.25 million from the 106 account.

Background and Discussion: This project is part of a \$40 million Agency program involving a joint effort among S&T, ANE LAC and AFR over a 10 year period. Asia and Near East Bureau has authorized \$2.5 million for the first 5 years of the program. This project will provide \$32.8 million from S&T and the balance of \$4.7 million will be provided by Africa and LAC and ANE bureaus and Missions. The goal of the program, which responds directly to the Agency's designation of fuelwood as a priority research area, is to help LDCs meet their needs for fuelwood and other tree products; for improved land, water, agroforestry and human resources management; and for increased employment and income.

The project design is based on field assessments of current research on fuelwood in LDCs as well as on reviews of the Fuelwood Research Implementation Plan developed in collaboration with the regional bureaus and consultations with Missions, LDC scientists and other donors. A PID was approved in December 1983, and the PP was reviewed by the EN and HR Sector Councils on December 12, 1984. The project is consonant with Agency Forestry Policy guidance and the approved Forestry Sector Strategy.

Project activities will begin in Asia with subsequent phases in Africa and Latin America. The Project Paper (Attachment 2) describes the S&T/ANE phase; the details of the AFR and LAC phases will be prepared after project activities in both regions have been discussed and agreed upon by the respective bureaus, Regional Offices and Missions. When specific project activities have been developed for Africa and LAC they will be submitted to a joint Sector Council for review and to me for approval.

A Memorandum of Understanding between S&T and the Asia and Near East Bureau has been drafted and will be signed following your approval of the project. The "Memorandum of Understanding" establishes general terms and conditions under which S&T Bureau and Asia and Near East Bureau will cooperate in funding, organizing and managing the Asia Research Program under the Forestry/Fuelwood Research and Development Project. It covers the first five years of the project and is subject to annual review and the availability of funds.

The following categories of activities will be implemented:

I. Research Planning and Management: promote development of country specific national fuelwood/forestry plans and programs; provide training and other assistance to strengthen key LDC institutions to carry out national forestry/fuelwood research and development plans.

II. Network Development and Research: develop and monitor agreed upon collaborative research programs; improve research methods and information management; conduct workshops and conferences; purchase commodities essential to conduct research and support publication of results; supply expertise, mostly short-term, to host countries to assist in project design and management, fuelwood research assessments, appraisals and evaluations, and behavioral, institutional and human resource evaluation. This is the major focus of the project and will address networking and research support at the regional level.

III. Global Research: develop state-of-the-art papers and other technology assessments; assist in integrating, structuring and evaluating currently available information; evaluate fuelwood/multi-purpose tree species as components of agroforestry or other farming systems approaches to define new research needs.

The following mechanisms will be used to implement the Asia component of this project:

1. Asia Forestry Research Services Contractor

The project will be implemented primarily by contract with a United States firm or institution that will be selected by competition.

Certain technical services required for the project may be available only from organizations or individuals in free world developed countries in AID Geographic Code 935. A waiver of United States nationality requirement for suppliers of services is requested, and justified in attachment 2, page 21, in order to permit the contractor to sub-contract services from Code 935 countries under these circumstances.

2. Recruitment applications will be called for a Personal Services Contractor, funded by the Asia and Near East Bureau's Forestry Research and Development Project, to be located in Thailand. This contractor will assist the Asia and Near East Bureau Project Director in planning, implementing and monitoring project activities. The contractor will serve as liaison with Asia Missions, host country institutions, and representatives of other donor agencies involved in forestry/fuelwood research.

Funding for this \$40 million project will come from S&T (\$32.8 million), Asia and Near East Bureau (\$2.5 million authorized, \$2.5 million to be proposed), from other Bureaus and from Mission buy-ins (projected at \$2.2 million over 10 years).

By the end of this project we expect that participating LDCs will have: 1) increased government commitment to research on multi-purpose trees; 2) expanded the number of multi-purpose tree species available for use in rural development forestry programs; 3) developed improved seed supplies of selected multi-purpose tree species; 4) strengthened capacity to address the social and economic issues in rural tree crop production and management; 5) developed improved techniques for managing fast-growing, multi-purpose trees; and 6) formed an international community of interest in multi-purpose tree species research and established several viable research networks with wide-spread donor support.

A substantive Congressional Notification for this project (copy attached) has been prepared and sent forward to Congress on May 6, 1985. The period for Congressional comment, therefore, expires after 15 days, i.e., on May 21, 1985.

Particular attention has been given to compliance with the "Gray Amendment" through discussions and agreements with the Office of Small and Disadvantaged Business Utilization and SER/CM. The firm selected (by competition) to negotiate the prime contract will be required to submit an acceptable subcontracting plan that will include small and disadvantaged business concerns as sub-contractors. AID will provide, for consideration of the prime contractor, the names of a selected

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number of socially and economically disadvantaged firms that are potential subcontractors.

Recommendation: That you sign the attached Project Authorization.

Attachments:

1. Project Authorization
2. Project Paper

Clearances:

AA/ASIA:CGreenleaf	/s/	Date	5/31/85
GC:HFry	/s/	Date	6/07/85
S&T:DBrennan	/s/	Date	5/30/85
S&T/PO:GEaton	(KM)	Date	5/23/85
ASIA/TR/EFE:Richard	/s/	Date	5/17/85
S&T/HR:RZagorin	/s/	Date	5/15/85
S&T/RD:CRussell	/s/	Date	5/14/85
S&T/RD/RRD:ECheerwynd	/s/	Date	5/12/85
S&T/EN:JVanderryn	/s/	Date	5/14/85
S&T/FENR:JDSullivan	/s/	Date	5/10/85
S&T/FENR/F:CGallegos	/s/	Date	5/10/85
PPC/PDPR:ARosenberg	(PO'F)	Date	6/07/85

S&T/RD/RRD/S&T/FENR:IM:JKP:da:3/20/85:W1467n  
Revised:4/5/85:4/12/85

PROJECT AUTHORIZATION

Name of Project: Forestry/Fuelwood Research and Development

Number of Project: 936-5547

Name of Country: Worldwide

1. Pursuant to Sections 103 and 106 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Forestry/Fuelwood Research and Development project, involving centrally funded planned obligations not to exceed \$32.8 million in grant funds over a 10-year period from the date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/Allotment process. The project may also include additional funding up to \$7.2 million provided for this purpose by Regional Bureaus and A.I.D. Missions.

2. This project consists of furnishing technical assistance, training, research grants, and equipment for the following purposes:

(A) Research Planning and Management: promote development of country specific national fuelwood/forestry plans and programs and strengthen key LDC institutions to carry out national forestry/fuelwood research and development plans;

(B) Network Development and Research: improve research methods and information management; develop and monitor agreed upon collaborative research programs; conduct workshops and conferences; purchase commodities essential to research management and support publications of results; supply expertise to host countries to assist in project design and management; undertake fuelwood research assessments, appraisals and evaluations, and behavioral, institutional and human resource evaluations.

(C) Global Research: develop state-of-the-art papers and other technology assessments; assist in development of research models as a basis for integrating and structuring currently available information; support use of research models to evaluate fuelwood/multi-purpose tree species as components of agroforestry or other farming systems approaches to define new research needs.

INTERNATIONAL COUNCIL FOR RESEARCH IN AGROFORESTRY

(ICRAF)

Collaborative and Training Programs

Agroforestry Research Network

for Africa

(AFRENA)

- Sub-humid Bimodal Highlands Zone -

Cooperative Agreement

in response to an

unsolicited Proposal

from ICRAF

- PRESENTED TO USAID/S&T/FENR -

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EXECUTIVE SUMMARY

1. In the highlands of East and Central Africa, the need to feed a rapidly burgeoning population has led to widespread natural resource deterioration. Improved agroforestry methods are needed to meet food production requirements and maintain environmental stability on which agricultural productivity rests.
2. Research will be undertaken through this Cooperative Agreement to help selected African institutions develop improved agroforestry technologies through the selection, improvement and cultivation of multipurpose woody species for use in agroforestry systems. The research will be implemented through an intercountry collaborative research network for which ICRAF will provide technical backstopping and coordination.
3. As improved woody species are identified for each technology, ICRAF, in cooperation with institutions from developing countries and other donor organizations, will help produce seeds/plant material to accelerate the dissemination of the improved biological materials.
4. The multidisciplinary nature of this research requires the combined use of resources available in institutions from the agriculture and forestry sectors. Networking is the appropriate operational model to bring together these various disciplines, given its flexible nature and potential for using available resources in a complementary fashion. In northeast Africa, the research capabilities of most forestry/agriculture institutions is minimal, and it is anticipated that research networking will result in strengthening the capabilities of these institutions to do agroforestry research.
5. The intercountry collaborative research network approach is used to fully involve forestry and agricultural researchers from the participating country institutions. This involvement will include developing country participation in planning network activities and implementation of in-country research trials, along with formulating training needs. The network approach will also result in strengthening the capabilities of these institutions to do agroforestry research.
6. This Cooperative Agreement will be carried out over a period of 5-years with an evaluation occurring in the third year. The expected outputs at the end of the 5-year period are:

- a. Establishment of MPT agroforestry technology/species intercountry research networks involving at least four participating countries;
  - b. The identification of superior species and strains of multipurpose woody plants to be used in agroforestry systems;
  - c. Increased production of genetically improved seed/plant material for 5-10 selected MPT species;
  - d. The training of in-country agroforestry technical groups needed to implement the collaborative research in each of the cooperating countries;
  - e. Identification of location or country-specific agroforestry research problems.
6. In producing these outputs, collaborative efforts are proposed with other donors (e.g., GTZ, IBRD, IDRC, CTFT, the Swiss Development Corporation, etc.) and with CGIAR institutions (ILCA, ICRISAT, and IITA).
  7. A Cooperative Agreement best reflects the association of the Agency and the recipient (ICRAF) in carrying out research and training activities that are important to AID's future work in agroforestry, and at the same time, an integral part of ICRAF's overall program and long-term development.
  8. Since ICRAF's mandate is to strengthen an international network of agroforestry research and development institutions through this Cooperative Agreement, AID will be supporting the strengthening and expansion of a more formal network of LDC institutions in Africa that will sustain and increase agroforestry research and training.
  9. This proposal can contribute to the overall ICRAF Sub-Saharan Africa Agroforestry Research Network program under which networks will be organized on a broad ecological basis in four zones including: the lowland humid tropics of Western Africa, the Sahel, the sub-humid unimodal highlands of Southern Africa, plus the moist sub-humid bimodal highlands of Eastern Africa. Thus far, Canadian CIDA has committed funding for program activities in Southern Africa, Western Africa research will be financed by France, and the World Bank has allocated funds to support research to be done in the Eastern and Southern highlands. This Cooperative Agreement will support networking in the sub-humid bimodal highlands zone; participating countries within this zone will be Kenya, Rwanda, Burundi and Uganda.

10. The total amount for this 5-year Cooperative Agreement is \$4.0 million (grant). \$1.3 million of this amount is dependent upon mission buy-ins.

## INTRODUCTION

1. In the highlands of East and Central Africa, the need to feed a rapidly burgeoning population has led to widespread natural resource deterioration. Improved agroforestry<sup>1</sup> methods are needed to meet food production requirements and maintain environmental stability on which agricultural productivity rests.
2. A number of land use systems exist in the zone and vary in predominance according to the agro-environment and socio-economic conditions. Broadly, six land use systems are identified. These include forests, shifting cultivation, mixed arable farming, plantation agriculture, grazing, and agroforestry systems.
3. Mixed arable farming is the most common in the zone. It is practiced mainly under mixed subsistence/cash cropping conditions. Of the several variations of arable farming, fallow systems are the most common. It is characterized by small landholdings on which permanent cash crops are planted and food crops are cultivated. The latter alternates with short fallow periods. Fallow vegetation consists of grass and crop residues used for grazing.
4. Arable farming systems are experiencing many production constraints which include:
  - a. Lack of fertility maintenance due to overcropping;
  - b. Soil erosion due to continuous cropping;

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<sup>1</sup>Agroforestry is the term used for land-use systems which combine the growing of woody perennials on the same piece of land with agricultural crops and/or animals, either integrally or sequentially. These different components interact ecologically and economically, in both positive and negative ways over time. Agroforestry is chosen over alternative land use systems in circumstances where this interaction of components results in higher productivity, sustainability, and/or diversity of outputs such as food, fodder, water, shelter, and energy plus soil fertility and stability.

- c. Serious conflicts between cash crops and subsistence food crops; and
  - d. Degenerating livestock economy due to lack of fodder.
5. Under these circumstances, the agroforestry approach of incorporating woody perennials into existing farming systems constitutes a sound practice, given the potential of trees to produce food or fodder in combination with fuel or timber, as well as to protect soils, and even restore soil fertility.
6. The role of agroforestry in mixed arable farming systems would be to:
- a. Increase effective land availability for food production through intercropping of food crops with tree crops (Melia azedarach, Olea welwitschii);
  - b. Improve productivity and sustainability through hedgerow intercropping and planted fallow;
  - c. Improve tree-crop productivity by addition of appropriate woody herbaceous "service" components (N-fixing and/or shade providing trees/shrubs; i.e. Trema orientalis, Lespedeza bicolor, and herbaceous living mulches); and
  - d. Introduction of multi-layer crop canopies for better soil cover utilizing deep rooting trees (Mimosa scabrella, Maesopsis eminii, Acrocarpus fraxinifolius) in nutrient recycling and increasing soil stability.

#### PROBLEM AND NEED

7. The agroforestry approach to land use has been practiced by farmers all across Africa for centuries, if shifting cultivation is considered an agroforestry practice, and is still being practiced by many, particularly small holders. But neither land use circumstances under which existing agroforestry technologies are applied, nor their structure and function, are, in most cases, properly understood. This retards both their wider dissemination and their potential improvement.
8. Efforts by existing research systems to generate new agroforestry technologies are also relatively scarce, when compared to those applied to cash and food crops. In inter-tropical Africa, research has been mostly confined to

three types of practices; "taungya"<sup>2</sup>, practiced by forest departments bringing farmers into reforestation schemes with the main objective to reduce plantation costs; "alley cropping"<sup>3</sup> for sustained maize production, as carried out at IITA; and browsing, where considerable information has been produced on the chemical composition of fodder from woody perennials.

9. The scarcity of knowledge on existing and potential agroforestry technologies stems from the relatively recent "re-discovery" of agroforestry, and the corresponding lack of institutional capabilities to confront pressing land use problems requiring an innovative approach.
10. There is also a scarcity of knowledge concerning the multipurpose woody species<sup>4</sup>--both native and exotic--which are most appropriate for use in the highlands of East and Central Africa. Species information concerning adaptability to soil, climatic and other environmental conditions, and people preferences are lacking. In addition, knowledge of how to select, genetically improve, and propagate these woody perennials is also deficient.
11. A primary objective of this cooperative agreement is to increase our knowledge of these multipurpose woody perennials and of how they can be most effectively used in agroforestry systems. Included will be the selection of species and provenances with quality characteristics suitable for different ecological environments and for multipurpose uses in these environments.
12. The research will be planned and implemented through an inter-institutional collaborative research network involving institutions from at least four African countries. ICRAF will take the leadership in initiating the network and will provide technical backstopping as well as orientation and training for in-country researchers involved in the network. The approach will be designed to help the

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<sup>2</sup>The practice of combining seasonal crops with the initial stages of a more permanent tree crop.

<sup>3</sup>An agroforestry system in which food crops are grown in alleys formed by hedgerows of trees or shrubs.

<sup>4</sup>Trees/shrubs which are planted in agoforestry systems for a range of end uses including fruit, browse, shade and ground cover, fuelwood, building materials, etc.

countries strengthen their agroforestry research capabilities and especially those related to woody species improvement and integration into agroforestry systems.

13. The multidisciplinary nature of research on the agroforestry approach to land use requires the combined use of resources available in institutions from the agriculture and forestry sectors. In most countries, the implementation of such an approach faces a major constraint: it lacks a proper institutional "niche." The major challenge, therefore, is to develop viable and dynamic operational structures capable of integrating the efforts of research institutions from the agriculture and forestry sectors to achieve a more effective use of existing capabilities, both at national and regional levels. In this regard, there is considerable need for collaboration with the International Agricultural Research Centers (IARCs).
14. Networking is an appropriate operational model to face such a challenge, given its flexible nature and potential for using available resources in a complementary fashion. Networking is based on the development of information through research and the dissemination (or extension) of this information to other research facilities and to the user on the ground.

#### BACKGROUND

15. As the Cooperative Agreement aims to facilitate ICRAF's technical assistance to national research systems for generating agroforestry technologies, information pertinent to both the beneficiaries and the implementing agency will be examined. The intent of this project, as well as that of ICRAF as an organization, is to facilitate the strengthening of local forestry/agriculture institutions to carry out their own research geared towards solving local problems.

#### On the beneficiaries

16. In most countries of inter-tropical Africa, research systems cannot generate all the technologies required to overcome the spectrum of current land use problems. In spite of a steady increase in the number of scientists, such a situation arises from several causes: frequent reorganization of research structures; poor reward systems for scientists; lack of trained manpower; inadequate facilities; and budgetary stringencies, particularly operational funds.

17. Much of the generated technology has not been entirely appropriate to farmers circumstances, particularly small scale farmers, who constitute the bulk of the population and depend mostly on their own food production to satisfy family needs. The induced commodity-oriented research strategy may be partially responsible for the gap between research results and the adoption of recommended practices. Recognition of this problem has, lately, led to the application of a farming systems approach to research planning. The concepts and principles partially responsible for the farming systems methodology are valid for generating appropriate agroforestry technologies. But the purposes for which such a methodology is applied may be quite different.
18. In farming systems research, there are normally many validated technologies for improving the production of individual crops. Under these conditions the objective of systems research is to identify those farmers' constraints which hinder adoption of existing technologies. The latter are then adapted to meet prevailing circumstances. However, there are only a few research-validated agroforestry components in overcoming diagnosed land use problems, to specify their desirable characteristics, and to indicate appropriate spatial arrangements and management practices. In other words, it must be able to design and evaluate conceptual technologies from which research needs are then derived.
19. There is an increasing awareness in the region of the need to promote stronger cooperation and coordination among countries in matters of agricultural research. For example, the agricultural research cooperation among the so-called Southern Africa Development Coordination Conference (SADCC) countries, the "Comite International contre la Lutte et la Secheresse au Sahel" (CILSS), and the Forestry Education Committee for East Africa are examples of current efforts to address this need.
20. Agricultural research networks are expanding at an increasing rate; the great majority of them initiated by International Centres. For example, networks for testing germplasm and devising improved agronomic techniques for the major cereal and root crops are the ones on which most efforts are focused at present. There are, however, others in the fields of livestock diseases and "farming systems," the latter being of direct relevance to agroforestry research.
21. Unfortunately, there are no comparable networks concerned with woody perennials, their improvement and management in

agroforestry systems. There is just as great a need for such networks as for those focusing only on agricultural crops. The network to be implemented through this Cooperative Agreement will provide increased knowledge on the woody species and their management.

On the implementing agency

22. In September, 1982, the Agency for International Development (AID) and the International Council for Research in Agroforestry (ICRAF) entered into a Cooperative Agreement (Project No. 936-5545) for a total of US \$1,000,000 over a three-year period. The project's purpose was threefold:
  - (a) To utilize diagnostic methodology to identify agricultural and forestry land-use problems, analyze constraints, and recommend practices to mitigate these constraints;
  - (b) To assemble systematic documentation of existing world-wide agroforestry systems out of which new practices and systems can emerge; and,
  - (c) To develop and carry out training courses in agroforestry for LDC participants.
23. The development of such a program has enabled ICRAF to acquire the capability to assist national institutions in:
  - (a) Designing research projects to generate appropriate agroforestry technologies;
  - (b) Training cadres in the application of such a process; and,
  - (c) Collating information on existing agroforestry practices.
24. Such capabilities constitute the foundations on which this Cooperative Agreement is built and follow the recommendations of the Mid-term Evaluation Team for the AID-supported Agroforestry Research and Training project that states: "...in order to assist ICRAF to take a more active role in technology generation, we feel AID should examine the possibility of supporting the development and expansion of the Collaborative and Special Projects (COSPRO) programs." More specifically, AID could provide funds for a network of research projects under different ecological conditions (e.g. humid tropics, semi-arid tropics) that would have as their expected output relevant and profitable new agroforestry technologies.

25. ICRAF is proposed for this Cooperative Agreement because of its unique nature as an international agroforestry research institution. It is totally multidisciplinary in its project planning and implementation, is situated in Africa where much of AID's agroforestry work will be carried out, is located in the same city where AID has a Regional Office (REDSO/EA) with auditing, legal, contractual, and professional forestry and agriculture personnel (for assistance to S&T/FENR with project management), and has taken the leading role in agroforestry on a global basis. No other international, regional, or national institution provides this unique set of qualities that are needed to deal with agroforestry research and training on a global basis.

#### GOAL

26. To improve sustainable agricultural productivity through greater adoption of agroforestry technologies compatible with local land-use conditions thereby increasing national capability for food self-sufficiency in Africa. In particular, this project will focus attention on the selection and development of the most suitable woody species for agroforestry through linking in-country research in various countries by means of networks, and by providing technical support and backstopping for the efforts.

#### PURPOSE

27. To select and genetically improve multipurpose tree and shrub species to integrate with agricultural food crops into productive agroforestry systems for the sub-humid, bi-modal highlands of East and Central Africa.

#### OBJECTIVES

28. ICRAF shall build on the information previously derived for the Agency to accomplish the following:
- 28.1 To assist in the development, establishment, and coordination of an agroforestry research network in the ecozone focusing on multipurpose tree species, and tree improvement trials for incorporation into appropriate agroforestry technologies.
- 28.2 To collaborate with and provide technical support to national and international research institutions in the ecozone in the development of multipurpose tree species adaptation, tree improvement trials, and agroforestry technologies.

- 28.3 To assist national and international institutions and agencies in the choice and acquisition of quality seed/plant material for multipurpose tree species as components for agroforestry research efforts.
- 28.4 To train national institution personnel to evaluate land use systems (which involves the preparation of state-of-the-art reports on agroforestry for each country), and to apply agroforestry technologies to improve productivity and sustainability of production.
- 28.5 To furnish technical backstopping services for improved agroforestry systems in LDCs.

### OUTPUTS

29. Through collaborative efforts, the expected outputs of this five-year Cooperative Agreement will be:
  - 29.1 The initiation of collaborative intercountry agroforestry research network involving participants from at least four countries.
  - 29.2 Initiation and implementation of woody species improvement trials in the network countries leading to the production of genetically superior, multipurpose seed/plant material to be used for identified agroforestry technologies.
  - 29.3 Establishment of improved agroforestry technology trials with selected, improved multipurpose tree species in at least four countries in the ecozone.
  - 29.4 Four Agroforestry Technical Groups (one per country) trained in agroforestry research design and implementation emphasizing species and technology trials.
  - 29.5 An operational plan for agroforestry network development including preparation of a prioritized plan for agroforestry research actions.
  - 29.6 Identification and prioritization of location or country-specific agroforestry research problems.

### INPUTS

- 30.1 The total amount of this 5-year Cooperative Agreement is \$4.0 million. (\$1.3 million is dependent upon mission buy-ins.)

Of this \$2.4 million will come from the Africa Component of the Forestry/Fuelwood Research & Development Project (F/FRED) in the Bureau for Science and Technology.

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An additional \$0.3 million will be provided by the Bureau for Africa through the Strengthening African Agricultural Research (SAAR) project.

The Missions will be looked to for funding of in-country research and longer-term institutional development through buy-ins totaling \$1.3 million. Other donors will also be actively pursued for support of in-country research and institutional support.

- 30.2 Not included in this Agreement is the recruitment of a zonal coordinator.
- 30.3 The research coordinator will provide guidance and technical backstopping for the design and development of the species-specific and technology-specific research in the bimodal highlands zone. This person will organize and assist in implementing the various training sessions for the agroforestry teams from each of four countries, and will coordinate the establishment, maintenance, and evaluation of on-the-ground research conducted by host country nationals in each country.
- 30.4 ICRAF core staff will provide specialized technical assistance to the zonal coordinator and the research manager whenever necessary, and will provide assistance in planning, establishing networks, conducting training sessions, and designing research trials.
- 30.5 The budget details funds to cover operational costs (i.e. staff, training courses, networking) and the commodities needed to conduct multipurpose tree species/agroforestry technologies research in each country (i.e. equipment for research establishment and maintenance). Funding for in-country research will emphasize contributions from national (in-country) and bilateral donor sources available to the country. Initially this Cooperative Agreement may provide a portion of the operational costs if other sources are not available. After two years, it is expected that all in-country research operational costs will be funded by sources outside this Cooperative Agreement. Linkages formed between the parent Project (F/FRED) Data Base Management System (DBMS) and the ICRAF DBMS will facilitate the exchange of agroforestry information on a worldwide basis.
- 30.6 Various project design exercises and a design workshop will be held to develop research agendas and proposals.
- 30.7 Evaluation of the Cooperative Agreement will be conducted by specially formed teams at the end of the third year. Depending on results of this evaluation, the Cooperative Agreement may be modified. A final evaluation should be

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conducted at the end of the fifth year when the Cooperative Agreement is completed.

## ACTIVITIES

### 31. Network development

This activity will involve integrated planning and analysis among national institutions, and will analyze prevailing land-use systems in the ecozone to provide elements for decisions on the focus of agroforestry research and to propose organizational structures to conduct the research. Plan development, leading to research implementation and network development, will be undertaken according to the following approach:

#### 31.1 Mobilization, Promotion, Organization and Information Gathering.

This activity will be guided by ICRAF specialists, assisted by the Data Appraisal Team for Africa (DATA, constituted by junior scientists recruited and supported through an IDRC funded project) and will include the early participation of the Zonal Coordinator. This team will assist in:

- a. Identification of participating national institutions from the agriculture and forestry sectors;
- b. Developing the organizational framework for multi-institutional cooperation in the planning and implementing of multipurpose tree species and agroforestry research projects within each country, including the designation of national coordinating mechanisms;
- c. Defining objectives, structure, and operational procedures for a zonal agroforestry research network;
- d. Training in methodology for the analysis of existing uses of land vis-a-vis agroforestry potential; and
- e. Assisting cooperating national institutions in analyzing secondary information on land use in the ecozone.

#### 31.2 Introduction to Agroforestry networking and training.

This activity will be carried out using the methodology developed above with the participation of all National Technical Group members from the four countries (15-20 scientists) employing study materials developed by ICRAF's multidisciplinary team.

Country representatives in the ecozone are expected to participate in all steps of research planning: data evaluation, field assessment, and design of alternative agroforestry technologies.

### 31.3 Country-specific Agroforestry Systems Analyses.

Further in-country analysis of existing land use will be undertaken by the members of the National Technical Group in each country with periodic backstopping by ICRAF's Core Staff and the Zonal Coordinator. This activity will result in the preparation of a hard copy, state-of-the-art reports on agroforestry for each country which will include:

- (a) Identification and mapping of the major environmental regions of the country;
- (b) Quantitative description of the major land-use systems of each region, including their extent;
- (c) Identification and quantification of the nature and severity of problems faced by these land-use systems, including both problems of the farmer (or other land user) and problems of the environment;
- (d) Quantitative description of existing agroforestry systems and practices, traditional and modern, to be found in the country, with emphasis on the woody species used and their performance under particular climatic and soil conditions; and
- (e) Summarization of the present state of the capacity for agroforestry research in the country, including;
  1. research stations and their environmental conditions,
  2. details of current research, and
  3. principal results obtained.

## 32. Research Network Design and Implementation

### 32.1 Priorities identification workshop.

This workshop will take place in Nairobi with the participation of all Technical Groups from the four countries. Under ICRAF guidance, country-specific land use system analyses will be discussed and common problems and proposed agroforestry interventions will be identified and prioritized. Research priorities will be determined in

accordance first, with their importance at the national level, and second, by their regional significance. The end result will be an ecozone-wide action plan encompassing:

- (a) Selection of target species and ecozone significant agroforestry technologies to be used in testing the technologies;
- (b) Creation of an additional list of location or country-specific research actions; and
- (c) Preliminary discussion of guidelines for the selection of superior mother trees and the genetic improvement of desired species.

### 32.2 Research design and methodology training by country.

Using materials developed by ICRAF, National Technical Groups will be trained in research design methodologies to address problems identified in the workshop. Research design sessions will utilize ICRAF's Diagnostic and Design Methodology and will be held sequentially in each country. Specific topics will include:

- a. Development of a comparative testing and research design methodology compatible with international standards which may be employed for establishing trials and to rationalize ongoing or existing multipurpose tree species/agroforestry technology trials; and
- b. Development of seed/plant material collection and handling protocols for species in the following four categories (refer to Appendix 1 and Figure 1 for detailed activities regarding each category);
  1. locally utilized, well-known species (e.g., Grevillea spp., Maeosopsis spp.),
  2. locally utilized, little known species (e.g., Erythrina spp., Calliandra spp.),
  3. undomesticated native species with excellent potential (e.g., Albizia spp., Polycias spp., Markhamia spp.), and
  4. other untested exotic species with excellent potential (e.g., high altitude Leucaena spp.).

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### 32.3 Research mobilization.

In collaboration with local institutions, ICRAF will conduct visits to the respective countries in order to:

- a. Develop selection criteria for superior mother trees;
- b. Verify existence and availability of nursery sites and seed/plant material storage facilities;
- c. Help make selection of sites, determine the ICRAF and in-country contributions for establishment and operation of sites, and initiate actions to help establish the in-country research programs; and
- d. Initiate seed/plant material collection/procurement.

### 32.4 Research Implementation

The experimental phase of the species-specific and technology-specific research trials will be carried out with the guidance and backstopping of the ICRAF recruited Agroforestry Research Coordinator and the national committee implementation teams. These activities will utilize in part, the support funds earmarked under the budget, but funds obtained from national and other donor sources mentioned in section 30.5 will be used to supplement these resources and eventually take on all research activities. Technology-specific projects will be of a multi-station type with on-farm testing. The location or country-specific projects will be conducted on-farm.

The following three pronged approach for conducting agroforestry research will be utilized:

- a. Selection of promising agroforestry technologies for identified high priority land-use problems based on an evaluation of their adaptability to local farming systems;
  1. Consideration of appropriate management and/or cultural techniques based on an assessment of farmer preferences for both crop and tree outputs; and
  2. Collection of yield data and information on interactions among crops and trees in agroforestry systems used to revise agroforestry configurations and to provide parameters for assessing the performance of agroforestry tree/crop combinations.

