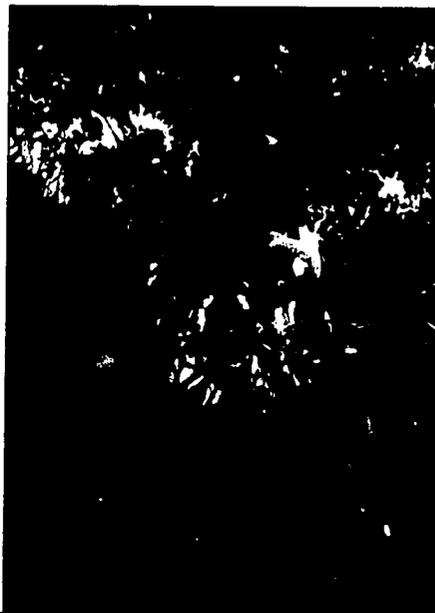


Multipurpose Tree Species Research Network



*Annual Report
1991*



Forestry/Pastorized Research and Development (F/PRED) Project

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Principal Writer and Editor

David Taylor

Collaborators

Norma Adams
Kamis Awang
Foster Cady
Celso Lantican
Sompetch Mungkorndin
Thomas Niblock
John Raintree
Ruiz Tabora
Rick Van Den Beldt

Design and Production

Blake and Associates
59 Soi Lang Suan, Ploenchit Road
Bangkok 10330

Publisher

Winrock International-F/FRED
c/o Faculty of Forestry
Kasetsart University
P.O. Box 1038
Kasetsart Post Office
Bangkok 10903
Thailand

Cover photos: At left, A Sri Lankan farmer stores fuelwood obtained from her homegarden (photo: A. Wickramasinghe); At right, *Artocarpus heterophyllus*, or jackfruit, is popular across Asia for its ability to provide food, wood, fuel, and fodder (photo: H.P.M. Gunasena).

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Acronyms

ACIAR	=	Australian Council for International Agricultural Research
ADB	=	Asian Development Bank
BAIF	=	BAIF Development Research Foundation (Pune, India)
CATIE	=	Center for Agronomic Research and Training (Turrialba, Costa Rica)
CIDA	=	Canadian Institute for Development Assistance
COGREDA	=	Consultative Group for Research and Development of Acacias
CSIRO	=	Commonwealth Scientific and Industrial Research Organization (Australia)
CTFT	=	Centre Technique Forestiere Tropical
CUSRI	=	Chulalongkorn University Social Research Institute (Bangkok, Thailand)
DANIDA	=	Danish International Development Agency
ER&D	=	Extension research and development
ERDB	=	Ecosystems Research and Development Bureau of the Philippines (Los Baños)
FAO	=	Food and Agriculture Organization of the United Nations
FINNIDA	=	Finnish International Development Agency
F/FRED	=	Forestry/Fuelwood Research and Development Project
FORSPA	=	Forestry Research Support Project for Asia-Pacific (Bangkok, Thailand)
FPRDI	=	Forest Products Research and Development Institute (Los Baños, Philippines)
FRDC	=	Forestry Research Development Centre (Bogor, Indonesia)
FRIM	=	Forestry Research Institute Malaysia (Kuala Lumpur, Malaysia)
FVF	=	Farm and village forestry
GIS	=	Geographic information system
IADSS	=	Information and Decision Support System
ICRAF	=	International Center (formerly Council) for Research on Agroforestry (Nairobi, Kenya)
IDRC	=	International Development Research Centre of Canada
ILCA	=	International Livestock Centre for Africa (Addis Ababa, Ethiopia)
IOF	=	Institute of Forestry (Pokhara, Nepal)
ITTO	=	International Tropical Timber Organization
IUFRO	=	International Union of Forest Research Organizations
GRS	=	F/FRED Global Research Systems
KUFF	=	Kasetsart University, Faculty of Forestry (Bangkok, Thailand)
LOA	=	Letter of Agreement
LSP	=	Leucaena Seed Production
MOU	=	Memorandum of Understanding
MPTS	=	Multipurpose tree species
MUSFAD	=	MPTS Utilization for Small Farm Development
NFTA	=	Nitrogen Fixing Tree Association (Waimanolo, Hawaii, U.S.A.)
NGO	=	Non-governmental organization
ODI	=	Overseas Development Institute of the United Kingdom
OFI	=	Oxford Forestry Institute
PFI	=	Pakistan Forestry Institute (Peshawar, Pakistan)
RECOFTC	=	Regional Community Forestry Training Centre (Bangkok, Thailand)
SIDA	=	Swedish International Development Agency
TFRI	=	Taiwan Forestry Research Institute (Taipei, Taiwan)
TISTR	=	Thailand Institute for Scientific and Technological Research (Bangkok, Thailand)
UP	=	University of Peradeniya (Peradeniya, Sri Lanka)
UPLB	=	University of the Philippines at Los Baños
UPM	=	Universiti Pertanian Malaysia (Serdang, Malaysia)
ViSCA	=	Visayas State College of Agriculture (Leyte, Philippines)

Introduction

This is the second report of progress of the Multipurpose Tree Species Research Network under the Forestry/Fuelwood Research & Development (F/FRED) Project. The second five-year phase of F/FRED (1990-1995) is implemented through a cooperative agreement for US\$12.49 million between the U.S. Agency for International Development and the Winrock International Institute for Agricultural Development.

Institutions in the MPTS Research Network share the goal of improving production and use of trees to meet the needs of small-farm households. The Network brings together researchers from national institutions in forestry, agriculture, and the social sciences in Asia. The MPTS Research Network now includes institutions and scientists in Bangladesh, India, Indonesia, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Republic of China (Taiwan), Sri Lanka, and Thailand.

The Network is managed by a Secretariat located with the Faculty of Forestry at Kasetsart University in Bangkok, Thailand. F/FRED staff at the Project Management Office in Arlington, Virginia, U.S.A., develop the project's research information system software, produce key project publications, and review issues of project management with donor agency representatives.

Summary

In 1991, the first full year of F/FRED's second phase, the MPTS Research Network interpreted results of its earlier research and used this analysis to help focus its agenda for the remainder of the project. The key to this focus in most areas of the Network's research is the user of the tree product. In the case of fodder or fruits used on the farm, the users are the members of the farm household itself. For tree products bound for the market, the end user is the buyer. Understanding the needs of these various users and the consequences of changes in their interlinking circumstances is essential to help small-scale farmers grow and manage trees for different products.

By studying the ability of multipurpose trees to provide rural growers with commodities for their own use or for sale, the Network's research complements other programs that study nutrient cycling, soil erosion, and the dynamics of farm systems.

Species Assessment and Improvement Trials

Experience from the first set of Humid/Subhumid Network field trials and findings from the region-wide survey of farmers' farm- and village-forestry practices provided background for a second series of multilocation trials in that environmental zone. The 1991 series of trials was successfully established on 33 sites, despite problems of seed recalcitrance experienced in introducing a food-producing species. With the addition to the staff of a full-time Network Specialist, Dr. Kamis Awang, Network cooperators in those trials are receiving more support than previously possible.

An intersite analysis of the 18-month data from the 1987 Network trials was published. Final 36-month measurements for these trials have been recorded and an intersite analysis is in preparation. In trials analysis, the Network recognizes the need to assess the trees' utilization properties at each trial site. Wood samples taken from each site are being used to assess suitability of genotypes for pulp, paper, plywood, and other uses. This approach goes beyond matching varieties to sites and explores relative end-use advantages of promising genotypes at each site.

Similarly, a guide produced for managers of F/FRED-funded *Leucaena* seed orchards in five countries describes how "plus" trees should be selected based on their performance under management for the end uses preferred by farmers at each location.

In the arid and semi-arid zone, Dr. Rick Van Den Beldt, who joined the Network Secretariat as Field Team Leader in August, led a review of the 1989 Network trials. The review meeting of trials cooperators reached consensus on which trial sites should be maintained, and that the original protocols should be pursued.

To make field trials results more comparable internationally, F/FRED co-sponsored a meeting with ICRAF at which leading forestry researchers drafted the basis for a manual, *Standard Research Methods for Multipurpose Trees and Shrubs*.

