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MULTIPURPOSE TREE SPECIES RESEARCH NETWORKS  
FOR THE FUELWOOD/FORESTRY RESEARCH AND DEVELOPMENT PROJECT (F/FRED)

RECOMMENDATIONS

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## EXECUTIVE SUMMARY

This report summarizes approximately 5 man-months of field work commissioned by Winrock International on the Fuelwood/Forestry Research and Development Project (F/FRED). The scope of work for this activity is found in Section 1.1. One of the primary objectives of this report is to recommend up to 3 networks upon which F/FRED will initially focus. In the process of collecting information on for this report, a wide range of critical considerations for F/FRED success were discussed and are also included in this report.

*Key Recommendation* { The team recommends that species networking research be initiated on two networks organized around environment zones. Priority species have already been identified by participants at the Kandy meeting, and are further narrowed in this report to 3 priority species within each network. The two environment types and recommended species are:

### NETWORK #1: MPTS FOR THE HUMID TROPICS

To include, but not be limited to the following species:

- (1) Acacia auriculiformis A. Cunn.
- (2) Acacia mangium Willd. "mangium"
- (3) Leucaena leucocephala (Lam) de Wit "leucaena"

### NETWORK #2: MPTS FOR THE ARID AND SEMI-ARID TROPICS

To include, but not be limited to the following species:

- (1) Acacia nilotica (L.) Willd. ex Del. "babul"
- (2) Dalbergia sissoo Roxb. "sissoo", "shisham"
- (3) Eucalyptus camaldulensis Dehnh "Red river gum"

These recommendations are described in detail in Section 6 and are based on the advice of over 30 forestry researchers, USAID mission staff and others. The recommendations of this group weigh heavily in favor of an approach which focused on MPTS research, but which does not limit network support to single species or genera, nor to rigidly defined networks. The environmental grouping of species for networking described in this report was preferred by the vast majority of interviewees. The environmental classifications are those used in the IUFRO Kandy meeting report. The Kandy report identified three environment zones: 1) wet/moist tropics, 2) arid/semi-arid tropics, and 3) tropical highlands and mountain zones. Due to the amount of work anticipated to establish any sort of MPTS

*Who, if any, did not represent?*

network in F/FRED, we suggest that only the two highest priority networks be focussed on initially.

At present, none of the IUFRO or Madamba-modified IUFRO networks exist in Asia. While informal communications networks do exist, such as Leucaena and NFT networks which run through the Univ. of Hawaii or NFTA, and while IDRC plans to improve its network support of bamboo and rattan research, there appear to be no formal MPTS networks in existence.

*Does not  
agree w/  
Dove*

The proposed approach would define networks by the general environment types used in the IUFRO Kandy meeting report. Network participants would be organized by the general type of environment in which they work rather than by species groupings alone. However, MPTS research would remain as the focus of the networks. The environmental network approach described here is recommended as the most appropriate response to MPT network research in the Asian region.

A key assumption here is that the greatest long-term biological benefits which can be realistically attained through F/FRED will be obtained by comparing MPTS in species elimination, provenance and management trials. Other species of local interest need to be compared with these promising MPTS, and networks with species-specific titles do not allow for this vital research. This approach also satisfies the AID criteria for network selection and offers several other advantages over the organization of networks as proposed in the Kandy report. It is also an approach which has been consistently endorsed by both USAID mission personnel and Asian researchers, including IUFRO Western Region Coordinator Dr. Salleh Nor.

In summary, the primary advantages of using this approach are:

- 1) The broader organization of networks will allow critical comparisons of promising exotic and locally important MPTS.
- 2) Environment type network groupings will provide linkages between scientists who face similar site conditions and constraints.
- 3) Selection of networks by environment type assures both a regional and zonal distribution of F/FRED sponsored research activities as required in the scope of work provided to this team.
- 4) Potential network participants tend to feel that the species selected are too few in number and/or are not the ones of greatest interest or importance to them.
- 5) Researchers seem to view the selection of particular species

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b*

by the network coordinators as an unwelcome constraint on their work.

\* 6) A narrow species focus appears to be somewhat opposed to the typically problem-oriented nature of scientific inquiry, particularly since our understanding of MPTS is still quite limited.

The factors that have been found in this study to be potentially critical to the success of the F/FRED networks can be grouped into three categories: project activities, project relations, and project foci. Project activities should include meetings, and there is unanimous agreement that it is important for these to be attended by the actual researchers, as opposed to the bureaucrats who merely supervise them. Another important activity is publishing, which should include network newsletters, reports on the research results of network participants, and extensive translations of these reports into and out of the region's various languages as well. The most important activity of all, of course, is research, and there is some sentiment to the effect that F/FRED should itself fund as much of this as possible, and more than it is currently planning to fund.

Regarding project foci: The problem of having to exclude particular species because another network has "taken" them arises only if the F/FRED networks are species-based: for a variety of reasons, this species focus is not recommended. More desirable would be an orientation based on environmental zones. One topic that can be recommended for inclusion is swidden agriculture. Whatever foci are decided upon, it is of utmost importance to remember that the object of the project is human development, and that the development or breeding of trees is only a means to that end, not an end in itself.

It is apparent that relations with regional projects such as F/FRED are often problematic, and that one likely way to improve these relations is for the project to increase its communications with the missions and attempt to be more responsive to the latter's opinions and concerns. Regarding project relations with Asian researchers and network participants, the most important conclusion to draw is that there are inherent, structural barriers to smooth relations and participation. Thus, the fact that many of the potential network participants are competing economically with one another will mitigate against their joint participation in the F/FRED networks, as will the fact that some of them are suspicious of the political and economic motives of the US government's involvement in the project, and also the fact that scientific culture is not the same in Asia - where the networks must operate - as it is in the West - from whence comes the network model that is being used.

These are serious constraints, but the means for overcoming them are already clear, at least in part. One of the first and most straightforward steps should be to establish formal, legal safeguards for the prior rights of each network participant to the results of his/her own research. A second step should be to bring as many Asian scholars as possible into the project administration, in particular in the role of consultants. This would immediately help to allay some of the East-West suspicions and tensions; and it will also contribute to the further professional training of the Asians thus employed. A third, related step is to develop the networks from the bottom up, making sure that the project administrators take much of their direction from the network participants. The experiences of other projects clearly demonstrate that network coordinators are most effective when they limit themselves to "coordinating", and least effective when they try to rule by fiat. Finally, it is clear that a crucial step in organizing and implementing F/FRED will be to establish personal relationships between network coordinators and network participants. There is strong and widespread agreement that this is the only way to overcome the competition and suspicions that are otherwise likely to hamper any international research effort of this sort. Indeed, it can probably be said that the success of the F/FRED project will vary directly with the strength of the personal bonds that are formed among the scientists who participate in it.

SECTION 1  
INTRODUCTION

This report has been prepared as part of a Winrock International assignment carried out from October 15, 1985 to February 15, 1986. A team of 4 individuals participated in this assignment over the 4 month period. These individuals and their dates of participation were:

Kenneth G. MacDicken, agroforester (10/15/85-2/15/86)  
Micheal R. Dove, anthropologist (10/20/85-1/15/86)  
James L. Brewbaker, geneticist (1/4/86-1/31/86)  
William F. Hyde, resource economist (1/2/85-1/31/86)  
?

1.1 Scope of work

1. Review USAID mission projects in energy, forestry and agriculture that would support network research and research dissemination. Relevant projects would be reviewed in detail with mission and host country counterpart staff.
  
2. Evaluate potential network institutions and their on-going research projects with multipurpose tree species. As time allows, this evaluation will include an analysis of the research planning and management capabilities required to support MPT network research.
  
3. Assess the level of participation by institutions and individual researchers in existing multipurpose tree networks,

and to the extent possible, evaluate existing knowledge of MPT production systems.

4. Develop recommendations for the establishment or enhancement of one to three multipurpose fuelwood tree networks. The criteria to be used in assessing species networks will include: (a) Regional distribution of network participants; (b) Zonal distribution of network institutions by environment type; and (c) The ability to get networks operating within the shortest time.

5. In carrying out the above work, due consideration will be given to the social implications of particular MPTs, and to the extent to which social factors are being or could be included in the research and activities of the people, institutions and networks reviewed.

## 1.2 Methodology

The methodology in this study consisted largely in interviewing government officials, scientists, and (to a more limited extent) farmers in the countries visited. The data obtained in these interviews are utilized in two ways in this report. First, much of it is considered to represent accurate, empirical assessments of institutions, people, tree species, and networks of relevance to the F/FRED project, and it is included as such in this report. However, it is also recognized that some of the data represent less empirical and more subjective assessments. This latter sort

of data is included in the report because of what it tells us about what people think of the project. These perceptions merit our attention because, regardless of how valid or invalid they are, they will affect the way that people relate to the project. By presenting these perceptions here it is hoped that the project can respond to them and thereby minimize the number of difficulties encountered during its start-up phase.

### 1.3 Definitions

One time consuming aspect of this teams mission was to try to reach common definitions and understandings of MPTS and networking with interviewees. This section defines MPTS and networking as discussed on the field trips and in this report.

#### 1.3.1 Multipurpose tree species (MPTS)

It has rightly been pointed out that unless further defined, multipurpose tree species can include just about any tree in existence. This point becomes clear when one considers the use of many tropical trees for human or animal shade in addition to any other wood, fodder or bark uses.

F/FRED usage of "multipurpose" trees species implies the use of trees for fuelwood or charcoal, fodder for domesticated animals, fruit for human food, green manure, etc. on a single tree in small farm management. This definition might exclude species which produce more than one important timber which cannot be

economically grown or processed on the small farm. Nearly all of the studies of on-farm use of trees in the developing tropics point to two main uses of MPTS - fuel and fodder. Since F/FRED has chosen to place its emphasis on multipurpose trees for small farm use, then fuel and fodder become very important attributes to consider.

### 1.3.2 Networks

Networking is a concept which is not widely understood among forestry researchers. As the network review team spoke with both western and Asian researchers it became apparent that at least three concepts of network research are widely held:

- 1) Networks are loosely grouped associations of researchers who divide research problems into work assignments which are then carried out primarily by a lead institution. This is basically the approach identified by IUFRO.
- 2) Networks are composed of participants who conduct a set of identical or similar trials for the purpose of solving specific research problems. This approach focuses on far fewer problems than the other approach, but concentrates much greater resources on a given problem.
- 3) Networks are primarily communications oriented and may simply be groups of people who communicate in areas of common interest.

The lack of a common understanding of networking will be one of the problems which F/FRED will need to address immediately after the TA team is fielded. For the purpose of this report, definitions two and three will be used except where otherwise noted.

## SECTION 2

### REVIEW OF RELEVANT USAID MISSION PROJECTS

This section reviews USAID mission projects in the AID countries visited which are closely related to F/FRED objectives, and which may be linked with proposed F/FRED activities.

#### 2.1 Philippines

##### 2.1.1 Rainfed Resources Project

The Rainfed Resource Project is designed to assist Philippine government insititutions in dealing with agricultural production problems in rainfed areas of the Philippines. The project utilizes an innovative rolling design concept which calls for the annual setting of goals and the development of annual work plans. The project consists of efforts in three general areas: 1) policy analysis and dialogue; 2) field trials in pilot projects and on-farm testing of development strategies, and; 3) research.

Implementation of project field activities began in late 1984, and has already included significant efforts in agroforestry and farming systems research. Some of this research has focused on MPTS such as leucaena and Gliricidia sepium, and it is anticipated that MPTS will continue to play an important role in project-supported research.

*How innovative?*

The fact that this project utilizes an annual planning process, is heavily involved in MPTS research, and has a number of operating field sites suggests that there are excellent opportunities for linking project activities into F/FRED network research. For example, the team was told that project participation in F/FRED-sponsored MPTS species trials for on-farm use might be a topic which could be included in upcoming annual plans. While mission personnel did not express much interest in the "buy-in" idea, they did think that project research activities might benefit from F/FRED MPTS networking, and could in turn provide inputs into MPTS networks.

*Why would they need to do so?*

#### 2.1.2 ASEAN-US Watershed project

The ASEAN-US Watershed Project began operations in early 1984, and is a regional ASEAN project designed to promote collaboration and cooperation among member countries in managing and developing their watersheds. The project has sponsored symposium, workshops, study tours and exchange of scientific information. Major areas of effort include:

- enhanced professional interaction
- transfer of appropriate technologies
- manpower training to build up and/or strengthen expertise
- research support

While no F/FRED linkages were seen with this project because of it's focus on watershed activities, there are a number of ASEAN-US project activities which are similar to those planned for

F/FRED or which can provide valuable lessons on regional networking in forestry research:

1. The project produces a quarterly newsletter, workshop proceedings, computerized data base, mailing lists, and an inventory of research projects. All of these are activities with which F/FRED will be involved;
2. The project hires division heads from the other member countries, who are stationed at the project headquarters in Los Banos. However, project coordinators are not paid with project funds, which has led to some difficulties;
3. Potential workshop or training project participants are classified into four categories, and are selected from these categories by country coordinators with inputs from project steering committee members. This has been suggested as one means of getting appropriate participants for F/FRED network meetings;
4. Regular meetings are planned for network participants.

It is suggested that Bangkok-based F/FRED staff meet with ASEAN-US project staff as soon as possible after project start-up.

## 2.2 Thailand

### 2.2.1 Village Woodlot Project

This project was implemented by the Royal Forest Department from 1981 to 1984. Now completed, the project was one of 14 components in the Renewable Nonconventional Energy Project. It is described here briefly to provide some insight into the use of MPTS in a mission project, and into the type of mission-sponsored research to which F/FRED can contribute.

The project included silviculture, economics, land use, sociology, and utilization components. These components were designed to be both research and demonstration for the ultimate purpose of increasing sustainable production of fuelwood in Northeast Thailand.

The species selected for all seven target provinces was Eucalyptus camaldulensis. Data were collected on the growth and survival of trial plantings throughout the project area (NEA, 1984). Economic and social studies of woodfuel use conducted to assess the degree of fuelwood shortages, and the attitudes of villagers towards the project. Planting activities were carried out on three land use types (public, monastery, and school lands). Finally, utilization studies were carried out to explore additional utilizations for 5 year old trees to be produced from village woodlot plantings.

While this project is now completed, it does provide an example of a USAID-financed project which might provide the F/FRED networks with valuable data on the growth and utilization of MPTS. Important recommendations from this project which have relevance for F/FRED sponsored research:

- 1) even though E. camaldulensis proved to be an appropriate species, trials with other species should be established;
- 2) mixed stands were recommended rather than monocultures;

- 3) narrower spacings of 1 x 1 m should be used on sites not suited to agroforestry practices;
- 4) research should be continued for a minimum of 5-6 years to provide data all the way through to harvest;
- 5) provenance trials and seed orchards should be established for E. camaldulensis.

The lessons learned in this project are the type which should be shared as part of the F/FRED networks. It is significant to note that while the VWP project focused on a single species, one of the final recommendations was to expand to include a range of other MPTS.

#### 2.2.2 North East Rainfed Agricultural Development Project (NERAD)

The NERAD project was initiated in 1981 for the purpose of increasing farm productivity and income levels in the rainfed agricultural zones of Thailand. Project emphasis has been on local level extension activities, water resources development, training, and applied research. Tambon (sub-district) Agricultural Development Committees decide on the implementation activities for each year.

Funds have been budgeted for cropping systems research and other types of agricultural research and demonstration. The team was told that NERAD has included some tree planting activities, although this has been a very minor part of the project to date. While no solid linkages between F/FRED and NERAD were discussed,

the potential for NERAD to benefit from network communications and experiments does exist.