- b. The choice of species/provenances of indigenous or well adapted exotic species (Appendix 1, Figure 1) to be tested in agroforestry configurations (identified above) including;
  - 1. Selection of plus trees from within provenances of indigenous or well-adapted exotic tree species based on selection criteria geared to compatability with agroforestry applications; and
  - 2. Corroboration and/or applied research on seed/plant material handling and nursery techniques for seed/plant material production will be conducted to obtain successful planting of these tree species.
  
- c. Basic research with promising species involving;
  - 1. Procurement of seed/plant material of the desired tree species; and formulation of experimental designs(s) needed for conducting and evaluating field trials,
  - 2. Establishment of species/site trials; maintenance of field plots; and collection of data that is subsequently analyzed under ICRAF guidance,
  - 3. Outstanding species can be incorporated into the operational seed orchard program, or species/provenance trials can be started for additional testing of promising provenances before incorporating them into the production/applied phase of such a program, and
  - 4. Management trials. (e.g. coppicing, to be conducted in the future).

### 33. Improved Seed/Plant Material Supplies

Criteria developed per the above for selecting the best species, the best provenances within species, and superior trees within a provenance will lay the groundwork for eventual large scale improved seed/plant material production. Work will be initiated to support and further the establishment of seed orchards aimed at producing genetically improved seed/plant material. In some cases, this can be done by simply converting adequately designed species trial plots into seed orchards or establishing grafted seed orchards. Having developed criteria for particularly promising agroforestry species, technical

backstopping and support would be provided through this Cooperative Agreement to complement on-going national/donor seed improvement/production efforts funded by other donors (e.g. GTZ/KARI, Swiss/Butare, CTFT/Burundi).

#### 34. Institutional development

##### 34.1 Establishment of coordination mechanism.

In order for the envisaged concerted cooperation to become functional, there is a need to develop institutional "niches" that advance such an objective within and among countries, as well as between countries and non-host country regional agencies. As mentioned before, agroforestry research requires structures that promote joint efforts by institutions from the agricultural and forestry sectors for integrated planning and pursuit of common goals.

To satisfy such a principle, it is foreseen that concerted co-operation could be achieved by some kind of National committee constituted by representation from government organizations from both the agriculture and forestry sectors dealing with research, extension, development, and training. In each country, the Technical Group will be responsible for setting up and implementing an agroforestry research plan, for coordination of funds from various sources, and to encourage complementary and co-operative research projects implemented by member institutions. Networking among countries within the ecological zone will be achieved through zonal meetings composed of representatives from the different National Committees, that will pursue the development of a zonal programme for co-operation on agroforestry research.

Networking among the national institutions will serve to enhance the exchange of information thereby strengthening the learning and development process fundamental to achieving material capability for agroforestry research and development.

##### 34.2 Personnel Development.

As part of the institutional development process, this Cooperative Agreement provides for training host country personnel.

Training of national cadres will be systematically coordinated with processes leading to the design and implementation of agroforestry research. It should be emphasized that as implementation activities are initiated under this Cooperative Agreement, personnel development

will evolve from training on research planning to training on experimental methods and field research techniques. Much of the training will be accomplished as national staff implement activities under this Cooperative Agreement in close association with the Zonal Coordinator, the Research Manager, and ICRAF backstopping personnel. More specifically, at least four training modules on key topics are planned for all participants under this Cooperative Agreement. These are:

- a. Multipurpose tree species selection for improved seed/plant material production;
- b. Land-use problem diagnosis and analysis of agroforestry applications;
- c. Agroforestry research priority identification and experimental design; and
- d. Case study-application of analytical tools at a real problem site.

35. Multipurpose Woody Species Data Base Operation

ICRAF will utilize its present MPT data base for accessing required species information and for storing the additional information generated in the course of research implementation. As a global data base is currently being developed under this Cooperative Agreement's parent project (F/FRED), every effort will be made to achieve compatibility of data bases (e.g., coordination, standardized descriptors, and software interchangeability).

36. Research Design, Action Plan and Annual Work Plans

Upon signing this Agreement ICRAF will prepare a Research Design and Action Plan for the life of project (LOP).

The Action Plan will describe the existing or proposed role of other donors in the other three zones and the relationship between activities funded by this Agreement in the sub-humid bimodal highlands zone with existing proposed activities in the other three zones. This Action Plan shall also indicate what actions are proposed for involving the other International Agricultural Research Centers (IARCs) in the Agroforestry Research Network for Africa.

A Work Plan shall be prepared each year describing the activities proposed for the year. This Work Plan shall include a statement on commitments made or anticipated by

host country research institutions for participation during the year. The Work Plan will require the approval of the A.I.D.'s co-managers.

37. Possible Extension into other Zones or Countries

Although this Agreement is specifically addressed to the sub-humid bimodal highlands zone of Africa, the possibility exists for expansion of the activities.

38. Project Management

The management of this Cooperative Agreement will be carried out jointly by S&T Bureau and REDSO/ESA. The A.I.D. Project Officer is S&T/FENR Ian G. Morison, his successor, or designee, who is also the S&T Program Manager, will have AID primary project management responsibility. The REDSO/ESA Co-Program Manager is James R. Seyler, his successor, or designee.

39. Program Description

This project will undertake activities according to the multipurpose tree (MPT) species/woody species continuum presented in Appendix 1. and Figure 1. ICRAF is expected to emphasize aspects of the continuum leading to the development of species/agroforestry technologies for a small number (5-10) of multipurpose woody species which will be jointly selected by ICRAF and the joint co-program managers. The project is expected to collaborate with other donors/institutions in the production of genetically improved seed of the species selected plus the further development and practical utilization of agroforestry cultural techniques.

IMPLEMENTATION PLAN

	1	2	3	4	5
1) MOBILIZATION (1-3) PRODUCTION/ORGANIZATION and information collection	<--->				
2) NETWORKING AND TRAINING IN LAND-USE ANALYSIS	<-->				
3) LAND-USE PROBLEM ANALYSIS (IN EACH COUNTRY (5-6-7))	<----->				
4) PRIORITIES ID WORKSHOP	<->				
5) RESEARCH DESIGN METHODOLOGY TRAINING (BY COUNTRY)	***				
6) RESEARCH MOBILIZATION-SPECIES SELECTION CRITERIA-SITE SELECTION SEED/PLANT MAT. (SEE APPENDIX 1.) COLLECTION (A CONTINUUM)	<----->	----->	----->	----->	----->
7) ESTABLISHMENT OF FIELD TRIALS		<->	<->	<->	<->
8) RESEARCH ANALYSIS		----->	----->	----->	----->
9) EVALUATION			<->		<->
10) CASE STUDY	<----->				
11) IMPROVED LAND-USE ANALYSIS	<----->				
12) LOCATION SPECIFIC PROJECT ID		<----->			
13) INFORMATION EXCAHNGE	<----->				
14) ANNUAL NETWORK MTG.		<-->	<-->	<-->	<-->

BUDGET SUMMARY

Salary and Wages	\$1,244,750
Fringe Benefits (30%)	373,425
Consultants	80,000
Travel and Transportation	80,000
Allowances and Per Diem	63,600
Expendable Equipment and Supplies	187,525
Publications	40,000
Participant Training	58,000
Workshops, Conferences and Studies	443,000
Contingency	375,000
Allowance for Inflation (5%)*	255,100
Overhead (27%)*	799,600

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Total	\$4,000,000 **
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\* Includes inflation and overhead costs for USIAD Missions and Africa Bureau.

\*\* \$1.3 million of this amount will be provided by selected missions as buy-ins.

BUDGET

Inputs/Activities (Network Startup & Implementation - \$000)

Activities	YEAR 1			YEAR 2			YEAR 3			YEAR 4			YEAR 5		
	S&T	Mission Buy-ins	Africa Bureau												
1) ICRAF Program Coordinators	50.0			40.0			30.0			20.0			10.0		
2) Mobilization/Organizational Country Visits	25.0														
3) AF Networking Workshop	36.0														
4) Country-specific Land-use Analysis			11.2												
5) Priorities Identification Workshop	40.55														
6) Training Course-Multi-purpose Tree Species Selection							46.0								
7) Network Strengthening-in-country operational costs & Technical Assistance	70.0	70.0			70.0			170.0			170.0			170.0	
8) Network Development Research & Coordination	70.0			90.0			80.0			80.0			80.0		
a) Research Coordinator	50.0			100.0			100.0			100.0			100.0		
b) Research Implementation/Technology and improved plant/seed material generation, equipment, and supplies	60.0	70.0	88.8	60.0	70.0	100.0		170.0	100.0		170.0			170.0	
9) Annual Network Meeting				16.0			16.0			16.0			16.0		
10) Information Exchange & Publications				10.0			10.0			10.0			10.0		
11) Evaluations							11.0						12.0		
SUBTOTAL	331.55	140.0	100.0	306.0	140.0	100.0	293.0	340.0	100.0	226.0	340.0		228.0	340.0	
12) Inflation (5%)	--	--	--	15.3	--	--	30.0	--	--	35.6	--	--	49.1	--	--
13) Contingency	75.0	--	--	75.0	--	--	75.0	--	--	75.0	--	--	75.0	--	--
SUBTOTAL	406.6	--	--	396.3	--	--	398.0	--	--	336.6	--	--	352.1	--	--
14) Overhead (27%)	109.8	--	--	107.0	--	--	107.5	--	--	90.9	--	--	95.1	--	--
* TOTAL	516.3	140.0	100.0	503.3	140.0	100.0	505.5	340.0	100.0	427.5	340.0	--	447.2	340.0	
GRAND TOTAL															\$4.0 Million

\* Total amounts for the USAID Missions and Africa Bureau do not show the inflation rate of 5% compounded annually nor the 27% overhead rate. Both inflation and overhead are included in the annual totals, but these will be paid through S&T F/FRED project to facilitate bookkeeping, (i.e., payments to ICRAF for overhead and inflation will come from one source).

Budget Notes

- 1) ICRAF Program Coordinators. (Collaborative and Training).
- 2) Mobilization/Organizational Country Visits - a 2 week mission to each of the four countries of the zone to include the zonal coordinator, one ICRAF staff member, and participation by host countries nationals.
- 3) Multipurpose tree species development, agroforestry networking, and land-use analysis training:  
(2 weeks in Kenya)  
travel: 4 persons x 4 countries x \$500 =\$ 8000.  
per diem: 4 persons x 4 countries x 10 x \$75 =\$12,000.  
ICRAF staff - 20 working days  
@ \$350/day =\$ 7000.  
Interpreters - 20 working days  
@ \$250/day =\$ 5000.  
Report preparation: Zonal  
Coordinator + 5 days ICRAF staff =\$ 2000.  
translation \$20 page x 100 pages =\$ 2000.  
\$36,000.
- 4) Country-specific land-use analysis:  
including: Zonal Coordinator and  
4 participants x 2 weeks in-country  
travel (per diem) @ \$50/day x 4  
countries =\$ 11200.  
1 week report preparation w/assistance  
of Zonal Coordinator in each country = N.C.
- 5) Priorities Identification Workshop:  
same as item 4 above =\$ 40550.
- 6) Training Course: Multipurpose tree species  
selection criteria propagation methods, and  
genetic improvement techniques =\$46,000.

- 7) Network Strengthening: including country-specific additional land-use systems analysis, site-specific case studies and location/country-specific problem identification led by the Zonal Coordinator w/input from ICRAF Program Coordinators, core staff, and other technical assistance brought in as needed by ICRAF. Estimated in-country operational costs are \$17500/country in the first year and \$10000/country/yr in the following 4 years = \$160000. Remaining S&T costs are for technical assistance, bringing total S&T contributions to \$400,000. Mission buy-ins for program development inside the 4 designated bimodal highland countries, as well as outside the targeted countries, is phased-in with \$70,000/yr. for the first two years and \$170,000/yr. for the last three years for a total of \$650,000 contributed by the Missions.
- 8) Network Development Research & Coordination:
  - a. Funding for the Research Manager provided by S&T at \$50,000 for the first year and \$100,000/yr for the remainder of the project.
  - b. Includes USAID Mission buy-ins for work to be done by ICRAF. Agreements to carry out these efforts should be based on mutual agreement between the Mission and ICRAF. This also includes costs for seed handling, seed storage and nursery equipment needed to grow seedlings for research. Large-scale, improved seed/plant material generation will involve the establishment of seed production areas and seed orchards, in collaboration with other donors, using in part end-of-year funds made available from AID/W. See separate sheets on: Research Cordination Costs.
- 9) Annual Networking Meetings: similar to Workshops but one week in duration = \$64,000 year.
- 10) Information Exchange - preparation of reports of major project meetings periodic research reporting, and newsletter preparation.
- 11) Evaluations, mid-term and final, involving two persons each.
- 13) Contingency, cooperator workshops, etc.

RESEARCH COORDINATION COSTS - (LOP - 5 years)

The following list is tentative and subject to modifications according to local needs and conditions.

<u>DESCRIPTION</u>	<u>\$ COST</u>
- <u>Research Manager</u> - (full-time) x 4 1/2 yrs @ \$100000./yr	\$ 450000.
- <u>Senior Counterparts</u> (4) - part-time-salary	HCC*
- <u>Senior Counterparts</u> (4) - <u>infield per diem:</u> 5 days x 3 trips x 4 people x \$50/day x 3 yrs	\$ 9000.
- <u>Cooperators Workshops</u> (twice/yr) travel: 12 persons x \$500 x 2 x 5 yrs per diem: 12 persons x 5 days x \$75/day x 2 x 5 yrs	\$ 60000. \$ 45000.
	Total \$ 564000
- <u>Collaboration w/other institutions</u> (National/ donor) to initiate in-country research for improved seed/plant material generation, and for seed production area and seed orchard establishment, and large scale production of seed/plant material.	\$494,800
	<u>Total \$1058,800</u>

\*Host Country Contribution

APPENDIX 1. - Multipurpose Tree (MPT) Species  
Woody Species Continuum

General

1. The steps outlined on the MPT Species Continuum are geared towards the production of improved seed/plant material needed for conducting species/agroforestry technology evaluation and to develop MPT selection criteria and provide selected trees that can be used for the establishment of seed/plant material orchards.
2. ICRAF will emphasize the aspects of this continuum leading to the development of species/agroforestry technologies, and will collaborate with other donors/institutions in the establishment and management of seed/plant material orchards geared towards the production of large quantities of improved seed/plant material.
3. Tree selection criteria for individual species will be based initially on specifications for MPT "idiotype(s)," derived from characteristics of agroforestry technologies designed to address prevailing land use problems.
4. A small number (5-10) of MPT species are to be selected, based on current knowledge available and local preferences, for conducting the research envisaged in this Cooperative Agreement.

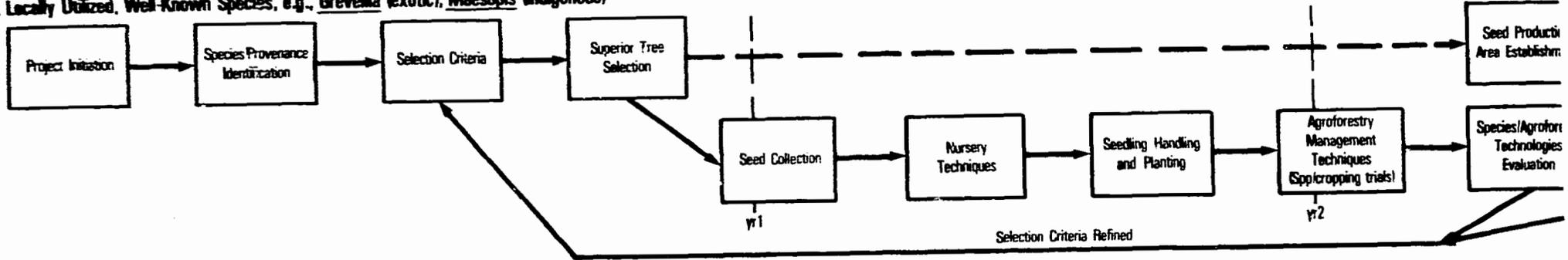
Categories of MPT species

1. MPT species are divided into 4 categories.
  - a. Locally utilized, well-known species (indigenous or exotic);
  - b. Locally utilized, little-known species (indigenous or exotic);
  - c. Undomesticated native species with excellent potential;  
and
  - d. Other untested exotic species with excellent potential.
2. Research phases for locally utilized, well-known species, are repeated in the other 3 species categories, but additional phases are added to each category continuum according to the amount of information that is available about a particular species. The research phases and approximate time frame needed to complete each category are as follows:
  - a. Locally utilized, well-known species (5 yrs);

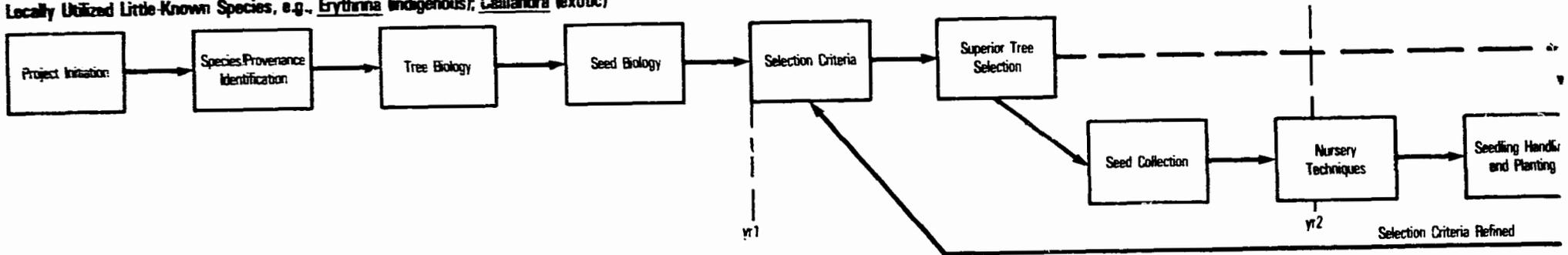
- 1) Species/provenance identification (emphasis on provenances);
  - 2) Tree selection;
    - a) Selection criteria refined as additional data become available,
    - b) Seed/plant material production areas established based on needs, and
    - c) Seed/plant material collection.
  - 3) Cultural techniques using a limited number of agroforestry technologies and a limited number of species tested under specially developed experimental designs; and
  - 4) MPT species/agroforestry technologies evaluation.
- b. Locally utilized, little-known species (6 yrs).
- 1) Species/provenance identification.
  - 2) Tree and seed biology.
  - 3) Repeat phases as for 2a (1-4), above.
- c. Undomesticated native species with excellent potential (10 yrs).
- 1) Species/provenance identification.
  - 2) Species/provenance trials.
  - 3) Tree and seed biology.
  - 4) Repeat phases as for 2a (1-4), above.
- d. Untested exotic species with excellent potential (13 yrs).
- 1) Species/provenance identification.
  - 2) Species/provenance screening trials.
  - 3) Large-scale (1-2 ha) species/provenance trials using winners from d. 2).
  - 4) Tree and seed biology.
  - 5) Repeat phases as for 2a (1-4), above.

Figure 1. Tree Species Continuum\*

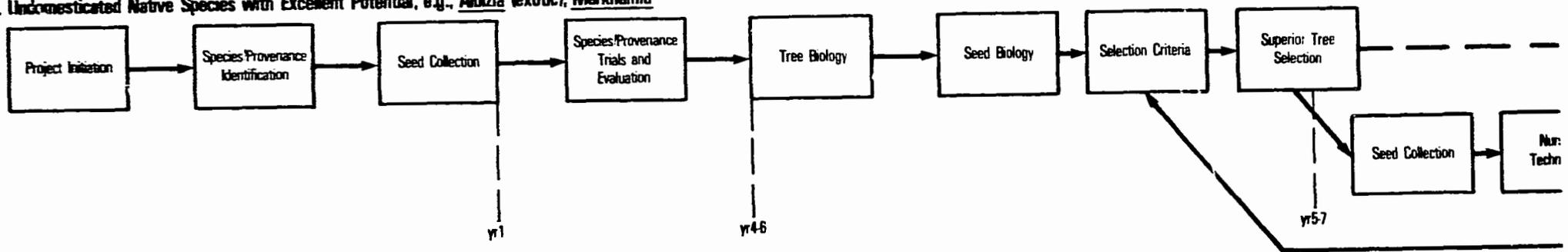
1. Locally Utilized, Well-Known Species, e.g., Grevillea (exotic); Maesopsis (indigenous)



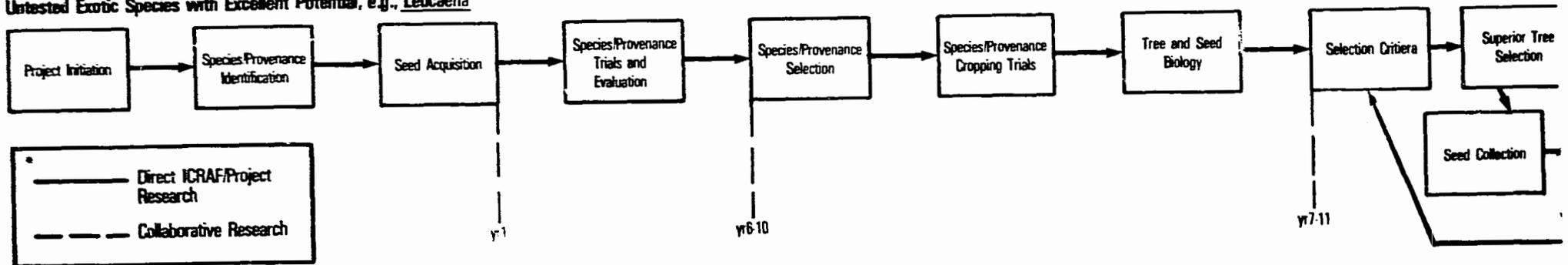
2. Locally Utilized Little-Known Species, e.g., Erythrina (indigenous); Calliandra (exotic)



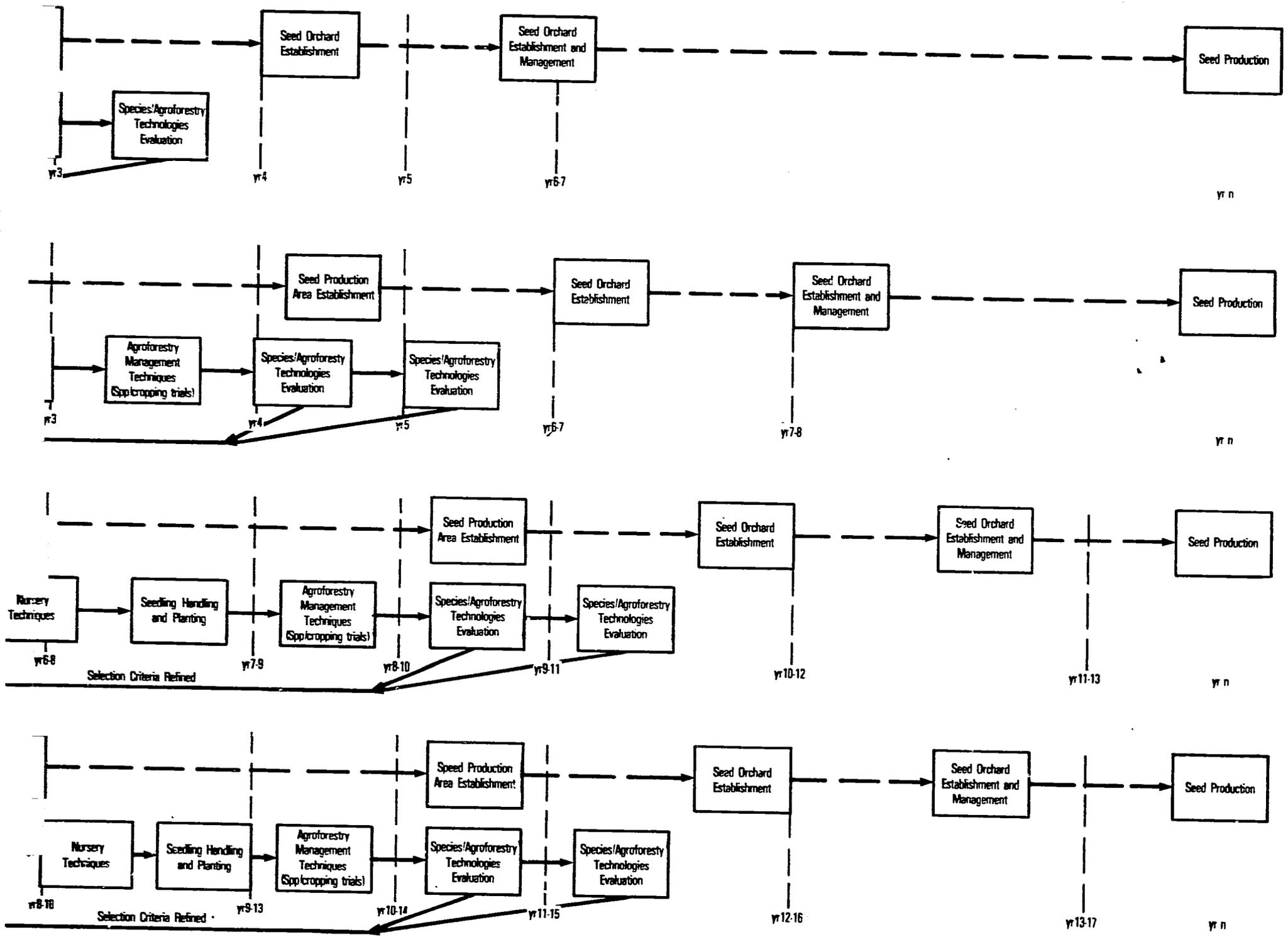
3. Undomesticated Native Species with Excellent Potential, e.g., Albizia (exotic); Markhamia



4. Untested Exotic Species with Excellent Potential, e.g., Leucaena



\* ——— Direct ICRAF/Project Research  
 - - - Collaborative Research



**FORESTRY/FUELWOOD RESEARCH AND DEVELOPMENT PROJECT**

**(936-5547)**

**April 5, 1985**

1985. 4. 5

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## EXECUTIVE SUMMARY

### SUMMARY AND RECOMMENDATIONS

#### A. RECOMMENDATIONS

This Project Paper proposes a \$40,000,000, ten-year AID project to improve forestry/fuelwood research and forestry research capabilities in Asia, Latin America, and Africa. It is recommended that \$32.8 million of S&T sections 103 and 106 funds be authorized for a ten year global program in forestry/fuelwood research and development. The first phase of this project will be a joint effort in Asia. It is recommended that \$19,680,000 of S&T Sections 103 and 106 funds be authorized for a ten-year program of work in Asia and that an amount of \$9,323,000, be authorized to finance the first five years of this effort. These resources will be combined with \$2,500,000 from Asia Bureau and \$1,410,000 from Asia missions over the first five years. The ten year commitment from S&T to Africa and LAC is a combined sum of \$13.12 million. It is estimated that the contribution to the program from the Bureaus and Missions of LAC and Africa will be a total of \$2.2 million over ten years. It is recommended that \$2,002,000 of S&T funds be obligated in FY 85. Subsequent phases involving Latin America and Africa will be prepared after project activities in both regions have been discussed and agreed upon by the respective Bureaus, Regional Offices and Missions.

The proposed funding from S&T Bureau and Region Bureaus and Missions is shown in table 1.

Table 1  
Proposed Funding for Forestry/Fuelwood Research  
and Development Program  
(\$ 000)

	<u>ASIA</u>		<u>LAC</u>	<u>AFR</u>	Life of Project <u>LOP</u>
	<u>Total 5 yr</u>	<u>Total 10 yr</u>			
Asia Bureau	2,500	5,000	-	-	5,000
S&T/FENR	7,643	18,000	6,000	6,000	30,000
S&T/RD	1,680	1,680	560	560	2,800
Other	1,410	2,200	-	-	2,200
Total	13,233	26,880	6,560	6,560	40,000

## B. SUMMARY DESCRIPTION

Virtually every Mission in Asia has, or is planning, activities in forestry and agroforestry research. For example, the Alternative Energy Resources Development Project of India has two million dollars allocated to support research and institutional development. Pakistan's Forestry Planning and Development Project has a major component which will finance farm-and energy-forestry research. These Mission level activities in Asia are viewed as complementary to the total forestry/fuelwood research and development effort being proposed by this Project. Without these Mission activities, F/FRED would have little chance of success. And, it is anticipated that existing and planned research through Mission projects will be enhanced by contributions from the Central and Asian components of the Project.

### 1. General

This is a new project that has grown out of the collaborative effort of S&T/FENR and S&T/RD and the Regional Bureaus in response to the Agency Administrator's designation of fuelwood as a major research priority. In each participating region, the S&T project will help organize and implement a research network among several countries experiencing common development problems in the forestry/fuelwood area. The project will concentrate on the Asia region initially but participation by the Bureau and Missions for LAC and the Bureau and missions for Africa is anticipated in later phases.

In Phase I, the project will utilize the Central and Asian components to systematically advance research and research capabilities in the area of fuelwood/multi-purpose tree species in developing countries.

To achieve this objective, project activities will enhance Asian research and research capabilities in multi-purpose tree species. Network support activities will include develop improved research methods and information management; and monitoring agreed upon collaborative research programs; holding workshops and conferences; training; technical services for problem solving and publications. An important objective of this project is to provide increased opportunities for sustained employment of the rural poor and to increase incomes derived from tree and forest products.

The project, entitled Forestry/Fuelwood Research and Development Project (F/FRED), was developed in response to documented fuelwood needs in developing countries and to the identification of LDC fuelwood research needs in each of the three regions. Project content and design are based on (a) field assessments of current

research on fuelwood in developing countries; (b) reviews of the Fuelwood Research Implementation Plan developed by S&T in collaboration with the Regional Bureaus; (c) the Project Implementation Document (PID); (d) a workshop in Washington, D.C.. on Human Factors Affecting Forestry and Fuelwood Production; (e) consultant assistance in the Project Paper background preparation (f) a planning conference in Bangkok in April 1984 with Mission representatives, Asian scientists, and technical experts; and (g) the results of a research planning conference sponsored by the International Union of Forest Research Organizations (IUFRO).

## 2. Project Goal and Purpose

The project goal is to meet basic needs of developing countries for fuelwood and other tree products; for improved land, water and human resource management; and for increased employment and income. The purpose is to enhance forestry/fuelwood research and research capabilities through: a) improved formulation, planning and management of forestry/fuelwood and agroforestry research; b) support and development of networks of scientists and institutions in LDC countries focused on the assessment, improvement, and management of fuelwood/multi-purpose tree species; and c) enabling LDCs to address their critical forestry/fuelwood needs through better use of forestry and agriculture related-research information.