Regional Comparative Studies in Farm and Village Forestry

1991 also saw an increasing focus on the end user in the Network's interdisciplinary comparative studies. Initial regional and national analyses of the Network's 1989 study of Farm and Village Forestry practices cited general trends in tree-growing across Asia. The regional analysis confirmed that farm size is an important factor influencing household use of tree products and where they are obtained. It also pointed out that food-producing species not previously considered by many scientists to be multipurpose are also major sources of fodder and fuelwood.

This latter point, and identification of *Artocarpus heterophyllus* (jackfruit) as a key multipurpose food species in the region, framed the Network's initiative in community-based tree improvement.

Scientists in the regional study reviewed their findings and methodology, which is being refined for further comparative studies. They also recommended practical action-research follow-up activities.

Scientists who participated in the Network survey of farmers' tree-breeding objectives reviewed the methods used in that study as well, identifying methodological variables and

situational factors that affected the exact expression of farmers' preferences.

Economics and Marketing Research

An orientation on the user helped to focus the Network's research in marketing and economics on several levels. Marketing studies suggested by the regional study findings are evaluating market forces and linkages in specific cases. At another level, the Network identified field trials scientists as "users" of economic tools for interpreting their results and their effects on farmers' economic decisions. Dr. Sompetch Mungkorndin, the Forest Economist who joined the Secretariat mid-year, is working with Network trials scientists to develop simple methods for them to use in assessing economic trade-offs in tree management. Scientists involved in the 1991 Network trials have also agreed to measure labor data for calculation of returns to labor.

Extension Research and Development

The term "Extension Research and Development," or ER&D, encompasses Network activities that use a range of participatory research approaches. As mentioned above, this program's initial focus on *Artocarpus heterophyllus* arose from the FVF study findings. The *Artocarpus* network began with pilot activities in the Philippines and Sri Lanka. This set of activities is developing a methodology for involving local communities in tree improvement research from the start. At the same time, these methods are being applied to improve jackfruit varieties for various uses.

More broadly-based ER&D activities include a study of community-based methods for screening MPTS in Thailand. The Network Secretariat identified potential partners in the ER&D process through workshops on the tree-growing activities of local and non-governmental organizations. The Network organized and co-sponsored a theme workshop on the Role of Non-Governmental Organizations in Promoting On-farm Tree-growing Technologies. The workshop identified lessons learned and areas for mutual support between NGO programs and research.

Information Systems Development

F/FRED's Global Research Systems staff, located with the Project Management Office in the United States, is developing MPTSys, a successor to the Project's IADSS computer package. MPTSys is designed to support MPTS research globally. The system's research and reference databases and decision-support packages are for use on microcomputers in any of three subsystem configurations. Each subsystem package is oriented to a group of users identified in consultation with Network scientists. As a result, field experimenters, growth modelers, and technology-transfer agents will have subsystems designed specifically for their needs. MPTSys Version 3.0 will be released in 1992.

MPTGro, the system's growth prediction model, was reviewed by a group of expert scientists that in January 1992 planned the further refinement of the model for longer-term and more reliable predictions, and to meet different user needs.

Strengthening National Research Programs

The Network has helped build stronger national research programs by: strengthening national scientific networks on MPTS, identifying the range and coverage of existing national MPTS research, fostering institutional linkages for mutual development, and developing regional research proposals composed of coordinated national plans. Short-term training courses and small research grants also enhance national research programs while at the same time building the regional Network.

National MPTS networks are bases for the regional Network, and receive F/FRED support for annual meetings and publications. In 1991 national meetings took place in seven countries. The national meetings are focal points for information exchange and discussion of MPTS-related research results among different agencies and scientists of various disciplines.

Training

The Ph.D. students in the F/FRED fellowship program launched in 1988 conducted their home-country research and prepared for their dissertation defenses. As that program draws to completion, the Network has begun arranging a

new Masters level program. The new program will work through the institutions in the Network's 'twinning' program to provide instruction and opportunities for home-country thesis research to scientists in the region.

"Roving" short courses, including two offerings of the course on Data Analysis and Interpretation by the Global Research Systems Staff, trained 163 scientists in the region. Training materials include desktop presentations and interactive software developed by the Project.

In announcing its first correspondence course, the Network is adopting an old approach in an innovative manner for offering more cost-effective training to a wider audience.

Publications

In 1991 F/FRED strengthened its publication support for the MPTS Research Network by including more research results in its quarterly newsletter, *Farm Forestry News*, and by launching a series of research bulletins, *MPTS Research Notes*. Responding to the results of a reader survey, *Farm Forestry News* added a department to provide a forum for discussing issues and problems related to MPTS research. The Project continued to publish Research Series reports, manuals, workshop proceedings, special meeting reports, and progress reports.

In addition to project publications, F/FRED streamlined its system for providing Network institutions with subscriptions to key journals and books produced by other agencies.

Species Assessment and Improvement Research



Photo: K. Awang.

Field workers prune trees in the 1987 Network field trial in Serdang, Malaysia (MP01). Cutting treatments permit comparisons of species' abilities to provide fodder, fuelwood, and timber.

Network field trial experiments began in 1987 through formal agreements between national institutions and Winrock International. Multi-location trials aim for improved knowledge of the site requirements, growth rates and yields, and responses to different management regimes of selected species. They also help to improve and standardize methods for comparable research on MPTS, and provide a focus for network development.

1987 Humid/Subhumid Zone Trials

Data collection was concluded for all sites in the 1987 trials of *Leucaena* spp., *Acacia mangium*, and *A. auriculiformis*. A preliminary intersite analysis of the data for 18-month-old trees at 10 sites appeared in *Farm Forestry News* (Awang et al. 1991). At 18 months, before the first cutting treatments were imposed, differences

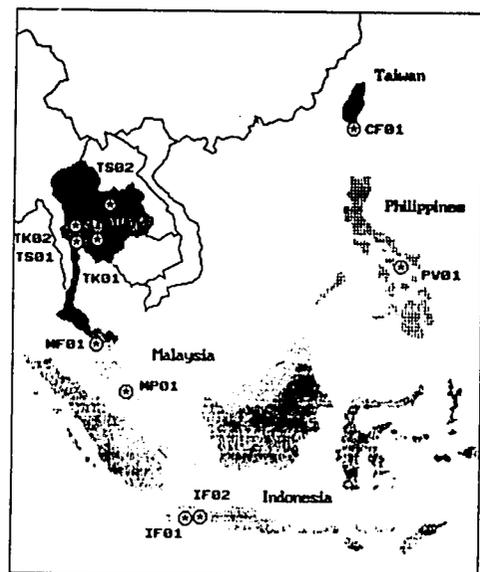


Fig. 1. Distribution of 1987 Humid/Subhumid Zone Network Trials

Table 1. Estimated 18-month dbh (cm) differences among species. *Source:* Awang et al. 1991.

Site ID	MP01	PV01	IF02	IF01	MF01	CF01	TS02	TK01	TS01	TK02
Site mean	2.94	4.13	4.27	4.51	4.69	3.03	3.57	3.97	4.43	5.09
<i>A. auriculiformis</i> - <i>A. mangium</i> difference	0.12	–	-1.0	-1.7	-0.90	-0.067	0.65	-0.57	-1.0	-1.5
<i>A. auriculiformis</i> - <i>L. diversifolia</i> difference	1.6	1.2	2.7	2.9	1.6	0.73	-1.6	0.28	-0.49	-0.10
<i>A. mangium</i> - <i>L. diversifolia</i> difference	1.5	–	3.7	4.6	2.5	0.80	-2.2	0.85	0.55	1.4
Standard error of the difference	0.23	0.20	0.17	0.43	0.34	0.32	0.21	0.14	0.25	0.18
Soil moisture regime	Udic	Udic	Udic	Udic	Udic	Udic	Ustic	Ustic	Ustic	Ustic

Positive differences indicate the species listed first has a greater dbh value than the second. Mean differences greater than twice the SE indicate significant differences ($p = 0.05$).

between the two genotypes tested within each species were not important. On all udic sites, *A. auriculiformis* and *A. mangium* showed greater diameter at breast height (dbh) than *Leucaena* (see Table 1). In general, *L. diversifolia* on ustic sites had significantly greater dbh than on udic sites, a finding consistent with the species' natural range.