### 2.2.3 Proposed Natural Resources Management Project

This project is presently being designed, and is scheduled to begin in 1987. One of the components in this project will be forest management, although the specifics have yet to be worked out. The mission anticipates utilization of F/FRED species recommendations, but little else. It also hopes to use the F/FRED PSC to assist in the development of the project paper. It is suggested that the long-term F/FRED staff discuss possible linkages to this project with Will Knowland and John Foty as soon as practical upon their arrival in Bangkok.

## 2.3 Bangladesh

At present USAID/Dhaka has no active forestry projects. However, the project paper for the Bangladesh Homestead Agroforestry Project was approved in mid-1985 and is currently awaiting Bangladesh government approval.

### 2.3.1 Homestead Agroforestry Project

There is a clear and positive opportunity for F/FRED to support this project if and when Government of Bangladesh approval of the mission project is obtained. This potential was apparently discussed with Project Managers Morison and Ichord in mid-1985,

and was discussed again during the team visit. Among the most important issues raised during the team visit were:

1. F/FRED regional project staff need to pass through Dhaka 3-4 times a year to provide assistance to the mission on the Homestead Agroforestry project and other forestry-related mission activities; 

2. The mission is not interested in a series of short-term consultants to replace this assistance. However, the alternative of providing the same short-term consultant regularly over the life of the project was acceptable;

3. The mission maintains its commitment to "buy-in" to F/FRED at an amount of about \$300,000, although they still have a number of questions about the specifics of this arrangement; 

4. Regional workshops should periodically be held in Bangladesh. This was suggested to circumvent the difficulties in getting Bangladeshi scientists out of the country for meetings, and to allow a larger number of Bangladeshis to participate in regional meetings.

Another way in which F/FRED could assist with the Homestead Agroforestry project would be to hold research management seminars which could be tied into the research component of the mission project. Even though there is significant suspicion of centrally funded projects, the mission staff here remains open to the use of F/FRED and should be approached with concrete responses to their stated concerns.

## 2.4 Pakistan

### 2.4.1 Pakistan Forestry Planning and Development Project

This project began in 1985 and is designed to support a range of farm forestry related activities with the provincial forest departments, the Pakistan Forest Institute (PFI) and the

(\*) Inspector General of Forests (IG/F) office. Winrock International is the project contractor and has fielded a long-term TA team of 5 professionals, three in Islamabad and two at the PFI in Peshawar. USAID/Islamabad has proposed a "buy-in" of between \$100,000 and \$300,000 from this project pending PFI and IG/F approval. The Forestry Planning and Development project contains over \$5 million in research money, and according to mission personnel could conceivably provide even more "buy-in" money should F/FRED prove of value to the project. Specifically, \$100,000 of this buy-in money was proposed for species and provenance trials with the possibility of an additional \$200,000 for seed processing, all of which is conditional pending GOP approvals.

Some of the research planned for this project is targeted for some of the species identified at the Kandy meeting (e.g. Acacia nilotica, Dalbergia sissoo, Populus spp.). However, a severe limitation on additional research is a lack of qualified staff. It was noted that there may even be difficulty in carrying out research already programmed in the USAID project. Thus, as far as F/FRED is concerned in Pakistan, funding will not be a problem, but finding personnel with the time to participate in effective research may be. The researchers interviewed by this team stated that they would not likely have more than 10% of their time available for F/FRED-related work. Thus, it is clear that for F/FRED to (effectively work) with PFI through the Forestry

Planning and Development project, it must exploit research which is already of high priority to PFI. Work on arid-zone MPTS such as Acacia nilotica is clearly of high priority to PFI and the USAID/Winrock project.

### 2.5 Nepal

USAID/Nepal has no active projects which are of direct relevance to F/FRED. All mission bilateral funds are committed, and little hope was held out for cooperative activities with F/FRED if mission funds were required. The mission would like to be involved in the initial stages of F/FRED implementation, and would like to be kept fully informed of all decisions relating to Nepal.

The USAID-financed Resource Conservation and Utilization Project (RCUP) which included forestry research institution building activities will be completed this year, and may be followed-on with a new project scheduled to begin in 1987. This new project has an approved PID and is expected to be an 8-year project with the Institute of Renewable Natural Resources (IRNR).

The mission has established what appears to be a very successful working relationship with the British Overseas Development Administration(?) (ODA) Forestry Research Project team in Nepal. The ODA has a major 5-year forestry research effort underway, part of which focuses on species elimination, provenance and

management trials. Species trials with MPTS for small farm use have not been done, due to an apparent inability to secure appropriate planting sites. This might be one area in which F/FRED might help provide direction to on-going research.

ODA staff suggested that they would keep F/FRED fully informed of it's research and in-turn would hope to receive some feedback from the F/FRED network. This is clearly a project <sup>with</sup> which the F/FRED Bangkok team will want to work closely ~~with~~, and will wisely consult with USAID staff on how this might best be done. It must be noted that qualified Nepali staff are still very lacking in number, and in the amount of work they can effectively carry out. As in Pakistan, money was not thought to be a major constraint, but rather the availability of personnel to conduct research programs with assured funding is still a major limitation.

## 2.6 Mission Interests and Concerns

Most of the mission personnel visited expressed a feeling that there had been insufficient communication from Washington regarding F/FRED. For example, we were told that missions were never really told what a "network" is nor what "buying in" to the project would mean. Some of the missions said that too little of their own input was incorporated into the project. Suggestions that were supposedly made but not incorporated included, focussing the networks not on MPTS but on research methodology,

and allocating more of the budget to research. The comment was made that it will be difficult for host country research institutions to participate in a research network if they do not have any money for this research.

On the other hand, some of the missions recognized that efforts had been made to incorporate some of their ideas into the project. In this regard, the Thailand mission spoke favorably of the addition of the personal service contract in Bangkok and the perceived decision to focus on extant research networks as opposed to creating totally new ones. The change in project focus from fuelwood to MPTS was also favorably noted in several missions.

There is considerable variation among the missions insofar as current plans to participate in F/FRED are concerned. The Thailand mission sees some possibilities for F/FRED to support their policy-oriented approach to forestry problems, but in general they have limited interest in the project. In addition, there seemed to be some sentiment in the mission that industrial forestry was the more desirable choice for Thailand's future development. The Philippine, Bangladesh, and Pakistan missions were more optimistic as to the possibilities for F/FRED supporting various mission projects. However, the feeling at USAID/Manila seemed to be that this support would not be important enough to justify "buying into" the project while the

Bangladesh and Pakistan missions definitely stated that their intention to "buy in" to the project provided their own requirements were met. In Bangladesh this included one visit (of 2-3 weeks duration) per quarter from the F/FRED staff in Bangkok. They want this support because of the lack of forestry expertise on their own staff. They made clear that this support could not be provided by short-term consultants unless the same short-term consultant came to them 3-4 times a year, for each year of the project. The Pakistan mission staff made clear that their "buy in" contribution be spent for in-country activities and not for external TA or travel. Several missions expressed the worry that after they have been persuaded to buy into F/FRED, Washington will then turn around and cut back on the centrally provided resources, forcing the missions to then dip into their own, otherwise committed resources.

One of the most positive reactions to F/FRED came from embassy staff in Malaysia. They perceive this as the sort of S&T project that they can work on with the government of Malaysia. The role that they envisioned for the Malaysians (and is envisioned by Dr. Salleh himself at the FRI) is as regional experts who could be brought into the project as short-term consultants. In the words of embassy personnel, "the hiring of Malaysians as consultants on the F/FRED project would be highly gratifying to the ambassador'.

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## SECTION 3

## EXISTING MPTS RESEARCH NETWORKS IN ASIA

3.1 Existing MPT Networks

No evidence of formal MPT networks was found by this team.

\* Create formal ones

Informal MPT networks exist to a limited extent for leucaena provenance trials, for nitrogen fixing tree species elimination trials, and for tree seed exchange and improvement. For example, there are extensive provenance or variety collections of Acacia mangium, Eucalyptus camaldulensis and Leucaena leucocephala.

These coordinated efforts lack formal funding and continuing support to collaborators, yet should not be dismissed as either short-lived or casual. Most involve dedicated scientists and institutions who might gladly collaborate with F/FRED in institutionalizing a network and giving it permanence. Several MPT related networks are described briefly in the following subsections.

### 3.1.1 ASEAN-Australia Forest Tree Improvement Program (AAFTIP)

This program has been planned after intensive previous studies in the region by Australian forest scientists A.R. Griffin and D.G. Nikles, and will presumably rely heavily on funds from ACIAR and ADAB. It focusses on seed improvement and production of genetically superior tree seeds. The proposal developed out of a

1979 study by the Thai Royal Forest Dept. A conference was convened in 1979 by DANIDA and proceedings published on this program, then focussed heavily on teak and pine.

The AAFTIP proposal represents an expanded seed improvement study to include as high priorities the species of: eucalypts, acacias, teak, and gmelina with related projects on the production of improved seed, trials of introduced species and provenances, and in-situ germplasm conservation.

### 3.1.2 IDRC-sponsored Bamboo Research

IDRC has sponsored at least 7 bamboo research projects in Asia over the last 4 years. This network of projects in Bangladesh, China, Indonesia, Sri Lanka and Thailand focuses on the selection, improvement, propagation and cultural techniques of important bamboo species. Project participants are loosely organized into a network by the fact that they are conducting IDRC-funded bamboo research, but do not at present share common research designs. However, research results have been shared through a "network" meeting held in China in October, 1985.

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# 2?*

While it is widely assumed that IDRC has assumed financial responsibility for an IUFRO bamboo network, its support of bamboo research falls far short of the ambitious IUFRO research program. In March 1985 IDRC hired a network coordinator based in Penang, Malaysia to coordinate their bamboo and rattan research.

Much of the coordinators time in this first year has been spent on "fact-finding" and collection of data. Plans for the second and third years include assistance to grantees in proposal writing, holding of small coordination meetings such as those held by BOSTID in the Tropical Trees program, and identification of new areas of research. IDRC is also moving to establish 3 "sub-networks" within the bamboo network: 1) China will have its own country specific network; 2) The Philippines will have regional responsibility for the Southeast Asian countries, and; 3) India will coordinate South Asian network activities.

The IDRC network coordinator has many of the same types of responsibilities that the F/FRED species network advisor will have. The IDRC scope of work includes the following activities:

1. To develop liason and support to bamboo research projects
2. Correspond and visit with project leaders
3. Help develop project proposals
4. Assist scientists with administrative problems
5. Assist project staff in reporting, planning and training
6. Facilitate meetings, workshops, seed exchange
7. Help to produce how-to manuals on bamboo and rattan research

Important features of IDRC support for bamboo research which are relevant to F/FRED include:

- 1) Careful identification of participating institutions and scientists.
- 2) Emphasis on funding of only selected research topics.
- 3) Use of Asian scientists as consultants to grantees



It is important to note that IDRC is the only institution other than AID to follow through on the Kandy meeting commitments. and it has not followed the approach suggested in the "Blueprint for Action...". Dr. Sastry of IDRC suggested that the Kandy meeting report provides a plan of action which is not likely to be acceptable to any of the donors, although the concept of supporting regional networking certainly is appropriate. This may be particularly true given the IUFRO decision to compile indicative plans and raise the expectations of potential network participants (Section 5.5).

There will be a number of opportunities for F/FRED to work with IDRC in network related activities. One such area of cooperation suggested by Dr. Sastry was the establishment of seed orchards and seed handling facilities for MPTS, including bamboo and rattan in a neutral and stable country in the region.

### 3.1.3 Oxford Forest Institute NFT Species Trials

The Oxford Forest Institute (previously, Commonwealth Forest Institute) has sponsored germplasm collections of forest trees in Latin America during the past decade. The ongoing collections by Dr. Colin Hughes focus on N-fixing trees and shrubs, with extensive species collections and limited provenance collections of selected species such as the leucaenas. These provenances are identified as "permanent" and collections include 25 trees per population and are in kg amounts. Distribution is made gratis to

*Different name in Table of Contents*

institutions around the world, and OFI expects to network the resulting experiments. This collection may be considered to be of major importance to the F/FRED networks, in all three identified environments.

#### 3.1.4 FAO/IBPGR Arid/Semi-Arid ~~Z~~one Trials

FAO Forestry has coordinated the collection of germplasm of a series of tropical arid-zone species, and coordinates the dispersal of this germplasm. Primary evaluations have been in Africa and India. Major seedstocks are of the Australian and African Acacia species. Provenances are limited for most of the species included.

#### 3.1.5 ACIAR Acacia species

A major collection has been made of the Australian species of Acacia, and ACIAR will be coordinating under J. Turnbull and Paul Ryan the dispersal and evaluation of this germplasm.

The Royal Forest Dept. of Thailand has 2 series of these trials, including 6 locations planted to 12 species and 23 provenances (4 Acacia auriculiformis provenances, 2 provenances of Acacia mangium). Additional plantings are planned at 7 additional locations, coordinated by Boonchob Boontawee. The germplasm is available for evaluation in other parts of Asia. It is probable that provenance collections will ultimately be extensive for many

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of these most important species, as they are already for Acacia mangium and Acacia auriculiformis.

### 3.1.6 BOSTID Tropical Trees Program

The National Research Councils sponsors an international series of experiments involving fast-growing tropical trees through the Board on Science and Technology in International Development (BOSTID). The 12 current projects largely involve N-fixing trees. The Asian Projects include:

- (a) Thai Institute of Science and Technological Research (TISTR), Bangkok. Evaluations of fast-growing trees at 3 locations which include species elimination, provenance, spacing, and soil amelioration trials.
- (b) Visayas State College of Agriculture (VISCA), Leyte, Philippines. Trials include species elimination, provenance, and agroforestry management trials largely with leguminous trees
- (c) Kerala Inst. of Water and Soil Conservation; Trials are beginning (1986) on agroforestry, largely involving coconut and other plantation crops and intercrops.

Support for each of these projects is around \$25,000/yr. and a high level of technical and institutional competence is associated with each. The BOSTID grantees are brought together

for an annual coordination meeting during which progress reports are made, and research problems and issues are discussed. While the research projects funded by BOSTID are much larger and in-depth than those planned for F/FRED, the BOSTID experience in bringing together developing world researchers is very relevant to F/FRED networking goals.

### 3.1.7 NFTA Multiple Species Trials

The Nitrogen Fixing Tree Association, Waimanalo, Hawaii, coordinates NFT species elimination and leucaena provenance trials throughout the tropics. The trials are supported only by provision of seedstocks of "standard" provenances (identified by NFTA), by provision of proposed trial designs, and of guides to the establishment of the trials. It is requested that data be shared through publication in NFT Research Reports and summarized periodically for sharing through an informal network. About 50 trials have been designated in this series, but communication is often poor and leaves uncertainty as to extent, intensity and effectiveness of the trials.

## 3.2 Relevant Agricultural Research Networks

The International Rice Research Institute (IRRI) conducts some research with leucaena in its Multiple Cropping trials, largely with upland rice. Leucaena is used as a hedge around upland trials to stabilize soil, provide nitrogen and other products for

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farm improvement and use. Dr. Carangal coordinates these trials, which are found throughout Asia, but are generally variable in design. Experience with this network is discussed in appropriate sections of this report.

### 3.3 Determinants of Success or Failure

*Criteria* | Some of the key factors in making a research network succeed were summed up by Dr. Salleh at the FRIM in Kepong. He noted that a successful network must: (1) come from the bottom; (2) have funds available for the use of its participants; (3) involve the actual researchers in travel and meetings, as opposed to bureaucrats; and (4) have not only regular meetings but also a newsletter to keep its participants involved. Most of these points were echoed by other people that we interviewed as well. The necessity for network coordinators to not dictate activities to the network participants, but rather to allow each participant freedom to follow his or her own interests (with only the very broad framework set by the coordinators) was mentioned by a number of potential network participants and organizers.