## 3. Project Activities

Project activities can be grouped into three interrelated components as follows:

- Research Planning and Management: assist Missions and Regional Bureaus in promoting development of country specific national fuelwood/forestry plans and programs; provide training and other assistance to strengthen key LDC institutions to carry out national forestry/fuelwood research and development plans.
- Network Development and Research: develop improved research methods and information management; developing and monitoring agreed upon collaborative research programs; conducting workshops and conferences; special research support through grants and loans; purchase of commodities essential to the conduct of research and support for publication of results; supplying expertise, mostly short-term, to host countries to assist them in project design and management; fuelwood research assessments; appraisals and evaluations; and behavioral, institutional and human resource evaluation.

(iv)

-- Global Research: Develop state-of-the-art papers and other technology assessments; assist in integrating, structuring and evaluating currently available information; evaluate fuelwood/multi-purpose tree species as components of agroforestry or other farming systems approaches to define new research needs. Global research areas will be:

- a) Multi-purpose/fuelwood tree selection and improvement
- b) Biotechnology
- c) Environmental models
- d) Socio-economic methods and tools
- e) Socio-economic research

The sequence of these components is based on the logic that:

- 1) Component I (Research Planning, and Management) addresses elements at the institutional and country level;
- 2) Component II (Species Network Development and Research Support), is the major focus of the project and addresses networking and research support at the regional level; and
- 3) Component III (Global Research Support) links Asia, Latin America, and Africa in relevant activities at the global level.

#### 4. Project Output

At the end of ten years, the project will have achieved the following results:

1. Increased LDC government commitment to research on multi-purpose/fuelwood tree species;
2. Expanded the number of multi-purpose/fuelwood tree species available for use in social or rural forestry programs;
3. Developed improved seed supplies of selected multi-purpose/fuelwood tree species
4. Strengthened the capacity of Asian countries to address the social and economic issues in rural tree crop production and management;
5. Developed improved techniques for managing fast-growing multi-purpose trees;
6. Formed an international community of interest in multi-purpose tree species research and established several viable research networks with wide-spread donor support.

## 5. Feasibility

According to the Food and Agriculture Organization (FAO) estimates, the rate of deforestation in the tropics is about 11.3 million hectares annually of which 6.1 million hectares is in closed productive forests. With increasing populations in most LDCs, the rate of deforestation is expected to increase even more. More than 85 percent of wood harvested in Asia is utilized for fuelwood. In Africa, 92 percent is used for fuel. According to FAO estimates, 1.4 billion people live in areas with fuelwood shortages. This is projected to increase to 3 billion people by the year 2000. In Central America alone, 14 million people live in areas where fuelwood supply is considered "critical."

Although difficult to quantify, new technologies developed through research are an effective means for increasing productivity. Studies of forest productivity gains in the U.S. are encouraging. For example, effective management techniques can increase productivity by 3-5 percent while a program of species/tree selection and improvement, site preparation and management can increase productivity by 20-30 percent in a single generation. Analyses indicate that similar gains can be achieved through activities conducted under this project. Analyses also indicate that the project is technically, administratively and socially feasible and has excellent potential for providing growth in the LDCs.

This project should generate significant country involvement, private sector participation and increased employment opportunities. It will provide gains in forestry/fuelwood productivity and potential gains in increased thermal efficiency through selection for species that produce greater caloric output when burned. Environmentally, the project will have a favorable impact through increased production of trees that contribute to soil stability, watershed conservation, energy supply and other goods and services, and reduced loss of natural tropical forest and biological diversity.

## 6. Evaluations

In addition to annual management reviews by the S&T Project Manager and Senior Technical Advisor and Regional Bureau managers, substantive evaluation with Mission participation will occur in years 3, 5, 8, and 10.

## 7. Organizational Arrangement

The umbrella Project Manager for AID will be a senior forest research manager in S&T/FENR (see Fig. 1). The Project Manager will be assisted by a Senior Technical Advisor designated by S&T/RD.

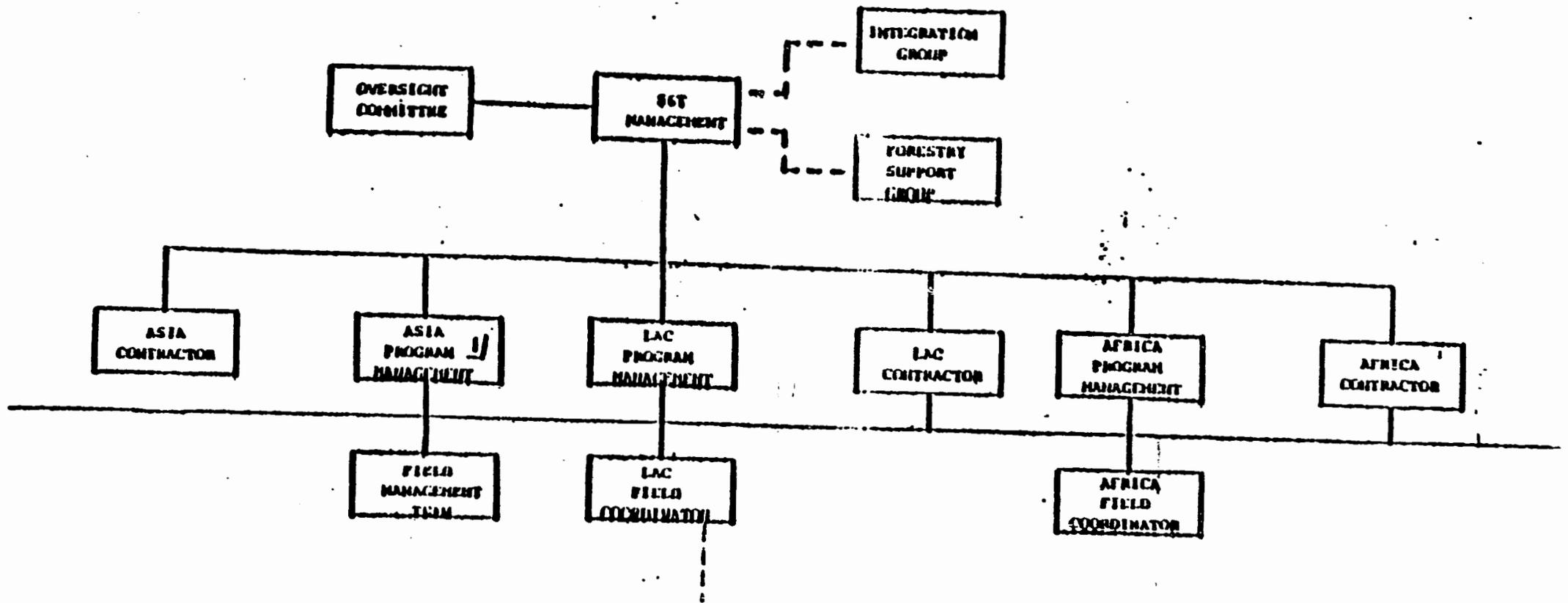


FIGURE 1

Proposed Organisation for the Forestry/Tourism RED Project

1/ See Figure 2 for details

An AID Oversight Committee, composed of a representative from each regional bureau will be created. The Project Manager and Senior Technical Advisor will also be Oversight Committee members, the former as Chairperson. Arrangements for joint management of project activities in each region will be established as described for Asia (see Figure 2). As the project moves to other regions, amendments to this Project Paper will be made. They will be taken to a Joint Sector Council meeting for review.

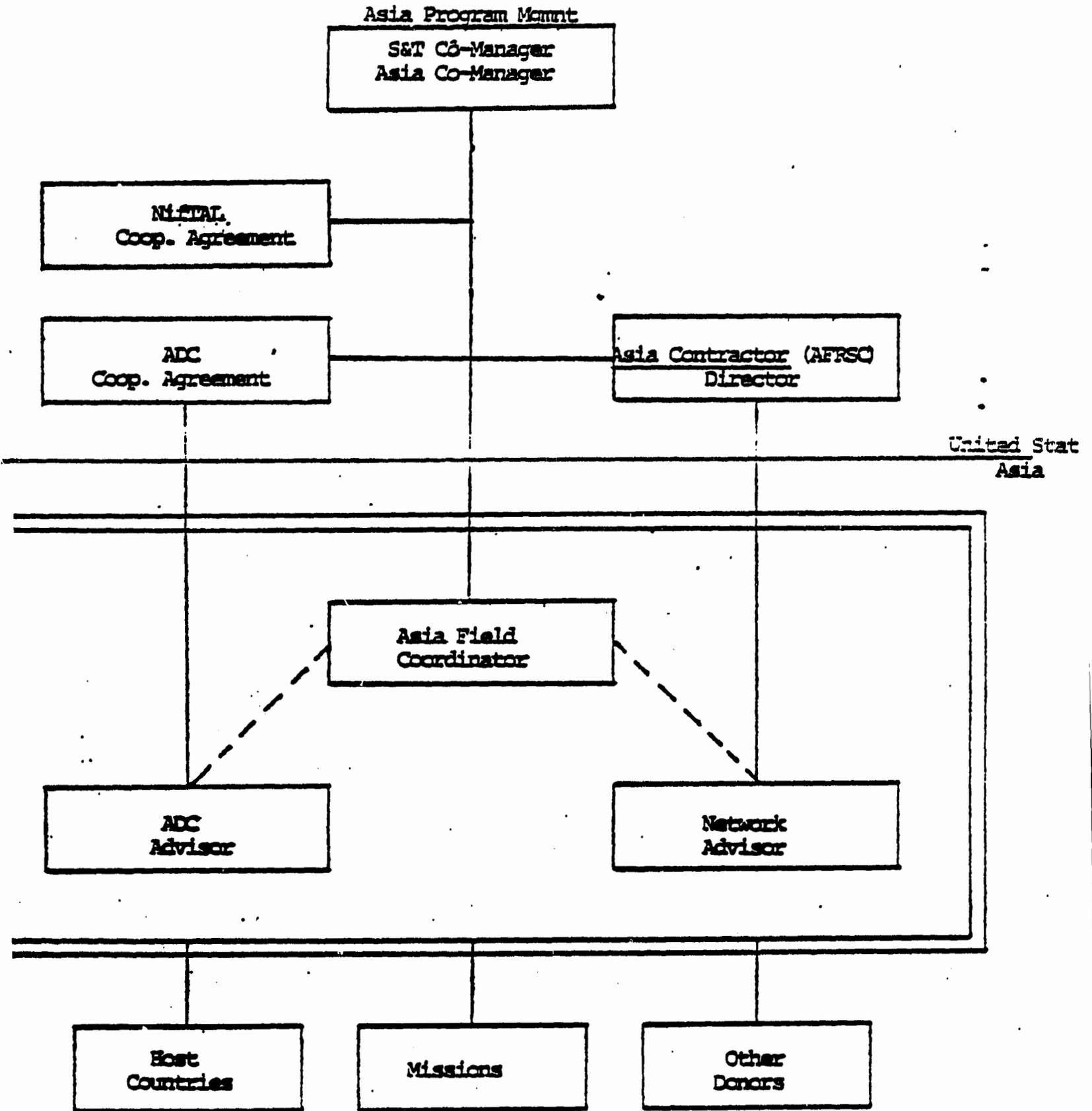
Contracts will be concluded for technical support to each regional program. The scope of work and budget of the initial contract will be subject to the approval of S&T/FENR, S&T/RD and the Asia Bureau. Representatives of each of these offices will participate on the Request For Proposal review committee. Subsequent contracts for LAC and Africa will be subject to the review and approval of S&T, the respective bureaus, and regional offices.

The contractor (s) will designate a U.S. based regional director, i.e., an Asia Director, who will be responsible for planning and executing project logistics and for project administration generally. This individual will be subject to approval by the Asia Program Management Team.

To facilitate network development and planning in close collaboration with Missions, a Project Field Coordinator will be stationed in each region. This individual will be under the administrative management of the Regional Office or, as in Asia, under the administrative management of a Mission Director. The Asia Field Coordinator will serve as a link between the Asia Project Management Team, the U.S. based support contractor and participating Missions and host country institutions.

Provision is made for Regional Bureaus and Missions to buy into the project to obtain additional services.

Figure 2  
Proposed Organizational Arrangements



## I. PROJECT RATIONALE AND DESCRIPTION

The Forestry/Fuelwood Research and Development Project will be a joint effort by the Bureau for Science and Technology and the Regional Bureaus, over a 10-year period, to assist the Less Developed Countries (LDCs) meet their needs for fuelwood and other tree and forest products; for informed management of natural and human resources; and for increased employment and income.

### A. Rationale

Growing population pressures and the resulting increase in activities caused by shifting agriculture farmers, fuelwood collectors, stockmen clearing for pastures and commercial loggers are leading to increased rates of tree cutting and to loss of forests and biological diversity. Current reforestation, afforestation, and natural regeneration programs cannot replace the losses.

The worldwide decrease in forest land area requires a strong program to provide people in the less developed countries (LDCs) with information, technical services, and institutional support to meet their critical needs through sustainable forestry and tree cropping activities, wise conservation of the remaining forests, and reforestation to develop economic forests. Much of the technology in use for these purposes and the human factors involved are not sufficiently understood and research is necessary to develop appropriate technologies.

According to Food and Agriculture Organization (FAO) estimates, the annual rate of deforestation in the tropics is about 12.3 million hectares of which 6.1 million hectares is in closed productive forests. With increasing populations in most LDCs, the rate of deforestation is expected to increase. More than 85 percent of wood harvested in Asia is utilized for fuelwood. In Africa, 92 percent is used for fuel. According to FAO estimates, 1.4 billion people live in areas with critical fuelwood shortages. This is projected to increase to 3 billion people by the year 2000. In Central America alone, 14 million people live in areas where fuelwood supply is considered "critical."

Government policies regarding the management of forests and land utilization are inadequate in many LDCs because of insufficient information, lack of planning, and general misconceptions and misinformation that exist regarding forests and trees. Forest management in many LDCs focuses on control and police functions rather than on development and support. In addition, planting of trees on farms producing agricultural food crops (on-farm forestry) needs better understanding. Uncontrolled and non-sustainable tree cutting is an indicator of more fundamental social and economic conditions, including population pressure, access to land resources, and tree ownership laws.

Therefore, a critical need exists to increase understanding of the complex biophysical and human factors affecting the management of forests and other natural resources and to apply current and newly developed technologies for the production of fuelwood and other goods and services in the developing countries. To address this need, the Agency for International Development (AID) initiated a Research Priorities Implementation Plan (RPIP) activity that focused on causative factors of fuelwood shortages in the LDCs. A panel of experts identified the following high priority fuelwood production research topics: Multi-purpose/Fuelwood Species Assessment and Trials, Soil-Site Relationships of Fuelwood Species, Fuelwood Species Biotechnology, and Biomass Systems Analysis. Field observations by the Bureau for Science and Technology (S&T) and Regional Bureau teams in selected countries in Asia, Latin America/Caribbean (LAC), and Africa, (AFR) further refined these research topics, and On-Farm Forest Management was added as a high priority research topic. Species assessments and soil/site relationships were considered to have the highest priority by the Missions.

The capacity for LDCs to conduct forestry research must be developed. Vernon Ruttan, a noted economist, states that by the mid-1970s, it was increasingly clear that the productivity of the international agricultural research system was severely constrained by the limited capacity of many national systems and that the adaptation and dissemination of the knowledge and technology generated at the international institutes was dependent on the development of effective national systems. Although there is no developed international forestry research center comparable to the Consultative Group for International Agricultural Research (CGIAR) centers for agriculture, there is an established body of knowledge and experience in tree breeding and research that could be applied in the LDCs.

Although difficult to quantify, new technologies developed through research are an effective means for increasing productivity. Studies of forest productivity gains in the U.S. are encouraging. For example, effective management techniques can increase forest productivity by 3-5 percent while a program of species/tree selection and improvement, site preparation, and management can increase productivity by 20-30 percent in a single generation of trees. Analysis indicates that similar gains can be achieved through activities conducted under this project. Analysis also indicates that the project is technically, administratively, and socially feasible and has excellent potential for providing growth in the LDCs.

Although the international research centers have been helpful in improving the quality of national research efforts, the priority of forestry research has generally been low in the national resource allocation decision process. The political and financial support necessary to attain increased investment for forestry can be augmented by stronger and well networked forestry institutions.

Networking projects will be successful only if the institutions and resources are available in-country to support the research to be networked. A CGIAR review identified the following as key ingredients for an effective network:

- (1) the scope of research is well defined;
- (2) the problem is shared by all the participating countries;
- (3) activities are restricted to a geographic region, thereby facilitating communications;
- (4) participating institutions are involved as equal partners;
- (5) each participant gains from the association and therefore enthusiastically supports it;
- (6) participating institutions have funds to collaborate fully;
- (7) the lead institutions have sufficient capability to provide strong and enlightened scientific direction.

The success of agricultural research clearly demonstrates the advantages for strong social science research intergrated with the biological and technical disciplines. Social science expertise is particularly essential to the identification of research priorities and of clients for the research and to the effective dissemination and utilization of technology developed by research.

A number of LDC forestry institutions needs to concentrate scarce resources on urgent and well-defined forestry problems. This project will provide opportunities to strengthen research quality and to increase the utility of research results by supporting regional research strategies on common themes and by supporting those local, national, and regional research and development institutions with the greatest potential to carry out the strategies.

The capacity for local, national, and regional institutions to conduct quality forestry/fuelwood and associated socio-economic research varies considerably. For each country participating in this project, it will be necessary to: (1) identify the institutions involved in forestry research; (2) determine their forest and tree resource problems from a biophysical and socio-economic viewpoint; (3) identify research strategies that address these urgent problems; and (4) determine, establish, and strengthen linkages between research institutions and policy-makers to guide forestry development within the context of the forest resource base and the broader socio-economic development policies.

#### Relation to AID Policy and Strategy

Agency policy emphasis on forestry is clearly presented in the recently approved AID Energy Policy Paper, in the Policy Determination (PD-6) of April 26, 1983, on Environmental and Natural Resource Aspects of Development Assistance, and in the Policy Determination (PD-7) of May 16, 1983, on Forestry Policy and Programs. The Energy Policy Paper directs AID to "...undertake a major fuelwood research initiative with support from both central

and regional bureaus." PD-6 directs AID to pursue programs in "...watershed protection, soil stabilization, social forestry, establishment or enhancement of natural areas or reserves, coastal zone management, and identification of plant and animal species in remote areas designated for development." PD-7 stressed the broad objective of improved forest and woodland management within "...a comprehensive plan for natural resource management, environmental protection and conservation." The principal policy elements include the improvement in country policies that will help arrest deforestation, development of human and organizational capabilities, expansion of the role of private enterprise, and close coordination with other donor programs and with AID programs in agriculture, energy, environment, and the private sector. "The critical role of applied and adaptive research in the development and transfer of technologies for meeting fuelwood needs will be stressed." Fuelwood research has been designated by the AID Administrator as one of the four research priorities of the Agency.

Energy and Natural Resources Sectors are important components of the Asia Regional Strategy Plan. The unifying theme is policy and management of forest and bioresource systems. Policy dialogue, the development of centers of excellence in training and research, and the promotion of private sector investment are high in priority. The establishment of a fuelwood research network in cooperation with the S&T Bureau is a major goal of the Strategy Plan for Asia.

## B. General

### 1. Project Description.

This project paper proposes a \$40,000,000, ten-year AID project to improve forestry/fuelwood research and research capabilities in Asia, Latin America, and Africa. The first phase will be directed to Asia. Subsequent phases involving Africa and Latin America will be initiated after project activities in both regions have been discussed and agreed upon by the respective Bureaus, Regional Offices and Missions. The S&T project, entitled Forestry/Fuelwood Research and Development Project (F/FRED), was developed in response to documented fuelwood needs in developing countries and to the identification of LDC fuelwood research needs in each of the three regions. Project content and design are based on: (A) field assessments of current research on fuelwood in developing countries; (B) reviews of the Fuelwood Research Implementation Plan developed by the S&T Bureau in collaboration with the Regional Bureaus; (C) the Project Implementation Document (PID); (D) A workshop in Washington, D.C. on Human Factors Affecting Forestry and Fuelwood Production; (E) Consultant assistance in preparing background for the PP (F) A planning conference in Bangkok in April, 1984, with Mission representatives, Asian scientists, and technical experts; and (G) the results of a research planning conference sponsored by the International Union of Forest Research Organizations (IUFRO).

This project has grown out of the collaborative effort of S&T/FENR, S&T/RD, and the Regional Bureaus in response to the Agency Administrator's designation of fuelwood as a major research priority.

The Central and Asian components of the project will:

- (1) improve the planning and management of Mission programs and projects in this sector;
- (2) assist Asia Missions to identify and address key technical and social research issues;
- (3) complement the major emphasis on rainfed agriculture and water management in the Asia strategy;
- (4) provide a means for promoting exchange of information among Asian countries and AID/Asia Missions; and
- (5) focus Agency and Bureau resources on a problem of urgent short and long-term importance to the Asia region and the Asia Bureau.

Virtually every Mission in Asia has, or is planning, activities in forestry and agroforestry research.

The three components of this project: (A) Research Planning and Management; (B) Network Development and Research; and (C) Global Research, are interrelated and mutually supportive. Each component is briefly outlined as follows:

A. Research policy, planning and management activities will assist Missions and Regional Bureaus in development of country-specific national fuelwood/forestry plans and programs. Additionally, these activities will provide training and other assistance to strengthen key LDC institutions for better implementation of national forestry/fuelwood research and development plans.

(1) Country-specific forestry research sector assessments and plans will assist at least five LDC governments in each region to formulate and design: (a) national forestry/fuelwood research programs that address biological, sociological, and economic research topics and (b) institutional and management mechanisms through which countries can formulate policies, programs, and projects that enhance research program implementation. Specific assistance will include: technical assistance in defining research policy needs and issues; training curricula in research techniques and data interpretation; workshops for host and donor institutions to disseminate research results; and joint donor program reviews and preliminary project identification.

AID's involvement with World Bank and The Overseas Development Administration (ODA) in the joint review of Forestry Research, Education, and Training in India is an excellent example of the productive role donors can play in technical assistance programs. Several other assessments and planning assistance activities will be carried out over the next five years. Discussions on potential assessment activities are currently underway with Indonesia.

(2) Institutional-specific guidelines and plans for research management and development will vary from one institution to another. Some countries have quite sophisticated forestry research organizations that function effectively while others have no research organization at all or one that is ineffective or moribund. This unfortunate situation propels many countries toward short-term remedies rather than investment in long-term forestry research to find practical solutions to their problems. As a consequence, current forest policy in many countries favors short-term solutions that may provide some immediate economic relief but are frequently inconsistent with long-term wise management.

High quality research, whether applied or basic, needs to be institutionalized and consistently supported over time. Organizations supporting research must develop procedures that include user groups to determine priority levels for research so that limited resources are always directed at the most important problems. The priority structure must be flexible to permit revision of priorities over time and adjustment of resources.

Another contributing factor to the lack of strong forestry research and development organizations is the apparent division of responsibility between National forestry organizations which decide policy and programming and Provincial or local government organizations that operate independently and do not necessarily follow central programming directions. Other important factors include: the lack of technology transfer mechanisms for research results; the poor image that characterizes research and reduced rewards and incentives for research scientists; and multiple agency involvement in forestry and forestry-related issues.

A major problem confronting many LDC forest institutions is the organization of effective mechanisms to meet the demands of the various publics for forest and tree goods and services. A vital component of this problem is the development of a research organization that can function effectively to achieve better forest management that maximizes forest values.

Assistance in Asia will involve working with National forestry research institutes to develop new emphases in their program directed toward multi-purpose tree species. In other cases, assistance may address the issue of integrating forestry with agricultural research. Such assistance could complement resources that Asia Missions have already programmed for institutional development and could help Missions develop the concept for forestry or agroforestry research activity.

(3) Regional research planning, evaluation, and related training will emphasize establishment of regional research priorities; mechanisms for collaborative regional research, including networks; the development of regional information management systems; and improved understanding of essential elements of effective research planning and management. In Asia, this effort will follow recommendations made at the Sri Lanka IUFRO Conference. This meeting was the first attempt by Asian scientists to jointly develop priorities. The meeting resulted in an Action Plan for research on multi-purpose tree species. The Plan has been circulated to governments and donors for consideration. This project will continue support for other regional planning efforts for forestry research in cooperation with the International Development Research Center (IDRC), the World Bank, Asian Development Bank, and other institutions. This project will assist in the identification of successful approaches to evaluate the impact of introducing new tree species.

Another important component is the training of a cadre of Asian expertise in the planning and management of forestry and natural resources research. The objective is to develop a core group within a country that has a shared and informed perspective on the economic, social, technical, and environmental issues involved in the planning and implementation of forestry and related natural resource projects. A regional course will be developed and carried out over a five-year period. Case materials from other Project activities from the World Bank's Economic Development Institute, FAO, and other sources will be utilized. Participants will come from private, public, and voluntary organizations in the forestry, energy, environmental, financial, and agricultural sectors. Models of the forestry and bioresource system, such as that being developed by the International Institute for Environment and Development (IIED) for use on microcomputers, will be developed or adapted for instructional purposes and for analysis of policy and program decisions in specific Asian countries.

(4) Information management systems include a recent survey of forestry research and related data base activities by major European donors (See Annex C, Rose, 1984). The survey indicates that forestry data bases are usually isolated, uncoordinated and not based on an organization-wide policy for such activities. The 1984 IUFRO Workshop in Sri Lanka also pointed up the need for more systematic collection, storage, and dissemination of research on multi-purpose trees. There is no effective system or repository of forestry research in Asia. Madamba, Suree, and others have made limited attempts to catalogue Asian research on multi-purpose trees. These have been individual efforts with little institutional support. An outstanding exception is the Commonwealth Scientific and Industrial Research Organization (CSIRO) activity in Australia to develop a comprehensive data base on Eucalyptus.

This Project can serve a unique function by supporting the development of an integrated approach to the management of regional and global forestry/fuelwood research information. Data base activities supported by this Project, such as the multi-purpose tree species data base being developed by the International Council for Research in Agroforestry (ICRAF), will provide information management systems that support research coordination, networking, training, and technical backstopping activities at all levels. This data base will: facilitate the flow of information between countries and regions, improve selection of high priority research problems, reduce unwanted redundancy in field research, establish standards for conducting research, and increase output from field projects. In addition, the system will provide for information flow from projects to lead network institutions or regional centers to provide a rational basis for planning, decision-making, and policy formulation.

Initially, the Project will help to assemble and organize data relevant to project implementation and network establishment. Similar data bases are currently under development in Central America (CATIE), Australia (CSIRO), and in Africa (ICRAF) and will be consulted to ensure as much coordination and uniformity as possible. This activity will be centered at Kasetsart University in Thailand. Kasetsart supports the Association of South East Asian Nations' (ASEAN) Tree Seed Center with Canadian assistance and has a large reference library in their School of Forestry. Formal links with the Commonwealth Forest Institute (CFI) in the United Kingdom (U.K.) and CSIRO in Australia will be developed in the design of the system. Distinct frameworks for data organization will be designed to accommodate different levels of decision making. Data base design workshops will be organized at different levels (project, national, regional, etc.) to coordinate data base design.

Data bases will be condensed information systems--not massive, uninterpreted reference collections. Data summaries and information will flow from individual projects in multiple countries to regional centers where integration and information management activities are located. Information will be further condensed and compiled into regional and global data bases available to all users upon request. Transfer of technology will be facilitated by the availability of condensed, well organized, and readily accessible summaries of key information about specific problems.

Computerized reference libraries and documentation centers will be developed. The development of a project specific reference library with a physical collection of all documents will facilitate access to documents by project scientists. Room will be provided to house these collections. The collections will include the unpublished project (AID as well as others such as UNFAO) documents which typically are not part of established reference libraries. Physically, the collection will reside where the contractor(s) is (are) located.

A mechanism will be developed for getting all relevant documents from the field level to the regional offices. Abstracting and highlighting of results will be undertaken by the scientist utilizing standard formats developed by the project. The regional offices and the Washington office will be responsible for maintaining and updating the regional and global reference library respectively. The latter should be available to the regional offices.

Reference libraries are most useful if they can be linked within a data base design with information summaries that show relevant, highly condensed contents of these references in tabular or other form. This is more useful than simple retrieval possibilities by key words, author, etc.

The design of these computerized reference libraries will follow some of the well established guidelines on technical reporting, e.g., NTIS. Use of standardized codes such as the Universal Decimal Classification (UDC) will be strongly encouraged. Beyond these considerations, the format and selection of specific fields, e.g., author, title etc. can be kept quite flexible. The availability of microcomputer software for total text searching facilitates searches for any user specified key word even if key word indexes were not developed.

The computerized reference libraries will be built up around the materials relevant to the problems in the F/FRED project. These libraries will grow, therefore, dynamically as reports are generated in field projects and as requests for specific information are received. Early in the project the search of existing libraries with fine collections on tropical forestry such as the Institute of Tropical Forests in Puerto Rico, the Forest Products Laboratory in Madison, Wisconsin and at several universities such as Yale, Florida and others will be made. Mechanisms will be set up to meet requests for documents promptly through mailing if possible of abstracts, text surrogates and microfiche. At the least, it will be possible to indicate where key documents are maintained and how they can be obtained.

The Project Manager's office will have access to major computer reference libraries such as AGRICOLA, AIDS, CRIS, SSIE, BIOSIS and CAB.

B. Network development and research activities will: (1) improve research methods and information management; (2) develop and monitor collaborative research programs; (3) organize and conduct workshops and conferences; (4) purchase commodities essential to research management and furnish support for publication of research results; (5) supply needed expertise, mostly short-term, to host countries to assist in project design and management; (6) assess, appraise, and evaluate research and evaluate behavioral, institutional, and human resources. The Project will also provide support for the establishment and/or maintenance of local, national,

regional, and global networks of forestry and associated socio-economic research activities. Research networks comprised of national forestry, energy, and associated socio-economic research institutions in each Region are the primary means for identifying common methods, for structuring synergistic research activities, for quickly communicating and exchanging information, for making rapid research adjustments, and for accelerating progress in common research areas. Linkages between LDC scientists and institutions and U.S. scientists and institutions (twinning) or with institutions in other developed countries will be encouraged to stimulate progress toward Project objectives. The Project will identify and strengthen linkages between: (1) forestry research and socio-economic research institutions; (2) forestry research and agricultural research and extension agencies; (3) forestry research institutions and National policy makers; and (4) AID and other donors. This work will be carried out in collaboration with projects developed in the Regional Bureaus for Asia, Africa, and LAC. Whenever possible, this effort will also be linked with related ongoing and proposed Mission projects (e.g., the Energy Resources Conservation and Development Project in Dominican Republic; the Forestry Research, Training and Extension Project being designed in India).