Soil characterizations provided the basis for selecting variables used in interpreting site by species interaction. Soil moisture regime, expressed as a dichotomous site variable (udic and ustic), is the basis for the estimated species by moisture model in Table 2. At the generally wetter udic sites, both *A. mangium* and *A. auriculiformis* had significantly greater dbh than *L. diversifolia* at 18 months. *A. mangium* is native to areas with much higher rainfall than the other two species; the reason for better performance by *A. auriculiformis* as opposed to *Leucaena* is less clear. *Leucaena*'s exposure to stem canker and the leucaena psyllid may partially explain this. In the ustic sites, there were no significant differences between species.

Using data from 36-month-old trees and final measurements of wood and leaf biomass, a second intersite analysis is in preparation.

Individual trials cooperators are also preparing their own interpretations of the results at their sites. Wood samples taken from each site are being used to determine chemical and physical suitability for pulp, paper, plywood, and other uses. This goes beyond matching varieties to sites and explores relative end-use advantages of promising genotypes at each site.

New Series of Network Trials

Following an experiment design meeting of network scientists in Thailand in December 1990, a second set of trials in this environmental zone was established on 33 sites in Costa Rica, Indonesia, Malaysia, the Philippines, Republic of China (Taiwan), Sri Lanka, and Thailand (see Figure 2). The participation of Costa Rican scientists, arranged through collaboration between F/FRED and CATIE, allows comparison of *Inga edulis*, a Latin American species originally included in the trial design, with performance in its native range.

Like the 1987 trials, the new set of trials includes pruning and thinning treatments to

Table 2. Estimated 18-month dbh means (cm) based on a multilocal species-by-moisture model. Source: Awang et al. 1991.

Species	Soil Moisture Regime		Soil Moisture Regime Differences	
	Udic	Ustic		
<i>A. auriculiformis</i>	4.3	3.9	0.36	(0.41)
<i>L. diversifolia</i>	2.5	4.4	-1.9	(0.43)
<i>A. mangium</i>	4.8	4.6	0.22	(0.44)
Species Differences	Soil Moisture Regime			
	Udic	Ustic		
<i>A. auriculiformis</i> - <i>L. diversifolia</i>	1.8	-0.46	(0.39)	(0.45)
<i>A. auriculiformis</i> - <i>A. mangium</i>	-0.53	0.67	(0.40)	(0.45)
<i>L. diversifolia</i> - <i>A. mangium</i>	-2.3	-0.22	(0.41)	(0.45)

Note: Values in parentheses are standard errors of the differences. The average of the absolute differences between measured dbh at each site and the means is 0.71 cm.

compare leaf and wood biomass production under different managements. The trials will also assess tree form. In addition, the scientists agreed to measure labor required for the cutting treatments at 12 and 24 months.

Seeds of *Leucaena* spp., *A. auriculiformis*, and *I. edulis* were distributed to trials scientists in early 1991. *I. edulis* was included by the scientists following the results of the regional study of Farm and Village Forestry, which showed farmers' preference for food-producing MPTS. *Artocarpus heterophyllus*, the leading Asian candidate for the trials, posed serious problems of seed recalcitrance and difficulties in synchronizing fruiting periods. The trials designers felt that *Inga* offered more potential for multilocation trials, as well as a range of products that included food, fodder, and shade for cacao and coffee. Germination of *Inga* was very poor at all sites, however, and required that the species be dropped from the randomized complete block design.

Reasons offered for *Inga*'s poor survival include the fact that *Inga* seed, like that of *A. heterophyllus*, is recalcitrant and therefore risky

vulnerable to non-viability in international multilocation trials. Furthermore, the methods used to test the transportability of the seed may not have matched the actual conditions of transpacific transport and germination methods used by the Asian cooperators unfamiliar with the species. The experience may partially explain why *Inga*, unlike species such as *Leucaena* that spread widely during the period of European exploration, did not spread far from its natural range, despite its multiple uses within that range. The experience also highlights the need for a better understanding of recalcitrant seed.

Dr. Kamis Awang, the Network Specialist for the Humid Zone who joined the Network staff in June, visited all the 1991 trial cooperators in Asia with soil scientists, characterizing the sites and familiarizing the scientists with aspects of the Network's program. All soil samples are being analyzed by the Department of Soil Science, Universiti Pertanian Malaysia. Through these visits, also, the manual for how to conduct the trials was finalized (see Awang 1991a).

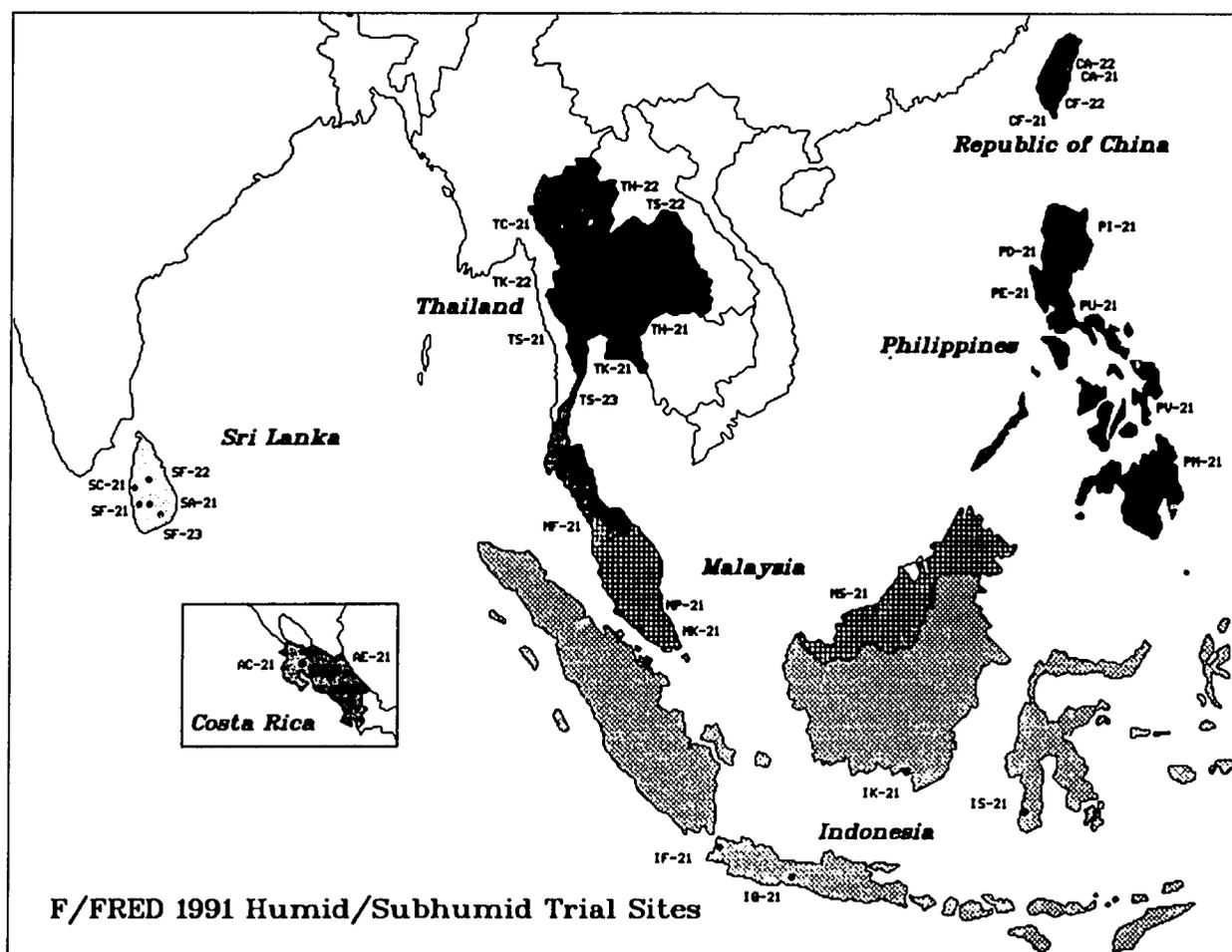


Figure 2. Sites in the 1991 Humid/Subhumid Zone Network Trials.