Dr. Carangal at IRRI emphasized that in order to initially establish the multiple cropping network, he had to provide his participants with minimal seed money, and then help them to find more substantial funds on their own. The lack of such funds was noted as a weakness in the UPLB's collaborative research program with a Japanese group. Virtually everyone interviewed on the

topic of participation strongly emphasized the need to include the actual researchers in meetings and travel, and to exclude the bureaucrats who may be more senior but who have no practical involvement in the networking activities. The ASEAN-U.S. Watershed Project based in Los Banos seems to have developed a successful solution to this problem by setting up four categories of people, and then specifying which categories can and cannot be invited to particular international meetings. In addition, they give ultimate veto power over who will attend their meetings to the Los Banos-based steering committee. Another way to ensure that the right people attend international meetings is for the network to focus on people (as participants) and not institutions. This focus on people was also cited in a more general context by many of the people that we interviewed, as one of the keys to a successful network.

## SECTION 4

### POTENTIAL F/FRED NETWORK INSTITUTIONS

This section identifies a number of institutions which were visited during the team visits and which have potential as network participants. It must be noted that due to time constraints a number of research institutions, particularly agricultural research organizations, were not visited by this team.

#### 4.1 Philippines

The Philippines has a large number of well trained scientists in agriculture and forestry. Due to time constraints, institutions such as the Visayas State College of Agriculture (VISCA) and the government-owned Paper Industries Corp. of the Philippines (PICOP) were not visited by the team. There are researchers at VISCA and PICOP who are actively involved in MPTS research who should be contacted as F/FRED begins. In addition the Program on Environmental Science and Management (PESAM) has a mandate to coordinate and integrate environmental research at UPLB, and should be consulted with regard to F/FRED activities in the Philippines.

##### 4.1.1 Forest Research Institute (FORI)

FORI is a large institution with over 850 employees, 320 of which are in technical specialties. As an institution it has adequate facilities, and the staff to do an impressive amount of quality research. However, perhaps due to the present fiscal constraints or other factors, FORI has generally demonstrated little ability to conduct "effective" research. Even though agroforestry and farm forestry have been long given "lip service" in the Philippines, FORI has yet to generate much practical research in these areas. The quality of the research done is often doubtful, and there is little emphasis placed on peer review. Yet given it's mandate for forestry research in the Philippines, F/FRED will likely find itself working with FORI in MPTS networking.

(\*) FORI has three research programs which are of relevance to F/FRED: 1) Biomass and fuelwood; 2) agroforestry, and; 3) multiple use forest management. F/FRED network activities might fit in with any of these programs, although the financial crisis which currently faces the government was given as a major limitation to on-going research projects.

FORI has had very limited collaborative research contacts of any sort. Among those mentioned were in-country projects with PICOP, and the Bureau of Forest Development (BFD). FORI interests in the IUFRO scheme were mainly in the leucaena and Albizia networks.

#### 4.1.2 UPLB College of Forestry

The College of Forestry of the University of the Philippines at Los Bancs (UPLB CF) has a regular in-service faculty of 56, 57% of which have on-going research projects. The College has a continuing commitment to research and training, with a total of 56 current research projects and several international training projects. However, the College is also severely affected by the government budget cuts and is working primarily on projects which were funded prior to the 1983 crisis. Thus there is very little new funding available for research.

UFLBCF was designated as the lead agency for the IUFRO Albizia network, and has prepared a detailed indicative plan which has already been submitted to IUFRO. This designation apparently came as an "assignment" which was not warmly received, as the College has little on-going research on Albizia. According to a recent report by the CF Forest Research Office, there are a total of about 10-12 current research MPTS projects which covers several MPT species.

In addition to faculty members who spend a relatively small portion of their time in research, UPLBCF also has a number of staff who are doing advanced studies at the same time they are teaching classes. This is in addition to the non-faculty graduate students who are engaged in thesis research. This pool

of researchers would be an attractive audience for F/FRED-sponsored network research.

## 4.2 Malaysia

### 4.2.1 Forest Research Institute of Malaysia (FRIM)

The Forest Research Institute of Malaysia (FRIM) is an autonomous statutory body of the Malaysian Government which is responsible for forestry research in Malaysia. It presently has about 375 staff, approximately 58 of which are research officers.

While Malaysia is not an AID country, the FRIM has enthusiastically offered its support to F/FRED and would be very willing to assist the project in whatever way possible. As mentioned elsewhere in this report, FRIM has offered its professional staff as consultants or resource persons to F/FRED, and appears to be qualified to do so. It is recommended that F/FRED seek some means of utilizing FRIM staff resources to assist with network activities.

### 4.2.2 Forest Research Centre - Sandakan, Sabah

The Forest Research Centre (FRC) in Sandakan maintains an impressive and expanding physical facility which is at present under-utilized. Most of the research underway at the FRC is directed at the study and management of natural forest stands, and the production of Acacia mangium. However, even though there is more Acacia mangium planted on Sabah than in any other place

in the world, FRC research on this species has been sorely lacking. One reason for this appears to be a severe lack of experienced staff. Most of the FRC staff are Forest Department personnel, and while assigned to FRC must apparently forgo other more lucrative sources of income. Thus, many of the FRC staff are very young and inexperienced. A prime example is found in the Silviculture Division, which is headed by a young B.S. graduate who is responsible for over 80 staff and a budget of >500,000 ringgit (US\$208,000) with virtually no out of school experience. There are 13 research officers in the FRC, mostly young people in serious need of training and experience.

FRC was selected as the lead institution for the IUFRO Acacia mangium network, and was preparing an indicative plan during our visit. The only "collaborative" activities we noted were seed exchanges between FRC and other institutions. Mr. T. Eusebio is in charge of the Seed Laboratory which was set up through a FAO project in the early '80s. This seed facility has excellent storage and processing equipment, and appears to be well-organized and operated. F/FRED might explore utilizing the staff and facilities here as part of a regional germplasm collection and distribution scheme.

#### 4.2.3 Plantation Development Group

The Plantation Development Group (PDG) is an informal group with members from the Sabah Forest Department, Sabah Foundation,

SAFODA, Sabah Softwoods, and Sabah Forest Industries. While this group has no legal personality at present, it does bring together all of the organizations on Sabah which are working on plantation forestry. Meetings are held about twice a year for the purpose of discussing current activities, problems, and research needs. Given the extensive area (>30,000 ha) planted to Acacia mangium on Sabah and the involvement of PDG members in these plantings, any effort to network research activities with mangium should be coordinated with the PDG.

#### 4.3 Taiwan Forest Research Institute

The Taiwan Forest Research Institute (TFRI) in Taipei is already heavily committed to silvicultural research on MPTS. The institute has been engaged in research with Leucaena leucocephala since the mid-70's and has effectively encouraged the use of leucaena as a plantation pulpwood species in Taiwan. TFRI has also conducted species trials of MPTS on a variety of sites throughout Taiwan, and has demonstrated a unique ability to effectively get research activities planned, completed, and extended to industry in a timely fashion. The use of leucaena in the Taiwan pulp industry is a direct result of TFRI research and encouragement.

TFRI was represented at the IUFRO Kandy meeting, although in an "observer" status due to its diplomatic status with the donor countries. Perhaps due to this unique situation, TFRI does not

feel itself a part of the IUFRO network process. This is most unfortunate because TFRI is involved in more networking with MPTS than any other institution visited by this team. This has included active cooperation with CSIRO on Acacia auriculiformis, and with NFTA on Leucaena leucocephala and species elimination trials. Most of this collaboration has involved only exchange of seed and experimental design, but has in the case of the leucaena experiments also included exchange of growth and yield data.

Although we cannot speculate on how TFRI might be brought into F/FRED due to the political situation, it is strongly urged that every effort be made to involve TFRI through whatever means possible. In the past, TFRI has received support from IDRC through NFTA, and from other donors through IUFRO. These mechanisms should be explored to determine how F/FRED might utilize the wealth of knowledge and experience which exists at TFRI.

#### 4.4 Thailand

Unlike all of the other countries visited, with the exception of Nepal, Thailand has no national forestry research institute. A Thai Forest Research Institute is planned and may be established within the next few years. Three institutions which conduct forestry research were visited by the team.

##### 4.4.1 Faculty of Forestry, Kasetsart University

species/provenance selections. The RFD and Kasetsart appear to work more closely together than any other two institutions visited by the team. For example, the bamboo and rattan project lab work is done by KU, while the field trials are done by the RFD.

RFD silviculture research staff expressed some doubt that collaborative trials using identical methodologies would be practical, and suggested that separated methodologies might be the best approach.

#### 4.4.3 Thailand Institute for Scientific and Technological Research (TISTR)

TISTR has been involved in MPTS research since 1982, primarily through a grant from the BOSTID Tropical Trees program. TISTR has successfully conducted species elimination and management trials on three sites in Thailand, and has proposed expanding into additional genetic selection and provenance testing with Acacia mangium. While not a forestry institution, TISTR has proven itself to be capable of effective MPTS research, and has already been involved in the informal network setup by BOSTID through it's series of "Grantee Coordination meetings".

#### 4.5 Bangladesh Forest Research Institute

The Forest Research Institute (FRI) in Chittagong was the only Bangladesh research institution visited by the team on this trip,

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Kasetsart Univ. Faculty of Forestry will serve as the "home" of the long-term F/FRED team in Bangkok, and will likely play an important role in F/FRED network research. However, the research visited by this team was largely directed to industrial wood production rather than MPTS. The faculty of forestry is involved in MPTS research with bamboo, Melia azedarach, Acacia mangium, and four species of eucalyptus, but distinctly retains a very traditional approach to the potential application of these species.

The Faculty of Forestry does have a number of well-trained faculty members who clearly have long-term interest in MPTS research, and is involved in a series of provenance trials and seed technology projects which will be of direct benefit to F/FRED.

#### 4.4.2 Royal Forest Department

The Royal Forest Department (RFD) is also conducting MPTS research, primarily on Acacia spp., bamboo, rattan, and eucalyptus. Currently underway are a series of species trials with several eucalyptus and acacia species which utilize seed from Australia in designs prepared by the RFD.

The Australian Council for International Agricultural Research (ACIAR) has provided the RFD with seed, travel funds, and limited equipment. They also cooperate in the experimental design and

and this visit was unfortunately very brief. FRI is a part of the Forest Department and is solely responsible for government forestry research in Bangladesh. FRI has done research on several MPTS in recent years including Eucalyptus camaldulensis, Acacia mangium, and bamboos. It presently has very heavy financial support from World Bank for forestry research, and has a significant grant from IDRC for bamboo research.

FRI appears to have more money available than it can effectively absorb at present. As with institutions in Pakistan and Nepal, FRI lacks the personnel to effectively expand its research beyond what is presently planned. There are competent researchers at FRI with interests in leucaena, Acacia nilotica, Acacia auriculiformis, Acacia mangium, and several other MPTS, and who could readily be brought into F/FRED network activities. It appears that any experimental work associated with the network would need to be done in connection with the World Bank/IDA research project, which is likely to utilize most of the available staff resources.

#### 4.6 Pakistan

There are two important organizational characteristics of the government of Pakistan which may have implications for collaborative arrangements with F/FRED: Pakistan is a confederation of four autonomous provinces and its public

institutions tend to have strong leadership from the top down.  
~~institutions.~~

Each autonomous province has its own research and educational institutions. There are important national institutions but their influence on the provincial institutions is minimal and their influence on provincial agriculture and forestry in general is constrained by regional autonomy. On the other hand, employees of the national institutions are often only deputized for temporary assignment from the provincial institutions. Therefore, their personal ties with the provinces remain stronger than, for example, the ties between the U.S. Forest Service and either our state forest agencies or state universities.

This suggests that F/FRED might be encouraged to participate not only with the national institutions, but also with the stronger provincial research and educational institutions. The strong top-down leadership style suggests that it is as important to develop associations with the senior administrators of these institutions as it is to develop them with the research faculty themselves. It also suggests that communication proceeds much more effectively from more to less authoritative foresters than it proceeds between foresters and agriculturists. This is important because agricultural scientists have considerable useful experience which may be relevant to short rotation forestry and the development of fast growing species, yet

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bringing Pakistani agricultural scientists into the F/FRED forestry networks may require unusual effort.

#### 4.6.1 Pakistan Forest Institute

The Pakistan Forest Institute is the most important forestry teaching and research in the country. As an institution it is comparable to Dehra Dun in India. Its research focus is largely on commercial timber management. Research and teaching on fuelwood species and farm forestry is relatively undeveloped. Furthermore, its faculty feel their time is fully committed to their current research and teaching responsibilities.

There is, nevertheless, some interest in multiple purpose trees and in F/FRED. The Director General, M.I. Sheikh, was an active participant at the Kandy IUFRO meeting where Pakistan was chosen as the lead country for three species: Populus, Dalbergia sissoo, and Morus alba. Sheikh has considerable personal research experience with Populus species and additional interest in Robinia pseudoacacia. Several other faculty might have some interest in F/FRED but only K.M. Siddiqui and S.M. Khan discussed active research which might interest F/FRED. S.M. Khan showed us extensive field trials of a number of MPTS. In addition, there are five faculty who are scheduled to return from overseas training whose research time is currently uncommitted and who might find participation with F/FRED attractive.

#### 4.6.2 Other institutions

The new Vice Chancellor of the Agricultural University of the Northwest Frontier Province, G.M. Khattak is an outstanding forester and former Director General of PFI. He plans to begin a farm forestry program at his university and would like to build associations with PFI and other foresters. In addition, we were encouraged to watch the development of the agricultural (Faisalabad) and forestry (Gatuala) schools in Punjab. They may develop good scientists who might collaborate with F/FRED.

The important national institutions are the Pakistan Agricultural Research Council and the National Agricultural Research Council. PARC is the umbrella funding agency through which both agriculture and forestry funds must flow. NARC is a research institute funded by PARC. It has the most modern facilities and a small forestry component.

#### 4.7 Nepal

Nepal is blessed with a highly qualified Chief Conservator of Forests (M. Haque) and by several aggressive young forestry researchers. The frequent problem of developing communication between agriculture and forestry researchers is probably not a problem in Nepal. There are no apparent agriculture-forestry jealousies and some good cross-programmatic links already exist.

The basic problem for F/FRED in Nepal will be to find sufficient numbers of skilled scientists. Only a few forestry teaching and research personnel have been trained past the bachelor's degree level and none whom we met have been trained past the master's degree level. A potential new USAID project designed to support the forestry faculty at Tribhuvan University (IRNR) will help correct this--but probably not quickly enough to aid F/FRED. A more obvious short-run source of assistance for Nepal's forestry research and teaching personnel and, therefore, for F/FRED is the unusually large number of highly skilled Western forest scientists associated with other development projects: e.g., ODA, Australia, FAO, ICIMOD, Winrock, and perhaps the Utah State project at Rampur agricultural campus. The F/FRED task will be to interest these scientists in active collaboration with bright young Nepali scientists on projects relevant to the F/FRED supported networks.

#### 4.7.1 Forest Survey and Research Office

The Chief (E.R. Sharma) of the Forest Survey and Research Office of the Ministry of Forests and Soil Conservation attended the Kandy IUFRO conference and has interest in F/FRED multiple purpose species networks. He is handicapped, however, by having only a small staff of nine permanent officers. The Chief pointed out three items of importance to multi-purpose species choice which we heard time and again in Nepal: (1) Forage is as at least as important as fuelwood, especially in the hills. (2)

's hillsides need protection from increasing soil erosion. The social science and community aspects of forest management are very important in all of Nepal's forestry programs.

Institute of Renewable Natural Resources (IRNR) Institute of Renewable Natural Resources of Tribhuvan University has several aggressive young faculty with active forestry research interests. The campus chief, M. Karki, is one among these. Some of his field experiments in the terai do fit well within an F/FRED species network. P.A. Dixit has a considerable IDRC project with research plots of special interest to F/FRED's networks--although the greater contribution of his projects may be of a social science nature.