In Asia, this Project will support the development and strengthening of Asian research networks on: (1) Multi-purpose Tree Species, and (2) Land and Forest Resource Management. In both areas, the Project will build on existing network activities.

(1) Networks on Selected Multi-purpose Tree Species

The research base is not adequate for effective rural and social forestry programs in the LDCs. The attention in this Project emphasizes short-rotation trees that can meet fuel, fodder, raw material, and other needs. Very few species have been explored sufficiently for efficient utilization in research programs, much less rural tree planting programs. Substantial gains in productivity can be achieved by the selection of the best-adapted provenances for prevailing environmental conditions. Further gains are possible through genetic improvement. As developed at the April 1984 Asia Forestry/Fuelwood Conference in Bangkok, AID will support a regional research networking program on the assessment, improvement, and management of multi-purpose tree species. The goals of this research are as follows:

- a. Species Assessment: Species will be screened and matched with site characteristics, cultural practices and client analysis to achieve the highest level of product goals within the constraints of the species-site interaction.
- b. Species Improvement: Species' capability will be refined to meet maximum levels of productivity and reduce the constraints imposed by cultural/environmental factors.

- c. Species Management: Appropriate cultural practices will be defined to achieve optimum levels of production in the variety of models suggested by the land-use classification.

The 1984 IUFRO workshop in Kandy on Multi-purpose Trees endorsed a networking approach based on intensive research on selected individual species. Asian forest scientists at the meeting compiled and analyzed a list of over 120 multi-purpose trees growing in the region. These species were then grouped by genera into 10 proposed networks, covering three major ecological zones. Selected genera were Acacia, Prosopis, Eucalyptus, Azadirachta, Bamboo, Dalbergia, Populus, Albizzia, Tamarix, Casuarina, Sesbania, Leucaena, Gliricidia, Alnus, Celtis, Prunus, Grewia, Robinia, Salix, and Pinus. Under the terms of the Cooperative Agreement with NIFTAL - University of Hawaii: NFTA, two to three species networks will be recommended to the Asia Forestry Research Services Contractor for development.

The workshop identified research institutions that would participate in the research networks and made a start on identifying scientists to participate. Socio-economic research also will be integrated into the Species and Land and Forest Management network activities.

## (2) Network on Land and Forest Resource Management

Asian research on the management of land and forest resources for the benefit of people is not well developed. Informal groups, such as the Agro-Ecosystems Working Group, have been established, but understanding of the social/economic as well as environmental implications of growing pressures on the forest and natural resource land base of Asian countries is limited.

This Project includes a component to jointly develop a well-reasoned research program in the social, economic, and environmental aspects of land and forest resource management in Asia. This joint effort (Asia Bureau, S&T/FENR, S&T/RD) will require significant attention to building an increased human resource capacity to carry out the needed research and then translate it into effective policies and programs.

A cooperative agreement will be concluded with the Agricultural Development Council, Inc., (ADC)/Winrock International to develop this network and program. Building on its existing network of economists and natural resource planners in Asia (Bangkok, Nepal, Indonesia, Bangladesh, and the Philippines), the ADC will establish a regional program focusing on systems for managing land, trees, and other local common-property resources. The program will consist of the following main activities:

- a. research awards to Asian scientists and managers for field research and policy analysis;

- b. short-term training in Asian institutions for prospective scientists and managers;
- c. limited graduate training in U.S. programs;
- d. workshops, seminars, and publications to support information exchange, research planning, and methodology development; and
- e. technical assistance to network scientists and institutions in research design, implementation, and evaluation.

ADC will provide a professional and experienced social scientist to be the network advisor in Thailand.

### (3) Network Meetings and Site Visits

Networking will provide a mechanism for implementing R&D results, research methods, and management techniques. The process will include a series of network and theme meetings, such as planning conferences designed for discussion of work plans, budgetary needs, methodological issues to standardize research, and comparability of results. Site visits will provide an opportunity for collaborators from other countries to see facilities and experiments at the host institution and, more importantly, will provide for peer group review. Formal and informal meetings will be scheduled as needs are identified by members of the network. The intent is to develop and share a knowledge base, to build upon that knowledge base during the life of the Project, and to institutionalize the process for continuing use in the future.

### (4) Newsletters and Publications

Newsletters will be developed to convey network information on past and current events as well as to provide advance information on future network activities. Publications will describe results of completed research and research methodologies. All such documents will meet AID requirements for publications.

### (5) Training

The training components of the Project will be focused on the design and conduct of research, the interpretation of results, and the administration of research. Specific examples of R&D training to be supported by this project include: (a) species selection and improvement, (b) vegetative propagation techniques, (c) use of human resource systems model(s) in research problem identification, (d) understanding the complexity and interactions of biophysical and socio-economic variables, (e) cost/benefit analyses of forestry/fuelwood projects, (f) soil/site analysis, (g) data base management systems applications, and (h) managing technical and scientific activities. Specific training activities will be determined by members of the network(s) and will address specific

objectives within the scope of the Project. Training will be directed at different audiences i.e., administrators, policy makers, scientists, and practitioners.

(6) Special Research Support

These activities are intended to supplement support from the various Missions, LDC governments, and other bilateral and multilateral donors. They include support to network research activities by providing technical assistance, institutional twinning, and commodities (i.e., computers). Prior contact with Missions and host country institutions indicates their needs for technical assistance to approach a number of forestry/fuelwood problems. To meet these needs, the Forestry/Fuelwood Research and Development Project will provide the following:

(a) Short-term Assignments. These will include short-term technical assistance to species research network participants to advance the development and implementation of research work plans, to plan and design new projects, and to monitor and evaluate ongoing projects. In Asia, this will include expert consultancies from U.S. or other Organization for Economic Cooperation and Development (OECD) institutions to provide review and advise on research projects in Asian institutions.

(b) Long-term Assignments. Long-term technical assistance will normally be supported by the Missions but may, under special circumstances, be provided through this Project.

(7) Network Coordination.

In addition to the preceding activities, there will be a continuing need to work with LDC research administrators and scientists, with Mission representatives, and with contractor representatives to ensure day-to-day cooperation and coordination of network activities, both within and among the networks that will be operating in each region. In response to this perceived need, the Project includes support for a long-term Field Project Coordinator (see Annex A). This individual will be critical to the synchronization and coordination of AID research activities and will provide for coordination with other donor projects.

C. Global Research will include responsibility for: (1) developing state-of-the-art papers and other technology assessments; (2) developing research models as a basis for integrating and structuring currently available information; and (3) using research models to evaluate fuelwood/multi-purpose tree species as components of agroforestry or other farming systems approaches. The project will develop, collect, analyze, and synthesize research information from all regions to encourage and support activities in selected research areas that have global application. Synthesis of research information on a global scale will provide numerous opportunities for technology assessments, for refining the focus on research

needs, and for integrating existing and new information to develop research models for further evaluation and refinement of research needs.

(1) Global Research Areas

(a) Multi-purpose/Fuelwood Tree Selection and Improvement. Multi-purpose tree selection offers significant productivity gains to LDCs to meet increasing demands for energy, slope stabilization and erosion control, forage, and revitalization of degraded environments.

Much of the information currently available on multi-purpose trees has been condensed into two National Academy of Sciences (NAS) publications on firewood crops. This Project will develop a multi-purpose tree species data base, supplementing the two NAS publications with information assembled by ICRAF in Africa and by CATIE in Central America.

The project will develop guidelines for tree improvement research and development activities to improve the knowledge base of native species. In addition, methods will be developed for selecting and testing native and exotic species and for attaining genetic improvement. A discussion of the various steps that might be included in the guidelines is provided in Annex C.

In addition to the data base and guidelines, the Project will provide additional training through workshops, on-site technical backstopping, and continuing follow-up during the Project. These activities will ensure that a complete understanding of multi-purpose tree selection principles can be developed and transmitted to others (see Annex C).

(b) Biotechnology. Over the last 30 years, powerful new technologies, based on tissue culture and cell genetics research, have dramatically increased the potential to manipulate inherited characteristics of plants, animals, and microorganisms. These new biotechnologies have great potential to improve productivity of multi-purpose fuelwood species which perform better in adverse conditions (especially climatic stress), which better resist diseases and attacks by insects, and which fix nitrogen more efficiently.

The development of regional biotech laboratories, supported cooperatively and with the help of international agencies, is crucial if the developing world is to participate fully in the new biotechnologies. Education, infrastructure, and support need to be addressed to enable less-developed countries use the information coming out of regional biotech facilities.

The most promising research areas for near-term applications of plant cell and tissue culture techniques are clonal propagation, reduction of disease, germplasm exchange and conservation, and gene

transfer by wide hybridization. Clonal propagation offers an immediate opportunity for forest plants to reproduce large quantities of selected or elite plants, to increase the supply of limited plant material, and to reduce the time required to introduce selected genetic traits into trees.

Investigations on tissue culture, genetic engineering, and advanced generation breeding of multi-purpose fuelwood trees will be sponsored at one or more institutions within the U.S. and at selected LDC facilities. This will facilitate future production of sufficient quantities of high quality seed or vegetative material for multi-purpose trees such as Acacia, Albizia, Leucaena, Prosopis, etc. that will be needed for plantation establishment (see Annex C)

This Project will develop documents that support technical assistance functions such as: (a) a state-of-the-art manual on biotechnology, (b) guidelines on other promising techniques identified in the state-of-the-art manual, (c) guidelines on tissue culture, and (d) workshops on biotechnology.

c) Environmental Models - Several environmental models have been reviewed to determine if they are suitable, either singly or in combination, for use when considering introductions of exotic species of fuelwood or multi-purpose trees into new geographical areas. If one or more of these models can be used to predict the probability of making successful introductions with greater reliability, then costly "trial and error" introductions would be reduced or eliminated, and use of exotic species could be considered a viable alternative to strict reliance on native species.

Environmental models that were looked at closely include the Koppen System, the Thornthwaite Classification System, the Global Environment Monitoring system, the Holdridge System, and the Benchmark Soils System. Except for the Benchmark Soils System, each relies on techniques that relate climax vegetation to long-term climatic patterns. The Benchmark Soils System relies on soil classification to indicate soil property relationships among broad groupings of soils at the family level.

A potentially workable system would be a combination of the Holdridge System to describe bioclimatic zones and the Benchmark Soils System to describe existing soil conditions as a basis for predicting the use of exotic species in new geographical areas. A computer based system to accomplish this has been developed by the Commonwealth Scientific and Research Organization (CSIRO) in Canberra, Australia, but this new system should be further evaluated before it is recommended for broad operational use.

d) Socio-economic Methods and Tools - Adapting available methodologies such as rapid reconnaissance techniques or accessing tools such as the Human Relations Area Files and other archives will enhance the contribution of trees and forest in meeting rural development goals. For example, the Haiti Agroforestry Outreach

project was designed after an anthropological analysis of reforestation and soil erosion projects that had been implemented in the country over the previous 25 years. Anthropologists recomfirmed that the major motivation for farmers to participate was increased income, and this became the rationale for the project design. It assumed that agroforestation was the practice that farmers would adopt and sustain because of its potential to increase rural income.

These tools and methods will be needed to support short-term research efforts that will key into species selection, improvement and management and into project design analyses as well as long-term studies which monitor and evaluate socio-economic variables and policy implications of forestry for rural development. Socio-economic factors that will be investigated include: (1) perceptions, values, roles, behaviors, participatory systems and patterns of social organization of people involved in forestry activities; (2) distributive mechanisms for land and forest resources; (3) economic mechanisms, such as credit subsidies and other incentives, affecting the adoption or rejection of forestry/fuelwood projects and, in particular, economic factors affecting the selection of specific multi-purpose tree species; and (4) institutions that regulate access and use of forest and tree resources and deliver a variety of forestry-related services.

e) Socio-Economic Research - This project will develop socio-economic research guidelines and encourage research to address various levels of information need. The kinds of research supported will be diagnostic, comparative, or experimental. Diagnostic questions might include: Who uses what forest resources with what frequency, in what magnitude, for what purpose, when? Comparative questions for planning might include: What strategies for local participation have been successful under what conditions and how might this relate to the context in which forestry planning is currently taking place? Experimental or quasi-experimental research will help establish specific cause-and-effect relations as a basis for policy actions and might include research on incentive structures as they effect resource management decisions. The purpose of these questions is to identify factors that facilitate or constrain the implementation of projects or that most likely will lead to project success or failure or to positive or negative social and economic consequences. For example, on-going locally based monitoring is best performed at the community level. Listening surveys may obtain best information at the household level. Review of available literature and documentation may be best at the national level.

(2) Regional Bureau Project Development.

(a) Latin America and Caribbean (LAC) Bureau. The F/FRED Project Manager traveled to Costa Rica in April 1984 at the invitation of the Regional Office for Central America and Panama (ROCAP) to participate in a review of the ROCAP/CATIE Fuelwood and Alternative Energy Sources (Lena) project. Participants in the

review recommended that the project be extended or that a new project be developed to encompass recommended new research directions. Opportunities for linking the new or revised project with the F/FRED project were discussed thoroughly.

The links with the new Lena project will be established through network support activities to improve research methods, develop guidelines to facilitate standardized approaches to experimental designs, and analyze global needs for information management. The network will develop and monitor collaborative research programs, schedule workshops and conferences to exchange information and to set new research priorities, provide training and necessary technical services and commodities.

In October 1984, ROCAP requested S&T/FENR to participate in the development of a PID for the Lena II project. During those sessions, F/FRED linkages were further discussed and are now incorporated in the PID. Additionally, both the F/FRED Project Manager and the Senior Technical Advisor have been invited to participate in drafting the Lena II project paper in May 1985.

Other potential areas for collaboration will be investigated as the design of the LAC component progresses. Additionally, mechanisms for integrating other sources of grant funds must be identified. Some longer-term training might be facilitated in the region by F/FRED. Information dissemination capabilities might be enhanced by building on the CATIE information base. The initial focus of F/FRED will probably be in Central American countries, then in South American and Caribbean countries. Mangrove ecology (Ecuador, Panama), agroforestry (Haiti, Costa Rica), and watershed management (Panama) might be three areas of potential networking as well as the future link with the proposed S&T/LAC initiative on Fragile Lands.

(b) Africa Bureau (AFR): Initial support in Africa will be through a Cooperative Agreement with the International Council for Research in Agroforestry (ICRAF).

During the 1985 ABS review sessions, an S&T/FENR proposal for a new project on "On Farm Forestry" focused on Africa was recommended for inclusion under F/FRED. Since that time, Africa Bureau has developed a "Forestry and Fuelwood Strategy Paper" that includes six components, three of which are closely allied to F/FRED. These will provide opportunities for cooperation and coordination for research to improve tree yields and study alternative on-farm tree planting systems.

A second AID funded, IUFRO forestry research planning conference will be held in Africa in November 1985. Perspectives developed at this meeting will assist in formulating a project paper amendment for Africa that will recognize that region's highest priority research problems and needs.

An important aspect of potential research activity in Africa is donor coordination. For example, the World Bank and the French may focus on institution-building activities while F/FRED focuses on networking and research management. Mission-funded forestry research in countries such as Senegal, Niger, Mali, and Burundi furnish opportunities for networking that should be included in the design of this component. Support activities, such as training of researchers and long-term technical assistance (project design, backstopping field staff, and monitoring results), must be included. The role of FAO, or other multilateral organizations, and overall donor coordination must be discussed to improve existing institutions as an important first step in increasing forestry research capabilities in Africa.

2. Logframe. (See following page.)

The log frame sets out the Narrative Summary of the Project, the Objectively Verifiable Indicators, Means of Verification, and Important Assumptions.

3. Objectives.

The Project objective is to enhance forestry/fuelwood research and research capabilities through: (a) improved formulation, planning, and management of forestry/fuelwood and agroforestry research; (b) support and development of networks of scientists and institutions in LDC countries focused on the assessment, improvement, and management of fuelwood/multi-purpose tree species; and (c) to enable LDCs to address their critical forestry/fuelwood needs through better use of forestry and agriculture-related research information.

To achieve this objective, Project activities will be designed to develop or refine (a) host-country activities in forestry/fuelwood research to assist policy makers, planners, managers, scientists, and practitioners to understand the role of research in forestry/fuelwood management systems; (b) an interdisciplinary approach to management of forestry/fuelwood systems; (c) the socio-economic dynamics of the interrelationships between fuelwood producers, users, government agencies, and the environmental milieu in which these groups operate; and (d) the institutional capabilities of organizations involved in forestry/fuelwood research and management training programs.

Within each participating region: (a) institutions will be identified and linked to carry out complementary research activities that address regional priorities; (b) a strategy with common research priorities will be agreed upon; and (c) research will be enhanced through strategy and networking workshops, conferences, training programs, and publications.

PROJECT DEI MARY  
LOGICAL FRAMEWORK

Life of Project:  
From FY 85 to FY 94  
Total U.S. Funding \$4,000  
Date Prepared:

Project Title & Number: Forestry/Fuelwood Research and Development (936-5547)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS																																						
<p><b>Program or Sector Goal:</b> The broader objective to which this project contributes:</p> <p>The project goal is to meet basic needs of developing countries for fuelwood and other tree products; for improved land, water and human resource management; and for increased employment and income.</p>	<p><b>Measures of Goal Achievement:</b></p> <ul style="list-style-type: none"> <li>--Increased goods and services from the forest</li> <li>--Improved forest and natural resource management</li> <li>--Direct benefits to locals</li> <li>--Improved levels of living</li> </ul>	<ul style="list-style-type: none"> <li>--Status of world forests (FAO, UNEP)</li> <li>--Forest products utilization patterns in LDCs (FAD country reports)</li> <li>--Forestry research institutions upgrade and research being conducted</li> <li>--On-site inspections by project staff</li> <li>--Project principles in use a decade or more after project initiation</li> <li>--AID project evaluations</li> <li>--Reports from LDC governments, missions and contractors</li> </ul>	<p><b>Assumptions for achieving goal targets:</b></p> <ul style="list-style-type: none"> <li>--Rational policies on forestry, fuelwood and natural resource management exist</li> <li>--Tech transfer and extension efforts translate research into field effectively so that farmer can benefit from research</li> </ul>																																						
<p><b>Project Purpose:</b></p> <p>The purpose is to build LDC capacity to develop and use forestry and agriculture-related research information to address fuelwood and other critical development needs.</p>	<p><b>Conditions that will indicate purpose has been achieved: End of project status.</b></p> <ul style="list-style-type: none"> <li>--Increased LDC government commitment to research fuelwood;</li> <li>--Expanded the number of multi-purpose fuelwood tree species available;</li> <li>--Developed improved seed supplies of selected multi-purpose/fuelwood tree species</li> <li>--Strengthened the capacity of countries to address the social and economic issues in rural tree crop production and management;</li> <li>--Developed improved techniques for managing fast-growing multi-purpose trees;</li> <li>--Established several viable research networks with wide-spread donor support</li> </ul>	<ul style="list-style-type: none"> <li>--AID PIR reports</li> <li>--Annual project assessment, monitoring and evaluation reports of project director</li> <li>--Adaptation and application of research tools and methodologies</li> <li>--Project records</li> <li>--Contractors' workplan and vouchers</li> <li>--Mission consulting requests</li> <li>--Seminars, workshops, etc.</li> </ul>	<p><b>Assumptions for achieving purpose:</b></p> <ul style="list-style-type: none"> <li>--Collaborative and complementary funding with Bureaus, Missions and other donors</li> <li>--Host country support of forestry/fuelwood research and development activities</li> </ul>																																						
<p><b>Outputs:</b></p> <ul style="list-style-type: none"> <li>--Research policy guidelines, DBHS (methods and tools)</li> <li>--Critical socioeconomic variables affecting forestry/fuelwood determined and theories revised</li> <li>--Regional forestry/fuelwood networks established</li> <li>--Multi-purpose species selection, improvement and management</li> <li>--National forestry research programs enhanced</li> </ul>	<p><b>Magnitude of Outputs:</b></p> <ul style="list-style-type: none"> <li>--Research methods and tools developed for use in regional networks and 125 LDCs</li> <li>--Networks estab.: 3</li> <li>--Personnel trained: 100</li> <li>--Species selected and improved: 10</li> <li>--National forestry research plans: 5</li> </ul>	<ul style="list-style-type: none"> <li>--Printed studies</li> <li>--AID PIR and PPAR</li> <li>--Quarterly progress reports of project director</li> </ul>	<p><b>Assumptions for achieving outputs:</b></p> <ul style="list-style-type: none"> <li>--Demand for output exists</li> <li>--Contractor able to provide adequate quantity of quality personnel</li> <li>--Linkages formed between LDC forestry institutions and U.S.</li> <li>--Relevant social science knowledge and expertise exists or can be developed</li> </ul>																																						
<p><b>Inputs:</b></p> <table border="0" style="width: 100%;"> <tr> <td>--AID Funding S&amp;T/FENR</td> <td style="text-align: right;">30</td> </tr> <tr> <td>S&amp;T/RD</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Bureaus/USAIDs</td> <td style="text-align: right;">7</td> </tr> <tr> <td><b>Total</b></td> <td style="text-align: right;"><b>40</b></td> </tr> </table> <ul style="list-style-type: none"> <li>--AID/W personnel for project management</li> <li>--Complementary funding of field research costs by USAIDs, LDC, other donors</li> <li>--Funding of complementary regional bureau forestry/fuelwood research projects</li> </ul>	--AID Funding S&T/FENR	30	S&T/RD	3	Bureaus/USAIDs	7	<b>Total</b>	<b>40</b>	<p><b>Implementation Target (Type and Quantity)</b></p> <table border="0" style="width: 100%;"> <tr> <td></td> <td colspan="4" style="text-align: center;">(\$000s) 10 yr. Program</td> </tr> <tr> <td></td> <td style="text-align: center;">ASIA</td> <td style="text-align: center;">LAC</td> <td style="text-align: center;">AFR</td> <td style="text-align: center;">LDC</td> </tr> <tr> <td>S&amp;T/FENR</td> <td style="text-align: right;">10,000</td> <td style="text-align: right;">5,000</td> <td style="text-align: right;">6,000</td> <td style="text-align: right;">30,000</td> </tr> <tr> <td>S&amp;T/RD</td> <td style="text-align: right;">1,500</td> <td style="text-align: right;">500</td> <td style="text-align: right;">500</td> <td style="text-align: right;">2,000</td> </tr> <tr> <td>Other</td> <td style="text-align: right;">7,200</td> <td style="text-align: right;">-</td> <td style="text-align: right;">-</td> <td style="text-align: right;">7,200</td> </tr> <tr> <td><b>TOTAL</b></td> <td style="text-align: right;"><b>18,700</b></td> <td style="text-align: right;"><b>5,500</b></td> <td style="text-align: right;"><b>6,500</b></td> <td style="text-align: right;"><b>40,000</b></td> </tr> </table>		(\$000s) 10 yr. Program					ASIA	LAC	AFR	LDC	S&T/FENR	10,000	5,000	6,000	30,000	S&T/RD	1,500	500	500	2,000	Other	7,200	-	-	7,200	<b>TOTAL</b>	<b>18,700</b>	<b>5,500</b>	<b>6,500</b>	<b>40,000</b>	<ul style="list-style-type: none"> <li>--Project Records</li> </ul>	<p><b>Assumptions for providing inputs:</b></p> <ul style="list-style-type: none"> <li>--LDCs will provide facilities and personnel AID/W, USAIDs, LDC, and other donor funding for research is forthcoming</li> <li>--LDC emphasis on forestry</li> <li>--Agreement on common themes for research is reached</li> </ul>
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#### 4. Inputs.

In Phase I, the project will utilize the combined resources of the S&T and Asia Bureaus to systematically advance research and research capabilities in the area of fuelwood/multi-purpose tree species in developing countries.

Inputs are detailed in Tables 2 and 3. Pages 23A and 23B

#### 5. Outputs.

Project outputs can be grouped into three interrelated components as follows:

- Research Planning and Management: assist Missions and Regional Bureaus in promoting development of country-specific national fuelwood/forestry plans and programs; provide training and other assistance to strengthen key LDC institutions to carry out national forestry/fuelwood research and development plans.
- Network Development and Research: improving research methods and information management; developing and monitoring agreed-upon collaborative research programs; conducting workshops and conferences; purchase of commodities to support these activities such as creating a computer capability with appropriate hardware and software and including workshop and conference materials; support for publication of results; supplying expertise, mostly short-term, to host countries to assist them in project design and management; fuelwood research assessments; appraisals and evaluations; and behavioral, institutional and human resource evaluation.

Global Research: Developing state-of-the-art papers and other technology assessments; development of research models as a basis for integrating and structuring currently available information; use of research models to evaluate fuelwood/multi-purpose tree species as components of agroforestry or other farming systems approaches to define new research needs.

At the end of ten years, the project will have achieved the following results:

1. Increased LDC government commitment to research on multi-purpose/fuelwood tree species;
2. Expanded the number of multi-purpose/fuelwood tree species available for use in social or rural development programs;

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3. Developed improved seed supplies of selected multi-purpose/fuelwood tree species
4. Strengthened the capacity of countries to address the social and economic issues in rural tree crop production and management;
5. Developed improved techniques for managing fast-growing multi-purpose trees;
6. Formed an international community of interest in multi-purpose tree species research and established several viable research networks with wide-spread donor support.

6. Assumptions.

This project rests on the basic assumption that AID can and should play an increased role in promoting improved forestry/fuelwood research, management, policies, and capabilities. It focuses on the role of trees and forestry in national development.

A critical assumption is that the sustained availability of fuelwood and other goods and services from forests and trees can be improved through strengthening forestry research and forestry research institutions in the LDCs. The primary philosophy behind this project is to coordinate and facilitate research which will be funded by other donors, bilateral programs, and host country governments. In addition to enhanced skills and knowledge of LDC scientists and technicians, attitudes and behavior at all levels within host countries should be modified to reflect modern management concepts and a sensitivity to and ability to integrate socio-economic variables. Attainment of the projected project outputs will depend in large part on the quality and experience of the contractor. The competitive bid process will be used to assure selection of the best available expertise.

There are three important assumptions: (1) that adequate funding will be available; (2) that suitable contractors can be located; and (3) that research networks to mobilize LDC personnel and institutions are currently available or can be developed. The first assumption is not assured but this is a high priority project within the Agency and the assumption must be considered plausible. The second assumption is also valid. Many potential contractors have already expressed interest and are developing critical masses of expertise in anticipation of a Request For Proposal. In regard to the third assumption, a planning conference held in Bangkok in April, 1984, documented willingness of LDC scientists to participate in both bilateral and multilateral networks to strengthen research on multi-purpose tree species. This willingness was reemphasized at an International Union of Forestry Research Organizations workshop on multi-purpose trees held in Sri Lanka in July 1984.

A great deal of information on species adaptability and species networking has been accumulated by developed countries in the region. For example, Australia has a very active Eucalyptus network in operation and it is of critical importance for the success of this project to tap these existing resources.

Goal. A basic tenet is that the rural and urban poor are the primary clients and users of the innovations and technology produced. While the project could be considered successful if research provided for increased production of forest/fuelwood resources, it would be considered more so if this technology could be transferred to the rural and urban poor and implemented on an operational basis. The project design, which will rely heavily on information management, will do much to focus research on high priority needs and thereby accelerate multi-purpose tree production systems to meet fuelwood and other needs for the rural and urban poor.

This project recognizes that extension efforts will be needed to transfer the information and technologies to the local populations. It is important to note that many of the Mission projects which will be linked to this project have extension components. These will be the primary mechanisms for transferring the lessons and technologies from the F/FRED common theme project. This project does respond to the Youngs' Panel which recommends that an effective means be found for "recalling and focussing appropriate technical information on problems in developing countries where such information could be useful in problem solution."

There are a set of issues relating to the role of forestry extension activities in Asian and other countries. The first basic question is whether investment in building a forestry extension organization to work with farmers is desirable. If trees are considered to be one of several crops that a farmer might plant, then it is reasonable to question whether existing agricultural extension organizations are not a better vehicle for the dissemination of technical information. This question also goes back to the issue of what are the priorities for research and how do the results of the research get disseminated quickly to the farmer and rural community. Incorporation of forestry into the job of the agricultural extension worker may be easier than the training of new cadre of forestry extension workers and the breaking down of traditional perceptions of the forester as a policeman. The economic costs and benefits as well as institutional feasibility of this approach needs to be addressed. It is a researchable issue that will be dealt with in this project.

#### 7. End-of-project Status.

End of project status will find an array of research projects ranging from simple species selection trials to highly sophisticated projects in biotechnology. This overall status will be greatly dependent on the point in time that project services are provided and the forestry research milieu in the recipient

countries. Because of the nature of this project, the expectation is for some regional organizations to have developed the institutional capability to effectively conduct training courses and special studies as well as to assume a lead role in networking activities.

Research and development activities in the area of multi-purpose fuelwood research will have been stimulated by the activities of this project. Indicators of this might be new multi-purpose fuelwood and related research proposals and projects and coordination activities among international donors.

## II. COST ESTIMATES AND FINANCIAL PLAN

### A. General

The recurrent costs of forestry/fuelwood research are the salaries, materials, utilities, maintenance, etc., that continue for the duration of the research effort. The Forestry/Fuelwood R&D project acknowledges these costs and will follow AID policy on recurrent costs. That is, the S&T project will determine the most appropriate response to the recurrent cost problem. These responses are project design and policy reform.

For project design, F/FRED managers and contractors will work with LDC governments, USAID Missions and other donors in assuring that components dealing with recurrent costs are economically feasible. For policy reform, F/FRED will encourage policy dialogue on the allocation of resources for forestry/fuelwood research. F/FRED will not provide recurrent costs support (e.g. salaries of researchers), but will work with USAIDs and other donors in determining appropriate and permissible levels of this support. The USAIDs and other donors will be dealing with specific recurrent costs in countries where they fund research activities. The development of the information management system through F/FRED will reduce the potential recurrent costs of networking by permitting electronic communication as the project evolves, thus reducing the costs of meetings, etc. Additionally, as the process become institutionalized actual costs should be reduced and absorbed by participating institutions.

### B. Shared Funding

#### 1. S&T/ASIA

A consolidated budget is presented in Table 1. Contributions from S&T Bureau and Asia Bureau have been disaggregated in Table 2, to provide estimated annual costs by component over the first five years.