Arid/Semi-arid Zone Trials

Species management trials in the arid and semi-arid zone are testing a total of five priority species: *Acacia nilotica*, *Dalbergia sissoo*, *Eucalyptus camaldulensis*, *Prosopis cineraria*, and *P. pallida*. Each trial site also includes a locally-selected species. The trials were reviewed by the Research Committee in June (Bhumibhamon et al. 1991), based on a report of site visits by Prof. H.P.M. Gunasena, interim trials coordinator. In light of germination problems and variations in methodology, the experimenters decided at a September meeting in Sri Lanka to maintain 8 of the 11 semi-arid trials, and only 4-5 of the arid zone sites. Despite methodological differences, the participants elected to continue the trials using the protocols established at the outset of the trials in 1989.



A soil scientist takes a sample for characterization of a site in the 1991 series of Network trials.

Photo: K. Awang.



Near the Semi-arid Zone Network trial at Shankar Nagar, Nepal, Rajendra Joshi notes the local use of *Shorea robusta* stems for cowshed roofing material. Their harvest from the Forest Department-managed area is arranged between the District Forest Officer and the community.

Photo: D. Taylor.

Provenance Trials

In 1991, international provenance trials of *Acacia auriculiformis* (co-sponsored with ACIAR) and *Dalbergia sissoo* reached two and one years of age, respectively. Background on these two sets of trials and where they are being conducted are described more fully in *Tree Improvement and the MPTS Research Network: A progress report, May 1990-May 1991*. The Research Committee visited one of the five *Dalbergia sissoo* sites during its June meeting in Nepal.

Data for intersite analysis of the *A. auriculiformis* trial is being collected and reviewed with ACIAR scientists. Data from three ACIAR-funded experiments of this series in Thailand were presented by Luangviriyasaeng et al. in *MPTS Research Notes* 1(3). At 12 months, no distinctly superior provenances had yet emerged, but already the experiments indicated great genetic diversity within the natural range of *A. auriculiformis*. Further assessment will include measures of tree form, which Network staff developed with ACIAR.

Standard Research Methods

At a May working meeting in Thailand, a group of key international forestry researchers reached consensus on standardized research methods for assessing multipurpose trees and shrubs. Participants, who represented ICRAF, OFI, CSIRO, CATIE, DANIDA Forest Seed Centre, FAO, and Winrock International, produced a document that formed the basis for a manual entitled *Research Methods for Multipurpose Trees and Shrubs*. Both the workshop and manual were co-sponsored by Winrock International and ICRAF.

Such research issues as measuring multiple stems have been featured in opinion columns by manual contributors in *Farm Forestry News*.

Other Species Research

Acacia mangium will be the subject of a monograph synthesizing research results. The

Table 3. Scientists in the Leucaena Seed Production program, and the principal genotypes at each site.

Institution	Lead scientist	Country	Principal genotypes in seed orchard
Bogor Research Institute for Food Crops	Dr. I.N. Oka	Indonesia	KX1 (<i>L. diversifolia</i> x <i>L. pallida</i>) <i>L. pallida</i> Comp 1
Visayas State College of Agriculture	Dr. Rudolfo Escalada	Philippines	<i>L. diversifolia</i> 4n Comp KX3 Maui Comp
Taiwan Forestry Research Institute	Dr. Fuh-Jiunn Pan	Taiwan (ROC)	KX3c and KX3 Maui Comp
Thailand Institute for Scientific and Technological Research	Dr. Kovith Yantasath	Thailand	<i>L. leucocephala</i> PR Comp 1 <i>L. salvadorensis</i> Comp 1

Research and Steering Committees confirmed support for this initiative at their 1991 meetings. F/FRED has commissioned papers for the book in preparation for a meeting of a Consultative Group for Research and Development of Acacias (COGREDA) in mid-1992.

In response to a severe outbreak of wilt disease in *Azadirachta indica* (neem) in West Africa, F/FRED arranged to cooperate with the Centre Technique Forestier Tropical (CTFT) of France on neem research. This collaboration will include seed collection and processing by Network cooperators in India, Pakistan, and Thailand for a first range-wide collection and study of neem provenances.

Through a contract with NFTA, the F/FRED-funded Leucaena Seed Production (LSP) program began in 1989 to develop seed orchards in five countries in Asia: four of these are preparing to produce seed for use in research and farmers' fields (Table 3). Network Secretariat staff visited the orchard in Chan Thuk, Thailand with NFTA scientists late in 1991. The orchard will produce seed for distribution in 1992. The LSP program is described further in *Tree Improvement and the MPTS Research Network: A progress report, May 1990 - May 1991*.

The Network's improvement studies with *Artocarpus heterophyllus* are described on page 16.



Photo: Fuh-Jiunn Pan.

Network researchers at TFRI are crossing *Leucaena diversifolia* ssp. *trichandra* (2n) at left with *L. diversifolia* (4n) for greater vigor, psyllid resistance, and to obtain sterile triploid progeny, which is useful for maintaining quality seed orchard populations.

Studies of Recalcitrant Seed

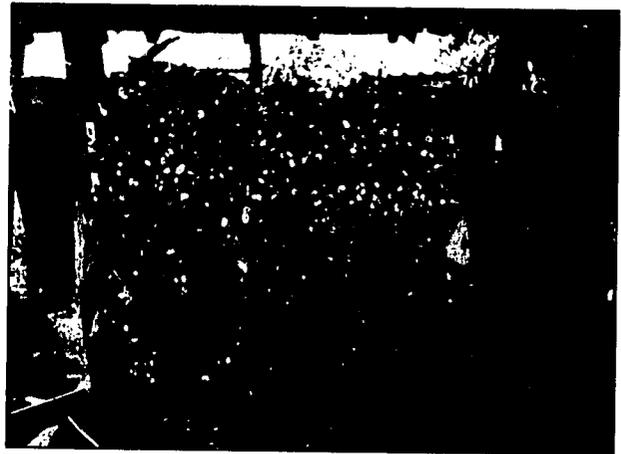
The inter-regional cooperation on neem will also include studies of prolonging neem's viability. Neem seed, like that of *Inga edulis* and *Artocarpus heterophyllus*, is recalcitrant and thus short-lived. Wider use of many valued MPT species is limited because of seed recalcitrance. F/FRED has initiated support for research on recalcitrant seed. In addition to the work on neem for the arid/semi-arid areas, F/FRED in 1991 began support for seed research on *A. heterophyllus*.

Regional Comparative Studies in Farm and Village Forestry



Photos: Nattaya Cherdchuen.

A scientist from Chiang Mai University interviews a husband and wife of Onklang village, Thailand in the study of Farm and Village Forestry practices. At right, fuelwood is stored under a household's rice barn.



Farm and Village Forestry Practices

The six-country study of Farm and Village Forestry Practices, conducted in 1989, yielded further results in 1991, including a first regional analysis, a subregional analysis for South Asia, a national analysis for the Philippines, and five additional case studies.

The regional analysis by Mehl (1991) identified four general trends in farmers' use of trees. First, relative farm size influenced household use of tree products and where they are obtained. For all farm-size groups except landless households, the household farm is the primary source of fuelwood. Larger farmers are more likely than small farmers to have an agroforestry system or a tree farm as their major source of timber.

Second, there is an apparent connection between agroforestry or tree-farming and use of government extension services, but this requires more intensive study for confirmation.

Third, homegardens are the most common on-farm site for growing trees, followed by crop fields.

Finally, the regional analysis found that fruit and other food trees were the most popular and widely used multipurpose species. In particular, *Mangifera indica* (mango), *Artocarpus heterophyllus* (jackfruit), and *Cocos nucifera* (coconut) were most common.

Further investigation of this fourth trend revealed that 7 of the 10 most commonly reported tree species produced at least locally important food (Raintree 1991a). In Bangladesh, farmers valued jackfruit more highly for fodder and timber

Table 4. The most frequently mentioned species for fodder and fuelwood, by country. The number of responses appears in parentheses. *Source:* Raintree 1991b.