### Social Research Capabilities

The amount of social research being done by forestry institutes in the region, as well as the capability to carry out this type of research, are quite limited at present. This is evident from the following country-by-country review.

#### The Philippines

ALB College of Forestry has a department of social forestry, which offers a Master's degree. An example of research which is relevant to F/FRED is the "Indigenous Agroforestry Project",

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in social research. FORI has one PH.D. and several M.A.'s in rural sociology on its staff, and it lists as one of its research goals the study of the "social-cultural impact" (of forestry policy). However at the time of our interviews none of the twelve components in their research program related directly to human communities and forestry or the impact of government forestry policies on upland farmers. Rather, all of the components relate to what the FORI staff themselves acknowledge to be their principal interest, namely forest production as opposed to forest utilization.

#### 4.8.2 Malaysia

The current research priorities of the FRIM in Kepong are tree improvement and stock production. Social research appears to be neither an interest nor a strength. An example of this is given in their IDRC-funded rattan network, which endeavors to provide useful information to the "rattan industrialist", and does not even presume to address the needs of (e.g.) the tribesmen and peasants who plant and harvest rattan on a traditional, part-time basis. In the state of Sabah there are a number of organizations involved in forestry research, but none of them have any marked strength in social research. This is evident from a joint proposal that these organizations prepared for the World Bank in 1984, entitled "Forest Plantation Development in Sabah: A preliminary Financial Analysis and Proposal for Implementation", in which the planting of oil palms

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on government timber plantations, to reduce the initial establishment costs, is called an "integrated agro-forestry approach". The Forest Research Center in Sandakan is no different in this regard. They have no agroforester (e.g.) on their staff, nor do any of their research divisions include any socio-economic topics. (They have one division called "Indigenous Silviculture", but it does not involve any study of the cultivation of trees by the native people, as might be inferred from the name.) As one staff member stated, they do not study man-forest relations, but instead restrict themselves to "applied research" - which they define as including tree production, provenance trials, and silviculture. However, the head of research here, a Mr. Rahim, spoke very sincerely and convincingly of their desire to move beyond their traditional silvicultural research into agroforestry and related fields.

#### 4.8.3 Thailand

Kasetsart University appears to have some capability to research the social aspects of forestry issues. The School of Forestry has two undergraduate and one graduate courses in agroforestry. In all of their cartographic projects (e.g.), they pay explicit attention to social factors, using either their own forest economists or outside sociologists (hired on a contract basis) to do so. As evidence of this apparent expertise, the government has recently asked them to host an international, four-week course on "community forestry". On the other hand, some of their

staff members have made statements such as "There is no use working with small farmers (as opposed to large and wealthy ones) because they cannot develop anything", or "it is too early for research on the use of MPTS by small farmers"; which suggest that they are still in the early stages of developing a capacity to do social research.

There is little such capacity at the Royal Forest Department, whose two main research groups are "silviculture" and "forest products". There are some social scientists in the RFD, but their work is limited to such topics as supply/demand for various wood products. Their strengths and priorities are reflected in the fact that they are involved in a project entitled "Australian Hardwoods for Fuelwood and Agroforestry in Thailand", but their work to date has been limited to species and provenance trials.

#### 4.8.4 Bangladesh

The Forest Research Institute in Chittagong appears to have done little research on social aspects of forestry in the past, but there seems to be considerable enthusiasm for studying such topics in the future. They expressed great interest to us in studying the use of MPTS for small farmers - including degraded slash-and-burn agriculture areas. They stated that they want to carry out base-line studies of farmer attitudes towards trees, species preferences, traditional uses, and so on. USAID's planned Homestead Agroforestry project is to set up an

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agroforestry cell in FRI and should significantly strengthen their future ability to carry out this type of research.

#### 4.8.5 Pakistan

Our exposure to the social science resources of Pakistan was minimal. G.M. Khattak (Vice Chancellor, Agricultural University of Northwest Frontier Province) showed concern for social science problems and concern for building social science skills into his proposed farm forestry program. There are three employees of the economic branch of PFI but their interests appear to focus on macroeconomic problems which are probably of little interest to F/FRED. M. Dove, an anthropologist on the Forestry Planning and Development project, may be able to help identify social science researchers in agricultural institutions who would like to expand their research interests to include farm forestry and marginal land and other related issues of interest to F/FRED.

#### 4.8.6 Nepal

The social science resources at the Institute of Renewable Natural Resources of Tribuvan University are limited. There may be some social science support from the agriculture campus in Rampur and the main campus in Kathmandu. We made no careful inquiry. The general national interest in community forestry, social forestry, farm forestry, common property, land tenure and the rural poor and other traditional social science/forestry issues is great. Social science research may be a particularly



fruitful area for collaboration between other scientists from development projects and younger IRNR faculty.

## SECTION 5

### NETWORK PARTICIPATION

For F/FRED to create networks of Asian researchers which will withstand the test of will time require careful consideration of what will motivate these researchers to participate in network activities. This section examines a variety of social issues which surfaced during the course of this study.

#### 5.1 Social aspects of participation

F/FRED is to establish networks of people. In this case it will be people gathered together by interests in MPTS research, but this does not diminish the fact that people will be the critical factor in getting the networks established and operating.

##### 5.1.1 Cultural Factors

There is an assumption in the background papers for the F/FRED project that the values of research networking are universal rather than culture-bound. In Lundgren and Brister's background paper, entitled "Multiple Purpose Tree Species Research in Asia: Priorities and Potential for Networking", they write that the words "networking" and "networking" are current terminology for what has always been the rule, not the exception, in science (1984:217). It assumes that science in other parts of the world

- such as Asia - is the same as science in the <sup>W</sup>est, yet there is not a priori reason why this should be true. Similarly does Rose, in his background paper entitled "A Report to USAID/S&T/FNR to Support Development of a Project Paper...", write that the motivation for research networking is the exchange and flow of information (1983:35). The purpose or value of this exchange and flow is, he says, in part to reduce redundancy in research and establish standards for the broader research community (Rose 1983:35; USAID Attachment E 1985:8). Again, there is no reason to assume that these motives and values prevail in the Asian scientific community, and there is some reason to think that they may not. As regards the flow of information, for example, the staff at FORI in Los Banos expressed sharp anxiety that any valuable research data of their's that are entered into this flow might simply be appropriated by other members of the network.

As regards redundancy or duplication in research, Davidson - working at the FRI in Chittagong - noted the prevalent belief that the results of research done in other countries are not acceptable until that research had been repeated inside Bangladesh - by Bangladeshi scientists thereby "validating" the foreign research results. Thus, the assumption that the constraints of forest research in Asia will be the same as those in the U.S. (Lundgren & Brister, 1984). is not necessarily correct, and a statement such as the one by Burch (in his background paper "An Interpretation of Discussion at a Workshop

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on the Human Factors..."), that if the data base management system does not work "it will not be the fault of the technology" (1984:62), becomes of critical importance.

Yes!

The challenge in establishing the F/FRED network is to overcome not technological obstacles but rather cultural ones (among others). The implication that it is the business of F/FRED to only provide the technology, and that it is up to the network participants to utilize it or not, represents a far too narrow view of the project and of the kind of efforts that will have to be made to make it succeed. This matter did not go entirely unnoticed in the various project papers. McFadden (1984) noted the poor rewards and incentives for researchers in Asia. Similarly Parker (1984) wrote that "The implications of incentive structures within the scientific research community must be understood".

In addition to the broad cultural factors that affect scientific research and networking in general, there are several narrower cultural issues that emerged from our interviews that will also be of relevance to F/FRED. One is financial in nature. Staff members at the UPLB College of Forestry expounded at length upon the fact that when they have traveled in the past with Japanese counterparts, they have received from the government a per diem far lower than that given to the Japanese researchers by their government. As a result, they were not able to stay or sometimes

even eat in the same hotels and restaurants as their Japanese counterparts. This, the Thais said, was "insulting" - and it clearly should be avoided in F/FRED.

Another cultural issue involving status is the fact that all of the potential network participants are not of the same caliber - or at least they are not perceived as such by the participants themselves. Thus, Dr. Pollisco at PCARRD in Los Banos suggested to us that all of the institutions in the network should be of the same caliber; and he specifically noted in this regard that the Indonesian institutions are not the equals of their counterparts in the Philippines. Dr. Sajise at PESAM also noted the problem of differences in caliber among the institutions that will be involved in F/FRED, but he suggested a solution as well: he suggested that these differences can be overcome by having more than one "level" of networking, so that while institutions of very different caliber might not be able to collaborate in intensive research, there would also be less demanding levels of activity in the network where they would be able to collaborate.

A final cultural issue was raised by Bisson in the Philippine mission: he noted that some of the best Philippine scholars work out of the mainstream of research in the Philippines, whether by choice or necessity. These individuals should be identified through F/FRED because these isolated researchers - who will be left out of F/FRED if the project concentrates solely on

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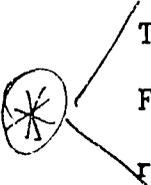
institutions - may not only some of the best researchers around, but they are clearly also the ones who could benefit most from participation in a research network.

### 5.1.2 Economic Factors

Economic factors are an important incentive for participation in the F/FRED network in most but not all cases. In the exceptional case of the Taiwan Forest Research Institute, for example, Dr. Hu went so far as to say that they could contribute some of their own funds to F/FRED activities if needed. This can be explained in terms of Taiwan's relative prosperity, its political isolation, and the unusual character of Dr. Hu himself. However, it is also characteristic of a cultural attitude towards giving and receiving that prevails throughout Asia. Namely, even the most needy person or institution does not always want to be a recipient, but at least occasionally wants to be a giver. Evidence of this attitude was given in the reaction of the foresters at Kasetsart University to being asked by the Thailand government to host an international workshop on community forestry. Again and again they expressed deep pleasure and pride over this - part of which had to do with the fact that they were chosen as the host by the government, but most of which seemed to be due to the fact that their country, although admittedly still poor, was going to spend its own resources on a development activity involving other countries in the region. The pride that

*This is  
civil social,  
& only incidentally  
economic!*

this sort of activity generates is a resource that the F/FRED project should take note of and try to tap if at all possible.

 These points aside, many potential network participants view F/FRED as a source of much-needed funding, especially for research. A number of researchers specifically stated that they were hoping for research funds from F/FRED, and indeed that they were hoping that a greater proportion of the F/FRED budget would be devoted to supporting research by the network participants than was presently the case. Cutbacks in government funding have made many researchers more and more dependent on funding from international donor agencies. Not all outside observers accept this view that research institutions in the area have become strapped for funds, however. Bisson in the Manila mission rejects the contention of Philippine researchers that the biggest constraint on their research is scarce funding (instead arguing that a far more important constraint is poor research methodology and often a lack of motivation). As an example of how much money is available for research at FRI in Bangladesh, the staff there told us about a three-year research project which was funded for "only" \$50,000 dollars. When we then asked if F/FRED research money of a maximum of \$5,000 dollars per researcher would be valuable to them, they laughed ruefully. Our surprise at this assessment was later somewhat mitigated by an explanation from Davidson to the effect that the \$50,000 dollars had to cover not just research costs but also considerable additional staffing.

However an upcoming IDA project will provide the FRI with a total of 7.4 million dollars over the next 5 years as a result of which they should have absolutely no shortage of research funds. The lack of qualified manpower in Bangladesh, Pakistan, and Nepal are clearly more important constraints than money at this point.

After funds for research, perhaps the next most important type of funding according to the potential network participants interviewed is funding for education, in particular for degree programs. FORI in Los Banos, the UPLB College of Forestry, and the TFRI which otherwise did not make a pitch for any F/FRED funds, noted that they might be able to use some scholarship money for study in the U.S..

Other perceived or expressed needs for funding from F/FRED include equipment, travel, and honoraria. A special possible use of F/FRED funding is to provide some sort of honoraria or salary supplement to "country coordinators" of the networks (assuming that this is how the networks are in fact set up). Dr. Carangal told us that he does not provide any such funds to the country coordinators in his multiple cropping network at IRRI; and Dr. Suree at Kasetsart University stated that he would gladly act as a coordinator for Thailand in the absence of any such compensation. However, Dr. Suree also told us that he would drop or turn down invitations to participate in other activities - all which are usually income-enhancing - if he indeed did become a

country coordinator for F/FRED. There is reason to suspect that if F/FRED does indeed make use of country coordinators, it should strongly consider the possibility of making them some sort of financial compensation. A case in point is the ASEAN-U.S. Watershed Project based in Los Banos, which - because of its ASEAN administration - has not been able to pay its country coordinators anything. According to staff members in Los Banos, this restriction has proved to be a problem, presumably because it has resulted in less activity by their country coordinators that would otherwise have been the case.

In general, two different attitudes towards the funding of F/FRED participants emerged in our interviews. The first, exemplified by the staff at FORI in Los Banos, represents a feeling that the projected levels of F/FRED spending on participants is inadequate, or more specifically that too small a portion of the F/FRED budget is being allocated to the participants, to their research and institutional development. The second attitude, in contrast, is based on a feeling that the provision of funding is not necessarily a good thing. The most sophisticated statement of this position came from Dr. Carangal at IRRI, who noted that when activities at a research institution are completely funded by an outside donor agency, there is a danger that those activities will come to a halt when the donor agency finally terminates its funding: that is, an activity funded in such a way likely will not become "institutionalized". However, Dr.

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Carangal also noted that it is still usually necessary for outside donor agencies to provide "seed money" to get the ball rolling (a point also made by Dr. Madamba of IUFRO). Both Dr. Carangal and Dr. Madamba also recommended that F/FRED help its network participants to find other donor agencies to fund their activities. And indeed, just such a function for F/FRED was anticipated in Winrock's project proposal (Winrock 1985: IV.25).

A final economic factor concerns the indirect incentives as well as disincentives to network participation. One disincentive is the fact that some of the F/FRED countries are competitors in the international agricultural marketplace. Foty in the Bangkok mission noted that the Thais are usually reluctant to share any of their agricultural data with the Philippines because the two are often competing for the same international markets. More concrete evidence was heard in Malaysia where shared research in oil palm production has contributed to lowered market prices. Thus Malaysia funded research has been used in other countries to the detriment of Malaysia growers. This issue of competition returns the discussion to one of the most basic issues of the F/FRED project, namely how to encourage collaboration in a research network without jeopardizing the legitimate rights of individual researchers. This crucial issue received surprisingly little attention in the background papers for F/FRED. In Rose's paper, "A Report to USAID/S&T/FNR to Support Development of a Project Paper for the F/FRED Project", he acknowledges that

"Priority use of data must rest with the collector" (1983); but no attempt was made either here or elsewhere to figure out how to ensure this while at the same time promoting research collaboration and networking. This is one issue that the F/FRED staff must address early on in the project, and in an explicit manner, so as to allay any anxieties and hesitance that potential participants might otherwise feel.

### 5.1.3 Political Factors

Two major political issues - affecting the establishment of the F/FRED networks and participation in them by Asian research bodies - emerged from our interviews. One is the general way in which Asian nations view their relationship with the West and the West's relationship with them. Rose (1983) acknowledges that F/FRED will have to take into account "isolationist attitudes" among the potential Asian participants, whereas Parker (1984) more openly and explicitly cites the possibility that some LDC's will suspect the West of using "networks" to exploit and dominate them. The reality of this suspicion was confirmed during our visit to FORI in Los Banos, where at least one or two of the staff expressed their fear that the CIA or USIS was behind the F/FRED project and would use its data management component to misuse information of importance to the livelihood and welfare of the Philippine people. (If there is no such ulterior motive to F/FRED, they asked, why should USAID not simply encourage the various national research bodies to exchange data directly with<sup>1</sup>

one another, as opposed to going through a centralized office in Bangkok?). In light of such fears, Burch's suggestion in his background paper (1984:62), that "A shared DBMS will liberate developing country institutions from having to depend upon the good will of North American or European institutions..." must be seen as a gross misperception of the actual state of affairs. Far from viewing F/FRED as liberating themselves from the West, some of the potential participants see it as ~~tying~~<sup>tying</sup> them more tightly - perhaps with ill results - to the West. Dr. Sajise at PESAM in Los Banos agreed that these anxieties and suspicions regarding the true purposes of F/FRED are inevitable, and he suggested that the best solution is to build the networks on close personal relationships, and count on these relationships and the passage of time to build more positive attitudes towards the project. Another step which would also go far towards lessening some of this anxiety, would be to involve Asians more directly in the administration of the project. The long-term slots have already all been filled, so it is not possible to put an Asian scholars, themselves based in the region, and sending them from one participant institution to another, might dramatically reduce the amount of anxiety about supposed CIA/USIS conspiracies.