TABLE 1. Proposed Funding

	<u>ASIA</u>		<u>LAC</u>	<u>AFR</u>	<u>Life of Project LOP</u>
	<u>Total 5 yr</u>	<u>Total 10 yr</u>			
Asia Bureau	2,500	5,000	-	-	5,000
S&T/FENR	7,643	18,000	6,000	6,000	30,000
S&T/RD	1,680	1,680	560	560	2,800
Other	1,410	2,200	-	-	2,200
<b>Total</b>	<b>13,233</b>	<b>26,880</b>	<b>6,560</b>	<b>6,560</b>	<b>40,000</b>

Table 3 provides detailed input budgets. These input estimates were developed by using records and experience from other projects in S&T Bureau. As indicated earlier, outputs are directly related to each of the three project components and represent elements that are critical to a research network support project. Person months to accomplish each output and its costs have been developed from project records which have produced similar outputs.

Component 2, Network Development and Research includes funding for the support of research networks with commodities, maintenance and technical assistance.

Virtually every Mission in Asia has, or is planning, activities in forestry and agroforestry research. For example, the Alternative Energy Resources Development Project of India has two million dollars allocated to support research and institutional development. Pakistan's Forestry Planning and Development Project has a major component which will finance farm and energy forestry research. These Mission level activities in Asia are viewed as complementary to the total forestry/fuelwood research and development effort being proposed by this Project. Without these Mission activities, F/FRED would have little chance of success. And, it is anticipated that existing and planned research through Mission projects will be enhanced by contributions from F/FRED and the Asia Forestry Research and Development Project.

There will be LDC input to the project in the form of participating trainees' salaries and logistical support. These contributions are difficult to estimate.

## 2. S&T/LAC & AFR

In each participating region, the S&T project will help organize and implement a research network among several countries experiencing common development problems in the forestry/fuelwood

**Table 1- Inputs by Procurement Mechanism**

	1 S&T/ASIA	2 S&T/ASIA	3 S&T/ASIA	4 S&T/ASIA	5 S&T/ASIA	SUB TOTAL S&T/ASIA	S&T/ASIA TOTAL	Mission Contribution	TOTAL
<b>COMPONENT 1</b>									
<b>AFRSC</b>	115 -	603 150	603 100	703 125	703 100	2727 475	3202	-	3202
<b>COMPONENT 2</b>									
<b>AFRSC</b>	1228 200	728 300	578 300	483 -	273 300	3290 1100	4390	1410	5800
<b>PSC</b>	- 300	- -	- 350	- 100	- -	- 750	750	-	750
<b>COMPONENT 3</b>									
<b>AFRSC</b>	239 -	203 -	203 -	203 -	203 -	1051 -	1051	-	1051
<b>EVALUATION</b>	- -	- 25	250 50	- 50	260 50	510 175	685	-	685
<b>CONTINGENCY</b>	260 -	235 -	210 -	210 -	210 -	1125 -	1125	-	1125
<b>Sr. Tech Advisor</b>	160 -	160 -	100 -	100 -	100 -	620 -	620	-	620
<b>SUBTOTAL</b>	2002 500	1929 475	1944 800	1699 275	1749 450	9323 2500	11823	1410	13233
<b>TOTAL</b>	2502	2404	2744	1974	2199		11823	1410	13233

**AFRSC - ASIA FORESTRY RESEARCH SERVICES CONTRACTOR**

**PSC - PERSONAL SERVICES CONTRACTOR**

Table - 3 Inputs by Components  
(000s)

	Year 1				Year 2				Year 3				Year 4				Year 5				5 year Total			Total
	S&T	A	M	Total	S&T	A	M	Total	S&T	A	M	Total	S&T	A	M	Total	S&T	A	M	Total	S&T	A	M	
I Research Planning & Management	115	-	-	115	603	150	-	753	603	100	-	703	703	125	-	828	703	100	-	803	2727	475	-	3202
II Network Development Research	1220	500	42	1770	728	300	342	1370	578	650	342	1570	483	100	342	925	273	300	342	915	3290	1850	1410	6550
III Global Research Support	239	-	-	239	203	-	-	203	203	-	-	203	203	-	-	203	203	-	-	203	1051	-	-	1051
IV Sr. Tech. Ad.	160	-	-	160	160	-	-	160	100	-	-	100	100	-	-	100	100	-	-	100	620	-	-	620
V Evaluation	-	-	-	-	-	25	-	25	250	50	-	300	-	50	-	50	260	50	-	310	510	175	-	685
VI Contingency	260	-	-	260	235	-	-	235	210	-	-	210	210	-	-	210	210	-	-	210	1125	-	-	1125
Totals	2002	500	42	2544	1929	475	342	2746	1944	800	342	3086	1699	275	342	2316	1749	450	324	2541	9323	2500	1410	13233

S&T - Bureau for Science and Technology

A - Bureau for Asia

M - Asia Missions' "buy-ins"

area. The project will concentrate on the Asia region initially, but participation by the Bureau and Missions for LAC and the Bureau and Missions for Africa is anticipated in later phases. Estimated S&T funds available for LAC and Africa Bureaus combined are shown below for the first five years.

	\$000,s					
YEAR	1	2	3	4	5	<u>TOTAL</u>
	398	771	1,156	2,500	2,352	7,177

### III. IMPLEMENTATION PLAN

Because each phase involves a large and disparate geographical region, it is anticipated that a different set of procurement mechanisms will be needed for each region beginning with Asia in the first year. This does not necessarily preclude, however, participation of Asia contractors from bidding for those portions put out to bid when the LAC and Africa phases are initiated.

In preparing this procurement package for Asia, a number of different concerns, constraints, and procurement alternatives were considered. Potentially, the project will need a contractor and/or cooperator in each region. Because of the strong emphasis on integrating biophysical and socio-economic factors, the major contractor will be required to bring together strengths in a range of disciplines. The Request for Proposals (RFP) will require competitors to discuss their institutional capabilities to work both within and across disciplines. In the Asia region, there will be direct integration of socio-economic considerations in each of the Species Networks and in the Land and Forest Management Network.

The following procurement elements were developed with the above consideration in mind, and specific details on selection criteria and responsibilities are found in Appendix 1

#### A. Contracting Modes

##### 1. Contractor (Asia Forestry Research Services Contractor; AFRSC)

A Cost Reimbursement/Level of Effort Contract will be let by competitive bidding for a five-year period. At the end this period, it will be competitively bid for the second five years.

A cost Reimbursement/Level of Effort contract will:

- (a) permit the development of institutional capacity
- (b) permit flexibility in the selection of field sites and the adaptation of research efforts

- (c) reduce paperwork and streamline the procedure for Bureau/Mission add-ons.

Level of Effort Contracts awarded to date have had the following characteristics. They:

- (a) provide for research, development, and assessment in project related areas which will strengthen the contractor's performance capabilities.
- (b) allow the contractor to provide technical services within the project areas that result from the research or are identified by Missions.
- (c) permit the identification of field sites and the development of implementation plans.
- (d) establish total estimated costs, at the time of contract award, based upon levels of effort.
- (e) permit incremental funding up to the limit of the total estimated contract cost.

## 2. Personal Services Contractor (PSC)

An individual will be given a Personal Services Contract to work as the Project Field Coordinator in the Asia region. This individual will be under the administrative direction of a field Mission (i.e., Thailand) and under program direction of the ASIA Project Management Team in AID/W. This contract will be funded entirely from Asia Bureau funds and will be administratively managed through that Bureau.

## 3. Cooperative Agreements (CAs)

The purpose of the Cooperative Agreements is to strengthen the recipient's program of cooperation with LDC institutions, to identify and resolve forestry/fuelwood research issues, and to develop approaches that reduce or eliminate practices that result in deforestation.

Recipients of Cooperative Agreements will work collaboratively with LDC institutions, AID/W Project Management, the Regional Bureaus, and AID Missions. An annual workplan will be required that will specify the level of effort required for the various targeted outputs and the mix of personnel/disciplines needed to accomplish each task. The annual work plan is not intended to be a rigid document but will encourage:

- (a) a clear understanding of the overall allocation patterns against project outputs;

(b) a clear statement at a point in time of staff obligations for specified outputs;

It will also provide the basis for S&T/FENR, S&T/RD, and the Asia Bureau, support activities over the year.

Agreements between the cooperators and the project will specify expectations for cooperation and coordination between the cooperators and the major contractor. An evaluation will be conducted near the end of the CAs to determine if a subcontract for additional work should be negotiated with the major contractor.

Two CAs are planned: (1) One with the Agricultural Development Council (ADC)/Winrock International to implement the Land and Forest Management Network activity for a three (extendable to five) year period. Prime responsibility for management of this CA lies with the Asia Bureau and will be jointly funded by S&T and Asia Bureau. The S&T/RD Senior Technical Advisor will play the lead role in S&T in co-management of technical aspects of this Cooperative Agreement. (2) The second with the Nitrogen Fixation by Tropical Agricultural Legumes Project (NIFTAL - University of Hawaii; NFTA) for a nine-month period for the detailed feasibility analysis and design of one or more species networks. Prime responsibility for management and funding of this CA lies with S&T.

Each of these two organizations has the unique capability to carry out the terms of the agreements as set out below. NifTA/University of Hawaii/NFTA is the sole known organization that has worked closely with research institutions in Asia in the areas of fast growing multi-purpose tree species networking. The agricultural Development Council Inc./Winrock International is the sole known organization that has developed networks of research institutions in Asia in social, economic and environmental aspects of land and forest management.

The criteria for implementor(s) selection, qualifications, and responsibilities appear in Appendix I.

## B. Management

### 1. Overall Management

Because the problems related to forestry/fuelwood research and development are global and expertise is widely dispersed, a major problem confronting the project is how to effectively utilize this expertise. There are essentially two options available. The first is to implement the project on a regional basis over time but maintain the global aspects of the project through effective networking and a single project management team. The second is to implement three separate regional projects. We consider the first option to be more feasible from the standpoint of cooperation, coordination, integration, networking potential, and the most efficient use of available resources. Coordination between the three regional contractors will be carried out as appropriate.

Both S&T/FENR and S&T/RD have agreed to work cooperatively and are following models developed previously within the Agency. This combination assures close integration of the biological and socio-economic approaches needed for successful implementation of the project at all levels.

The S&T, F/FRED Project Manager will be a senior forest research manager in S&T/FENR (see Fig. 1) and will be the overall manager of the global project involving all three regions. The Project Manager will be assisted by a Senior Technical Advisor designated by S&T/RD. In the absence of the S&T/FENR Project Manager, the S&T/RD Advisor will take the lead in project management activities. This global project will have an Oversight Committee, composed of a representative from each regional bureau, the Project Manager, and Senior Technical Advisor. The Project Manager will be chairperson of the Oversight Committee.

Management of the project will involve the active participation of two S&T Directorates, as well as the regional bureaus. Involvement of these various entities will ensure that project outputs will be relevant to Mission and LDC needs and that services provided will be of high quality. At the same time, it is imperative that a single individual, in this case the S&T/FENR Project Manager, be responsible for successful execution of all project tasks. This is consistent with the usual mode of AID project management. Active involvement of other offices and bureaus also is not new and this approach will be reinforced in Phase I implementation by working jointly with Asia Bureau to oversee interactions between this project and the Asia/Regional Forestry Research and Development Project (498-0276).

Similarly, from the contractor's point of view, even though this project will require high levels of flexibility, coordination, and cooperation, the line of authority will be clear. It will be the responsibility of the Project Manager to resolve any problems, tensions, or difficulties that may arise during the implementation and tenure of this project.

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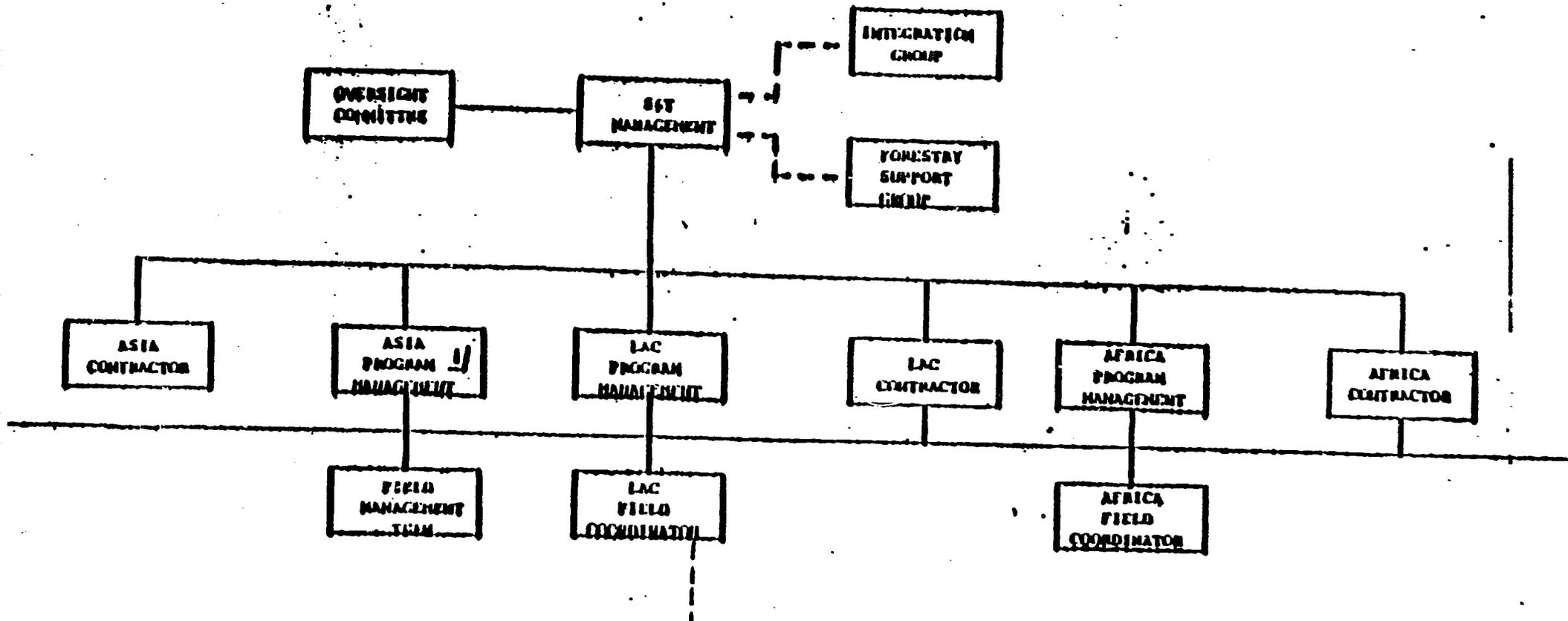


FIGURE 1

Proposed Organization for the Forestry/Fuelwood NED Project

1/ See Figure 2 for details

AD

Finally, the procedure for selecting contractors for each phase, through competitive bidding, is the option preferred by federal procurement regulations. The competitive process is expected to yield the best possible proposals.

## 2. S&T/ASIA Project Management

Prime responsibility for this project lies with S&T. As project activities are phased in Latin America and Africa, new Cost Reimbursement/Level of Effort Contracts may be competitively bid for work in these regions or Cooperative Agreements let.

The contractor will establish an Integration Group in the United States as part of the activities planned for Asia. This group will monitor and integrate global research information relevant to the program in Asia and provide a global perspective in the development of guidelines for project networks, information management systems, R&D project design and training.

Coordination of field activities in Asia will be the responsibility of a field management team consisting of the Project Field Coordinator and advisors to the two research networks. This team will work with representatives of host countries and missions to implement components of the Asia program. A more detailed description of this relationship is provided in Annex A.

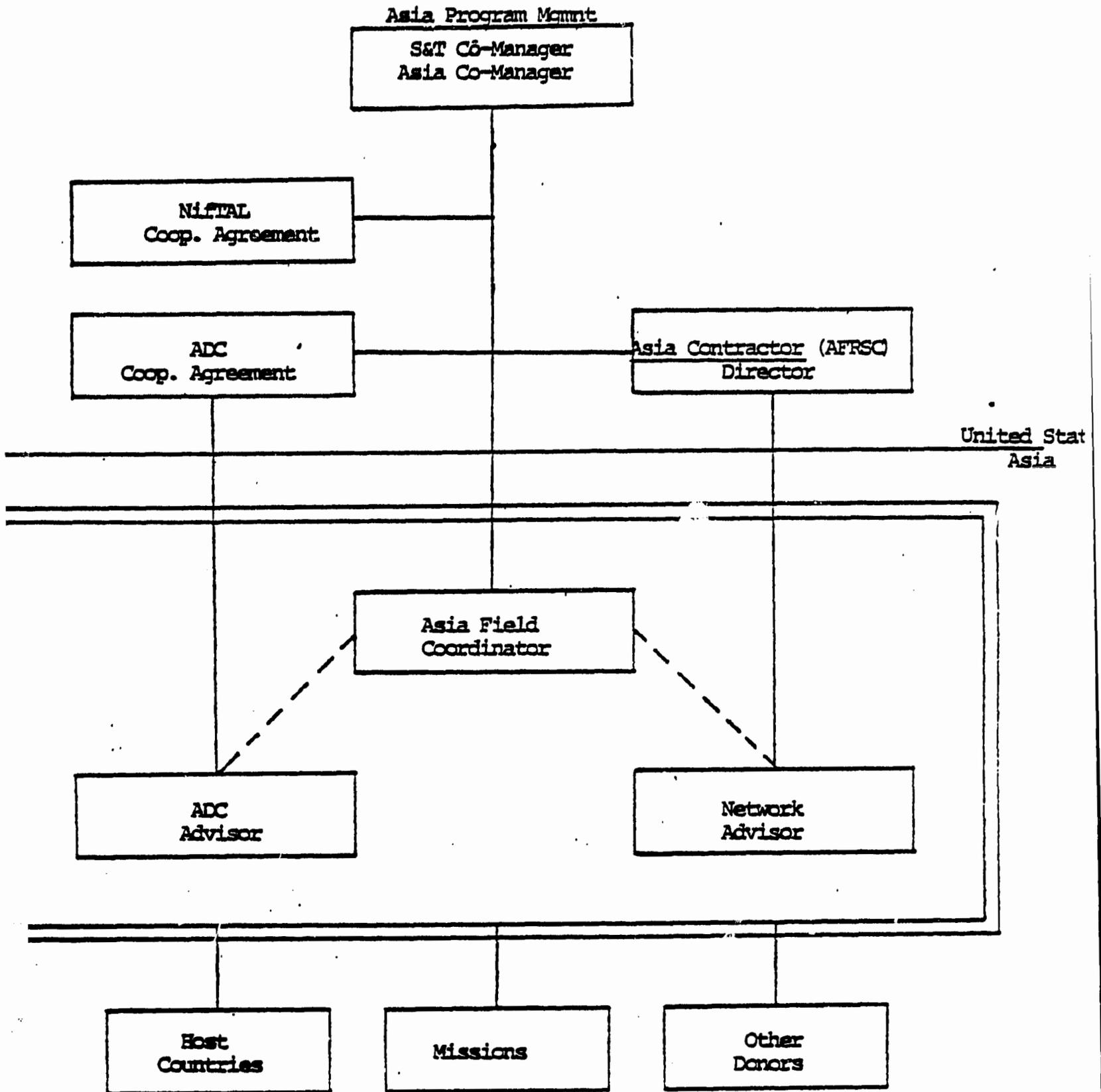
The project will be implemented in Asia according to an annual work plan developed in collaboration with mission personnel, network participants and other donor project managers. The following is the anticipated schedule for the initial year.

March, 1985:	Project approved;
April/May, 1985:	Work plan, format and outline developed with Missions;
April/May, 1985:	RFP for Asia Research Services Contract issued;
June/July, 1985:	Project Field Coordinator in Thailand;
July, 1985:	Cooperative agreements concluded;
July-September, 1985:	Network organizational meetings;
September, 1985:	Asia Forestry Research Service Contractor in place;
November, 1985:	Workplan for FY 86 developed with Missions;
January, 1986:	Inter-network planning meeting.

## 3. S&T/LAC & AFR Project Management

Arrangements for joint management of project activities in each region will be established as described for Asia (see Figure 2). As the project moves to other bureaus, amendments to this PP will be made. They will be taken to a Joint Sector Council meeting for review. Project Management costs will be borne by the respective Offices and Bureaus in Washington.

Proposed Organizational Arrangements



#### IV. PROJECT MONITORING

##### A. S&T/ASIA

###### 1. Project Work Plans

All contractors and cooperators will submit the annual work plan to S&T/FENR, S&T/RD, and the Asia Bureau each year for review. The workplan will contain, at a minimum: a summary of past work, a budget projection (for the coming fiscal year), a schedule of intended activities by category and anticipated level of effort; a justification of proposed research; and a schedule of planned outputs.

###### 2. Contractor Periodic Reports

###### a. Quarterly

All contractors and cooperators will be required to submit progress reports to the Project Manager each quarter.

###### b. Annual

All contractors and cooperators will be required to submit annual progress reports to the Project Manager.

###### 3. Site Visits

These will consist of visits to participating network institutions by members of the field management team each year of the project and with members of a project evaluation team in years 3, 5, 8, and 10. The purpose of these site visits will be to review project activities and network participation, including facilities, research management, research per se, personnel, and collaborative efforts. Ideally, each participating institution will be visited at least once each year.

##### B. S&T/LAC & AFR

The reporting procedures for the AFR and LAC components will be developed as the activities in these regions come on line. The general guideline will be to follow AID reporting procedures.

##### C. Evaluation

###### 1. Yearly Management Review

The Project Manager and the Senior Technical Advisor, with Regional Bureau coordinators, will conduct annual management reviews and summarize their findings on a Project Evaluation Summary (PES) form for the record. Results of the reviews will be used to make adjustments in the project as appropriate.

## 2. Substantive Evaluations

In addition to annual management reviews by the S&T Project Manager, the Senior Technical Advisor and Regional Bureau managers, substantive evaluation with Mission participation will occur in years 3, 5, 8, and 10. These substantive evaluations will be conducted under the guidance of the joint S&T and Regional Bureau Oversight Committee. The following outlines the general nature of the evaluations of F/FRED.

1. Year 3 - This evaluation will assess the quality, quantity, and timing of project inputs to achieve desired outputs. Quantitative evaluation will concentrate on numbers of networks established, numbers of guidelines and manuals produced, etc. Qualitative evaluation will review effectiveness of workplan process; explore the nature of LDC institutions and mission commitment; determine if countries are working together; scientific achievements and increased productivity; development of meaningful research; Mission commitment to research policy changes; national research policies in place; institutional changes such as human, financial and extension services.

2. Year 5 - This evaluation will be to assess the accomplishment of outputs and to examine the validity of assumptions made during project design. Deficiencies identified in year 3 will be reevaluated.

3. Year 8 - This evaluation will examine the probability of attaining the project purpose, or reasons for variance.

4. Year 10 - This will be an evaluation to assess the long term impact of the project.

Evaluations of the Asia component are characterized by the following:

The S&T and Asia Bureau project managers will prepare a written evaluation report each year. An appropriate time would be following their participation in the annual workplan meeting with Mission staff.

In Year 3 the focus of the evaluation will be of the quality, quantity and timing of project inputs to achieve the desired outputs. Key indicators for quantitative analysis will be:

- number of networks developed and workplans in place;
- increases in staff and budgets of participating institutions;
- number of species trial plots established since the project began;
- number of case studies of land and forest management systems completed;

- the amount of support contributed by other donors and AID missions for in-country research activities;
- productivity of seed from different species and provenances;
- use of improved seed in national programs.

During the first year, a baseline survey will be conducted by the Asia Forestry Research Services contractor that will initialize these variables.

Qualitative evaluation will review the effectiveness of the workplan process; explore the nature of LDC institutions and Missions' commitments; determine if countries are working well together; evaluate the significance of scientific information developed; review the priority national governments are placing on multi-purpose tree species research. The year 5 evaluation will focus on the accomplishment of outputs and the validity of assumptions made during project design. Deficiencies identified in Year 3 will be reevaluated. The implications for future Asia Bureau participation in the joint effort will be assessed.

The process of project evaluation will be coordinated, at strategic times, with reviews by the IUFRO Asia Coordinator and the IURFO Board of Governors of the overall program of research on multi-purpose trees. A joint donor review may also be merited at some future time.

The project itself will seek to develop in one or more Asian network institutions the capability to evaluate the research process from a regional perspective. Kasetsart University is a logical candidate for this role given its technical forestry staff, the presence of the AID-supported technical advisors in Thailand, and the work of the ASEAN Tree Seed Center in Bangkok in monitoring the development of improved genetic material.

## V. ANALYSES

### A. Technical Analysis

1. Timeliness. During the next decade, AID has an opportunity to make a lasting impact on rural development in LDCs through improved knowledge of the human and natural ecosystems in which forest/fuelwood production and management take place.

2. Appropriateness. The project is designed to: address major common themes in forest/fuelwood production which transcend political boundaries, strengthen host country research capacity, provide sustained support where a long-term research effort is needed, strengthen regional research linkages, use and enhance the comparative advantages of each institution in the network, and create a resource pool unattainable by each country working by itself.

A central aim of the project is to understand the complexity and interrelatedness of socio-economic and biophysical factors in forestry. Technical information can most effectively be applied where there is an understanding of social, economic, and institutional factors that influence the wise use of resources.

No one country within a region has the human and financial resources to deal with the research issues that have regional significance. Few national programs have the interdisciplinary capability to address regional issues. The fundamental concept in the regional approach is to develop a cadre of scientists which can respond to regional needs while contributing to their national programs.

This is a research and development project. It will provide R&D guidelines, facilitate networking, support training in research design and management, and enhance information management capacity. Through these activities, the project will strengthen the capabilities of LDC institutions to conduct and manage research on forestry and fuelwood issues.

This project will assist missions with projects where economic analyses have been conducted and where economic analyses need to be conducted.

Project inputs have been costed-out. It is, however, difficult to cost-out project outputs. The project involves a large number and range of activities that will be implemented under a variety of conditions. The emphasis on networking requires a degree of flexibility that makes it difficult to project estimates of economic benefits. There are several levels on which the economic benefits of this project may accrue.

As an example, improved upstream watershed forest management may require similar basic inputs by upstream farmers and downstream farmers, but the benefits occurring externally to the upstream farmer's field may be different. In this case, the external effect may be in reduced upstream erosion which thereby may reduce sedimentation in a downstream reservoir. Thus, the benefit may not accrue directly to the farmer upstream but will undoubtedly accrue to the wider downstream society that uses and benefits from the reservoir's existence.

Perhaps the most important benefit is found in improved cost effectiveness of forestry/fuelwood production investments derived through improved design and implementation of projects based upon capturing and systematizing knowledge. This is a cornerstone of the project, and it is anticipated that the project will yield much larger benefits relative to costs over the long term.

Very few, if any, studies exist that attempt to calculate the economic value of trees to a nation or society. The economic importance of wood for cooking, heating, fodder production, and soil and water conservation is difficult to quantify.

In general, research affects different management activities in different ways. The use of research results may change the:

- (a) kinds of inputs required or outputs produced;
- (b) amount of inputs used for outputs produced;
- (c) values of inputs and outputs;
- (d) timing of inputs and outputs;
- (e) distribution of costs and benefits among people within society.

Each of these prospective changes can affect the present value of inputs and outputs, and thus change the economic viability of a given forestry project. This result will in turn affect the economic evaluation of the research program.

The introduction of new technologies typically produces a complex of effects. It may alter both the costs of inputs and the values of outputs, and also change the distribution of costs and benefits over time and among people. Only a careful analysis can evaluate the net benefits of the introduction of a new or modified technology. The effects of new technologies cannot be easily generalized or anticipated.

## B. Economic Analysis

The economic mechanisms affecting the adoption or rejection of fuelwood projects must be examined. For this, it is important to understand what people value. Where individual land area is limited, the opportunity costs of choosing one option (i.e. agricultural cash cropping) over another (i.e. tree planting) must be better understood. In many areas of Africa, Food for Work is being used as an incentive to get people to plant trees, but it is not at all certain whether those people will maintain the trees once planted unless the food continues as payment. In the Dominican Republic, national policy against tree cutting has had the ironic impact of providing no incentive for tree planting, since if one cannot cut to derive benefit, there is no incentive to plant. Thus, a range of incentives (tax cuts, subsidies, credit, etc.) is needed to encourage both the reforestation and the management and wise use of existing forests and trees in all countries.

The following is an illustrative economic analysis of eucalyptus research in India.

Under the hypothetical Network Program, India, in 1985, would establish 40 hectares of research plots for Eucalyptus species and provenances at a cost of \$500 per hectare, or a total cost of \$20,000 for the year. From 1986 through 1991, these established plots would be protected, tended, and monitored; data would be collected and analyzed; and supplementary plots would be established as needed. The cost for doing this would be \$20,000 per year. From 1992 through 1994, the most promising Eucalyptus species and provenances would be selected and enough planting stock of these

Eucalypts would be developed to meet the need for large-scale field planting in 1995. We assume that this could be done for \$20,000 per year. The total cost of this 10-year investment in Eucalyptus research and development would be \$20,000 each year for 10 years, for a total investment of \$200,000. This budget does not include the cost of nursery operations, because it is assumed that these new species or provenances will replace existing ones already being grown for field use.

Annual plantings of new and improved species will begin in 1995 and will continue each year until 2025. We assume conservatively that only 80 percent of the area planted each year would survive to produce fuelwood. Once established, the plantations will be maintained indefinitely. Fuelwood cuttings would begin 5 years after planting, and would produce the same yield of fuelwood at each cutting every 5 years thereafter. The first annual harvest of fuelwood from the plantations with improved species will be made in the year 2000, 15 years after the start of the research program. Each year from 1995 to 2025 the annual planting program will expand the area of fuelwood plantations by the amount of planted areas that survives. To provide a termination point for this analysis we assume that after 2025 no new plantations will be established. For this evaluation, yields after the year 2034 will be ignored.

Almost all of the expenses of establishing, maintaining, managing, and harvesting the plantation would tend to remain the same regardless of the productivity of the trees planted.

Vivekanandan, a Sri Lankan researcher, has stated that there is considerable variation among provenances of Eucalyptus camaldulensis, and that certain provenances are excellent choices for dry climatic conditions. He cites average growth rates for northern India in dry conditions of between 7 and 11 cubic meter per hectare per year. Under more favorable climate and site conditions other Eucalyptus species can yield from 20 to 35 cm/ha/year. With this much variation among Eucalyptus species and provenances it seems reasonable, and conservative, to estimate that a series of Eucalyptus species and provenance trials could result in the choice of species and provenance that on drier sites would increase firewood yields by at least 1 cm/ha/yr. over species and provenances currently used. This would be an increase of less than 20 percent in the yields cited above. This incremental yield is assured in this analysis.

A general methodology for this type of problem is to consider the research costs as an investment that will produce increased yields over some period of time over some area. Standard compound-discount interest rate multipliers are used to determine the present value of both the discounted costs and the discounted returns. These are then used to evaluate the proposed research project as an investment, using different investment criteria, such as internal rate of return and present net worth.