Country	Fodder Sources	Fuelwood Sources
Bangladesh	<i>Mangifera indica</i> (117) <i>Artocarpus heterophyllus</i> (103) <i>Oryza sativa</i> (67) Grass species (42) <i>Triticum sativum</i> (34)	<i>Mangifera indica</i> (77) <i>Corchorus capsularis</i> (48) <i>Schima cuminii</i> (43) <i>Acacia nilotica</i> (42) <i>Artocarpus heterophyllus</i> (32) <i>Phoenix dactylifera</i> (32)
Indonesia	<i>Paraserianthes falcataria</i> (173) <i>Maesopsis eminii</i> (77) <i>Leucaena leucocephala</i> (76) <i>Artocarpus heterophyllus</i> (38) <i>Gliricidia sepium</i> (30)	<i>Paraserianthes falcataria</i> (279) <i>Cocos nucifera</i> (101) <i>Maesopsis eminii</i> (62) <i>Schima noronhse</i> (41) <i>Leucaena leucocephala</i> (36) <i>Swietenia macrophylla</i> (36)
Nepal	<i>Ficus glaberrima</i> (98) <i>Ficus lacor</i> (97) <i>Ficus nemoralis</i> (76) <i>Prunus cerasoides</i> (65) <i>Artocarpus lakoocha</i> (53)	<i>Castanopsis indica</i> (181) <i>Schima wallichii</i> (143) <i>Alnus nepalensis</i> (95) <i>Ficus glaberrima</i> (74) <i>Betula alnoides</i> (65) <i>Ficus lacor</i> (64)
Philippines	<i>Leucaena leucocephala</i> (132) <i>Paspalum conjugatum</i> (69) <i>Cocos nucifera</i> (31) <i>Imperata cylindrica</i> (25) <i>Zea mays</i> (8)	<i>Pinus kesiya</i> (186) <i>Leucaena leucocephala</i> (177) <i>Gliricidia sepium</i> (162) <i>Coffea arabica</i> (109) <i>Cocos nucifera</i> (100) <i>Shorea polysperma</i> (44)
Sri Lanka	<i>Artocarpus heterophyllus</i> (25) <i>Exacum trinerva</i> (29) <i>Musa sapientum</i> (7) <i>Musa acuminata</i> (6) <i>Persea gratissima</i> (1)	<i>Exacum trinerva</i> (24) <i>Madhuca longifolia</i> (17) <i>Musa acuminata</i> (16) <i>Careya arborea</i> (15) <i>Cocos nucifera</i> (12) <i>Pongamia pinnata</i> (12)
Thailand	<i>Oryza sativa</i> (108) Grass species (71) <i>Imperata cylindrica</i> (17) Arun species (15) Grass species (15)	<i>Shorea obtusa</i> (157) <i>Shorea siamensis</i> (98) <i>Tamarindus indica</i> (88) <i>Irvingia malayana</i> (44) <i>Dipterocarpus tuberculatus</i> (28) <i>Mangifera indica</i> (26)

than for human food. This raised the research question of how farmers in different countries manage these food-producing species for other non-food products (see Table 4).

South Asia Analysis

A comparative analysis for the six FVF villages in Bangladesh, Nepal, and Sri Lanka was presented at a workshop in India sponsored by the Oxford Forestry Institute (Wickramasinghe 1991a). The study paid particular attention to food-producing species and the relatively greater dependence of smaller farms on homegardens (Table 5). It also explored the variations in on-farm tree management, both among the countries and in terms of traditional and innovational practices.

FVF in the Philippines

In the Philippines, a preliminary national analysis of the eight villages in the study was presented at the annual national MPTS network meeting, along with four case studies. The national analysis provisionally identified that agroforestry innovations were taking place even where extension services were not available (de los Angeles 1991). It also noted the significant relationship between farm size and tree-use practices, and identified differences among regions in the country in terms of wealth, credit

availability, farm area, time devoted to agriculture, and access to common areas. Regression analyses studied: use of government forestry extension, fuelwood gathering from forests, relationship between farm size and use of state forests, and the relationship between portion of women's time devoted to agriculture and household consumption. Table 6 shows that as women devote more time to agriculture or other occupations, fuelwood consumption decreases due to reduced time available for wood-gathering.

The four Philippines case studies highlighted the social and economic roots of illegal logging (Maligalig 1991), the importance of the homegarden and its various arrangements (Ponce et al. 1991b), factors affecting community participation in forest resource management (Francisco 1991), and changes in the farming patterns of tribal groups (Mallion et al. 1991).

A fifth case study on perceptions of the changing role of district forestry officer in Nepal, by Kailash Pyakuryal, appeared in *Farm Forestry News* 4(3).

Review and Consolidation

At a workshop in the Philippines in December, the study researchers reviewed and consolidated the experience with the study, and identified priorities for follow-up actions and further research. Two practical action-research activities they recommended were: (1) using the

Table 5. Sources of tree products used by sample households in South Asia. *Source:* Wickramasinghe 1991a.

Sources	Bangladesh	Nepal	Sri Lanka	Total
State forests	1	314	227	542
Private forests	123	141	3	267
Common forests	2	290	2	294
Other commons	2	817	1	44
Homegardens	817	552	118	1,487
Farm plots with only trees	18	151	77	246
Farm, agroforestry systems	9	137	14	160
Farm, scattered trees	440	725	0	1,165
Purchased tree products	188	752	94	1,034
Non-tree products (bought or collected)	38	21	0	59
Total records	1,638	3,124	536	5,298



Photo: D. Taylor.

Table 6. Regression of fuelwood consumption on selected variables, from six Philippine villages. Source: de los Angeles 1991.

Variable	Intercept (t-value)	Regression coefficient (t-value)	F-value (R2)
% of income from tree products consumed or sold of total income	6.82 (12.36)**	0.03 (2.03)**	4.11** (0.03)
% of time spent by spouse on agriculture	9.21 (12.35)**	-0.03 (-3.19)**	10.17** (0.07)

*significant at 0.10 level. **significant at 0.05 level.

FVF studies to identify species for further research in each participating country, and (2) distribution of appropriate planting material to communities that participated in the study (preferably according to user-specific needs assessments and lessons on distribution systems gained from a follow-up study.

The FVF researchers concluded that further analysis of the FVF data set should receive

FVF researchers in the Philippines present their findings as case studies and a national analysis at the national MPTS meeting in Tagaytay City.

first priority in follow-up research. Comparative analysis is likely to reveal more important patterns of tree planting and use than analysis of aggregated data. Commodity economics, land-use analysis, and household decision-making perspectives were considered the most important bases for hypotheses in further analysis.

Based on their review, the researchers identified five topics for further comparative studies. These were:

Regional

1. Study on gender analysis of FVF patterns using a standard methodology
2. Analysis of the impact of government policies on farmers' use of MPTS
3. Comparative study of experience with local nurseries and other MPTS systems for distributing seeds and seedlings

Selected FVF Communities

4. Inventory of MPTS biomass supply, subsistence demand, and market surplus

5. Diagnostic assessment of MPTS needs and specific relevance of network trials results

They also identified priority topics for further individual case studies.

As a follow-up both to the recommendations of the Research Committee's working group on MPTS for Food and the November FVF meeting, a concept paper on gender analysis was commissioned to develop the focus for Network comparative studies on gender issues. The paper is being prepared by Dr. Anoja Wickramasinghe, one of the original FVF researchers, in consultation with the Network Secretariat. Preparation of the paper included F/FRED support for Dr. Wickramasinghe's participation at an FAO consultation on gender analysis in Bangkok.

Geographic Information System Support

To support the Regional Comparative Studies, a geographic information system (GIS) is being developed by the Network Secretariat. After testing various GIS packages for applicability, software from Clark University is being used, with support from the U.N. Environment Programme's GRID project at the Asian Institute of Technology. A similar GIS at the national scale is being developed for first use in the Philippines.

Farmers' Tree-Breeding Objectives

Case Studies

The 1989 regional survey of farmers' tree-breeding objectives, detailed in a 1990 report by Drs. Lert Chuntanaparb and Radha Ranganathan, yielded two case studies in 1991. Wickramasinghe (1991b) explored farmers' ideotypes for different planting niches and systems in the Sri Lankan study villages. Ponce et al. (1991a) compared the tree types preferred by upland villagers for various products with those identified by lowland dwellers.