A second, political issue is the relationship that will exist between the F/FRED project and IUFRO. Dr. Salleh of the FRI, he noted that the intention of IUFRO had been to interest donor

agencies in funding its research networks, not to set up independent ones - as USAID was doing with F/FRED. Accordingly, he proposed that the F/FRED project be turned into a joint IUFRO-USAID project; one advantage of which, he said, would be that nations whose relations with the U.S. were problematic could be included in the network. An example of IUFRO's political finesse and neutrality<sup>X</sup> is the Kandy meeting where representatives from both Taiwan and the Peoples' Republic of China sat down at the same table.

## 5.2 Activities

### 5.2.1 Research

At the moment there appears to be very little genuinely collaborative international research on this or related topics going on in Asia. Even in the case of ACIAR's research network, the member countries work out their research designs not with one another, but individually with ACIAR - according to our interviews with the RFD staff members in Bangkok who participate in this network. There are many different reasons for this state of affairs, one of which is the nationalistic attitude that leads researchers to distrust research results from other countries and to insist upon repeating all research on their own in their own country. What this means for the collaborative research that is planned under F/FRED is that there is little predisposition in its favor, and there is some predisposition against it. Staff members at the RFD in Bangkok flatly stated that they thought a

common research design for the F/FRED participants would be "difficult"; and at Kasetsart University the foresters said that they thought it would take them "two years" of in-country research and preparation before they would be ready for any international collaboration on research. Even then, it was not clear if what they see as "collaborative" research is the same as that envisioned in F/FRED: they described it as each participating country tackling a different aspect of one broad research problem.

Although this collaborative research may not be easy, there is much evidence to suggest that it may be very important. Davidson at the FRI in Chittagong told us that the simple coordination of species trials by F/FRED would represent a major contribution to this area of development in Asia.

The potential importance of this aspect of the F/FRED project is indeed such that Dr. Salleh said, the project should emphasize research as opposed to networking per se. This issue, concerning just what sort of a project F/FRED will be, is an important issue for the F/FRED staff that they should recognize that there are many different perceptions of and hopes for the project.

#### 5.2.2 Data Bases

The researchers whom we interviewed expressed a moderate interest in improved access to the results of research in other countries

in the region. Typical was the comment from that they in particular lacked data on those tree species that, while of only minor importance in the Philippines, were of major importance in neighboring countries. Other institutions, such as the FRC in Sandakan, noted that they lack data from research in particular countries, such as Indonesia and the Philippines, where differences in language or bureaucratic idiosyncracies impede the flow of research data. As Dr. Sajise of PESAM in Los Banos reminded us, however, the difference between recognizing a lack of data from other countries and sincerely wanting to overcome it will be determined by whether or not the data involved are important to one's "bread and butter". Where this incentive is present, Dr. Sajise suggested, researchers will be sincerely interested in improved access to one another's data.

On the other hand, material incentives to acquiring someone else's data can be disincentives to sharing one's own data with someone else. As noted earlier in section 5.1.2, economic competition is said to be a major constraint on the sharing of agricultural data between Thailand and the Philippines, as a result of which (e.g.) the data banking efforts of the ASEAN agricultural center in Thailand have not been very successful. There is general agreement that it is the commercial or private sector research organizations that are most reluctant to share their data with others; a fact that should be borne in mind if an attempt is made to involve private sector organizations from

either Asia or the U.S. in F/FRED. While non-commercial research organizations such as FORI or the UPLB College of Forestry in Los Banos promise to be somewhat more open in sharing their data with others, even their staff noted that some types of data would have to be excluded from such sharing, specifically data that may be economically valuable, threatening, or etc.

One solution to this problem is to ensure that each researcher who contributes data to the F/FRED networks retains prior rights to their exploitation. How to do this is no easy matter, but it is one that must be tackled by the F/FRED staff early on in the project. If it is not, the most valuable data may be withheld from the F/FRED data bases. Alternatively, these data may be contributed but then misused by third parties, discrediting the project. In deciding how to protect the rights of the individual researchers, some thought must also be paid to what will happen after the termination of the project. In this and other respects as well, a central data bank is indeed problematic, as Dr. Madamba noted in our interview with him. Dr. Madamba also noted the most likely solution to this problem is to make F/FRED a network of not institutions but people, and count on their personal relations to overcome suspicion and establish trust.

### 5.2.3 Seed Exchange

This is one area of projected F/FRED activity in which some truly international collaboration seems to be already taking place.

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The FRC in Sandakan is already engaged in some exchange of tree seeds with other ASEAN countries, for example, as is the FRI in Kepong. (The latter case involves rattan seeds, but the researchers involved said that they were exchanging these seeds on their own initiative, not within the IDRC rattan network.) This also seems to be one area of projected activity whose value is fairly broadly acknowledged and endorsed. Such widely disparate institutions as the UPLB College of Forestry and Sabah Forest Industries in Kota Kinabalu stated that seed exchange and acquisition is an area in which F/FRED could be of great help to them; while Davidson at the FRI in Chittagong expressed the opinion that this is one of the two most important contributions that F/FRED can make to the development of MPTS in Asia.

While there is extant interest in and therefore support for this activity, it is not without its problems. As the foresters at Kasetsart University in Bangkok told us, the collection and exchange of tree seeds is "expensive, hard to organize, and heavily regulated by the governments of the region" - as a result of which, they said, they could not foresee being able to exchange any genetic material before the third year of the F/FRED project. It is clear why expense and organization should prove as serious an obstacle to seed exchange as the foresters at Kasetsart intimated, given that these are the very resources the F/FRED promises to bring to bear on this activity. It seems more likely that a major if unstated concern of the Thais is that seed

What?

stock is a scarce resource, over which there is or may be competition. This competition was evident throughout the region, especially where commercially oriented organizations were involved (e.g., the FRC in Sandakan complained to us that the government owned corporation, Sabah Softwoods, is secretive about its seed stock and will not freely share it with the FRC). One solution, at least for the early stages of the F/FRED project, might be to concentrate on the collection and exchange of seeds of MPTS that are likely to be used for subsistence purposes by small farmers (e.g. Acacia nilotica) as opposed to MPTS that might lend themselves to market oriented exploitation on large scale plantations (e.g. Acacia mangium).

#### 5.2.4 Publications

Of the various types of publishing activities in which F/FRED might involve itself, the one that is of the most obvious value and is the easiest to carry out is probably a network newsletter. A newsletter is necessary to keep the participants in a research network together. A somewhat more challenging activity is assisting in publishing the research results of network participants. Some potential participants, such as the FRC in Sandakan, claim to already have adequate outlets (at least in-country) for their research; while others, such as the UPLB College of Forestry, say that they do not. In the latter case, the major constraint to publication was said to be funding.

This is certainly one area in which it would be easy for F/FRED to assist, although the ultimate value of simply assisting participants in turning out in-house publications is questionable. Far more valuable would be assistance in raising the quality of research reports, so that they could be published in a form adhering to recognized academic standards. An ambitious but potentially very important activity for F/FRED in this regard would be for it to assist in establishing in the region a refereed journal or occasional paper series on MPTS.

*Because*  
 Since the honor of publishing in a refereed medium is not as yet widely recognized in Asia, initial contributions could be stimulated by promoting the "social status" of publishing there. A final type of publishing venture in which F/FRED might want to get involved would be a project reprint series. Articles, chapters, or papers written by network participants that are of high quality and relevance to the project, but that have seen limited distribution could be reprinted and distributed to researchers within as well as without the F/FRED network. In this case as well, of course, some peer review would be needed to determine which papers will be reprinted and which will not.

#### 5.2.5 Translation

A necessary counterpart to the data banking and publishing discussed above will be an active program of translating. Mutual incomprehension of languages is at present a major obstacle to research networking in the region. This was acknowledged to be

an obstacle to the use of research data from other countries (especially Indonesia) by FORI and the UPLB College of Forestry in the Philippines, and by TFRI in Taiwan. Interestingly, the staff of the latter institution asked the F/FRED project for assistance not only in translating research reports (or at least abstracts of them) from other countries in the region, but also asked for assistance in editing their own reports for publication in English. Precedents and models for this sort of activity are provided by a number of international research programs in the region, such as the ASEAN-U.S. Watershed Project mentioned earlier, or - most notably - BIOTROP in Indonesia. BIOTROP has probably the highest standing in the international community of any scientific organization in Indonesia, and its vigorous program of English language publishing is clearly one of the major reasons for this. English should probably be designated as the common language of the F/FRED networks, therefore, but this designation must be accompanied by the realization that many participants cannot operate in it and will therefore require a serious (and this means well-funded) translation program if they are to truly participate in the networking.

#### 5.2.6 Meetings

One of the four key components for successful research networks identification Section 3.3 is regular meetings among the participants. Without such meetings, for example, the RFD in Bangkok asserted that a common research design for participants

in the F/FRED network would be impossible: with them, they admitted that a common design just might be achieved. The research design aside, such meetings - and the international travel that they involve - also provide one very significant incentive for participation in the network. At research institutions with somewhat greater resources, such as the TFRI in Taipei, even just an official invitation from F/FRED to an international meeting would be valued, because this is a necessary prerequisite to traveling on their own resources. In some cases, notably for researchers in Bangladesh at the moment, attendance at international meetings might prove difficult even with an official invitation and outside funding in hand. A partial solution to this problem would be to ensure that at least some of the network meetings are held in Bangladesh, thus providing the researchers there with exposure that may otherwise be sorely lacking.

As also noted earlier in section 3.3, the question of who is to attend these international meetings is an important one. Their attraction to researchers does not mean that they are any less attractive to bureaucrats not involved in research; and the intention of using them as an incentive for the former does not mean that they will not be snapped up as a "perk" by the latter. This, as everyone we interviewed agreed, is to be avoided at all costs. The attendance at meetings of the actual people engaged in research was cited by Dr. Salleh as one of the keys to successful

research networking. Staff in the Manila mission said that the naming of specific people helps to ensure attendance by researchers as opposed to their bureaucrat superiors. On the other hand, it bears noting that Dr. Ali at BARC in Dhaka views "name" invitations as more problematic than "open" ones. The politics of the research establishment there may be such that if the right people are named in an invitation, no one will be allowed to attend; whereas if the invitation is left open, then there is at least a chance that the right people will be allowed to attend.

#### 5.2.7 Training

There is some demand in the region for the type of training that F/FRED will be able to provide. At the FRC in Sandakan, for example, we were told that, as a result of a government cap on the hiring of new staff, they are concentrating on the training of extant staff and would welcome assistance from F/FRED for short-term non-degree training of junior staff, as well as for study tours by the more senior staff. Even at the relatively well-endowed TFRI in Taipei, we were told that although their need for assistance with long-term degree programs of training is mixed, (given that there are also in-country government funds for this), they have a very clear need and desire for short term training assistance from F/FRED.

Tailor each invitation

Some of the data gathered during our interviews suggest that the training provided under F/FRED should not all be structured along the traditional student-teacher lines that prevail in most development programs. It was evident to us that more innovative training programs are not only enjoying great successes, but are also necessitated by current cultural and political realities in the region. Thus, Dr. Ralston spoke of the considerable success that the Thai Ministry of Agriculture has had with a training program that pairs one Thai scientist with one US scientist for one month - either in Thailand or the US. The "collegial" aspect of this arrangement clearly contributes to its success and is a clever recognition of the sensitivities of senior Asian scientists, as well as an honest recognition of the fact that Asian scholars are capable of teaching, as well as learning from, Western ones. Precisely these sentiments lay behind Dr. Salleh's offer of assistance from his FRI for F/FRED's training program. He sees his staff as capable of training other Asian Scholars - and indeed he sees them as more capable of conducting such training than the typical short-term Western consultant. At the same time, he exhibited a very sophisticated grasp of the effects of such training on the trainers themselves. Opportunities to carry out such responsibilities and train junior colleagues are, he noted, a vital component in the professional development of a scholar. If all such opportunities are given to Western scholars, a key stage in the training of Asian scholars is thereby forfeited. In cases where a Western candidate for a



training position has marginally superior credentials to an Asian candidate, this dual value of employing the latter (viz., with benefits for trainer as well as trainee) should be borne in mind.

### 5.3 F/FRED Relationships

#### 5.3.1 Administrative Relations

While all of our interviewees favor a focus on individuals as opposed to institutions and on researchers as opposed to bureaucrats, no one suggested that F/FRED should ignore or bypass the institutional establishment. Quite the contrary, everyone with whom we discussed this topic emphasized that all F/FRED communications and actions must proceed through the proper channels. In some cases, this is dictated by official policy. Thus, in Bangladesh we were told by Dr. Ali at BARC that any F/FRED funding to the FRI in Chittagong would have to be channeled through BARC or, alternatively, through the Forest Department. Similarly in the Philippines, any F/FRED funding to the UPLB College of Forestry would probably have to go through PCARRD. The formal arrangements for funding and cooperation aside, we were told that all F/FRED dealings with individual researchers have to go through official channels as well. Dr. Hu at the TFRI in Taipei said that this applied to all such dealings with researchers in his country, with the possible exception of inviting them to seminars.

This is not to say that the national bureaucracies should be allowed to dictate the nature of the project's relations with individual researchers - this is to be avoided at all costs, as discussed in earlier sections - but only that recognition and sanction of these relations must be secured from these bureaucracies. Thus, Dr. Sajise at PESAM in Los Banos said that F/FRED should specify not just the institutions with which it wants to work, but the specific individuals within them as well - but then F/FRED must secure the approval of the institution for the individuals selected. The lesson seems to be that it is necessary for a successful research network to be run with some independence of the government bureaucracies, but that this independence is possible only by obtaining the good will of these bureaucracies through patient and determined political lobbying.

*Good point*

In addition to relations between F/FRED and the respective government bureaucracies, the question of administrative relations within F/FRED bears some mention here. Two important questions in this regard were raised by Foty in the Bangkok mission. First, what will the role of Kasetsart University be vis-a-vis other participants in the F/FRED network? That is, will it assume some special role owing to the fact that it houses the project team? Second, he asked, what would be the relation between the two Winrock employees on this team and the one person on a personal service contract from USAID? This second question is probably the more important one, since it involves the nature

of the relationship that will obtain between Winrock and USAID in general. Without attempting to discuss what the nature of either this personal or this institutional relationship should be, suffice it to say here that the more this is discussed beforehand, and the more respective responsibilities are delineated and potential conflicts anticipated, the more auspicious it will be for the start-up of F/FRED.

Aside from the Winrock and USAID positions, the various other proposed positions in the project also received some comment during our interviews. The so-called "advisory group", was commented upon by Dr. Carangal of IRRI: he said that in general such groups are a bad idea, because they typically are made up not of the actual researchers but of bureaucrats. The only time that it makes sense to form an advisory group, he said, is when it is needed to fulfill the political purpose of selling a research project to a particular national government.