The present values of the costs (PVC) of this 10-year research program, discounted for a range of interest rates in percent are:

<u>Interest</u> <u>rate</u>	<u>PVC</u>
0.10	\$122,892
0.15	\$100,376
0.20	\$ 83,850
0.25	\$ 71,410
0.30	\$ 61,830

To illustrate the potential impact of such a research program in an actual setting, we will use data from the USAID Project Paper on the Madhya Pradesh (MP) Social Forestry Project in India. The MP Social Forestry Project proposes to increase the supply of firewood, fodder, fruit, small timbers, and other minor forest products in fuel deficient regions of the state. In the 39 districts of MP covered by the Project, the projected deficit of fuelwood is 8 million cubic meters per year by the year 2000. With an assumed realized mean annual increment (MAI) of about 4 cm/ha/yr, a total of 1.96 million hectares of fuelwood plantation would be needed to meet fully this need.

MP is proposing a planting program to begin reducing this anticipated fuelwood deficit. This program would establish forest plantations near villages, and along road, rail, and canal sides. By the end of 6 years this program is expected to be establishing 20,000 ha/yr. When added to the expected Forestry Department planting of 33,000 ha/yr, and other private and community plantings, about 65,000 ha/yr. of new plantations will be established each year in the 39 districts of MP by the end of the 6-year program. For analysis, we will assume that once this level of planting is achieved, it will be continued until the year 2025, when it will be terminated.

These plantations would be harvested periodically for fuelwood, beginning five years after planting. We will ignore the production of fruit, fodder, poles, and other products from the plantations and assume that this will be unchanged by our research program. In other words, we will insist that the research program be justified in terms of increased yields of fuelwood alone. We are not evaluating the feasibility of the MP planting program. We assume that it will be carried out using the available planting stock, whether or not the species trials research is carried out.

The Project Paper proposed establishing four different types of multiple purpose tree plantations, with different mixtures of tree species:

<u>Type of Plantation</u>	<u>% of Area Planted</u>	<u>% Planted to Eucalyptus</u>	<u>Eucalyptus Area as % Total</u>
Model I	40%	8%	3.2%
Model II	10%	8%	0.8%
Model III	30%	12%	3.6%
Model IV	<u>20%</u>	<u>20%</u>	<u>4.0%</u>
All Plantations	100%	48%	11.6%

The area planted each year is 65,000 hectares. Of the total area planted, 11.6% is planted to Eucalyptus, or 7,540 hectares. Of this area planted to Eucalyptus, 80 percent survives, or 6,032 hectares. We will assume that of the approximately 6,000 hectares of Eucalyptus trees that become established each year, 5,000 hectares will have improved species and provenances that will produce an increase in mean annual increment of 1 cm/ha/yr. With a cutting for fuelwood every 5 years, the improved trees would produce an additional 5 cm/ha at each cutting.

The overall program schedule would then look as follows:

- 1985: Research Program is started. Large-scale planting of unimproved trees is underway.
- 1992: Improved species and provenances selected.
- 1995: Improved stock available for large-scale planting programs. First plantation with improved stock planted; of these, 5,000 ha of improved Eucalyptus trees survive to become established.
- 1996: Annual planting of improved stock continues, adding 5,000 ha of improved Eucalyptus trees each year.
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- 2000: First annual fuelwood harvests from plantations with improved stock.
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- 2024: Last plantation with improved stock established. Annual fuelwood harvest continue.

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--2034: Last harvest of fuelwood to be included in the research evaluation.

We also assume that of the 65,000 ha planted each year, only 80% or about 50,000 ha would survive to be harvested. With this level of survival, after four decades of planting MP would have about 2 million ha of multiple purpose tree plantations by the year 2025. Of this, 150,000 ha would have improved species of provenances of trees under our program assumptions.

With the improved trees these plantations would make available to the rural people of India an additional 50,000 cubic meters of fuelwood annually by the year 2005. By 2015 this additional volume will have risen to 100,000 cubic meters annually, and by 2025, 150,000 cubic meters per year.

The economic value of fuelwood in the MP area given in the report is Rs 0.15/Kg. Using a current (September 1984) exchange rate of \$0.086/Rupee, and the conversion value of 800 Kg/cm used in the MP project paper, the gross economic value of firewood in this area would be \$10.00/cm.

The following tabulation shows the additional volume and value of fuelwood expected to be harvested each year from the plantation with improved species, over what would have been harvested had the improved species not been used.

Additional Annual Fuelwood Harvested

<u>Years</u>	<u>Volume (1000cm)</u>	<u>Value (\$10/cm)</u>
2000-2004	25	250
2005-2009	50	500
2010-2014	75	750
2015-2019	100	1,000
2020-2024	125	1,250
2025-2029	150	1,500
2030-2034	150	1,500

The present values of these benefits (PVB) from this research program, discounted for a range of interest rates, are shown in the following table.

(1)

Present Values of Benefits from Eucalyptus Trials

<u>Interest</u> <u>Rate%</u>	<u>PVC</u>
0.10	\$1,360,520
0.15	391,968
0.20	134,935
0.25	51,016
0.30	22,271

The present Values of research costs and benefits and the internal rate of return can be seen as the point where discounted benefits equal discounted costs--23%. This return on a research investment of \$20,000 per annum would appear high enough to justify the research investment program outlined above.

Even if the costs of the research program were twice as high as estimated, the rate of return would still be 18%. Or if the increase in yields were only 0.5 cm/ha/yr, the investment would still yield almost 18%. Yields could fall to 0.26 cm/ha/yr. and the IIR would be 15%. Varying the number of hectares planted with improved Eucalyptus species from 5,000 to 1,300 per year, the investment would still earn 15 percent. If twice as much area were stocked with higher-yielding trees, the research investment would yield a 28% rate of return. And to conclude this sensitivity analysis, if future values of fuelwood dropped from the current \$10 per cubic meter to \$2.60 per cubic meter, the investment would still earn 15 percent.

In summary, it seems reasonable to conclude that such a research program would pay for itself, even if the results were used nowhere else but in Madhya Pradesh. If we include potential yield increases for fodder and timber products, the return may be even greater. And given the fact that Eucalyptus accounts for a large proportion of the short-rotation trees being planted in social forestry program in Asia, a regional research network program that developed a range of superior seed for Eucalyptus species and provenances adapted to various conditions within the region would seem well worth a 10-year investment of several million dollars.

Finally, there is the question of recurrent costs. However, because much of the emphasis in this project will be on networking, the question can be rephrased to ask what are the recurrent costs involved in networking. This is not a trivial question but it appears that networking costs will be greatest at the time of implementation but as the project matures and the process becomes institutionalized actual costs should be reduced and absorbed by participating institutions. The development of systems for managing information will also contribute to the reduction in recurrent costs in networking. Recurrent costs in information management should not occur if microcomputers are used almost exclusively.

C. Social Analysis

1. Nature and Impact of Social Science Research

The research to be managed by this project and which focuses on biophysical, social, economic and institutional issues and their integration will enhance the ability of AID planners, LDC foresters, and other practitioners to design and implement forestry and fuelwood projects or components of projects to meet rural development needs. The project outputs are listed in the Outputs section of the project paper. In general, it will concern itself with improved multi-purpose fuelwood species selection and improvement, species management and cultural practices to enhance productivity, socio-economic methods and tools, and applied socio-economic theory. The Forestry/Fuelwood project will encourage a major effort to interrelate the socio-economic and biophysical factors involved in forestry and fuelwood production to increase productivity and to enhance income opportunities. This will be done in the Asia Region through socio-economic research support in each of the species networks as well as in the Land and Forest Management Network. The avenues for integration in the LAC and Africa components will be carefully designed as Phases II and III come on line.

Some of the general issues that must be addressed are briefly described in the following discussion:

People's perceptions, values, roles, behavior and participatory systems and how they shape the decision-making process can be construed as constraints and potentials to forestry/fuelwood project success. Forestry Departments in many LDCs are perceived in negative terms by rural inhabitants. The impact on forests has concomitantly been negative. In India, concessionaires have been contracted by the government to cut trees. Reaction has, in some cases, been strong such as in the village of Reni in 1974. Twenty-seven women from the Uttar Pradesh village protected the forest from being cut. Women from other villages have since followed suit. In Africa it is important to discern priorities such as this and to understand how to thereby link extension efforts between trees and soil and water conservation.

Values are another issue that must be understood. In many areas of countries like Peru and Haiti, livestock is considered to be a "Bank." The value of the livestock can be drawn upon to enhance the family's status or to actually help the family survive in time of great need. This issue of the value of livestock is significant to many fuelwood projects because livestock grazing is a major competitor on

marginal land that might otherwise go to fuelwood/forestry production. Thus, status issues must be understood to develop more appropriate agrosilvipastoral systems.

Roles are another important variable, thus women are a group that merit more attention. Not only are they the major collectors and domestic users of wood, they are a major component in the agricultural labor force.

Participatory systems is another issue. It combines many of the preceding aspects to help us understand why people do or do not participate in fuelwood projects. What problems people perceive, what they value, what roles they have, and how they behave lend insight about how and why they organize themselves to participate in a fuelwood effort. It is also important to understand how the farmer, as in Costa Rica, makes a decision to plant or not to plant. To do this, there is a set of variables of need, risk, value, etc. that need to be identified so that more effective projects can address these variables in project design.

In many areas of Africa, the pattern of local social organization (e.g. community) may regulate lands on which planting is done; require communal action for maintenance of these lands, and allocate resources to these lands. In Peru, a major problem in project success has been the turnover of local community authorities every two years. It is important to understand that the success of communal woodlots is probably much more limited where communal organization does not exist since the dynamics of an "aggregate" of people is frequently different than that of a "community."

Socio-economic research may identify social-institutional barriers to the adoption of new technologies in forestry, suggest ways to overcome these barriers, and explore opportunities for increasing the extent of technology application. By expanding the potential scope of application, the effectiveness of other research activities is enhanced. Socio-economic research may identify marketing opportunities for tree crops, thus improving the distribution of income-generating activities among rural people.

## 2. Likelihood of Sustaining and Disseminating Results and Benefits

The collaboration of LDC and developed country scientists and institutions will be initiated or enhanced by support for networking, research planning and management, and global research activities. This project will concentrate on developing the capability of LDC institutions to address the forestry/fuelwood problems of their own country. In order

to disseminate the results and spread the benefits of this project, there will be a communications component that will be directed toward scientists (to enhance and systematize learning through publications, workshops, seminars, and other training) and policy makers (through policy dialogue on important issues related to forestry/fuelwood production and resource decision making).

### 3. Impact on Target Population

a) Impact on Primary Audience--The primary audience of this project is the cadre of working professionals who can further the evolution of their national research programs' ability to address the forest and fuelwood production and management problems of their countries. This includes foresters, researchers, and other personnel from agricultural, forestry, planning, and other institutions. The effort is oriented toward structuring and strengthening national forestry/fuelwood research capability within each region.

There are a number of good forestry researchers and institutions in the LDCs. However, there are a number of gaps in the field of forestry/fuelwood production and management that will be addressed through this project. For example, the capacity to conduct tissue culture research on multi-purpose-tree species in most LDC research institutions is limited. This capacity will be strengthened. Forestry practitioners with social science training are relatively few. In the U.S., this kind of multi- and interdisciplinary expertise is scattered thinly among many universities and other institutions. Forestry practitioners in LDCs would benefit greatly from the opportunity to share their experiences in workshops and through periodic publications. There is a need to train LDC nationals in forestry and associated socio-economic research principles and methods, for ultimately it is these professionals who are charged with the responsibility of fostering improved forestry and fuelwood production and management in their countries. In some cases, efforts at bureaucratic reorientation will be initiated; in others, where changes are already taking place (e.g., where Social Forestry programs have been established), efforts will be strengthened. In short, this project will address the needs for building national capacity and regional networks through the specific activities described in Part I.

### b) Impact on Secondary Audience

1) General Audience--The secondary audience that will receive benefits from this project through the strengthening of host country capabilities in forest and fuelwood production and management are the rural poor,

urban poor, small rural industry, and urban industry. The anticipated impacts are:

- Improved agricultural productivity and net income
- Improved forest management
- Improved multipurpose/fuelwood species
- Improved methods to meet energy and other basic human needs
- Improved equity in access to tree and forest resources
- Improved conservation of water and soil resources
- Improved and new technologies that fit socio-economic context
- Increased local participation in tree planting and natural forest management
- Improved cost effectiveness of forest/fuelwood investments through
- improved design and implementation of projects based on research
- oriented more toward the use of local knowledge to meet local needs
- and better monitoring and evaluation to systematize and increase our learning.

As mentioned earlier, this project does not have an extension component, per se. However, many of the participating Mission projects which have a small forestry research component are larger agriculture projects with extension components. Thus, individual projects with extension activities will have access to more useful information that can be packaged and flow directly to the general population.

2) Role of Women--A specific segment of this secondary audience that will receive benefits from this project is women. They are intimately concerned in many LDCs with questions related to forestry and fuelwood. This project will specifically encourage research looking at the role of women, the division of labor in the household, preferences, participation in tree planting and maintenance, etc. Some of the literature on women in development suggests the kind of questions that might be asked. For example, what is the relationship between resource scarcity (e.g., availability of fuelwood) and household productivity? What is the relationship between women's interest, time availability, and perception of benefits in the trees planted by their husbands and their own level so performance in maintaining those trees once planted? This may be directly related then to survival rates (if biological factors such as climatic conditions and seed viability, are assumed to be equal across cases). The question about women's knowledge of and values related to specific species must be looked at relative to the acceptance of those species. Other questions about the introduction of certain technologies (e.g., chain saws) must be addressed in terms of their potential negative impact of displacement, of women from forestry activities. Issues of women's

access and control over tree and forest products as competitive with other household and agricultural production activities, allocation of time for fuelwood collection incentives for production, etc. must be investigated. The objective of this focus will be to increase the sensitivity of researchers, foresters, policy makers, and others to the role of women in the production, protection, and consumption of the goods and services provided by forests and trees. Special focus will be placed on the production goals of households. This focus will draw researchers and decision-makers to look at the role of women in the production system and attempt to enhance the achievement of total production goals, in this case, insofar as forestry activities contribute to rural production systems.

The nature of this Social Soundness Analysis is very broad since it attempts to draw brush strokes across global issues. Social, Economic, and Institutional Analyses in the Asia Bureau Forestry Research and Development Project and future regional efforts as they come on line provide the details needed for more careful analysis of the issues at hand in each region. The Annex on Human Factors in Forestry and Fuelwood also outlines more specific social, economic, and institutional considerations.

#### 4. Social and Economic Aspects of Forestry/Fuelwood in Asia

The following provides an overview of some of the major social, economic and institutional issues related to forestry and multi-purpose tree species production and management in Asia. It is not intended as a comprehensive dealing with these problems. It does suggest, however, the kinds of problems that researchers, planners, foresters, politicians and others must concern themselves with in designing and implementing forestry and multi-purpose tree species production and management programs.

##### a) Importance/Role of Multi-purpose Trees to Target Social Groups

B. P. Srivastava, former Inspector General of Forests of India has described the multiple purposes of trees and forests:

- "Apart from providing the basic need for fuelwood, forests influence community stability by providing
- small timber for households, agricultural implements;
- gums, resins, honey, medicinal herbs, tannings, dyes, etc.;
- food in the form of fruits, nuts, berries, roots, shoots, mushrooms, etc.;
- cattle and livestock fodder;
- self-employment and income through a series of agriculture supportive activities like lac cultivation, silk worm

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rearing, basket making, bee-keeping, sale of firewood, supply of raw material for handmade paper, etc.," (Srivastava, 1980:7).

The significance of these multiple uses of forests and trees in the lives of peoples of the Third World is contrasted with the relatively uncontrolled destruction of the resource base that provides the goods and services so highly demanded. Since the turn of the century two-thirds of the forests of the Philippines have been cut; one half of India's since 1950; one half of Thailand's since 1970; only one half of one percent of Pakistan's forests remains. All Asian countries are importers of pulp and paper products in spite of their wood production potential. And, fuelwood has to be shipped from over 100 km to Delhi because of increasing scarcity (Gibbs and Romm, 1982). These figures paint a broad picture of the needs and realities of Asian peoples with regard to trees and forests.

These needs and realities are particularly acute for the poor, landless and women. It is often assumed that merely by growing more trees will help these typically marginal and unrepresented peoples. Eckholm states, however, that:

"With forest products, as with food, merely growing more produce is not necessarily sufficient to eliminate deprivation. Who does the producing, and how the benefits are distributed are equally crucial considerations ... with wood, as with other resources, buying power rather than need, determines the allocation of the traded products" (Eckholm, 1979:34).

Traditionally, forest lands with no determined ownership have been used by the landless. Land tenure is obviously insecure, so annual crops are the most rational land use alternative. Forests are, thereby, increasingly devastated to clear land for the landless. Yet, there is concern that even if food is produced, there will be no fuel to cook it.

The significance of this is strengthened when figures show that 90 percent of the rural labor force in Pakistan, Bangladesh, and Java is landless or near-landless. Fifty percent of the rural labor force in Sri Lanka and the Philippines are landless (Esman and Associates, n.d.). The dependence of these people in many areas on fuelwood for cooking and on forest products for limited commercialization must be understood by national and international forestry programming. Additionally, the role of forests and trees in providing off-farm rural employment opportunities should be carefully investigated.

b) Social Impacts of Fuelwood Use and Shortages

A major use of wood in Asia is for domestic energy consumption. In Indonesia 77.55 percent of the total domestic energy consumed comes from fuelwood and wastes (Ghosh, 1984). In Nepal,

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eighty-seven percent of the energy needs are provided from fuelwood. The implications of this use are important to understand as well as the impacts of shortages when and where they occur.

The impacts of use and production of multipurpose fuelwood trees have not been well documented. The impacts on health are basically defined in terms of smoke emissions and pests.

Smoke is considered to be a major hazard from the burning of wood in stoves or open fires. Carbon, tars from hydrocarbons, and other substances are released through the combustion process. Some research indicates that women inhale as much benzo(a) pyrene as they would if they smoked twenty packs of cigarettes a day. Irritation of the eyes and respiratory diseases such as bronchitis have been documented from studies of wood use for domestic consumption (Foley and Moss, 1983).

While smoke has been determined to have detrimental impact on health, this smoke also has been considered to be useful in ridding smoke-filled houses of termites and other pests. Pests, however, are another consideration when put into the context of wood production rather than wood consumption. Rambo (1984) explains:

"The incidence of many serious human diseases in the tropics, such as malaria and scrub typhus, is closely related to the nature of land use. In Indochina and Malaysia, for example, malaria is largely absent from both undisturbed forests and fully-developed permanent agricultural areas. In contrast, it is endemic in upland areas where shifting cultivation is practised. This reflects the fact that the vector mosquito breeds in clear sunlit streams, precisely the habitat created by the opening of swidden plots... Agroforestry projects, unless properly designed may create equally unfavorable habitats for disease vectors" (Rambo, 1984:44).

The nutritional aspects of forests and trees must also be considered. Ganguli (1980) points out that forests contribute to nutrition by providing a source of fruits, nuts, mushrooms, and other foods that add to a balanced diet. Rambo (1984) emphasized this by suggesting that agroforestry projects can contribute to the diets, especially of children, when they emphasize the production of fruit trees. These agroforestry projects can also have an adverse effect if they focus on tree cash crops. Thus, in the rare case where trees successfully compete against agricultural crops, these considerations must be addressed by project designers.

Another issue related to wood, fuel, and diet is when shortages of fuel for cooking occur. Hoskins (1979) reports that women change household cooking and eating habits. More raw foods, for example, are found in the diets of people in Nepal because of fuel shortages. These shortages are also affecting the amount of boiled water that people consume which has obvious nutritional and health impacts.

Income distribution is another impact that must be looked at in production systems where multi-purpose trees are found. There is a need to better understand the economics of multi-purpose species production. This concept should be broadened to include the distribution of benefits in general because the scope of benefits goes considerably beyond income. These benefits might include higher standard of living, prestige, improved health and nutrition, power over decision-making, greater independence, confidence, and so forth.

These are all positive aspects of a production system where trees actually contribute to rural development. For example, Rambo (1984) reports that a fuelwood production scheme in Java was of most benefit to the poor since it provided them with fuel. In this case, the rich were not particularly concerned since they used kerosene for domestic energy.

On the other hand, Douglas (1982) suggests that:

"... experience in Bangladesh shows that schemes directed at market supply in general have a tendency to deliver maximum benefit to richer groups and minimal or no benefits to poorer people. The dilemma therefore, becomes one of devising schemes which will deliver at least some significant measure of improvement in the fuel/energy flow to those most in need within the social and political constraints that apply."

In India, the production of eucalyptus is criticized by some because: its production is less labor intensive than other crops (therefore, landless workers are not in as much demand as they are in the production of other agricultural crops); it burns quicker as a wood fuel, thus more is needed for cooking; it is in great demand for paper and rayon production so that it is too expensive generally for domestic use. The argument here is that the production of this fast growing species has increased the gap between the rich and the poor in certain areas (Shiva and others, 1982).

Other changes in the distribution of benefits are found when trees become a cash crop. In many societies, women are the primary beneficiaries of wood until it enters a market economy. It is then that men become more involved and receive the monetary benefits. Again, however, it is more than income that is affected. Rambo states that:

"In contrast to many traditional Southeast Asian agricultural systems, where work is equally divided between males and females and where consequently women enjoy a relatively high social status, forestry is often exclusively a male activity. To the extent that this sexual division of labour is followed in community forestry projects, the status of women can be adversely affected. Colfer, 1981, for example, has shown how the introduction of chain saws into forest - living Dyak

communities in Kalimantan threatens the status of women in these swidden farming communities, since only men are able to use the new technology" (Rambo, 1984:43-44).

Thus, there are many issues related to the distribution of income and other benefits from natural forest management and activities dealing with the production of multi-purpose/fuelwood tree species in Asia that must be addressed.

At the same time that one looks at benefits, one must also consider resource conflicts between forest management and tree production and other land uses. For example, in Nepal, the demand for food is causing deforestation as people cut forests to clear land for crop production. This land is also demanded for livestock (cattle, pigs, goats, etc.) that are required for food, milk, transportation, draft power and the like (Wallace, 1983).

Other resource conflicts are human and financial. Human resources are needed for the planting, maintenance, harvesting, marketing, etc., of trees. These human resources are often involved in other agricultural pursuits and the seasonality of planting food crops and tree crops frequently causes conflicts in the diversion of people from planting one to planting the other.

Economic conflicts arise because of the delay between investment and profit since, even with fast growing species, actual harvesting is delayed from two to five years depending upon the end use (Hoskins, 1979). Incentive structures must be better understood to reduce these conflicts. Conflicts between industrial forestry and other forestry practices are discussed in Lundgren and Brister's (1984) paper.

Thus, resource conflicts are important concerns that merit more attention. The whole range of social and economic aspects of forest management and tree production must be given greater attention in the design of forestry projects. This is why the Ad Hoc Working Group on Forestry Research stated that there are:

"(i) three main topics that require the greatest attention, and these are: research related to the contribution of forestry of rural development, i.e., the contribution of forestry to meeting the production, income and employment needs of rural people.

(ii) research related to energy production and use, into ways and means of increasing the productivity of trees to produce maximum biomass and energy yields, and into conserving wood resources by more efficient use of wood for energy.

(iii) research related to more effective conservation and management of tropical forest ecosystems with special ecosystems and with special reference to protection of the environment."

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The answers to these common concerns across Asia are not merely technical ones, because the complexity of the human resource system in which forests are managed and trees are produced requires better understanding as well of the social, economic and institutional issues affecting management and production activities.

c) Land Use Issues and Incentives for Forest Management and Reforestation

Access to forests and trees is one of the most significant issues related to forest management, tree planting, and distribution of benefits. Those forests that are protected by Forestry Departments are basically inaccessible to rural inhabitants except through illegal action. Other lands are inaccessible insofar as tenure is insecure or where there is a difference between de facto and de jure tenurial patterns. And, in some places, access to trees themselves is difficult because of ownership laws. On the other hand, there are issues of common property access and free access to forest resources that must be considered. These land use issues are closely tied to incentives that might be used to encourage the management of natural forests or the planting of trees. Markets for the products of forests and trees exist already in places where they are no longer considered to be free goods. And, potential markets can be developed as the supply increases.

Forestry Departments in many LDCs are perceived in negative terms by rural inhabitants. The impact on forests has concomitantly been negative. In India, concessionaires have been contracted by the government to cut trees. Reaction has, in some cases, been strong such as in the village of Reni in 1974. Twenty-seven women from the Uttar Pradesh village protected the forest from being cut. Women from other villages have since followed suit (Anon., 1983).

Another account describes reaction of some tribal people of central and eastern India who have traditionally subsisted on forest lands. With government policy emphasizing commercial exploitation and with corruption among officials, huge areas of forests are cut annually. One report states that:

"The tribal inhabitants of the Singhbhum district are resisting the replacement of the *Shorea robusta*, locally known as the Sal tree, which is used for cattle fodder, for construction and for making farm and household tools, by teak, which is purely commercial timber. After a year of petitioning the Government, it was reported, the tribal people of the district began destroying teak saplings in Government nurseries and forestry buildings to press their demands. A confrontation in 1980 resulted in the deaths of 16 people, including three policemen" (Anon, 1982).

Similar cases of conflict over land use are cited in Papua-New Guinea (Waiko, 1975) and other areas.

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In other countries, other responses to Forestry Department actions have varied depending on the circumstances. Wallace describes the situation in Nepal where:

"Until 1957, when the forests were nationalized, villagers controlled the use of the forests in their localities. Following nationalization, the government was unprepared to assume the technical and administrative responsibilities of forest ownership. Besides, villagers reacted negatively to nationalization, believing that their traditional rights of access and use had been curtailed. As a result, local responsibility for forest protection disappeared. Whereas previously there had been communal responsibility for managing the forest, after nationalization no one took responsibility for managing the resource. Moreover, because there were no land records, villagers had a strong incentive to destroy the forest so that land could be claimed as private property after it was cleared and cultivated," (Wallace, 1983:224).

While there are conflicts between Forestry Department land use and that of local inhabitants, there are also internal conflicts on land owned by a single household or a village. For example, in Thailand, land in northeastern Thailand is managed for various purposes. Most intensive use and management is on areas for rice and home garden herbs and vegetables. Less intensive management ranges from cassava to livestock to fruit trees. Forests, which are used for fuel, construction poles, fodder, medicines, foods, and other products, have the least intensive management.

Thus, agriculture is a major competitor for land in spite of the fact that forests provide many important products to meet the basic needs of households. This is true of most areas in Asia not just the one in Thailand characterized here.

Not only are there conflicts over uses of land in communities but also conflicts over access among local users of forest lands themselves. The issues of land and tree tenure which this consideration implies are perhaps some of the most significant in determining the success of forestry project objectives.

The difference between de jure and de facto tenure is reflected in the response to tree planting. While designed as a community forestry activity, the project actually had to go to individual farmers who would plant on their own land and would thereby accrue the benefits. Project evaluators discovered that these were principally large landowners. The situation therefore became one where:

"It appears that the tracts of Shamlat land being offered for planting -- and assumed by the project to generate benefits for village communities -- have surreptitiously changed their tenurial status, and in fact are managed on a strictly private

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basis. Their de facto owners hope to get their "Shamlat" lands planted at full government expense, and without making any repayment commitments" (Cernea, 1981:19).

This access to land has facilitated farmer response to tree planting. The plight of landless peoples and women have been briefly discussed, but must be emphasized once again here. Their access to land, particularly, is a serious problem in Asia.

While access to land and trees is an important concern, it is one of a vast and complex array of factors that determine how and why people manage and/or plant tree resources. The incentives for management and planting are equally complex. Romm (1980) describes a number of these factors --

1. Appropriate technologies that are more productive
2. Ecological sustainability
3. Profitability
4. Security of benefits
5. "Insurance" against risk (e.g., guaranteed prices, technical assistance)
6. A functioning administrative structure
7. Policy support (e.g., tax relief for allocation of land to tree planting)

Burch (1983:10) emphasizes this point:

"Species trials and even more super trees may not really matter if farmers have already been convinced, chosen and planted a particular species -- say Ipil-Ipil. They have now a time period, and institutional structure, a certain level of knowledge, some reasonable markets, etc. They cannot be expected to jump on the next super tree bandwagon, no matter how much better adapted the new species may be. Farmers are conservative -- because it is the only means of subsistence survival. To try new risks requires a cushion of wealth and comfort usually denied our target 'beneficiaries'."

#### d) Species Assessment Research and Social Impact Analysis

The link between species assessment research and social impact assessment is described by Hasan (1978) in discussing the Bangladesh experience in resettlement of shifting cultivators:

"Suggestions have been made to grow fast-growing forest trees during the fallow periods to augment income of the cultivators in the form of firewood, building poles, pulpwood, etc. From the viewpoint of the state establishment of high yielding forest plantations, with the help of shifting cultivation, has proven economically very useful. If the cultivator has to grow and harvest his own trees, its usefulness has to be assessed from his point of view not the state" (Hasan, 1978:2).

This suggests that if the tree is mainly desired for firewood, it is most appropriate to select and manage it principally for multiple stem production. If the primary purpose is construction poles, species selection and management it should be for a straight trunk. The acceptability of a species will depend upon preferences, profit, or other factors upon which the planter bases his/her decision to plant. There are many examples around the world where undesirable trees were not planted or were destroyed because of superstition, previous negative experience, competition between trees and agricultural crops, and so forth.

Thus, we must assess the potential of the human and natural systems. We must understand what is demanded and what is actually a resource to local peoples. We must also assess who is likely to gain or lose and at what cost. And, we must assess how those resources will be distributed.

Understanding links is an essential aspect of understanding the complexity and interrelatedness of the total human resource system. This system is the complex of biophysical factors, resource practices and socio-economic factors and the processes (ecological, social, economic, etc.) which prevail in a specific context. By understanding the factors, and how they link, and the processes, planners can better analyze existing systems to enhance opportunities and reduce constraints, analyze proposed systems to determine the cultural fit of proposed activities, and to compare systems (Grandstaff, 1984) to arrive at generalizations for future planning. Ghosh (1982) described the contemporary scene of rural forestry in India as the:

" . . . complex imprint of past history. . . . The forest environment as juxtaposed to society may be interpreted to include the interface between the two. In some respects these are reasonably discrete areas, nevertheless interrelated and interdependent though often in conflict" (Ghosh, 1982:28).

It is important to keep in mind that the very nature of forestry itself, like that of other natural resource practices, is social. It engages people in highly complex social organizations to establish, maintain, protect, produce, and distribute goods and services provided by forests and trees (Parker and Burch 1984). This systemic perspective will enhance the ability of planners to design projects in Asia that are basic to the understanding of the multiplicity of factors involved in forestry activities.