Review and Consolidation

The scientists involved in the tree-breeding objectives study met in September in Sri Lanka to consolidate their experiences and results. They reviewed the methodological variables and situational factors that influence the expression of tree ideotypes. Their discussions are being documented in a report of the workshop.



Filipino farmer-respondents in San Isidro, Baybay, Leyte select line drawings of their preferred tree characteristics, while research assistants record their responses.

Photo: Lucylen Ponce.

Economics and Marketing

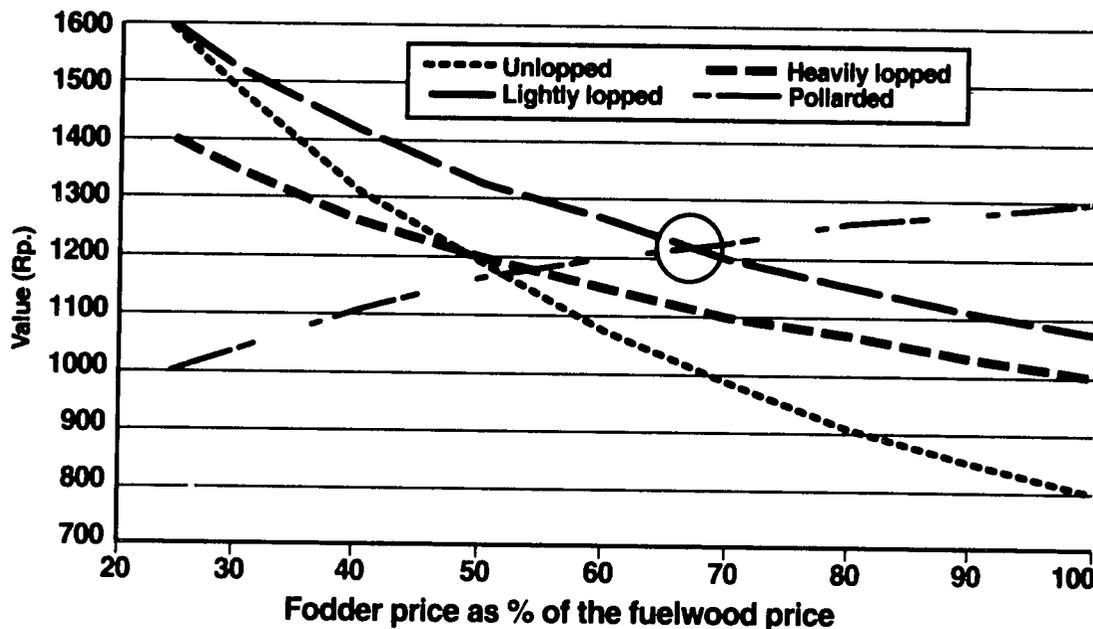


Figure 3. Sample bioeconomic model showing total revenue for leucaena wood and fodder under different management regimes and market conditions in India. *Source:* Raintree et al. 1991.

An article by Raintree, MacDicken and Roos in *Farm Forestry News* (1991) helped to focus the Network's agenda in the Economics of MPTS. By concentrating on the relationship between biological production systems and their economic implications, "bioeconomics" can assess trade-offs between tree management treatments (Figure 3).

These ideas, as well as the premise that economic analyses of benefits must be tailored to specific user groups, were further explored at the IDRC-sponsored Colloquium on Forestry Economics Research in March (Raintree and Lantican 1991; Mungkorndin, in press).

Dr. Sompetch Mungkorndin joined the Network Secretariat staff as Forest Economist in mid-year. One of his first activities was to participate in the International Workshop on Financial and Economic Analysis of Agroforestry Systems, hosted by NFTA in Hawaii, U.S.A. Workshop participants included staff from CARE, CATIE in Latin America, and ICRAF and ILCA in Africa. Two Network scientists from Malaysia presented a paper on Incorporating Marketing Costs in Financial Analysis for MPTS Research (Woon and Lim 1991). Working groups made recommendations on guidelines for financial and economic analysis of agroforestry systems, data collection, and markets.

Economic studies commissioned through the small research grants program cover studies of costs, returns, and net benefits from MPTS production and distribution. In discussions with Network cooperators, the Forest Economist has begun to develop bioeconomic tools for analysis – that is, tools for interpreting the practical economic implications of biophysical data – and methods for collecting additional data from field trials.

Marketing Studies

The FVF study finding that villagers were willing to buy tree products for most uses under certain conditions suggested the need for a better understanding of market processes. Francisco and Pabuayan (1991) contributed to the dialogue on marketing at the March Colloquium on Forestry Economics Research by outlining key entry points for MPTS marketing research.

Network studies are underway in Malaysia, the Philippines, and Thailand. Two case studies were completed (Woon and Lim 1991; Lim and Woon 1991), and six more case studies and comparative analyses were funded. Marketing research was also an important part of the first phase studies in the pilot program on improvement of *Artocarpus heterophyllus* in central Philippines.

Extension Research and Development (ER&D)



Photo: D. Taylor.

A farmer (far right) discusses control of caterpillars infesting his fruit-tree seedlings with staff of the Network Secretariat and Save the Children's agroforestry project near Nakhon Sawan, Thailand.

The consolidation of the results of earlier comparative regional studies has contributed to the development of the ER&D program. ER&D here refers generically to methodologies that combine elements of participatory action research and development, "farmer first" on-farm research, and classical extension. By drawing from this range of methodologies, the Network staff aim for genuine collaboration among professional researchers, extension agents, and farmer researchers.

Community-based Tree Improvement: Jackfruit

Within ER&D, Community-Based Tree Improvement is intended to take forward the concept of "barefoot tree breeders" outlined in a 1990 paper by Mr. K.G. MacDicken and Dr. Suree Bhumibhamon. This set of activities is developing a methodology for involving local communities in tree improvement from the start. *Tree Improvement and the MPTS Research Network, May 1990* and *May 1991*, describes early Network activities in this area with *Artocarpus heterophyllus* in the Philippines.

A December 1991 draft report of the pilot project by staff of ViSCA included a review of the available literature on the biology, production, and utilization of *A. heterophyllus* and ongoing research in the Philippines (Accedo in press). The report mapped and surveyed jackfruit production in Central Visayas (Figure 4), identified major user groups – including guitar manufacturers and ice-cream producers, and documented their preferences regarding tree characteristics. At the household level, fruit processing is mainly done by women.

A similar review of jackfruit production, use, marketing and research in Sri Lanka is being prepared by the College of Agriculture, University of Peradeniya. It will also be published in 1992.

ER & D Methods: Species Selection

In northern Thailand, a secondary school teacher near Chiang Mai has, with small-grant funds from the Network, begun a trial of local and introduced species for comparison and demonstration. The trial and study aim to learn about students' and villagers' knowledge of these