The project position that received the most discussion was that of country coordinator, all those interviewed seeming to agree that this position is crucial to the successful functioning of any international research network. Strategies to enhance the value of this position - having the coordinators chosen not by their respective national governments but by the central project staff, and furnishing the coordinators with a salary if possible - have been mentioned in earlier sections. Another tactic for

strengthening this position is to ensure that all communications to network participants are channeled through their respective country coordinators. The reality of the country coordinators in some extant research networks falls short of this ideal, in particular insofar as economic support is concerned. Due to bureaucratic or financial constraints, many country coordinators are not paid - those currently working in the IUFRO MPTS network being one example of this. Dr. Salleh of FRI in Kepong (a IUFRO executive board member) in fact asked us if the F/FRED project might be able to give some financial support to the volunteers who are now manning these positions.

### 5.3.2 Financial Relations

One financial aspect of the project administration was just mentioned in the preceding section, namely the capability and advisability of paying the country coordinators. As also mentioned earlier, some prospective coordinators maintained that they would not have to be paid as the people who become country coordinators are typically "big guys", of position and wealth, and so they really do not need to be paid. This is not always true as suggested by the staff of the ASEAN-US Watershed Project, in that they felt constrained by their statutory inability to pay their country coordinators.

Probably more important than the presence or absence of pay for particular project positions, however, is the overall flow of

project funds. Some of our informants intimated that this is a problem with any USAID-funded project. The ASEAN-US Watershed Project staff said that USAID budgeted plenty of funds for them, but they could not get them when they needed them. Apparently with similar experiences in mind, Dr. Ralston at the Ministry of Agriculture in Bangkok suggested that it would be much more expeditious if F/FRED's funds could be channeled through Winrock as opposed to USAID, which we understand to be the current plan. However, the most important aspect of the flow of project funds is not their speed, but rather their source and routine. This is of critical importance in countries with which the US has no diplomatic relations and/or no USAID program. In the event of just the latter, as in Malaysia, F/FRED funds could possibly be channeled through the ASEAN bureaucracy - in the opinion of Wojtasiewicz in the U.S. Embassy in Kuala Lumpur. In the case of a country without diplomatic relations with the US, such as Taiwan, F/FRED funds might be channeled to network participants through US universities with which they are working, or a NGO. Dr. Hu at the TFRI said that this route had worked successfully in past cases involving financial assistance from the US government. Another route, in either of the above cases, might be to channel the funds through IUFRO. Dr. Salleh told us that IUFRO was willing and able to do this in countries where there is no USAID mission. Such an arrangement would seem to be the best of all, depending only upon what the specific constraints or

requirements of IUFRO might be in rendering this assistance.

### 5.3.3 Personal Relations

One of the four keys to the success of a research network, according to Dr. Salleh of FRI is that it must "come from the bottom". A "bottom-up" type of approach was also recommended for F/FRED by Dr. Hu at the TFRI in Taipei, as well as by others whom we interviewed on this topic. For Dr. Salleh, this type of approach consists in limiting the western role in the project and increasing the role of Asians. Unless the Asian participants are given some responsibility, he said, "they will not commit themselves". For Dr. Madamba, a regional coordinator for IUFRO, a bottom-up approach means that the project networks should begin and remain at a personal level. For Dr. Carangal at IRRI, a bottom-up approach means starting small and providing only limited funding to project participants. If the project provides too much funding then its activities will never become institutionalized (e.g., the activities will have no life beyond the life of the project). The need to structure the project so that its activities will become institutionalized is a concern for the potential participants in F/FRED (see section 5.2.2) as well as a concern of extant participants in other networks (e.g., the foresters at Kasetsart University openly expressed their doubts to us as to what will happen to IDRC's rattan research projects when IDRC eventually withdraws its financial support).

#### 5.4. Impact of IUFRO Network preparations

Many of the researchers whom we interviewed voiced criticisms of the IUFRO networks, and some expressed their readiness to join the F/FRED network on this basis. For example, the foresters at the UPLB College of Forestry told us that they prefer F/FRED to IUFRO because the former is focussed on the condition of the farmer, whereas the latter is not; and the foresters at Kasetsart University told us that they are happy about F/FRED because "it will give us something", whereas IUFRO exists "on paper only" (although, they added, it does "provide direction"). The majority of criticisms of the IUFRO networks focussed on their selection of species and on the fact that this selection is being forced upon the network participants. Thus, the staff at the UPLB College of Forestry made it clear that, while they were preparing proposals for research on Albizia because this was assigned to them by IUFRO, many did not consider this to be the species of greatest interest or importance to them. Equally unhappy were the staff of BARC in Dhaka, who feel that jackfruit is the ideal MPTS for Bangladesh, but see it being officially ignored by the IUFRO networks because it did not make it onto the final list of "high priority" species at the Kandy conference. The response of a surprising number of research institutions has been to ignore (in part or in whole) the Kandy list. Thus, at the FRI in Chittagong, the foresters have unilaterally decided to add species of particular interest to Bangladesh to the Kandy

Major objection

list. The foresters at Kasetsart University say that Thailand will do the same. To these criticisms we would add the observation that the IUFRO networks to date contain little if any actual networking. In the country proposals that are being solicited by and submitted to Dr. Madamba, on behalf of IUFRO, there is virtually no mention of networking activities (at least among the ones that we examined): they are only proposals to do numerous discrete research projects. And indeed, when we discussed the purpose of these proposals with Dr. Madamba, he stated not that it was to promote research networking, but rather that it was to "rationalize the donor situation" in each of the countries involved - which is not the same thing at all.

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## SECTION 6

## NETWORK RECOMMENDATIONS

One of the major outputs of this mission is the recommendation of up to 3 networks upon which F/FRED is to begin work. This section describes three approaches to network support, and states the basis for the following recommendation. The team recommends that species networking research be initiated on two networks organized around environment zones. Priority species have already been identified by participants at the Kandy meeting, and are further narrowed in this report to 2-4 priority species within each network (Section 6.4.4). The two environment types and recommended species are:

*Key Recommendation*

NETWORK #1: MPTS FOR THE HUMID TROPICS

To include, but not be limited to the following species:

- (1) Acacia auriculiformis A. Cunn.
- (2) Acacia mangium Willd. "mangium"
- (3) Leucaena leucocephala (Lam) de Wit "leucaena"

NETWORK #2: MPTS FOR THE ARID AND SEMI-ARID TROPICS

To include, but not be limited to the following species:

- (1) Acacia nilotica (L.) Willd. ex Del. "babul"
- (2) Dalbergia sissoo Roxb. "sissoo", "shisham"
- (3) Eucalyptus camaldulensis Dehnh "Red river gum"

These recommendations are described in detail in Section 6.4 and are based on the advice of over 30 forestry researchers, USAID

mission staff and others. The recommendations of this group weigh heavily in favor of an approach which focused on MPTS research, but which does not limit network support to single species or genera, nor to rigidly defined networks. The environmental classifications are those used in the IUFRO Kandy meeting report.

At present, none of the IUFRO or Madamba-modified IUFRO networks exist in Asia. While informal communications networks do exist, such as Leucaena and NFT networks which run through the Univ. of Hawaii or NFTA, and while IDRC plans to improve its network support of bamboo and rattan research, there appear to be no formal MPTS networks in existence.

The proposed approach would define networks by the general environment types used in the IUFRO Kandy meeting report. Network participants would be organized by the general type of environment in which they work rather than by species groupings alone. However, MPTS research would remain as the focus of the networks. The environmental network approach described here is recommended as the most appropriate response to MPT network research in the Asian region at this point in time.

A key assumption here is that the greatest long-term biological benefits which can be realistically attained through F/FRED will be obtained by comparing MPTS in species elimination trials.

Other species of local interest need to be compared with these promising MPTS, and networks with species-specific titles do not allow for this vital research. This approach also satisfies the AID criteria for network selection and offers several other advantages over the organization of networks as proposed in the Kandy report. It is also an approach which has been consistently endorsed by both USAID mission personnel and Asian researchers, including IUFRO Western Region Coordinator Dr. Salleh Nor.

In summary, the primary advantages of using this approach are:

- 1) The broader organization of networks will allow critical comparisons of promising exotic and locally important MPTS.
- 2) Environment type network groupings will provide linkages between scientists who face similar site conditions and constraints.
- 3) Selection of networks by environment type assures both a regional and zonal distribution of F/FRED sponsored research activities as required in the scope of work provided to this team.
- 4) Potential network participants tend to feel that the species selected are too few in number and/or are not the ones of greatest interest or importance to them.
- 5) Researchers seem to view the selection of particular species by the network coordinators as an unwelcome constraint on their work.
- 6) A narrow species focus appears to be somewhat opposed to the typically problem-oriented nature of scientific inquiry, particularly since our understanding of MPTS is still quite limited.

#### 6.1 Network Establishment Other Than by Species

In Winrock's proposal to carry out the F/FRED project (1985,

Annex B:1), as well as in Lundgren & Brister's background paper for this proposal (1984:194), it was noted that the Kandy conferees recognized that species-based networks would not cover all of the collaborative research on MPTS that needs to be done in Asia, and that this type of focus has a number of drawbacks. One of these drawbacks, as discussed in section 5.4, is that many network participants feel constrained by a focus on a particular tree species. In the face of similar dissatisfaction with species foci dictated by network coordinators, other research institutions such as ACIAR have allowed their participants to select the species of interest themselves.

Acceptance  
of 'noise'  
in system

There are other shortcomings to species-based networks from the standpoint of MPT production. As Dr. Brewbaker of the University of Hawaii has stated, the study of a particular tree species in isolation is not recommended: each such study should include a number of potentially important species. This point is underscored by the current pest crisis with Leucaena leucocephala in the Philippines. Leucaena has been devastated there by a jumping plant louse which has effectively destroyed the leucaena production of the country, at least for the immediate future. So much effort has focused on leucaena that there are no alternatives ready to offer farmers who now receive a substantial portion of their income from this single tree species. Had other species been studied along side leucaena, alternatives would now be better understood. We would apply this principle even a

AB

tree species should include studies of the particular socio-economic contexts in which they are grown and utilized. The danger in any species-focussed research activity is that the plants will tend to be evaluated as good or bad in and of themselves, on largely or exclusively botanical criteria, on the assumption (which was proven false, at great cost, in the Green Revolution) that a "good" plant can be plugged into any given socio-economic context.

Another shortcoming of the species focus involves the great amount of environmental variation that prevails within each country in the region. Because of this variation, the researchers at most institutions cannot really confine themselves to any one species. Thus, the RFD in Bangkok is trying to establish research stations in each of Thailand's many environmental zones, with the aim of finding one or more fast growing tree species specifically suited to each (not every) zone. For the same reasons, numerous researchers told us that they are interested in not one or two MPTS, but in many. A final drawback to a species focus is that elimination trials might knock out a species that was designated as the basis for a network. What would then happen to that network? (Winrock 1985, Annex B: 1).

#### 6.1.1 A Problem Oriented Focus

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This type of focus is not unknown among research networks. For example, Dr. Salleh spoke to us of an Australian Tree Improvement Network which is essentially problem-oriented and cuts across the species-oriented IUFRO network lines. Problems suggested to us as potential foci were research methodology, fuelwood or fodder. This singular advantage of these types of network foci is that they are inherently more suited to the general pattern of scientific inquiry, which is most often problem oriented. Consequently, more scientists share common interests in problems than in species, and it would be proportionately easier to establish a research network based on the former as opposed to the latter - a point made to us by Dr. Davidson at the FRI in Chittagong.

*as West  
knows it?*



This approach has been rejected by this team, primarily for one reason. It is now commonly understood that most small farmers do not plant trees for a single purpose - indeed, the shift of F/FRED from fuelwood to multipurpose trees indicates an understanding of this situation. Given the importance of trees with multiple uses to farmers, it is illogical to further encourage research along "single-purpose" lines and at the same time expect the results to meet small farmer needs.

#### 6.1.2 An Environmental Zone-Oriented Focus

An alternative to the problem-oriented focus that is more favored by many of the scholars who have been or still are involved in

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the F/FRED project, is a focus based on different environmental zones. Such a focus was recommended in Winrock's (1985: 1-3) project proposal, based on the likelihood that it would bring together scientists with the same site problems (1985: Annex B: 1). The problem orientation of this focus was also seen as a strength by Bisson in the Manila mission. Another advantage of focussing the networks on environmental zones is that much of the national forestry research in the region is already zone-oriented. Bringing this kind of orientation to bear on MPTS research would cast a new light on some species: for example, Leucaena has come to be seen as something of a "wonder tree", yet only tolerates a relatively small portion of the tropics. A final advantage of focussing the research networks on environmental zones is that this would facilitate the inclusion of Asia's arid and mountain areas. These countries may otherwise be left out, as Dr. Salleh told us, because of the emphasis in the Kandy conference list on high priority, moist lowland tree species.

The use of environmental zones to focus the research networks is not without its problems, however. One problem is that this, like any other focal point dictated by the network coordinators, may simply not suit the interests or needs of network participants. For this reason, Dr. Carangal rejected the initial proposal (from USAID) to base his multiple cropping network on

agroclimatic zones, and instead left it up to the participants (with broad limits) to choose their own topics of interest.

*Not necessarily*

A more serious problem with a focus on environmental zones is the conceptual exclusion of man from this scheme. In Lundgren & Brister's (1984: 79-81) background paper, for example, they note that the major determinants of environmental type or zone are rainfall, temperature, soils, and drainage. Thus, despite the fact that most of Asia is today covered either by the crops that man has directly caused to grow or the anthropogenic vegetation that he has indirectly caused to develop, he is ignored as a determinant of environmental variation. This could be remedied - assuming that the networks are indeed focussed on environmental zones as opposed to species - by recognizing "people-oriented" MPTS research problems (e.g. fallow needs in shifting cultivation, fire tolerance of MPTS, etc.). Selecting, breeding, and managing MPTS for these problems is far more likely to succeed than selecting, breeding and managing MPTS based only on the characteristics of the environment while completely ignoring the human activities that have created and are maintaining these agroecological zones.

*Agro-ecological zones*

## 6.2 Description of proposed network activities

Discussions with both Asian researchers and USAID staff have lead to considerable thought on the main types of network activities to be sponsored under the F/FRED project. This section describes

the team's understanding of the types of work that F/FRED has been designed to engage in.

#### 6.2.1 Communication

Clearly a major focus of F/FRED networking is the communication of research priorities, methodologies, and results among network participants. The researchers interviewed by this team have generally expressed interest in sharing information (Section 5). The environmental focus recommended in this report would allow exchange of information on a range of MPTS research activities.

Perhaps most important of these is communication of basic information on completed or existing species elimination or provenance trials. Such trials have been carried out with traditional forest species for decades. Some of these trials have included MPTS species, and others have contributed to the development of useful methodologies for the study of MPTS for small-farm use. Thus, an important focus of F/FRED networking activities will be to summarize previous MPTS experiments, and to communicate results from existing research efforts.

#### 6.2.2 Collaborative trials

F/FRED has limited money to support individual research projects. It is anticipated that much of this money will be used to fund collaborative research, including replicated trials of common design which will be conducted by all of the network

participants. Species elimination, provenance, and management trials are basic types of experiments which are expected to be done collaboratively through F/FRED.

Networks in agriculture have been established primarily for the improvement of crop and animal species through the identification of improved germplasm and management methods. Collaborative network trials are often conducted for the purpose of identifying germplasm and methods of wide regional significance, and of accelerating the rate of exchange of information about such germplasm and methods. Although F/FRED networking may be expected at first to involve heavily the networking of institutions and personnel with similar interests for information exchange, network field trials having similar or identical design are important to the long-term contribution of such networks. The types of trials foreseen for F/FRED and relevant considerations of germplasm collection and deployment are discussed in this section.