#### D. Institutional Analysis

The following provides an Institutional Analysis that focuses on the Asia Region. Institution Analysis for the LAC and Africa regions will be done as future phases of the project are designed.

Historically, forestry institutions in Asia have focussed on the "protection of the interest of the state. The forest has been the

resource base for war and defense, the buffer zone between states, and the source of goods and services for a ruler's survival" (Gibbs and Romm, 1982:3-4) and "...since the Western tradition was virtually identical, the colonial era changed none of the fundamentals, merely adding one new dimension, a cash market for timber. Colonial governments also reinforced recognition of the value of timber revenues to the state's treasure" (Gibbs and Romm, 1982:4).

Priority has always been placed on commercial timber production, and in the past decade seventy-five percent of the world's hardwoods (e.g., teak) have been supplied by the nations of Southeast Asia. This emphasis has led forestry institutions and agencies to be custodial and protection-oriented.

It is only recently that these institutions have begun the process of directing themselves to development functions. For example, social forestry is being touted in India, community forestry in Nepal, and agroforestry in the Philippines. There is more emphasis being placed on extension, growth of small forest industries, and forest planning as part of national economic development strategies.

While positive, these changes in forestry institutions and agencies are only a start. Institutional barriers persist. Rhetoric about forestry for rural development far exceeds institutional ability to translate it into action. Traditional bureaucratic attitudes, negative incentives (bribes to forest officials), and lack of human and financial resources are principal reasons. In few Asian countries (e.g. Malaysia) are there strong links between national planning authorities and forestry institutions. The inability of economists and other social scientists to communicate with foresters exacerbates already existing problems. Policy analysis in forestry agencies is extremely weak and leads to limited support. Issues such as land and tree tenure and their impact on forestry programs are poorly understood as are those related to local decision-making economic mechanisms, delivery systems, and distribution of benefits (Gibbs and Romm 1982).

The institutional capacity to undertake research on multi-purpose species must be enhanced by looking at these obstacles (see below) and taking measures to overcome them.

Obstacles to research planning and execution caused by external and internal forces

Identified by Forestry Research Directors Workshop, Honolulu, 1982

[While it must be realised that the external and internal forces interaction and are not independent of each other, the separation is still useful because the internal forces can be directly manipulated while the external forces require different strategies to affect them.]

Group 1

<u>External</u>	<u>Internal</u>
Lack of political support status of and state of research.	Lack of relevant research and programme, inflexibility of plans.
Lack of qualification of recruitments.	Lack of leadership and motivating forces.
Lack of stability of staffing.	Ineffective or lack of on job training procedures.
Lack of material support by government and department (funds and facilities).	Excess of bureaucratisation/centralization.
Lack of incentives to scientists (money, recognition, rewards advanced training, public appearances, travel).	"Ivory Tower Syndrome" (institutional, disciplinary, geographic and personal isolation).
Interagency rivalry.	Dissipation of efforts and activities into meaningless projects and inefficient administrative work.
Intra and interdepartmental antagonism.	Lack of feeling or relevance.
Inappropriate priorities of problem government and departmental policy.	Lack of proper procedures of analysis, designing monitoring and reviewing.

Brain-drain to private business or abroad.

Lack of proper data and record filing, storing and retrieving procedures (files in shambles and incomplete data identification and processing).

Deficiencies in the educational systems, lack of competence in basic cultural abilities of school leavers (logic writing, motivation) and of technical and general competence and understanding of university leavers.

Group 2

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<u>External</u>	<u>Internal</u>
Lack of understanding of the principles of scientific work.	Lack of understanding of the interdependencies between the political and scientific sectors.
Lack of public recognition of relevance and urgency.	Lack of communication "scientific researcher: practitioner", no feedback.
Lack of political support of scientific research (science as alibi for foregone conclusions and decisions, short-term interests).	Lack of initiative to use media other popular means for disseminating results.
Lack of willingness to accept the risk of uncomfortable results on the part of politicians or other donors.	Lack of provision for result transfer in research projects proposals "Ivory Tower Syndrome", use of unintelligible jargon in writing, isolation from reality, of avoidance non-scientific audiences.
Traditional thinking and attitudes.	
Dogmatic, empirical approaches in practice dominating	Lack of understanding of the relationships between scientific research, technical development and practical application.
No provision of suitable demonstration and verification trials.	Lack of experience, lack of knowledge in information science.

Lack of compatibility of donor's objectives and scientific research needs.

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(Source: Bruning, 1982)

(Source: Report of Ad Hoc Study Group on Forestry Research. 1984).

Many Asian foresters will readily admit that the real problems they must deal with are social, economic, and institutional, not technical. Yet in few forestry institutions are there social scientists or economists to address these "real" problems. Even where they do exist, there is a tendency to focus on the farmer alone, omitting the role of other family members. For example, surveys of local people in India suggest that trees were most important for shade, agricultural implements, and fruit. These responses did not reflect a significant shortage of fuelwood in the region because the surveyors did not question the women whose main job it was to collect the ever more scarce wood (Agarwal, 1983). While some research is being done, there is still a great deal of distrust and political opposition to social scientists and social surveys.

There are some institutions in Asia where more multidisciplinary research is being done (e.g., University of the Philippines at Los Banos, Dehra Dun Forestry Institute in India, and Kasetsart University in Thailand). As a result there has been a trend away from conventional production forestry (which was concerned mainly with technical solutions) which has created an increasing need for forestry practitioners who better understand people and their relationship to trees (Rambo, 1984).

Gibbs and Romm (1982) describe the nature of this move away from traditional forestry. They state that:

"Throughout Asia, government forestry institutions are evolving rapidly from a purpose of state custodianship toward more specialized developmental functions. The effects of this can be seen in the progressive division of functions, organizations and approaches that are emerging from a common custodial heritage" (Gibbs and Romm, 1982:4).

They give as examples the new strength of private and public corporations for economically sound commercial forestry production, new community fuelwood projects in every Asian nation except Malaysia, forestry extension programs, and new policies to encourage forestry for regional development.

The very nature of the "new" forestry for local development emphasis is documented by FAO and other donor organizations. Barin Ganguli (1980:36), now at the Asian Development Bank, suggests that:

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"The main thrust of research should ... be on sociology and extension methodology which will aim to identify 'demonstration' centres to be used as growth centres for motivation, to devise means to capture the experience of the Forest Department and people, to enable the programme to be successful for local development and devise means to translate these experiences into action programmes."

This is a critical period of transition for traditional forestry in Asia. It is a period of diverting efforts and investments into new activities that focus on the role of forests in socio-economic development. The success of these efforts depends upon improved knowledge about social, economic, and institutional constraints to forestry and multi-purpose species research. Socio-economic research can provide a substantial contribution to capturing existing knowledge, reconceptualizing and assessing the nature of problems (institutional, organizational, policy, social, structural, economic, technological, and biophysical) and the context in which they exist, and understanding the factors (e.g., behavioral, normative, management) impinging upon the successful design and implementation of forestry and multipurpose species programs (Burch, 1983). However, this will require a commitment to improving the problem solving capability of national and international research institutions. More strategic approaches must be developed to strengthen existing institutions or create new ones if appropriate. Creativity must be nurtured in the scientific community through investments in research and incentives for researchers. Training will be required. Political backing is an important prerequisite to forestry as an activity in socio-economic development. Regional cooperation is required through twinning and networking. International development assistance is essential. And, time is key to successful efforts (Report of the Ad Hoc Study Group on Forestry Research, 1984).

#### E. Environmental Analysis

Several environmental models have been reviewed to determine if they are suitable, either singly or in combination, for use when considering introductions of exotic species of fuel-wood or multi-purpose trees into new geographical areas. If one or more of these models can be used to predict with greater reliability the probability of making successful introductions, then costly "trial and error" introductions would be reduced or eliminated, and use of exotic species could be considered a viable alternative to strict reliance on native species.

Environmental models that were looked at closely include the Koppen System, the Thornthwaite Classification System, the Global Environment Monitoring system, the Holdridge System, and the Benchmark Soils System. Except for the Benchmark Soils System, each relies on techniques that relate climax vegetation to long-term climatic patterns. The Benchmark Soils System relies on soil

classification to indicate soil property relationships among broad groupings of soils at the family level.

A potentially workable system would be a combination of the Holdridge System to describe bioclimatic zones and the Benchmark Soils System to describe existing soil conditions as a basis for predicting the use of exotic species in new geographical areas. A computer based system to accomplish this has been developed by the Commonwealth Scientific Industrial and Research Organization (CSIRO) in Canberra, Australia, but this new system should be further evaluated before it is recommended for broad operational use.

No environmental assessment is required, according to AID's revised Environmental Procedures, 22CFR Part 216.2(c)(2), as the project consists of analyses, studies, research, training, and information transfers.

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Glossary

ADC	Agricultural Development Council, Inc.
AFR	Africa Region
AID	Agency For International Development
AID/W	Agency For International Development In Washington
CATIE	Centro Agronomico Tropical de Investigaciones y Ensenanza
CFI	Commonwealth Forestry Institute
CGIAR	Consultitative Group For International Agricultural Research
CSIRO	Commonwealth Scientific And Industrial Research Organization.
DBMS	Data Base Management Systems
EN	Energy and Natural Resources Directorate
FAO	Food and Agriculture Organization
F/FRED	Forestry/Fuelwood Research and Development
FENR	Forestry, Environment, and Natural Resources
HR	Human Resources Directorate
ICRAF	International Center For Research In Agroforestry
IDRC	International Development Research Center (CANADA)
IUFRO	International Union Of Forest Research Organizations
LAC	Latin America And The Caribbean Region
LDC	Less Developed Country
LOP	Length Of Project
MPTS	Multi-Purpose Tree Species
NFTA	Nitrogen Fixing Tree Association
NIFTAL	Nitrogen Fixation by Tropical Agricultural Legumes

**PSC**                    **Personal Services Contractor**  
**RD**                    **Rural and Institutional Development, Office Of**  
**RFP**                    **Request for Proposal**  
**RSSA**                   **Resource Services Support Agreement**  
**S&T**                    **Bureau For Science And Technology**

APPENDIX 1

IMPLEMENTOR(S) SELECTION CRITERIA, QUALIFICATIONS,  
AND RESPONSIBILITIES

The following outlines the selection criteria, qualifications, and responsibilities for all procurement mechanisms.

A. Implementor(s) Selection and Qualifications

1. Contractor (AFRSC)

The following four criteria will be used to select the Asia contractor: personnel qualifications, organizational capacity, technical approach, and institutional experience.

The following factors will be considered in evaluating these criteria:

(a) Personnel Qualifications.

(1) Previous long-term field experience in developing countries, especially Asia, in forestry research, networking, research management, and implementation and management of projects.

(2) Expertise to accomplish the varied activities of the project; adequate explanation of where expertise is found in bidding institution(s) and how it will be made accessible.

(3) Skills of staff in areas of required expertise with a reputation for innovative networking, research planning and management, training, global research, information management, research, and implementation.

(b) Organizational Capacity

(1) Capacity to manage a complex project of this type including: overall planning, task development, task assignment and tracking, cost control and management mechanisms for making staff available on flexible time schedule, hiring temporary staff, and subcontracting for needed services.

(2) Ability to provide support staff and facilities at the headquarters of the project.

(3) Ability to rapidly assemble skilled teams for field assignments with adequate administrative and scientific back-up support.

(4) Capacity to produce a sound work plan for the effective use of resources to accomplish project objectives; for inter-institutional bids, the ability of institutions to jointly manage and allocate tasks.

(c) Technical Approach

(1) Technical competence in research disciplines related to selection, improvement, and management of multi-purpose tree species.

(2) Technical competence in developing information management systems.

(3) Policy analysis capabilities on a wide range of natural resource issues.

(4) Ability to provide an inter-disciplinary and integrative approach to meeting the goal and purpose of the project.

(5) Ability to address: (i) complex biophysical and socio-economic issues related to development in LDCs and (ii) related problems in agriculture, energy, environment, and forestry which contribute to the fuelwood problem.

(d) Institutional Experience

(1) Experience in long-term or large-scale technical assistance programs in Asia or, as a second preference, in assistance programs in other regions.

(2) Experience in networking, planning, and management of research, research support, and implementation of forestry/fuelwood projects in developing countries.

(3) Experience in working collaboratively with host-country institutions, and experience in strengthening such institutions.

(4) Experience in the management of workshops, seminars, information exchange, and coordination of research efforts.

(5) Institutional experience in addressing the role of women, the landless, and other marginal groups.

2. Personal Services Contractor (PSC)

(a) Doctorate degree in forestry or forestry-related specialty.

(b) At least five-years experience in forestry research beyond the doctorate level with at least two additional years experience in management of interdisciplinary research.

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(c) Familiarity or experience with projects or programs in international forestry, agroforestry, and fast-growing multi-purpose trees.

(d) Experience in dealing tactfully and diplomatically with high-level officials in government agencies and host-country universities.

(e) Demonstrated skills in written and oral communication.

(f) Willingness to be stationed overseas

3. Cooperative Agreement with the Agricultural Development Council, Inc. (ADC)

(a) Broad experience in development and management of social science networks.

(b) Familiarity with existing social science/natural resource-related networks in Asia and with key social scientists and institutions in the region.

(c) Strong administrative support.

(d) Sufficient background in social science related aspects of forestry and natural resources to evaluate capabilities of LDC institutions for participation in the Species Networks and the Land and Forest Management Network.

(e) Demonstrated ability to work cooperatively in a multidisciplinary team.

4. Cooperative Agreement with NIFTAL - University of Hawaii; NFTA

(a) Broad experience in the development and management of biological networks.

(b) Familiarity with existing forestry and forestry-related networks in Asia, primary forestry research institutions in Asia, and key scientists working in the region.

(c) Strong administrative support to assist the Asia contractor (AFRSC) in acquiring knowledge of research on fast-growing, nitrogen-fixing, and multi-purpose tree species.

(d) Broad experience in, and knowledge of worldwide testing efforts to improve genetically fast-growing, nitrogen-fixing, and multi-purpose tree species.

(e) Sufficient background in forestry research and research management to evaluate the research capabilities of LDC institutions for participation in Species Networks.

(f) Demonstrated ability to work cooperatively in a multidisciplinary team.

5. Senior Technical Advisor

(a) Masters Degree or higher in social ecology or closely related specialty.

(b) Two years or more field experience in a developing country working in social ecology or related area.

(c) Research management experience.

(d) Familiarity or experience with social science aspects of projects or programs in international forestry, agroforestry, or fast-growing, multi-purpose tree species.

(e) Experience in dealing tactfully and diplomatically with officials in government agencies and host-country universities.

(f) Demonstrated skills in written and oral communication.

B. Implementor(s) Responsibilities

1. Contractor (AFRSC)

General Guidelines: The contractor will be responsible for:

(a) Research planning and management

(b) Species and Socio-economic Network development and support in coordination with other cooperators and contractors

(c) Global research support (integration of information from regional research networks and other data sources, and technology transfer) See Pages 13 - 18

Specific Contractor Responsibilities

(a) Research Planning and Management

(1) Country-Specific Forestry Research Sector

Assessments and Plans - The contractor will assist LDC governments in Asia in formulating and designing: 1) national forestry/fuelwood research programs that address biological, sociological, and economic research topics; and 2) institutional and management frameworks that help countries formulate policies, programs, and projects that enhance research program implementation. Specific assistance will include: technical assistance in defining research policy needs and issues; training curricula in research techniques

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and data interpretation; conducting workshops for host and donor investigators for dissemination of research results; and participation in joint donor program reviews and preliminary project identification.

(2) Institutional Specific Guidelines and Plans for Research and Management: The contractor will work with LDC Institutions to develop a quality research organization (e.g. adequate facilities, trained personnel) that can function effectively to conduct research on multi-purpose/fuelwood species and related forestry and socio-economic issues to facilitate achievement of forestry management objectives in rural and agricultural development.

The contractor will work with National forestry research institutes to develop a new emphasis in their program on multi-purpose/fuelwood tree species with strong integration of biophysical and socio-economic factors.

The contractor will work with institutions to address the issue of integrating forestry into agricultural systems research. This will complement resources that Asia Missions have programmed for institutional development and will assist Missions in developing concepts for forestry or agroforestry research activity.

(3) Regional Research Planning, Evaluation, and Related Training: The contractor will assist in the establishment of regional research priorities; mechanisms for collaborative regional research, including networks; the development of regional information management systems; and improved understanding of essential elements of effective research planning and management. In Asia, this effort will follow recommendations made at the Asia International Union of Forest Research Organizations (IUFRO) conference held in Sri Lanka.

The contractor will assist in the identification of successful approaches to evaluate the impact of introducing new tree species.

The contractor will be responsible for developing and conducting training courses for a cadre of experts from Asian countries in the planning and management of research in forestry and natural resources. The objective is to begin developing a core group within any one country that has a shared and informed perspective of the economic, social, technical and environmental issues involved in the planning and implementation of forestry and related natural resource projects.

In developing the training program, the contractor will utilize models of the forestry and bioresource systems for instructional purposes and/or application in analyzing policy and program decisions in specific countries of the region.

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(4) Information Management Systems - The contractor will develop an integrated approach to the management of regional and global forestry/fuelwood research information. The contractor will assist in the continuing development of data base activities, such as the multi-purpose tree species data base being developed by the International Council for Research in Agroforestry (ICRAF). The contractor will provide guidelines for information management systems that support research coordination, networking, training, and technical backstopping activities at all levels within countries and will facilitate the flow of information horizontally, between countries within the region.

The contractor's responsibility here is to improve selection of priority research problems, reduce redundancy in field research, establish standards for conducting research, and increase output of useable data from field projects. The contractor will assist lead network institutions in providing rational bases for planning, decision-making and policy change.

The contractor will develop or adapt frameworks for data organization to accommodate varying levels of decision making and will conduct data base design workshops which will be organized for different levels (project, national, regional, etc.).

The contractor will facilitate the transfer of technology by making available condensed, well organized and readily accessible summaries of key information on specific subjects related to the Project objectives.

(b) Network Development and Research Support:

As a start-up activity of this project a Cooperative Agreement with NIFTAL - University of Hawaii; NFTA will be initiated to evaluate each of the ten species networks identified at the IUFRO meeting in Sri Lanka for their feasibility to succeed as a network and to meet project goals. The Cooperator will provide recommendations to AID/W project management on priorities of species networks for development and research support from AID. AID/W project management will then provide the contractor with guidelines for implementation of from one to three species networks.

The contractor will assist in the establishment and/or maintenance of National and regional networks of forestry/fuelwood and associated socio-economic research activities. The contractor will facilitate linkages between LDC and U.S. scientists and institutions (twinning) and with institutions in other developed countries. The contractor will identify and strengthen linkages between forestry research institutions and socio-economic research institutions, between forestry research institutions and agricultural research and

extension agencies, between forestry research institutions and national policy makers, and between AID and other donors. The contractor will work in collaboration with projects developed in the Asia Regional Bureau and with ongoing and proposed Mission projects.

The contractor is responsible for the following activities in implementing the species networks:

Network Meetings and Site Visits - The contractor will implement the networks with a series of network and theme meetings such as planning conferences, which will provide forums for discussing work plans, budgetary needs, and methodological issues related to standardization and comparability of results. The contractor will facilitate site visits as an opportunity for collaborators from other countries to see at first hand the facilities and experiments at the host facility and, more importantly, provide for peer group review. The contractor will schedule these formal and informal meetings as needs arise and as they are identified by members of the network.

Newletters and Publications - The contractor will develop newsletters to convey network information on past and current events as well as to provide advance information on upcoming network activities and to assist in the publication of completed research results and research methodologies. They will meet all AID requirements for newsletters and publications.

Training - The contractor will design the training component of this project to address issues related to the design and conduct of research, the interpretation of results, and the administration of research. The contractor will work with members of the networks to determine specific training activities and will address specific objectives within the scope of this project. The contractor will direct training directed at different audiences, i.e. administrators, policy makers, scientists, and practitioners.

Special Research Support - The contractor will provide special support through short and long-term technical assistance. This will be supplementary to support from the various missions, Asia Bureau, LDC governments and other bilateral and multilateral donors.

Network Coordination - Over the life of the project, the contractor will work with LDC research administrators and scientists, with mission representatives and with representatives of other donor organizations to coordinate network activities, both within and among the networks that will be operating in each region. The contractor will work with the long term Field Project Coordinator to perform these functions.

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(c) Global Research

The contractor will develop, collect, analyze and synthesize research information from all regions to encourage and support activities in selected research support areas that have global application, such as multi-purpose/fuelwood tree selection and improvement; biotechnology; environmental models; and socio-economic research guidelines, methods and tools.

In the selected global research areas, the contractor will develop guidelines, state-of-the-art manuals, workshops for the exchange of information, and special training.

The contractor will utilize these functional global research areas to ensure exchange of information across the various species networks through the use of special workshops, meetings, or publications directed at these functional areas (e.g. biotechnology, soil fertility).

The contractor will synthesize research information on a global scale to: (1) provide technology assessments, (2) refine research needs, and (3) integrate both existing and new information for the development of research models that will define and evaluate further research needs.

Contractor Professional Staff (Figure 2, Page 28A)

1. Director, Asian Forestry Research Services Contract (AFRSC)

The Director, AFRSC will be:

(a) located in the Washington, D.C. area in proximity to the offices of the Project Manager.

(b) responsible for all contract obligations on a day-to-day basis (full time)

(c) responsible for reporting to the S&T Project Manager for global activities and to the Asia Project Management Team for Asia activities.

2. Research and Development (R&D) Director

One specialist (half-time) responsible for global concerns relative to Data Base Management Systems (DBMS) modeling and integration and with short-term technical backstopping from specialists in R&D design, networking, and training.

3. Species Network Advisor

The Species Network Advisor will be:

(a) a specialist in tree species networking

(b) responsible for establishing 2-3 proposed Multi-purpose Tree Species (MPTS) Networks in support of MPTS research

The Species Network Advisor will:

(a) help to identify and involve participating institutions and scientists

(b) facilitate network organization and management

(c) participate in the development of technically sound workplans

(d) arrange for administrative and technical support to carry out research and development programs of the several different species networks

(e) collaborate with the ADC Land and Forest Management Network Advisor

(f) in advance, through the Personal Services Contractor, notify all AID Missions of travel to a particular AID country.

(g) develop a mechanism for forming cross cutting linkages with various IUFRO networks in Asia.

4. Other specialists for short-term assignments as listed in the AFRSC contract.

5. AFRSC will be expected to subcontract services from developed country consultants and organizations if they have unique talents that enhance the accomplishment of project purposes. This will be permitted following a nationality waiver on geographic code 935.

2. Personal Services Contractor (PSC)

(a) Responsibilities:

(1) Assists the Director, AFRSC in planning, implementing and monitoring project activities in Asia region.

(2) Serves as the liaison with Asia Missions, host-country institutions, and representatives of other donor agencies involved in forestry/fuelwood research to facilitate link up to the F/FRED project.

(3) Provides leadership for contractors and cooperators in implementing new networks and providing support for those already in existence. Members of team report directly to him/her.

(4) Helps lead network institutions in developing and strengthening species networks.

(5) Coordinates all field activities of contractors and cooperators.

(6) Works closely with network institutions and Missions to help: (a) develop quality research proposals to address high priority research needs; (b) coordinate all network projects including those involving other donors in region; and (c) promote effective networking, technology transfer, and institution building.

(7) Works closely with Project Manager in AID/W.

(8) Provides support to AID missions and the species networks on the full range of technical and socio-economic research issues.

(9) Provides acceptable written reports as specified in his contract.

(10) Provides assistance to the AFSRC contractor in developing annual plans of work for technical assistance and network support for review and approval in Washington.

(b) Conditions:

The PSC will:

(1) reside in Thailand.

(2) have access to Mission cable facilities but will generally use commercial channels when cabling network participants and AID/W.

(3) be funded by Asia Regional Project and will report directly to the Project Management AID/W.

(4) obtain clearance from all AID missions in advance of travel to a particular country.

3. Cooperative Agreements

(a) The Agricultural Development Council, Inc., will:

(1) Develop and coordinate a well-reasoned research program in social, economic, and environmental aspects of land and forest management in Asia.

(2) Build increased human resource capability to carry out this research and translate it into effective policies and programs in conjunction with ongoing or soon to be developed species research networks.

(3) Build on existing network of economists and natural resource planners in Asia (Thailand, Nepal, Indonesia, Bangladesh, and the Philippines).

(4) Establish a regional program focusing on systems for managing land, trees, and other local common property resources and integrate with ongoing or soon to be developed species research networks.

The program will consist of the following main activities:

(1) Research awards to Asian scientists and managers for field research and policy analysis.

(2) Short-term training in Asian institutions for young, prospective scientists and managers.

(3) Limited graduate training in U.S. programs.

(4) Workshops, seminars, and publications to support information exchange, integration, research planning, and methodology development.

(5) Technical assistance to scientists and institutions in the species research networks in research design, implementation, and evaluation

(b) Cooperate with the Nitrogen Fixation by Tropical Agricultural Legumes Project (NifTAL - University of Hawaii; NFTA)

#### General Responsibilities:

(1) As a start-up activity of F/FRED, AID considers this 9-month CA as a means to begin immediate review of potential networks and to provide an entry point for the primary contractor. This preliminary network evaluation work will gain valuable time while the process of selecting a primary contractor is being completed; will provide a mechanism for identification of on-the-ground needs and capabilities of LDC institutions, existing networks, and socio-economic factors which might influence success; and will provide an opportunity to familiarize LDC institutions, USAID Missions, and other donors with F/FRED.

(2) During the first six months, the Cooperator will coordinate all field evaluation and data collection with the Agricultural Development Council, Inc. (working under a

separate Cooperative Agreement), including travel and meetings.

(3) During the second phase of 3-months' work, the cooperators will coordinate reporting activities and development of recommendations and provide AID/W project management with a comprehensive report.

**Specific Tasks:**

(1) Select individuals from NIFTAL and the Nitrogen Fixing Tree Association (NFTA) who will be permanently assigned to the 9-month activity.

(2) Prepare a joint work plan with ADC. This work plan will include evaluation criteria for:

- Lead network institutions
- Secondary participating institutions
- Personnel
- Facilities
- Equipment
- Existing and planned research programs
- Ongoing research projects
- Proposed research projects
- Government support (e.g., policy, budget)
- Areas of biophysical and socio-economic research interest
- Past experience with species research and level of experience
- Training capabilities
- Training needs
- Existing information management systems
- Research planning and management capabilities
- Quality of overall R&D design capabilities
- Field research capability
- Communications capability (telex, cable, phone)
- Technology transfer capability (publications)
- Level of participation in existing networks
- Opportunities and constraints to expand participation in international workshops, etc.
- Other donor support (existing and anticipated)
- USAID bilateral project potential (energy, forestry, agricultural projects that can be tapped) for research funding and extension of results
- Opportunities for agricultural and other non-forestry institution participation

(3) Travel to AID/W for workplan review and approval by the Asia project management Team.

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(4) Travel to host countries to evaluate capabilities (based on workplan) of existing and proposed multi-purpose tree species networks identified at the Sri Lanka IUFRO meeting.

(5) Provide report of analysis of networks, including analysis of network support activities that will be needed for each species network over the first five years and a preliminary estimate of expected achievements and costs. This should include the need for workshops, training, education, information needs, and technical assistance.

#### 4. Senior Technical Advisor

Responsibilities to the F/FRED Project:

(a) Provide technical and training support to S&T's Forestry/Fuelwood Research and Development (F/FRED) Project.

(b) Act as the Senior Technical Advisor to the Project Manager in her/his areas of expertise.

(c) Help identify, organize, and synthesize existing social science theoretical and methodological knowledge related to forestry and natural resource activities in LDCs with special emphasis on fuelwood production and help identify gaps that can be addressed by interdisciplinary research efforts in the field.

(d) Write technical papers, analyses and studies in her/his field of expertise to assist the Project Management Team and the Asia Field Team.

(e) Provide technical support, especially on social ecology.

(f) Participate in evaluations of the F/FRED Project and related forestry/fuelwood projects in her/his area of expertise.

(g) Review and comment upon Project initiatives in areas of expertise and attend formal reviews of documents as a technical resource person.

(h) Serves as technical resource person on intra-agency and external consultative groups in areas of expertise.

(i) Identifies external technical resources in social ecology, rural sociology, natural resource economics, and related fields as required by Agency entities in Washington and by Missions.

(j) Provides technical assistance to field Missions in identification, design, implementation, and other elements of the project cycle in areas of expertise under the F/FRED Project.

(k) Initiates contact with non-Bureau personnel and promotes use of Project resources consistent with work plans and within personnel and financial constraints.

(l) Keeps abreast of literature and current practices in fields of expertise in order to ensure state-of-the-art approaches in projects/activities.

(m) Serves as expert advisor to the Project on social ecology.

INTERNATIONAL COUNCIL FOR RESEARCH IN AGROFORESTRY

(ICRAF)

Collaborative and Training Programs

Agroforestry Research Network

for Africa

(AFRENA)

- Sub-humid Bimodal Highlands Zone -

Unsolicited Proposal

from ICRAF

- PRESENTED TO USAID/S&T/FENR -

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## EXECUTIVE SUMMARY

In the highlands of East and Central Africa, the need to feed a rapidly burgeoning population has led to widespread natural resource deterioration. Traditional forms of agriculture are no longer adequate to meet food production requirements and maintain environmental stability on which agricultural productivity rests.

Under these circumstances, the agroforestry approach of incorporating woody perennials into existing farming systems constitutes a sound practice, given the potential of trees to produce food or fodder in combination with fuel or timber, as well as to protect soils, and even restore soil fertility.

The scarcity of knowledge on existing and potential agroforestry technologies stems from the relatively recent "re-discovery" of agroforestry, and the corresponding lack of institutional capabilities to confront pressing land use problems requiring an innovative approach.

Furthermore the seed that is available for use in agroforestry is either scarce for various species, and for other species the quality and source of seed is dubious.

The research undertaken in this project is aimed at improving species/agroforestry technologies with a selected number of species, and to produce seed from superior trees based on selection criteria developed for each tree species.

The process involved in conducting research for MPT species selected in this project is viewed as a continuum, and the amount of time required to achieve results for a particular species is dependent upon the amount of information available for that species.

The multidisciplinary nature of research on the agroforestry approach to land use requires the combined use of resources available in institutions from the agriculture and forestry sectors. Networking is the appropriate operational model to bring together these various disciplines, given its flexible nature and potential for using available resources in a complementary fashion.