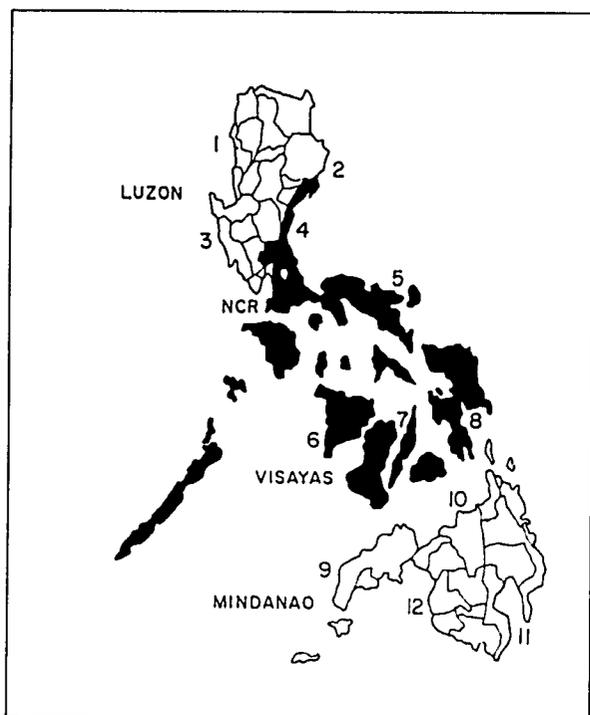
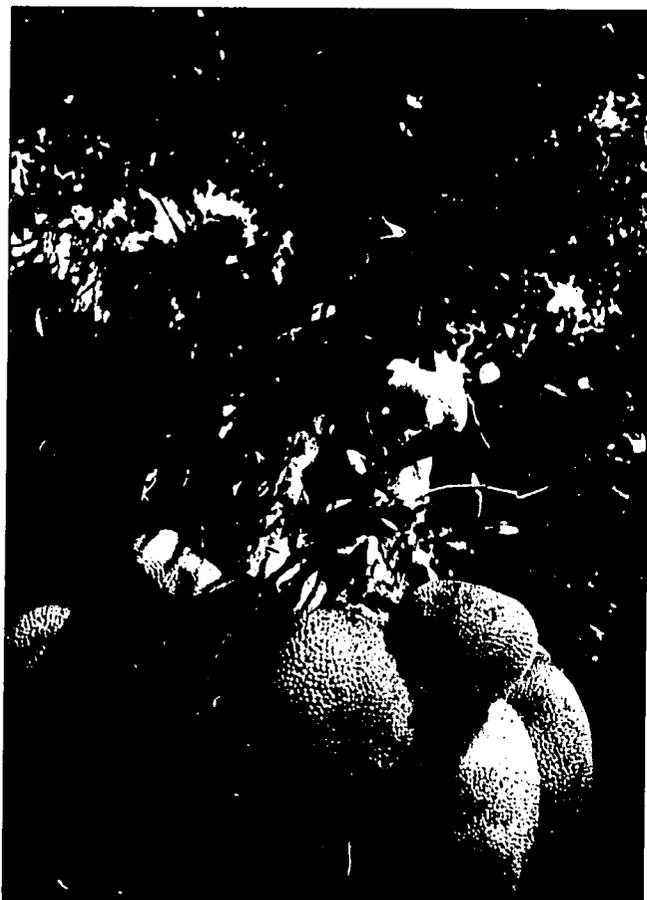


Figure 4. Map of the Philippines, showing areas of intensive jackfruit cultivation. *Source:* Acedo, in press.

species. It also aims to produce a model of local education in growth and use of MPTS. One site in the 1991 Network trials conducted by Dr. Kovith Yantasath, TISTR, is located on the school grounds, and provides one basis for local species assessment.



Bearing fruit from its trunk, single-stemmed A. heterophyllus competes relatively little with nearby crops for light.

Photo: H.P.M. Gumasena.

Strengthening National Research Programs

As the bases for the regional Network, national MPTS networks have received F/FRED support in the form of funds for annual meetings, organizational costs, publications, and equipment, such as copiers and computers. The regional Network also has encouraged MPTS research in participating countries by documenting national studies and coordinating regional programs of national research.

National Network Meetings

In 1991, national MPTS meetings took place in India, Indonesia, Malaysia, Papua New Guinea, the Philippines, Republic of China (Taiwan), and Sri Lanka. These meetings are intended to exchange experiences among in-country organizations on activities and updated knowledge on MPTS, prioritize needs, identify areas for cooperation, and determine representation to the regional Research Committee. In Nepal and Thailand, national network activities continued without formal meetings in 1991.

At the Philippines national meeting, which F/FRED co-sponsored with the Ford Foundation, participants discussed findings from F/FRED-sponsored studies as well as other ongoing research. In formalizing their organization as MPTS-Philippines, they outlined a program for research, training, and publications. The research program included a plan for a geographic assessment of environmental and socioeconomic problems affecting MPTS use in each region of the country.

The National MPTS Research Committee in Sri Lanka is coordinated from the Faculty of Agriculture, University of Peradeniya. The Faculty has established a secretariat office and with F/FRED support for equipment is beginning information exchange activities. Its April 1991 meeting included presentations of experience from forestry and agricultural government agencies, university research, and NGO programs (see Gunasena 1991). Among the national networks, the Sri Lankan network has been perhaps the most aggressive in publishing the proceedings of its



Photo: D. Taylor.

In the Philippines, H.P.M. Gunasena (Sri Lanka) examines a jar of Artocarpus heterophyllus preserves at the Multipurpose Training Center of Don Severino Agricultural College with college president Ruperto Sangalang. Scientists in both countries are conducting Network studies on jackfruit.



Photo: FRDC.

A Javanese farmer explains his 'cut and carry' system for integrated tree, crop, and livestock production during the June Indonesia MPTS meeting.

national meetings for wider distribution.

Indonesia also established a national secretariat with a plan of activities outlined and discussed at its national meeting in June. Participants developed a matrix of research needs for eight priority species, using three categories of research: cultivation/biology, utilization, and socioeconomic. For coordination with a related regional FAO project, the national MPTS secretariat is housed at the Forestry Research and Development Centre next to the Secretariat of the Asia-Pacific Agroforestry Network.

The Malaysia national meeting in December included presentations on the development of a system for economic valuation of MPTS utilization, and potential medicinal and chemical uses of MPTS. The meeting included a session in which the Executive Committee of MPTS-Malaysia, the national coordinating body, proposed seminars and activities for 1992.

National meetings are an important source for *MPTS Research Notes*, providing nearly half of the research bulletins published in 1991.

For more information on network activities in each country, see the reports of the representatives to the Research Committee meeting in June (pp. 9-12 in Bhumibhamon et al.).

Support for National Research

A Compendium of National Research on Multipurpose Tree Species, 1976-1990 contains listings and abstracts (where available) for 704 studies in Bangladesh, Indonesia, Malaysia, Philippines, and Thailand. The country contributions to the compendium, published in April, were prepared by network cooperators, and organized by genus and author. Records include publication citations, project status, executing and funding agencies, language used, site names, species, and key words. The compendium includes first-time English abstracts of research in Thailand. It serves as a benchmark and a tool for use in identifying gaps for further study. For example, Table 7 reflects the priority species in each country by indicating the number of studies recorded for each.

To encourage coordinated national research on utilization of non-wood MPTS products, the Network brought together scientists from five Southeast Asian countries in January in Taiwan. National components of a coordinated regional program for MPTS Utilization for Small-Farm Development (MUSFAD) were agreed upon, with priority topics and species identified for each

Table 7. Number of records in the Network's compendium of national MPTS research for each of some important species, by country. *Source:* Lantican and Taylor 1991.

Species	Bangladesh	Indonesia	Malaysia	Philippines	Thailand	Total
<i>Acacia auriculiformis</i>	13	8	24	4	53	102
<i>Acacia mangium</i>	4	34	123	6	9	177
<i>Albizia (or Samanea) saman</i>	0	0	2	1	1	4
<i>Azadirachta indica</i>	19	0	0	0	19	19
<i>Calliandra calothyrsus</i>	0	3	1	0	0	4
<i>Casuarina equisetifolia</i>	0	0	6	1	25	32
<i>Eucalyptus camaldulensis</i>	21	0	0	5	118	144
<i>Eucalyptus deglupta</i>	0	6	7	25	0	38
<i>Gliricidia sepium</i>	0	0	5	8	0	13
<i>Gmelina arborea</i>	0	5	32	26	0	63
<i>Leucaena diversifolia</i>	0	0	1	1	0	2
<i>Leucaena latisiliqua</i>	0	0	0	1	0	1
<i>Leucaena leucocephala</i>	15	19	10	87	42	173
<i>Melia azedarach</i>	4	0	0	0	45	49
<i>Paraserianthes falcataria</i>	0	25	20	36	0	81
<i>Pithecellobium dulce</i>	0	0	0	3	0	3
<i>Sesbania spp.</i>	2	0	2	2	0	6

set of country proposals. Among species to be studied are *Acacia auriculiformis*, *Artocarpus heterophyllus*, *Azadirachta indica*, *Eucalyptus camaldulensis*, *Melia azedarach*, and *Pithecellobium dulce*. As of December 31, 1991, the Network Secretariat had received country proposals from Malaysia, Philippines, and Taiwan. Donor support for this innovative program is being sought.