### 6.2.3 Types of experiments

The Kandy meeting report identified 21 major research goals or activities. Of these, 78% focused on just four research areas:

- choice of species
- genetic improvement
- improved biomass yields through silviculture/management
- agroforestry systems design

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Thus it is strongly recommended that three primary types of trials be encouraged for F/FRED collaborators: 1) species elimination; 2) provenance, and; 3) management trials. As concluded for this report, the F/FRED networks will be environmentally defined and will give primary attention to the species elimination trials for network collaboration. Such trials mandate collaborative planning in design, and provision for a centralized analysis of data from the combined experiments. It is expected that provenance and management trials will also be included in the project as the networks develop.

#### 6.2.3.1 Species elimination trials

Species elimination trials are generally conducted for the primary purpose of comparing species for their yield and characteristics such as form, pest, and stress resistance, quality of wood and/or foliage, and suitability to local cultural practices. This type of experiment helps to identify a range of sites to which a species is adapted. It is essential that such sites be described fully to permit their incorporation into a network, such descriptions to include accurate soil analysis prior to establishment, and environmental data (weather, disease and pest conditions) during the experimental period. Many tree species elimination trials have been conducted in Asia, but very few of these compare important MPTS species. Information on seed sources of the provenances chosen are commonly lacking or

dubious. In most cases, species trials in Asia are to be taken only as rough guides to performance of MPTS.

#### 6.2.3.2 Provenance trials

Provenance trials are progeny tests of populations of the same species, but of different provenances (geographical area and environment). Limited provenance trials of Acacia mangium, Dalbergia sissoo, Eucalyptus camaldulensis, Leucaena leucocephala, Tectona grandis, and selected pine species. Few have been subjected to combined analysis and interpretation, employing concepts of genotype x environment interaction. Two examples highlight the explosive power of new germplasm in familiar species in the tropics--in E. camaldulensis and Leucaena leucocephala. F/FRED will want to help develop provenance tests of important MPTS species as soon as possible.

#### 6.2.3.3 Management trials

Management trials can be of many types, of which the most important for fuelwood productivity would appear to be spacing trials. In a vast majority of the trials we have seen spacings were chosen for long-rotation timber production, not for fuelwood or fodder yields. Studies of wood yields on the types of lopping or coppice management commonly practiced by small farmers are virtually non-existent. F/FRED must mandate trials at close spacings and coppice frequencies similar to those

recognized by farmers to maximize yields, with care to evaluate long-term effects of such management.

#### 6.2.4 Germplasm collection

Significant advances with essentially all of the proposed species in F/FRED networks can be expected from genetic improvement. In few instances have provenance collections been made to permit an early assessment of this possibility. The great superiority of selected provenances of Eucalyptus camaldulensis in Nepal, India, Mediterranean, etc., and complete failure of others illustrates the folly of initiating extensive trials of any species without knowing the natural variability of the species.

*Danger* {

Each F/FRED network must be based on collection, increase, and deployment of germplasm. Germplasm collection expertise is relatively limited in the tropics, and vested in institutions like CSIRO (Australia), CIAT (Colombia), USDA and Oxford Forestry Inst. (formerly CFI). It is reflected in species and provenance collections currently under evaluation in Asia of N-fixing trees by the Oxford Forestry Institute, CSIRO, IBPGR in Bangkok, NFTA, NifTAL Project, and the Univ. of Hawaii. These efforts must be extended and expanded greatly. Germplasm increase requires methods of seed production or of vegetative reproduction that are known well for very few species under consideration by F/FRED. The dearth of experience in this area is reflected in the fact that the only widely deployed provenances in Asia of improved

germplasm are purchased routinely in places such as Australia and Hawaii. Seed increases in the region for network trials will be essential, and should be done with full knowledge of pollination biology and breeding systems.

### 6.3 IUFRO species networks

One of the tasks requested of this team was to recommend a short-list of up to 3 species networks for inclusion in early F/FRED efforts. These three networks were to be selected from the 10 networks identified at the 1984 IUFRO meeting held in Kandy, Sri Lanka. However, as the IUFRO expectations became evident, it became clear that F/FRED was not designed to provide the kind of support that IUFRO anticipated (Sec. 5.4).



? what?

IUFRO preparations for a series of MPTS networks have provided much background material and impetus for the F/FRED project. One very important aspect of this network selection teams mission is to make recommendations on how F/FRED supported networks will relate to those proposed by IUFRO. It must be noted at an early stage that the approach envisioned by IUFRO is quite different than that proposed by F/FRED.

IUFRO has proposed a system of 10 revised species oriented networks based largely on the species identified at the Kandy meeting. The originally proposed species have been regrouped into new network groupings as described in Section 6.4. IUFRO

has prepared a detailed proposal for this set of networks (Madamba, 1985), and has solicited from each lead institution an indicative research plan. These plans include a "wishlist" of research projects and identify participating institutions and individual scientists. They also provide rough cost estimates of the proposed research. To date six of the ten lead institutions have submitted these indicative plans. This proposed five year research program will require over US\$10 million in donor resources and proposes the following activities:

- 1) Each lead country will name and appropriate research officer as its National Research Program Director, who in the case of the lead countries will also serve as the Regional Species Research Network Coordinator. This person will likely be the head of the institution with major participation the MPTS networks.
- 2) Identification of institutions which could take care of the documentation and information retrieval system.
- 3) Regional Species Network Coordinator would meet with National Species Research Managers to finalize species research programs.
- 4) Workshop plans for research planning will be formulated by coordinators in consultation with IUFRO.

From F/FRED?

5) Indicative plans to be reviewed by IUFRO MPTS regional advisory board and donor agencies and returned to national and regional research coordinators so that detailed research program proposals can be prepared.

6) A range of country officials are to be named including species research program managers, study leaders and scientists.

Lead institutions designated at the Kandy meeting were asked by IUFRO to prepare indicative research plans which would be funded under the IUFRO MPT network umbrella. In reviewing several of these proposed work plans the team found that most of the individual research proposals were in excess of US\$5,000 and that the number of projects proposed far exceeds the number of grants which F/FRED will provide. The IUFRO plans call for the funding of a wide range of research topics coordinated by lead country institutions and a series of network coordinators. In terms of the number of grants available and the amount of money proposed for each of grant, most of the research proposed under the IUFRO networking concept would not be supported under F/FRED even if the project were to "support" up to 3 of the networks as identified at Kandy. In other words it is virtually impossible for F/FRED to support the IUFRO MPTS networks as proposed in the Kandy report.

*Conclusive*  
*[Signature]*

The ten networks proposed at the Kandy meeting were:

1. Acacia species: *Acacia auriculiformis*, *A. mangium*, *A. senegal*, *A. tortilis*, and *A. nilotica*.
2. Bamboo
3. *Albizia* and *Leucaena*
4. Eucalyptus species: *E. camaldulensis*, *E. microtheca*, *E. deglupta*, *E. urophylla*
5. *Dalbergia sissoo*, *Morus alba*, and *Populus* spp.
6. *Azadirachta* spp. and *Melia* spp.
7. Rattan
8. *Prosopis cineraria*
9. *Salix* spp. and *Robinia pseudoacacia*
10. *Alnus nepalensis* and *Grewia oppositifolia*

These 10 networks have been modified somewhat in recent months by the IUFRO-commissioned report by Dr. J. Madamba (1985) and are discussed in the next section.

#### 6.4 Modification of the IUFRO species networks

It is generally agreed that the species network groupings in the IUFRO Kandy report are not the most logical biological groupings. For example, both the Acacia and Eucalyptus networks contain species of the humid and arid zones. While this grouping may be consistent with the IUFRO Kandy approach of identifying and dividing research work among network participants, it does not appear to be consistent with the F/FRED objectives of network building.

IUFRO has also recognized that the original Kandy species groupings are not the most suitable. Madamba (1985b) prepared a proposal to IUFRO which summarizes IUFRO MPTS network organization activities since the 1984 Kandy meeting. The F/FRED network selection team met with IUFRO Species Network Coordinator Madamba in November, 1985 and discussed the inadequacy of the Kandy network groupings. In his final report, Madamba himself reorganizes the original Kandy network groupings. These modified networks are:

Phase 1

Leucaena spp.  
Bamboo spp.  
Acacia mangium  
Acacia auriculiformis  
Rattan spp.

Phase 2

Eucalyptus camaldulensis  
Eucalyptus deglupta  
Eucalyptus urophylla

Phase 3

Albizia spp.  
Azadirachta/Melia spp.  
Alnus nepalensis

These network re-groupings more closely resemble those recommended by this team. If a network which begins with a rigid list of species is demanded by USAID, the following set of networks are suggested in order of priority as a modification of the IUFRO Kandy list:

1. Leucaenas

To include: Leucaena leucocephala, Leucaena diversifolia, interspecific hybrids

2. Dry zone Eucalypts

To include: Eucalyptus camaldulensis, Eucalyptus teriticornis,

3. Acacia nilotica and Prosopis

To include: Acacia nilotica, Prosopis cineraria

An advantage to a modified IUFRO approach which identifies species from the very beginning of the project is that additional uncertainty is removed about the biological focus of the networks. This might allow project activities to begin slightly faster than if species were to be selected by a group of network participants and F/FRED staff. It is felt, however that a succinct statement by F/FRED project staff about the focus of the networks will be required at the outset of the project, and could as easily define any of the alternative network approaches.

This approach also has the advantage that it more closely resembles the approach advocated in previous AID documents, which suggested the support of up to 3 of the 10 IUFRO identified networks.

The disadvantages are stated in section 6.1.

6.5 Network establishment by general environment type

This approach would define networks by the general environment types used in the IUFRO Kandy meeting. Network participants would be organized by the type of environment in which they have the greatest interest, rather than by species groupings alone.

The environmental network approach described here is recommended as the most appropriate response to MPT network research in the Asian region.

Potential network participants would be identified by their current research focus, and would be invited to participate in an initial network planning meeting in Year 1 of project implementation. Priority species have already been identified by participants at the Kandy meeting, and are further narrowed in this report to 3-5 priority species within each network. The broad categories suggested contain a great deal of variation between locations, countries and cultures. It is anticipated that one of the first tasks of these networks will be to define sub-categories or sub-activities within each proposed network. Several possible sub-categories are suggested in Section 6.1.2.

The three environment types as identified at the Kandy meeting are:

- 1) Wet and moist tropics (>165 days of rain/year)
- 2) Arid and semi-arid zone (<165 days of rainfall/year)
- 3) Mountain zone (tropical highland and temperate climates)

*Re-define in  
Agro-ecologic  
terms?*

It is suggested that initial F/FRED efforts concentrate on the first two networks as the highest priority.

#### 6.5.1 Advantages

This approach satisfies the AID criteria for network selection and offers several advantages over the organization of networks along the lines proposed in the IUFRO Kandy report. It is also an approach which has been consistently endorsed by both USAID mission personnel and Asian researchers, including IUFRO Western Regional Coordinator Dr. Salleh Mohd. Nor. The advantages of this approach include:

- 1) Environmental network groupings would provide linkages between scientists who face similar site conditions and constraints. Recognizing that tree species have particular environmental requirements, it seems logical to group researchers by bio-physical problems, and hence the biological options which they face. Networks which are defined by species are already constrained by environmental factors - the environmental requirements and limitations of each selected species. For example, researchers in the tropical highlands would have little interest in participating in a network based upon Leucaena leucocephala, which does not perform well in the highlands. Networks based on environment type would recognize this limitation and provide a set of species which are adapted to similar environment types.

2) Research activities grouped by general environment type would encourage network participants to make comparisons of several priority species in network trials, rather than focus on only a single species or group of species to the exclusion of other promising MPTS. Species elimination trials would provide a much more sound scientific basis for future network research than the assumption that a single species is the most appropriate from the outset. There are clearly species which are well-enough understood to proceed with immediately. These are identified in Section 6.4.4. To fail to test these species in network species trials is the loss of a tremendous opportunity to greatly enhance the knowledge of the site and management requirements of these trees.

The environment approach allows the flexibility to test a limited number of priority species with the advantages of a single species approach without the limitations of focusing on a single species or genus.

3) Selection of three networks which are not only species oriented, but encourage focus on several priority species might also encourage other donors to support closely related research which F/FRED is not designed to support. A major hope of IUFRO is that donors will support one of the suggested networks in its entirety or a portion of the proposed program. F/FRED support of

network activities falls far short of present IUFRO-generated expectations of species network support. The research proposals and corresponding budgets seen by the network review team clearly exceed the proposed level of support envisioned through F/FRED. For the F/FRED project to propose support of the networks suggested by IUFRO might discourage other donors from partial support of a network which is identified with AID funding.

Networks grouped by environment type would focus on several priority species which would be tested at all of the participating institutions, and would thus achieve most of the goals of species-oriented networks, but would not leave the false impression that AID support allowed in-depth research coverage of a particular species. It would be disastrous for F/FRED to support an Acacia auriculiformis network and perhaps preclude additional donor funding of research on this promising species. By supporting species research networks which do not claim AID sponsorship of a single species or genus, additional support of species research by other donors becomes a more realistic possibility. The realism of this perception is seen in the F/FRED project itself. The network review team was advised that neither the bamboo nor the rattan networks suggested by IUFRO would be candidates for F/FRED support because of existing IDRC support. Upon closer review, IDRC support of these networks is quite limited, but has resulted in the widespread perception that each of these two networks are "IDRC supported". In fact, IDRC

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has funded individual MPTS research projects (including bamboo and rattan) in amounts which average more than 10 times that proposed under F/FRED. While IDRC support appears to be very effectively used, it is research project oriented rather than network oriented and does not approach the level of network support envisioned under F/FRED or the level being proposed by IUFRO.

4) Choosing networks by environment type assures both a regional and zonal distribution of F/FRED sponsored research activities as required in the scope of work provided to this team. If networks were to be selected by interest in species alone, the vast majority of effort would be directed to the wet/moist zone species of Acacia, Leucaena and Eucalyptus and would largely exclude critical arid or mountainous areas of Nepal and Pakistan, and the tropical highlands of the Philippines and Thailand. Support of the environment type networks will assure that the pressing problems of the mountain or arid and semi-arid regions are not neglected.

#### 6.5.2 Limitations

Limitations to this approach include:

1) Lack of experience with environmental-grouping of research networks. While this also holds true for the other networking options proposed in F/FRED, no precedent was found for network groupings by general environment type. This may mean additional

*Mountain Research*

*Arctic Zone Research*

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time needs to be spent by F/FRED staff in defining and explaining the concept to participants.

2) Some researchers have broad interests which transcend environmental boundaries. Scientists working with provenance trials might well have research interests in more than one of the proposed network groupings. However, the groupings are broad enough to preclude this from being a major limitation.

3) This proposed network grouping does not directly relate to that proposed by the IUFRO working group on MPT networks. This is also true for the F/FRED concept, which provides little money for actual research projects, but primarily supports network activities such as meetings, publications, etc.

4) Failure to focus on high-priority species groups might discourage intensive research that allows rapid genetic progress and might diffuse interest and activities over too many species to have major impact on any of them.

#### 6.5.3 Recommended species groupings

The establishment of networks on an environmental basis presupposes a broad base of species elimination trials, and of investigators linked through common interest in MPTS within these environments. Several species are of such high priority

throughout the region, and globally, that they should serve as "standard" species for comparison in these trials.

The following species are recommended for each of the three networks. This list was derived by examining the IUFRO Kandy listings and the Madamba report, and by interviewing MPTS researchers:

**NETWORK #1: MPTS FOR THE HUMID TROPICS**

- (1) *A. auriculiformis* A. Cunn.
- (2) *Acacia mangium* Willd. "Mangium"
- (3) *Leucaena leucocephala* (Lam) de Wit "leucaena"

**NETWORK #2: MPTS FOR THE ARID AND SEMI-ARID TROPICS**

- (1) *Acacia nilotica* (L.) Willd. ex Del. "babul"
- (2) *Dalbergia sissoo* Roxb. "sissoo", "shisham"
- (3) *Eucalyptus camaldulensis* Dehnh "Red river gum"

**NETWORK #3 FOR FUTURE CONSIDERATION: MPTS FOR TROPICAL HIGHLANDS AND MOUNTAIN ZONES**

- (1) *Alnus nepalensis* D. Don "Nepalese alder"
- (2) *L. diversifolia* (Schlecht) Benth.
- (3) *Robinia pseudoacacia*

These species groupings are suggested as those which would be routinely included in the collaborative trials described in Section 6.1. It is strongly recommended that these species be compared with MPTS of local interest. For example, fodder trees are very important in major areas of Bangladesh and Nepal, with strong farmer preference for local fodder species.