The project is to be conducted under a 5-year cooperative agreement with an evaluation occurring in the third year. The expected outputs at the end of the 5-year period are:

- a. Four agroforestry <sup>Technical Groups</sup> ~~Coordinating Committees/Mechanisms~~ (one per country) trained in agroforestry research;
- b. A master plan for network development;
- c. Establishment of MPT species/agroforestry technology network in up to four countries;

- d. Increased production of genetically improved seed for 3-10 selected MFT species;
- e. Identification of location or country specific agroforestry research problems.

In accomplishing these outputs, collaborative efforts are envisaged with other donors (e.g., GTZ, IBRD, IDRC, CTFT, the Swiss Development Corporation, etc.) to enhance the production of improved seed, and with CGIAR institutions (ILCA, ICRISAT, and IITA) to develop agroforestry technologies.

I. Goal:

To improve sustainable agricultural productivity through greater adoption of agroforestry technologies compatible with local land-use conditions thereby increasing national capability for food self-sufficiency in Africa.

II. Purpose:

To promote better land-use applications by developing national capability to put in place appropriate agroforestry technologies as part of a pragmatic integration of agriculture and forestry.

III. Objectives:

- A. To compile and disseminate information on the needs, actions and potential for agroforestry in the sub-humid, bi-modal highlands of East and central Africa.
- B. To assist in the development, establishment and coordination of agroforestry research network in the ecozone focusing on agroforestry technology, multipurpose tree species and tree improvement trials.
- C. To collaborate with and support national and international research institutions in the ecozone in the conduct of agroforestry technology, multipurpose tree species adaptation and tree improvement trials.
- D. To assist national and international institutions and agencies in the choice and acquisition of quality seed for multipurpose tree species as components for agroforestry research efforts.
- E. To assist national institutions in strengthening the capability of their personnel resources to evaluate land use systems and apply agroforestry technologies to overcome identified constraints and improve productivity and sustainability.
- F. To facilitate consulting services and advice for agroforestry in LDCs.

#### IV. Outputs:

The expected outputs of this project will accrue throughout the five-year life of project in five categories:

A. Four Agroforestry Technical Groups (one per country) trained in agroforestry analysis of land-use problems, *and* agroforestry research design and implementation with the latter emphasizing species and technology trials.

B. A Master Plan for agroforestry network development including:

1. preparation of a hard copy state-of-the-art report on agroforestry development for each country.
2. preparation of an ecozone-wide agroforestry assessment.
3. preparation of a prioritized plan for agroforestry research actions.

C. Establishment of high priority agroforestry technology trials with selected multipurpose tree species and in up to four countries in the ecozone.

D. Tree improvement trials leading to the eventual increased production of genetically superior multipurpose tree seed for identified agroforestry technologies.

E. Identification and prioritization of location or country specific agroforestry research problems.

#### V. Activities:

##### A. MASTER PLAN FOR NETWORK DEVELOPMENT

This activity will involve integrated planning and analysis among national institutions, and will analyze prevailing land-use systems in the ecozone to provide elements for decisions on the focus of agroforestry research and to propose organizational structures to conduct the research. Master plan development, leading to research implementation and network development will be undertaken according to the following approach:

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1. Mobilization, Promotion, Organization and Information Gathering

This activity will be guided by ICRAF specialists, assisted by the Data Appraisal Team for Africa (DATA, constituted by junior scientists recruited and supported through an IDRC funded project.) and will include the early participation of the Zonal Coordinator. This team will be charged with:

- a. Identification of participating national institutions from the agriculture and forestry sectors.
- b. Developing the organizational framework for multi-institutional cooperation in the planning and implementing of agroforestry research projects within each country, including the designation of national coordinating committees/mechanisms.
- c. Defining objectives, structure, and operational procedures for a zonal agroforestry research network.
- d. collecting and analyzing secondary information on land use systems (LUS) in the ecozone.
- e. selection and development of a training module for the Land Use Systems Analysis Training.

2. Introduction to Agroforestry networking and training in LUS analysis.

This activity will be carried out using the module developed above with the participation of all National Technical Group members from the four countries (15-20 scientists) employing study materials developed by ICRAF's multidisciplinary team.

The seminar will focus on the application of ICRAF's Diagnostic and Design Methodology. Country representatives in the ecozone are expected to participate in all steps of research planning: pre-diagnostic data evaluation, field diagnoses, "ex-ante" design and evaluation of alternative agroforestry technologies, and project formulation.

### 3. Country-specific Land Use Systems Analyses

Further in-country analysis of existing LUS will be undertaken by the members of the National Technical Group in each country with periodic backstopping by ICRAF's Core Staff and the Zonal Coordinator. This activity will result in the preparation of a hard copy state-of-the-art reports on agroforestry for each country which will include:

- (a) identification and mapping of the major environmental regions of the country.
- (b) quantitative description of the major land-use systems of each region, including their extent.
- (c) identification and quantification of the nature and severity of problems faced by these land-use systems, including both problems of the farmer (or other land user) and problems of the environment.
- (d) quantitative description of existing agroforestry systems and practices, traditional and modern, to be found in the country.
- (e) summarize the present state of the capacity for agroforestry research in the country, including:
  - research stations and their environmental conditions
  - details of current research, and
  - principal results obtained.

## B. RESEARCH NETWORK DESIGN AND IMPLEMENTATION

### 1. Priorities identification workshop

This workshop will be held in Nairobi with the participation of all Technical Group from the four countries. Under ICRAF guidance, country-specific LUS analyses will be discussed; common problems and proposed agroforestry interventions will be identified and prioritized. Research priorities will be determined in accordance first, with their importance at the national level, and second, by their regional significance. The end result will be an ecozone wide action plan encompassing:

- (a) selection of ecozone significant agroforestry technologies and target species to be used in testing the technologies.
- (b) an additional list of location or country specific research actions.
- (c) preliminary discussion of selection guidelines for superior seed trees.

## 2. Research design and methodology training by country.

Using materials developed by ICRAF, National Committees will be trained in research design methodologies to be used to address problems and suggested agroforestry interventions identified above. Research design workshops will be held in each country sequentially depending on the level of each country's mobilization capability. Specific topics will include:

- a. development of a comparative testing and research design methodology compatible with international standards which may be employed for establishing trials and perhaps to rationalize on-going or existing trials.
- b. Development of seed collection and handling protocol for species in the following four categories:
  - locally utilized well known species (e.g., Grevillea spp., Maecosopsis spp.)
  - locally utilized little known species (e.g., Erythrina spp., Calliandra spp.)
  - unknown exotic species with excellent potential (e.g., high altitude Leucaena spp.)
  - unknown native species with excellent potential (e.g., Albizia spp., Polycias spp., Markhamia spp.)

Protocols will be implemented according to the indicative plan found in Annex .....

### 3. Research mobilization

In collaboration with local institutions, ICRAF will conduct visits to the respective countries in order to:

- a. engage required manpower resources, initiate commodity procurement and make selection of sites;
- b. verify existence and availability of nursery sites and seed storage facilities;
- c. development selection criteria for superior seed trees;
- d. initiate seed collection/procurement.

### 4. Research Implementation

The experimental phase of the species-specific and technology specific research trials will be carried out by the ICRAF recruited agroforestry research manager and the national committee implementation teams utilizing the operational funds earmarked under the project budget. Technology-specific projects will be of a multi-station type with some on-farm testing in collaboration with national and international programs. The location or country specific projects will be conducted on-farm.

The following three pronged approach is recommended for conducting agroforestry research consisting of:

- a. the selection of promising agroforestry technologies for identified priority land-use problems based on an evaluation of their adaptability to local farming systems..
  - Consideration of appropriate management and/or cultural techniques based on an assessment of farmer preferences for both crop and tree outputs.
  - The collection of yield data and information on interactions among crops and trees in the agroforestry systems will be used to revise agroforestry configurations and provide parameters for assessing the performance of agroforestry tree crop combinations.
- b. The choice of species/provenances of indigenous or well adapted exotic species to be tested in agroforestry configurations identified above.
  - Selection of seed trees from within provenances of indigenous species or well-adapted exotic trees based on selection criteria geared to compatibility with agroforestry applications.

- Corroboration and/or applied research on seed handling and nursery techniques for seedling production should be conducted to enable successful planting of these tree species.
- c. Basic research with promising species involving:
- procurement of seed of the desired tree species; formulation of experimental designs(s) needed for conducting and evaluating field trials.
  - establishment of species/site trials; maintenance of field plots and collection of data that is subsequently analyzed under ICRAF guidance.
  - Outstanding species can be incorporated into the operational seed orchard program, or species/provenance trials can be started for additional testing of promising provenances before incorporating them into the production/applied phase of such a program.
  - Management trials. (e.g. coppicing, to be conducted in the future.

The advantage of this <sup>approach</sup> is that planting programs with known species can be initiated immediately, thereby making it possible to address pressing planting needs. This also contributes to research for the improvement and/or development of nursery techniques and cropping methods needed for enhancing production. Basic research conducted to identify new species and initiate tree improvement work makes it possible to further increase productivity of agroforestry plantings.

### C. IMPROVED SEED SUPPLIES

Criteria developed per the above for selecting the best species, the best provenances, within species and superior trees within a provenance will lay the groundwork for eventual large scale improved seed production. Work will be initiated which will lead to the establishment of seed orchards aimed at producing genetically improved seed. In some cases this can be done by simply converting adequately designed species trial plots into seedling seed orchards or establishing grafted seed orchards. Having developed criteria for particularly promising agroforestry species, funding is envisaged for complementing known on-going national/donor seed improvement/seed production efforts (e.g. GTZ/KARI, Swiss/Butare, CTFT/Burundi).

## D. INSTITUTIONAL DEVELOPMENT

### 1. Establishment of coordination mechanism

In order for the envisaged concerted cooperation to become functional, there is a need to develop institutional "niches" that advance such an objective within and among countries, as well as between countries and external agencies. As mentioned before agroforestry research requires structures that promote joint efforts by institutions from the agricultural and forestry sectors for integrated planning and pursuit of common goals.

To satisfy such a principle, it is foreseen that concerted co-operation could be achieved by some kind of National Mechanism committee constituted by representation from government organizations from both the agriculture and forestry sectors dealing with research, extension, development, and training. In each country, the Technical Group will be responsible for setting up and implementing an agroforestry research plan and should preferably be given the authority to allocate funds that encourage complementary and co-operative research projects to be implemented by member institutions. Networking among countries within the ecological zone will be achieved through project sponsored zonal meetings composed of representatives from the different National Committees, that will essentially pursue the development of a zonal programme for co-operation on agroforestry research.

Networking among the national institutions will serve to enhance the exchange of information thereby strengthening the learning and development process fundamental to achieving material capability for agroforestry research and development.

### 2. Personnel Development:

As part and parcel of the institutional development process, the project will focus part of its resources on training host country personnel in various aspects of agroforestry research and development.

Training of national cadres will be systematically coordinated with processes leading to the design and implementation of agroforestry research efforts. It should be emphasized that as project implementation activities are initiated, personnel development will evolve from training on research planning to training on experimental methods and field research techniques for agroforestry. Much of the training will be accomplished as national staff implement project activities in close association with the zonal coordinator, the research manager and ICRAF personnel. More specifically, however, at least four training modules on key topics are planned for the full project audience. These are:

- a. land-use problem diagnosis and analysis of agroforestry applications;
- b. agroforestry research priority identification and experimental design; and,
- c. case study-application of analytical tools at a real problem site;
- d. multipurpose tree species selection for improved seed production.

E. MULTIPURPOSE TREE DATA BASE OPERATIONS

This project will make use of the present ICRAF sponsored MPT data base both for accessing required species information and storing the additional information generated in the course of research implementation. As a global data base is currently being developed under this project's parent project (F/FRED), every effort will be made to achieve compatibility of data bases (e.g., coordination, standardized descriptors and software interchangability).

## INPUTS

1. The principal AID - supplied input is US \$3.6 million, provided through a cooperative agreement, obligated in FY 1986 and expanded by ICRAF during CYs 1986-1990. The source of those funds will be the Africa component of the Forestry/Fuelwood Research and Development project (F/F RED) plus additional funds acquired in AID/W.
2. Recruitment of a zonal coordinator with expertise in ~~agroforestry~~ *coordinate development of the Master Plan, serve as the* tree breeding who will ~~primary liaison~~ between ICRAF and selected host country institutions for the purpose of developing and assuring the functioning of the agroforestry network. The person will also develop and assist in on-the-ground implementation of species/agroforestry technologies research in four countries within the bimodal highlands. In addition, the individual will function as the primary contact with other zonal networks contemplated under the ICRAF Agroforestry Networking in Africa master plan.
3. The research manager will oversee the design and development of the species specific and technology specific research in the bimodal highlands zone. This person will organize and implement the various training sessions for the agroforestry teams from each of four countries, and he will oversee the establishment, maintenance and evaluation of on-the-ground research conducted in each country.
4. ICRAF core staff will be relied upon to provide assistance in developing the master plan, establishing the networks, conducting training sessions, designing research trials, and providing specialized technical assistance to the zonal coordinator and the research manager whenever necessary.
5. The project budget ~~of~~ details funds which will be provided for operational costs (i.e. staff, training courses, networking), plus the commodities needed to conduct this research in each country (i.e. vehicles, tools, research establishment and m:

6. Various project design exercises and a design workshop will be held to develop research proposals.
7. Evaluations of the project will be conducted by specially formed teams at the end of the third year. Depending on results of this evaluation, the project may be modified. A final evaluation should be conducted at the end of the fifth year when the project is completed.

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BUDGET

Inputs/Activities (Network Startup & Implementation)

1) ICRAF Program Coordinators	50	50	30	20	10
2) Zonal Coordinator	100	100	100	100	100
3) Mobilization/Organizational Country Visits	25				
4) AF Networking and LUS Analysis Workshop	40.55				
5) Country-specific Land-use Analysis	11.2				
6) Priorities Identification Workshop	40.55				
7) Training Course-Multipurpose Tree Species Selection			50		
8) Network Strengthening-in-country operational costs		40	40	40	40
9) Information Exchange- reports and publications	20	20	20	20	20
10) Annual Network Meeting		20	20	20	20
SUBTOTAL	287.3	230.0	260.0	200.0	190.0
11) Research Implementation					
-Operational Costs	152.9	152.9	152.9	152.9	152.9
-Collaboration			100.0	100.0	100.0
-Commodities	158.6	34.85	34.85	109.85	34.85
12) Evaluations			11.		12.
SUBTOTAL	598.8	417.75	558.75	562.75	477.75
13) Inflation (5%/yr)---		20.89	57.27	88.70	102.96
SUBTOTAL	598.8	438.64	616.02	651.45	587.70
14) Overhead (27%)	161.68	118.43	166.32	175.89	156.79
TOTALS	760.48	557.07	782.34	827.34	737.50
GRAND TOTAL					\$3,664,730.*

\*This overall grand total may be adjusted downwards to take into account phasing in of both countries and activities, e.g. points of adjustment

-employment date-research manager  
-participation in all facets of the project by Uganda.

Budget Notes

- 1) ICRAF Program Coordinators
- 2) Zonal Coordinator - includes salary, fringe benefits, travel and per diem
- 3) Mobilization/Organizational Country Visits - a 2 week mission to each of the four countries of the zone to include the zonal coordinator, one ICRAF staff member and participation by host countries nationals.
- 4) Agroforestry networking and LUS Analysis Training Workshop:  
(2 weeks in Kenya)  
Travel: 4 persons x 4 countries x \$500 = \$ 8,000.  
per diem: 4 persons x 4 countries x 14 x \$75 = 16,800.  
ICRAF staff - 20 working days  
@ \$350/day = \$ 7,000.  
Interpreters 20 working days  
@ \$250/day = \$ 5,000.  
Report preparation: Zonal  
Coordinator + 5 days ICRAF  
staff = \$ 1,750.  
Translation \$20 page x 100 pages = \$ 2,000.  
\$ 40,550.
- 5) Country-Specific LUS Analysis:  
including: Zonal Coordinator and 4 participants x 2 weeks in-country  
travel (per diem) @ \$50/day x 4 countries = \$ 11,200.  
1 week report preparation/assistance of Z.C. in  
each country = N.C.
- 6) Priorities Identification Workshop:  
same as item 4 above = \$ 40,550.
- 7) Training Course: Similar to items 4 and 6 above allowing for increased  
participation = \$ 50,000.
- 8) Network Strengthening: including country-specific additional land-use  
systems analysis site-specific case studies and location/country-specific  
problem identification led by the Zonal Coordinator w/input from ICRAF  
Program Coordinators and other core staff: estimated in-country  
operational costs \$10000/country/yr x 4 countries x  
4 years = \$160,000.
- 9) Information Exchange - preparation of reports of major project meetings  
periodic research reporting, newsletter preparation.
- 10) Annual Networking Meetings: similar to Workshops but one week in  
duration = \$ 20,000 year.
- 11) Research implementation Costs - see separate sheets on: Research  
Implementation Costs, Commodities, Commodities Purchase Plan and Host  
Country contributions.
- 12) Evaluations- mid-term and final involving two persons each.

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Research Implementation Costs - LOP - 5 years

<u>DESCRIPTION</u>	<u>\$ COST</u>
<u>Research Manager</u> - (full-time) x 5 yrs @ \$100,000./yr . . . . .	\$ 500,000.
<u>Senior Counterparts</u> (4) - part-time - salary . . . . .	HCC*
<u>Senior Counterparts</u> (4) - infield per diem: 5 days x 3 trips x 4 people x \$50/day x 5 years: . . . . .	\$ 15,000.
<u>Technical Counterparts</u> (full-time) (4) @ \$3,000/yr x 5 yrs. . . . .	\$ 60,000.
<u>Drivers</u> (full-time) - (4) @ \$800/yr x 5 yrs. . . . .	\$ 16,000.
<u>Laborers</u> (full-time) - 3 per country x 4 countries @ \$500/yr x 5 yrs . . . . .	\$ 30,000.
<u>Guards</u> (full-time) - 2 per country x 4 countries x 5 yrs @ \$700 per/yr. . . . .	\$ 28,000.
<u>Seasonal Laborers:</u>	
-nursery startup - 5 persons x 5 days x 4 countries	= 100 p/d
-planting - 20 persons x 5 days x 4 countries	= 400 p/d
- maintenance - 5 persons x 5 days x 4 countries x twice/yr	= 200 p/d
= 700 person days/year	
rounded to 1000 p/d per year @ \$3/day = \$3000/yr x 5 years.	\$ 15,000.
<u>Communications</u> (telephone/telex) \$200/mo. x 12 mos. x 4 countries x 5 yrs . . . . .	\$ 48,000.
<u>Cooperators Workshops</u> (twice/yr)	
-travel: 6 persons x \$500 x 2 x 5 yrs . . . . .	\$ 30,000.
-per diem: 6 persons x 5 days x \$75/d x 2 x 5 yrs. . . . .	\$ 22,500.
	\$ 764,500.
<u>Collaboration w/other institutions</u> (national/donor) for improved seed production - yrs. 3-4-5 @ \$100,000./yr. . . . .	\$ 300,000.
 TOTAL . . . . .	 \$1064,500.

\*Host Country Contributions

Commodities (Start up/ implementation)

<u>Item</u>	<u>Cost \$</u>
- <u>Vehicles</u> (four in yr. 1 and four in year 4.) @ #15000	120,000.
- <u>Vehicle</u> spares - 25% in each yr. of purchase	30,000.
- <u>POL</u> : 20000 Km/veh/yr.	80,000.
- <u>Nursery Materials</u>	40,000.
- <u>Tools</u>	20,000.
- <u>Fencing</u>	20,000.
- <u>Seeds/Seed Collection</u>	10,000.
- <u>Seed Storage capability</u> (rental)	15,000.
- <u>Books/Publications</u>	4,000.
- <u>Office Supplies</u>	4,000.

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Commodity Purchase Plan

Year Item	1	2	3	4	5
Vehicles	60,000.			60,000.	
Spares	15,000.			15,000.	
Maint.	6,000.	6,000.	6,000.	6,000.	6,000.
POL	16,000.	16,000.	16,000.	16,000.	16,000.
Nursery Mat.	20,000.	5,000.	5,000.	5,000.	5,000.
Tools	15,000.	1,250.	1,250.	1,250.	1,250.
Fencing	20,000.				
Seeds	2,000.	2,000.	2,000.	2,000.	2,000.
Seed Storage	3,000.	3,000.	3,000.	3,000.	3,000.
Books	800.	800.	800.	800.	800.
Office Supplier	800.	800.	800.	800.	800.
Yearly Totals	158,600.	34,850.	34,850.	109,850.	34,850.

Host Countries' Contributions

- Ministerial/Institution Representatives (part time) on Agroforestry  
Cordinating Committees -3-4 per country
- Senior Research Implementation Counterpart - (part-time) - 1 per country
- Technical Counterpart - full-time- designation only (project covers all  
costs) - 1 per country
- Land use required for trials
- Access to nursery facilities (project pays labor/materials/minor  
improvements) - 1 per country
- Office space/furniture

IMPLEMENTATION PLAN

	1	2	3	4	5
1) Mobilization (1-3) Promotion/Organization and information collection	<----->				
2) Introduction to project Networking and training in land-use analysis	<->				
3) Land-use problem analysis (in each country (5-6-7))	<----->				
<u>IMPLEMENTATION</u>					
4) Priorities ID Workshop	* *				
5) Research design methodology training (by country)	***				
6) Research Mobilization-species selection criteria-site selection seed collection (a continuum)	<----->	----->	----->	----->	----->
7) Planting field trials		< >	< >	< >	< >
8) Research Analysis		----->	----->	----->	----->
9) Evaluation			< >		< >
<u>CONTINUED NETWORKING</u>					
10) Case Study	<----->				
11) Improved Land-use Analysis	<----->				
12) Location Specific Project ID		<----->			
13) Information Exchange	<----->				
14) Annual Network Mtg.		< >	< >	< >	< >

APPENDIX - MPT Species Continuum

General

1. The steps outlined on the MPT Species Continuum are geared towards the production of improved seed needed for conducting species/agroforestry technology evaluation and to develop MPT selection criteria and provide selected trees that can be used for the establishment of seed orchards.
2. ICRAF should emphasize the aspects of this continuum leading to the development of species/agroforestry technologies, and it is also expected to collaborate with other donors/institutions in the establishment and management of seed orchards geared towards the production of large quantities of improved seed.
3. Tree selection criteria for individual species should initially be based on the desired end-products/uses for that tree, e.g., fuelwood, forage, building materials, windbreaks, etc. These criteria will be refined as results from species/agroforestry technologies research are obtained.
4. A small number (5-10) of MPT species are to be selected, based on current knowledge available and local preferences, for conducting the research envisaged in this project.

Categories of MPT species

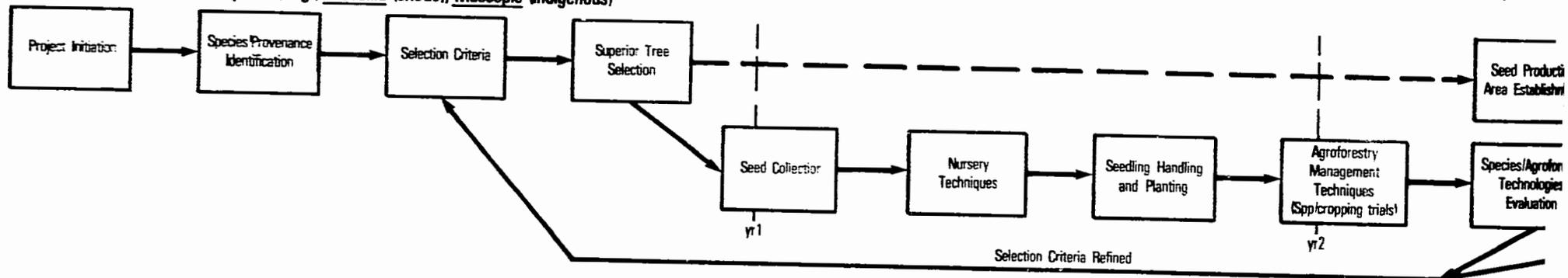
1. MPT species are divided into 4 categories.
  - a. Locally utilized, well-known species (indigenous or exotic);
  - b. Locally utilized, little-known species (indigenous or exotic);
  - c. Unknown native species with excellent potential and
  - d. Unknown exotic species with excellent potential.
2. Research phases shown in Figure 1 for locally utilized, well-known species, are repeated in the other 3 species categories, but additional phases are added to each category continuum according to the amount of information that is available about a particular species. The research phases and approximate time frame needed to complete each category continuum are as follows:
  - a. Locally utilized, well known species (5 yrs).

- 1) Species/provenance identification (emphasis on provenances)
  - 2) Tree selection.
    - a) selection criteria refined as additional data become available.
    - b) seed production areas established based on seed needs.
    - c) collaborate with other donors in the establishment and management of seed orchards.
  - 3) Seed collection.
  - 4) Cultural techniques using a limited number of agroforestry technologies and a limited number of species tested under specially developed experimental designs.
  - 5) MPT species/agroforestry technologies evaluation.
- b. Locally utilized little-known species (6 yrs).
- 1) Species/provenance identification.
  - 2) Tree and seed biology.
  - 3) Repeat phases a. 2) through a. 5) above.
- c. Unknown native species with excellent potential (10 yrs).
- 1) Species/provenance identification (*emphasis on species*).
  - 2) Species/provenance trials.
  - 3) Tree and seed biology.
  - 4) Repeat phases a. 2) through a. 5) above.
- d. Unknown exotic species with excellent potential (13 yrs).
- 1) Species/provenance identification (*emphasis on species*).
  - 2) Species/provenance screening trials.
  - 3) Large-scale (1-2 ha) species/provenance trials using winners from d. 2).
  - 4) Tree and seed biology.
  - 5) Repeat phases a. 2) through a. 5) above.

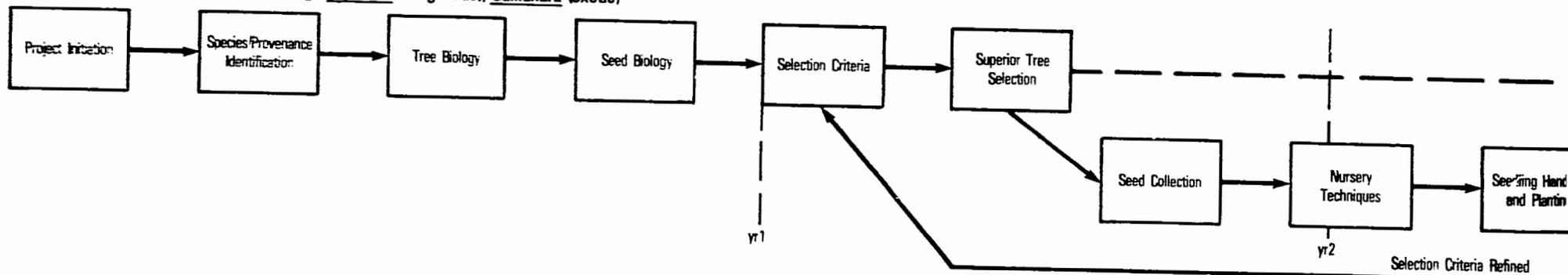
Figure 11. Tree Species Continuum\*

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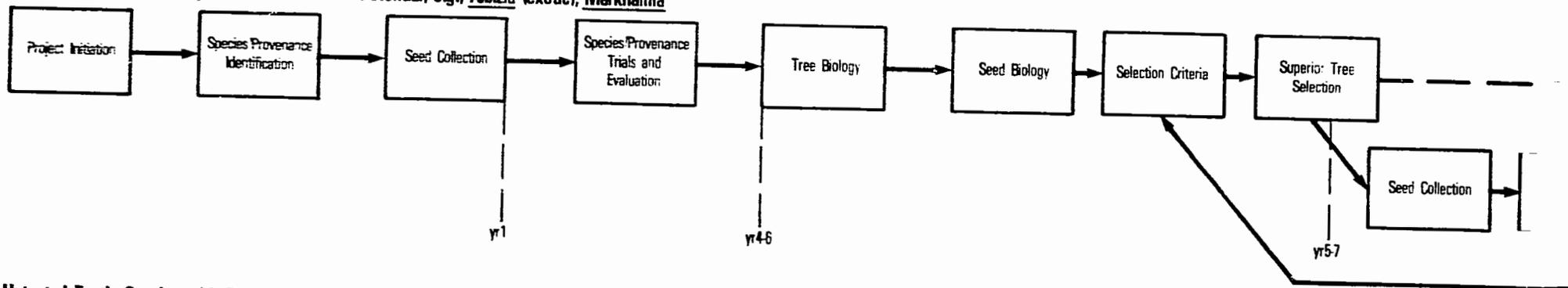
1. Locally Utilized, Well-Known Species, e.g., *Grevillia* (exotic); *Maesopsis* (indigenous)



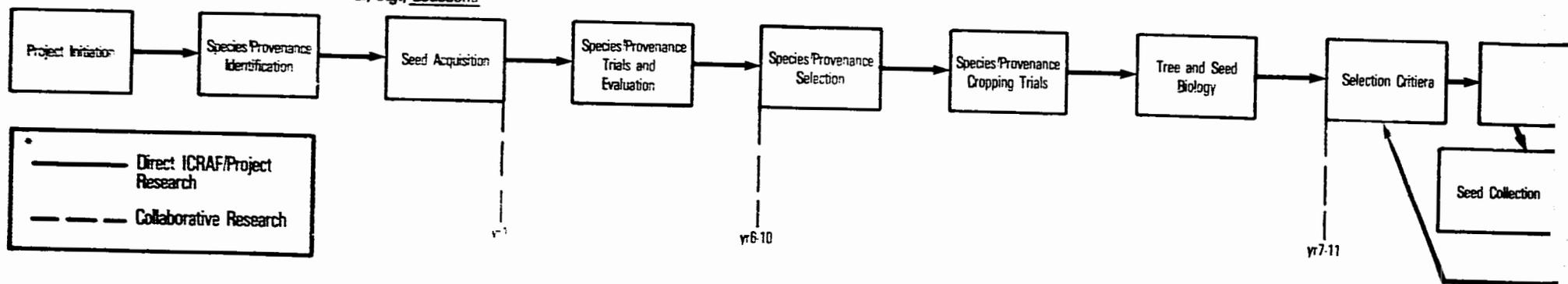
2. Locally Utilized Little-Known Species, e.g., *Erythrina* (indigenous); *Calliandra* (exotic)



3. Undomesticated Native Species with Excellent Potential, e.g., *Albizia* (exotic); *Markhamia*



4. Untested Exotic Species with Excellent Potential, e.g., *Leucaena*



— Direct ICRAF/Project Research  
 - - - Collaborative Research