F/FRED-sponsored research should encourage additional research with locally preferred species as well as comparisons of these indigenous resources with promising exotics.

Undoubtedly the most difficult of the proposed regions is that of the highlands, in which a large series of microenvironments occurs and in which problems of soil erosion and fertility, animal fodder, and fuelwood are often very severe.

Unfortunately, these are also areas in which little research has been undertaken. Consequently, there are very few researchers in the F/FRED countries visited who could carry out any additional network research in the mountain zone. This is the primary reason that this team does not recommend establishment of a mountain zone network at this time.

Fodder-producing trees are seen as an important target for F/FRED activities. Many of these are shrubs or small trees especially suited to growth on small farms, as hedges in alley cropping or as boundary plantings trimmed to reduce shading of crops. The IUFRO/Sri Lanka conference did not identify any shrub species. Important fodder shrubs or small trees in Asia which might merit inclusion in later F/FRED research include:

Calliandra calothyrsus and related spp.  
 Chamaecytisus palmensis  
 Codariocalyx gyroides and related spp.  
 Ficus spp.  
 Gliricidia sepium  
 Indigofera teysmanni

## 6.6 Social Considerations

### 6.6.1 Social Input into the Project Design

Since its inception, there has been an explicit social component in the F/FRED project and as the project developed from one focussed on fuelwood to one focussed on MPTS, this component became even stronger - to the apparent satisfaction of many of the potential project participants. Many researchers have expressed their strong approval of this shift from fuelwood to MPTS, noting that fuelwood is not a high priority issue in many parts of Asia, and that MPTS more clearly meet the needs of small farmers. The RFD in Bangkok, observed that F/FRED's focus on human development is the one thing that is most conspicuously lacking from their other projects financed by international donors - those projects, they said, focussing only on such things as species trials and tree improvement. Given the favorable perception of F/FRED in this regard, it may be important to review the development of its social component.

In the project's background papers, there are some exceptional comments, such as the one by Lundgren and Brister (1984: 234), to the effect that the rural people in Asia have hundreds of years of experience with MPTS; and one in a project paper (USAID, Attachment F:19), noting the relevance of "current and traditional ethnobotany systems" (in particular for the land and forest management network). However, the rest of the background material for the project suggests that these isolated references

to traditional knowledge and practices are pro forma only, and that no serious attempt is going to be made to address such matters in the project. For example, in Lundgren and Brister's list of high priority topics of research on MPTS for F/FRED participants, there is not a single socio-economic topic. This lack of attention to socio-economic factors also manifests itself in a number of naive conclusions regarding native peoples and plants that are strewn through the background paper. Thus, at one point in their paper, Lundgren and Brister (1984: 123) write that "It is assumed that a farmer's objective will be to maximize his crop production". Virtually all of the research that has been conducted on Third World farmers demonstrates that this assumption is invalid. Very often farmers choose to minimize risk at the cost of production, and in those cases where it is production that is maximized, there are some farmers who will maximize production per unit of labor, others who will maximize production per unit of seed, and still others who will maximize production per unit of land. Of the three, the last measure of production is often the least common, and yet this is likely the one that Lundgren and Brister had in mind.

Elsewhere in their paper, in a discussion of the types of land that should be reforested, they note (1984: 69) that Imperata is a "worthless cover" when in fact, in many parts of Asia Imperata is valued by the local people as a source of excellent thatch, an inexpensive source of fodder, and a manageable and

*Discrepancy*

*Error!*

soil-restoring ground cover during fallow periods in the agricultural cycle. In the areas where this is so, local people actively use fire to manage the Imperata, to maintain it in a impoverished state, and above all to prevent its succession to brush and forest, which occurs whenever human interference is halted (Dove 1983; in press).

The emphasis on introducing new plants into Asian societies with little real knowledge about how they will be received by these societies reflects a pervasive belief that plant breeding is a task sufficient unto itself, or that the goals of increased production - are universally desirable ones. Thus, in Lundgren and Brister's (1984: 159-183 passim) discussion of the "economic justification" for the F/FRED project, they simply cite the prospect for increases in absolute yields of tree crops. They do not even raise the question of how the costs and benefits of these increased yields may be distributed among the different segments of the rural population. The prospect of increased yields, in and of itself, is assumed to be enough. There is no mention of trying to define or select the species most appropriate to achieving optimum levels of production given extant cultural practices: rather, the trees and improved production are taken to be independent variables, and it is man and his society that is taken to be the dependent variable. It follows from this perspective that breakdowns in development are due not to problems with the plants, but rather to problems with

the people who are supposed to plant them. As Lundgren and Brister (1984: 8) put it, "Since existing knowledge and technology are not being fully implemented, there must be barriers preventing their use. These may be the lack of awareness of these technologies, or institutional, cultural, social, or economic barriers to their use." All possible barriers have to do with man, therefore: the possibility of barriers being erected by the plants themselves is not even raised. It follows that the role of socio-economic research is to identify these social-institutional barriers to the adoption of new plant technology. It goes without saying that one of the most important roles of socio-economic research is to identify the problems in the plant technology that have caused it to be rejected - and properly so- by an observant and rational peasantry.

*Key*

The misunderstanding here is a basic one, and it is by no means unique to the F/FRED project. It has plagued agricultural development projects in the Third World for several decades. It is due to the fact that plant scientists assume that any advance in production will benefit the farmers. The problem with this assumption is that the criteria by which they measure advances are universal, whereas in fact they are culture-bound. This was proven, at great cost to a great number of small farmers in Asia, during the course of the Green Revolution. One result of the advances in breeding rice (e.g.) was that labor inputs could be

replaced with capital inputs. For the Western Breeders, this was an advance; for large Asian landlords, this was also an advance; but for small Asian land owners and especially for the landless in Asia, this was not an advance: it was a disaster. The kind of plant-centered, sociologically naive research that led to this disaster must not be repeated by F/FRED. The possibility that it might be, and the need to ensure that it is not, is in fact noted explicitly in one of USAID's project papers (USAID 1985: Attachment F, 9). What is needed, then, is just to bring the various contributors and contributions to the project into line with USAID's forthright and informed stance on this point.

#### 6.6.1 Swidden Agriculture in F/FRED

A good example of the current state of sociological input in F/FRED can be seen in the stance that the project has taken towards swidden agriculture. This system of agriculture is discussed in most of the project's background papers as one of the underlying causes of the forestry crisis towards which F/FRED is addressed. In none of the background papers, however, did the discussion proceed beyond these perfunctory denunciations of this system of cultivation. Not one word was written about how F/FRED might specifically address some of the problems to which swidden agriculture gives rise. Rather, the stance taken towards swidden agriculture in this project - as in development projects in general - is that it is a destructive and profligate system of cultivation, and because it is destructive and profligate it will

bring about its own extinction; hence the project does not need to develop swidden agriculture, but only to fill in the void that will be left when it vanishes of its own accord. The problem with this stance is that developers have been taking it for a good half-century in some parts of Asia and swidden agriculture still shows no sign of vanishing: in Lundgren and Brister's paper, for example, they report that the number of shifting cultivators in Thailand increased from 300,000 in 1969 to over 700,000 in 1984 (1984: 131). This surprising persistence of swidden agriculture suggests that the popular views of its destructiveness and profligacy, and also productivity and sustainability, may be seriously flawed (Dove 1983). Of more immediate relevance to the present discussion, its persistence suggests that the F/FRED project would do well to directly address this system of cultivation.

Swidden agriculture is in fact an ideal candidate for some of the research and development in F/FRED. The fact that this has been overlooked is due in part to the sort of wishful thinking that was discussed in the preceding paragraph, and in part to a very elementary if common misunderstanding of this system of agriculture. Thus, most of the background papers to the project contain a statement to the effect that 80-85 percent of the wood harvested in the tropics in general, or Asia in particular, is used for fuel (e.g., Burch [1984: 5], USAID [1985: Attachment E, v]). This statement is fundamentally flawed, because it ignores

the vast quantities of wood that are felled, dried, and burned by swidden agriculturalists, in Asia as well as elsewhere in the tropics. The purpose in burning this wood, as scholars of the subject have known since the beginning of this century, is to make its nutrients immediately available for consumption by annual food crops planted in the ashes. If by the word "harvested" we mean "utilized", therefore, then most of the wood that is harvested in Asia is used not for fuel, but for fertilizer. Recognition of this fact opens up some very exciting new possibilities for the F/FRED project. The most obvious of these is to develop MPTS for use especially in swidden systems. The type of tree required is one that might produce fruit, fodder, and so on, but in particular would quickly produce a large amount of combustible biomass, or could be used in a fallow system which does not require fire (MacDicken, 1981). This would allow swidden fallow periods to be shortened - without any attendant declines in crop yields or degradation of the environment - and the total area under swidden agriculture to be thereby diminished. Cases in which this has occurred are found with Casuarina equisetifolia into a swidden system in Tamil Nadu, Leucaena into swidden systems on the island of Flores in eastern Indonesia and in the Philippines. Despite the existence of such cases, we detected virtually no interest in developing MPTS for this purpose - or even awareness that they could be used for this purpose - among either the formulators of the F/FRED project or the potential participants in Asia. The F/FRED project is

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Why?

tailor-made to make a pioneering contribution to such efforts, throughout most of Asia. It would, without exaggeration, be tragic if this opportunity is squandered.

#### 6.6.2 Species Selection

In the course of our interviews with potential network participants and other researchers in Asia, we received a wide variety of suggestions as to what MPTS would be good for the development of the small farmers and what MPTS would be bad. Good ones include (e.g.) jackfruit and pigeon pea, according to the researchers at BARC and the FRC in Bangladesh, and Leucaena according to the researchers at IRRI in the Philippines and the TFRI in Taiwan. At IRRI we were told that Leucaena is more suited to the small farmers than to big farmers or industry, because it can be used as green manure, it can be used to supplement cattle feed, and it can be sold for firewood. Unfortunately many of these farmers are being hurt by the insect problems of leucaena which are devastating the Philippine Leucaena industry.

The MPTS that are bad for small farmers include (e.g.) mahogany, according to the foresters at FORI in Los Banos - because you need a permit from the government to fell it - and Acacia mangium, according to the foresters at the FRC in Sandakan - who say that its only use is as firewood, and it is not even the preferred choice for that purpose among the local people. Albizia

is a bad or at best indifferent choice, according to researchers at both BARC in Dhaka and FORI in Los Banos - the latter of whom told us that it is really only suited for use as paper, and for other uses it is inferior to the native MPTS that the farmers already have. Of most interest, however, is the fact that some of the MPTS that were evaluated as bad by certain researchers, were the same ones that other researchers evaluated as good. The outstanding example of this is Leucaena. The dean of the Faculty of Forestry at Kasetsart University, Dr. Somsak Sukwong, also told us that Leucaena's only value was as fodder. Its wood is often not valued by the Thai farmers, its charcoal is thought, to have a bad taste, and in fact, he said, Leucaena is now regarded as no more than a weed in many parts of the country. Dr. Gritzner of the NRC/BOSTID views Leucaena not as a useless weed - as do the Thais - but as an unwanted source of competition to annual food crops, given that these crops and Leucaena are often both grown in the best soils available.

This wide divergence of opinion regarding the same MPTS, appears to be due to the fact that the benefits and beneficiaries of a given MPTS can vary from place to place, and in the same place over time. One example of this was given to us by Dr. Ralston, in the Ministry of Agriculture and Cooperatives in Bangkok. He referred to their NERAD Project, which was very successful in establishing woodlots in the villages of the area, until new regulations were passed by the government that prohibited the

villagers from felling any of the trees in these woodlots. At the start of this project, therefore, the woodlot trees had a high value for the local villagers; but after the change in government regulations, this value plummeted.

An example of the proper as opposed to perceived relationship between people and plants was given to us by Dr. Kovith of TISTR and Dr. Somsak of Kasetsart University, both in Bangkok. Both of these scholars told us that a major problem with the development of fast-growing trees in Thailand today is that trees are being planted for which there is no desire and no market - efforts which cannot succeed. Market appeal, they said, should be the principal criteria in the initial selection of the species to be planted rather than something to be developed after the fact. This is a direct criticism of the developmental paradigm in which plants are developed in the laboratory according to laboratory criteria, and then the socio-economic context is changed as needed to receive them. What the Thai scholars cited above are saying is that when a market has to be "developed" for a species, it is the wrong species for that situation. The socio-economic situation must be the determinant variable where the social values of the plant take precedence over its biological values, and - ultimately - that people are more important than plants. This simple, crucial and yet easily forgotten principle must be borne in mind as the F/FRED project unfolds.

Why?

Yes!

### 6.6.3 Species Rejection

The development of forestry projects in which the emphasis is on trees as opposed to people is often followed by the rejection of the project. Many such examples were encountered in the course of this study, most involving the use of fire. In the Philippines, Malaysia, and Thailand, the officials and researchers whom we interviewed all claimed that the destruction of government tree plantings, by fires set by local peoples, is a major problem.

All of the common rationalizations, attributing farmer hostility to "poor communication", "strength of tradition", "lack of education", and so on are merely that, rationalizations and nothing more. When forestry policy and activities are in the economic interests of the rural people, they will go along; and when they are not, they will not go along. This principle provides a very reliable method for monitoring the actual as opposed to the intended impact of the F/FRED project on the small farmers in Asia.

*Basic*

### 6.7 Ecological Considerations

One important consideration in the planting of fast-growing tree species is not their adaptation to the environment, but rather their impact on it. One potential problem is that a species will be introduced and will fail to perform its intended function, but will hang on as a pest or weed - as the dean of the Kasetsart School of Forestry maintains is now the case in Thailand with

Leucaena. Another, more important potential problem with the introduction of fast-growing trees involves potential nutrient depletion of the environment. He has carried out research on Leucaena in this regard and has found that at least four croppings or rotations of Leucaena can be carried out on their soils, before it is necessary to start putting some nutrients back in. He added that the problem can be mitigated if, during harvesting, only the main stems are removed and all of the branches and foliage are left to be returned to the soil. The trend in fast-growing tree technology does not seem to be in this direction, however. With the introduction of portable chippers that can process (for pulp) branches as small as one centimeter in diameter, the trend is towards taking more and more out of the environment and putting less and less back in. This is clearly an area of research to which the F/FRED project should devote some of its attention. What is the extent of the nutrient depletion problem? How can it be mitigated? And what are the implications for the costs and benefits of planting fast-growing trees in the long-term? All of these questions are pertinent to the avowed concerns of F/FRED.

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**APPENDIX A**  
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Nepal

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Department of Forests  
Babar Mahal, Kathmandu

Department of Soil and Water Conservation  
Kathmandu

Forestry Research Project Office  
Babar Mahal, Kathmandu

Forest Survey and Research Office  
Babar Mahal, Kathmandu

Institute of Renewable Natural Resources  
Tribhuvan University  
Hetauda

Winrock International  
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Appendix A

Pakistan

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Program on Environmental Science and Management (PESAM)  
UPLB  
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Singapore

International Development Research Centre (IDRC)  
Regional Office

Taiwan

Forest Research Institute  
Taipei

Appendix A

Thailand

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Kastesart University  
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Food and Agriculture Organization (FAO)  
Regional Office for Asia and the Pacific  
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