The Network's regional research programs, including field trials, comparative studies, and small research grants, also develop the capabilities of national programs.

Institutional Twinning

The Universiti Pertanian Malaysia published the proceedings of the 1989 regional symposium on Recent Developments in Tree Plantations of Humid/Subhumid Tropics of Asia (Abod et al. 1991). The symposium was part of the "twinning" agreement between the Faculties of Forestry of UPM and KU supported by Phase I of F/FRED. The proceedings contains 69 papers and discussion notes.

The forestry heads of UPM, KU, and UPLB met in May to arrange further collaboration through the "twinning" program. They agreed on

activities for mutual development in the areas of collaborative research, training, and materials development (Bhumibhamon et al. 1991). Under the arrangement, joint preparation of a field text and audiovisual materials on social forestry has begun. The three faculties agreed to jointly organize an international symposium in 1993 on MPTS for Rural Livelihood, and to encourage exchange visits by faculty and students. Collaborative research on *Acacia crassicarpa* under the agreement has already begun.

Training

Short-term, national courses arranged by the Training Specialist brought together scientists from an average of seven different institutions within each country and thus strengthened informal national networks (see pp 25-27).

Small Research Grants

The Network's Small Research Grants program is intended to foster independent research by up-and-coming scientists on MPTS-related topics. By focusing on topic areas determined by the Network's Research Committee, it complements Network research and fills research gaps.

Final reports for all grant studies awarded in late 1988 were received by the Secretariat by early 1991. The Network Secretariat has provided scientists in the program with authors' guidelines and editorial assistance in preparing their reports for submission to refereed journals.

Following an announcement of a second round of small grants in November 1990, the Network Secretariat received 115 proposals. Fifty of these passed an initial in-house screening and were sent for evaluation by experts in fields related to the proposals. The expert review resulted in 27 proposals selected for funding in the areas of: tree improvement and propagation (5), MPTS in farming systems (5), land tenure and extension

issues (5), silviculture and management for fodder and fuelwood (4), insect and disease control (3), MPTS for adverse sites (3), marketing (1), and tree physiology (1). The study on tree physiology will use data from sites in the 1987 Humid Zone Trials in Thailand. (See Bhumibhamon et al. 1991, pp. 58-59 for a complete list of topics.)

In addition to the studies funded through the Small Grants program, the process identified a number of studies that were then funded through the Network's Applied Social Science program. These proposals responded to identified needs in the Network program, with the added advantage that they were not commissioned, but prepared from the researcher's own initiative and interest.

Information Systems Development

The F/FRED Global Research Systems (GRS) staff, located with the Project Management office in Arlington, Virginia, U.S.A., has nearly completed development of MPTSys, a microcomputer-based information and decision support system. As a system that facilitates decentralized cooperation among researchers, MPTSys supports research of the Multipurpose Tree Species (MPTS) Research Network in Asia, and MPT research globally.

The GRS staff has collaborated with other international research organizations on entry, exchange, and use of summarized MPTS research data worldwide. Technical support for the Network Secretariat and Network cooperators has included research design and analysis, minimum data sets, standardized methodology, training and support for users of IADSS (forerunner of MPTSys), information exchange, data summarization, and training workshops on data analysis and interpretation.

MPTSys has been developed using a modular approach to software system design, with components consisting of database management and application programs. Stand-alone components are intended to give flexibility. Users can select components that match their needs and resources. The system does not require that the user have training in computers or database management. Consistent use of screens, options, and menus among the components and 'help' windows are intended to speed users' familiarity with the system.

MPTSys Development

System development in 1991 focussed on stand-alone, user-friendly MPTSys subsystems. The compositions of these subsystems were based on discussions with Asian scientists on their needs. Subsystems include:

- an improved and expanded **experiment subsystem** for data entry, storage, analysis and exchange of field plot and subplot measurements from network experiments and other trials

MPT-INFO and MPT-DATA create input files for use with MPTStat.

- a **growth and yield subsystem** for growth simulation integrated with the climate, soil, and weather databases

MPT-WTHR, MPT-SOIL, and MPT-CLIM create input files for use with MPTGro.

- a **species technology transfer subsystem** for environment (trial data) predictive modeling supported by international tropical climate and soil databases

MPT-INFO, MPT-DATA, MPT-SOIL, and MPT-CLIM create input files for use with MPTModel.

Stand-alone databases developed by the GRS staff include databases on farm and village forestry, abstracts, and MPTS specialists (see box).

Workshop to Evaluate and Plan Further Development of MPTGro

A workshop to evaluate the status of MPTGro and chart future model development, first scheduled for December 1991, took place in January 1992. Following a recommendation by the Research Committee, Dr. Kamis Awang organized and chaired the workshop in cooperation with Dr. Foster Cady, Director of the F/FRED Global Research Systems Staff. The workshop brought together 14 scientists representing 9 countries and a variety of disciplines, including silviculture, tree physiology, biometry, and ecology.

MPTGro's model simulates growth and yield of MPTS, incorporating the effects of management practices and environment stresses caused by limited moisture and sunlight (Figure 5). Species-specific allometrics and stand relationship information derived from empirical data drive the model. Dr. Susan J. Riha of Cornell University, who was instrumental in developing MPTGro to its current stage, presented the model along with Ms. Jennifer Phillips, author of the MPTGro user's manual.

The workshop identified two groups of users for the model: intermediate users (primarily

Research Database

Experiment Database <i>MPT-DATA</i>	Stores experiment/trial data at the stem, tree, and/or plot levels. Also stores site characteristics. Creates analysis data sets for MPTModel and MPTStat. Creates weather input files for MPTGro.
Summary Database <i>MPT-INFO</i>	Stores experiment/trial data at the treatment summary level. Creates analysis data sets for MPTModel and MPTStat. Developed in cooperation with the Division of Forestry, CSIRO, Canberra, Australia.
Soil Database <i>MPT-SOIL</i>	Stores chemical and physical characterization data of tropical soils at the horizon level. Creates input files for MPTGro and MPTModel. Developed in cooperation with World Soil Resources, Soil Conservation Service, U.S. Department of Agriculture, and stores data from the National Soil Survey Laboratory in Lincoln, Nebraska, U.S.A.
Climate Database <i>MPT-CLIM</i>	Stores long-term climate data as monthly means. Creates input files for MPTGro and MPTModel. Stores long-term FAO climate data.

Decision Support Packages

Data Analysis and Modeling - <i>MPTStat</i>	Provides statistical procedures for data summarization, inference, and graphics. Accepts inputs from the Experiment and Summary Databases.
Growth Simulation <i>MPTGro</i>	Provides tree growth simulation with or without water stress. Accepts inputs from the Soil, and Climate Databases.
Technology*Environment Modeling - <i>MPTModel</i>	Provides technology evaluations for management recommendations across environments. Accepts inputs from the Experiment, Summary, Soil, and Climate Databases.

Reference Databases

Specialist Database <i>MPT-PROS</i>	Stores information about MPT professionals.
Abstract Database <i>MPT-DOCS</i>	Stores citations and abstracts.
Species Digest <i>MPT-SPP</i>	Stores species characteristics and environmental requirements.

researchers interested in designing and analyzing experiments with MPTS) and end users (policy makers, operations managers, and extension agents interested in decision support for species selection and management). Thus the model should be complex enough to serve as a meaningful research tool and simple enough to communicate essential concepts to end users.

The participants, grouped in three expert teams, suggested future development of the model in terms of: (1) the basic growth model, (2) management influences on tree growth, and (3) environmental influences on tree growth. Each group prioritized its suggestions according to end-user objectives, urgency of need, lack of existing alternatives, and feasibility.

For the basic growth model, the expert team suggested ways to extend the model to simulate longer rotations, and that data from the MPTS Research Network's experiments be more extensively used to test model assumptions. The team dealing with management influences suggested that thinning experiments could form the basis for an added management component of MPTGro. Nutrient stress, particularly phosphorus and nitrogen, were identified as priorities for inclusion among environmental stress factors. A steering committee of three participants and the Network Specialist will pursue the workshop's recommendations.

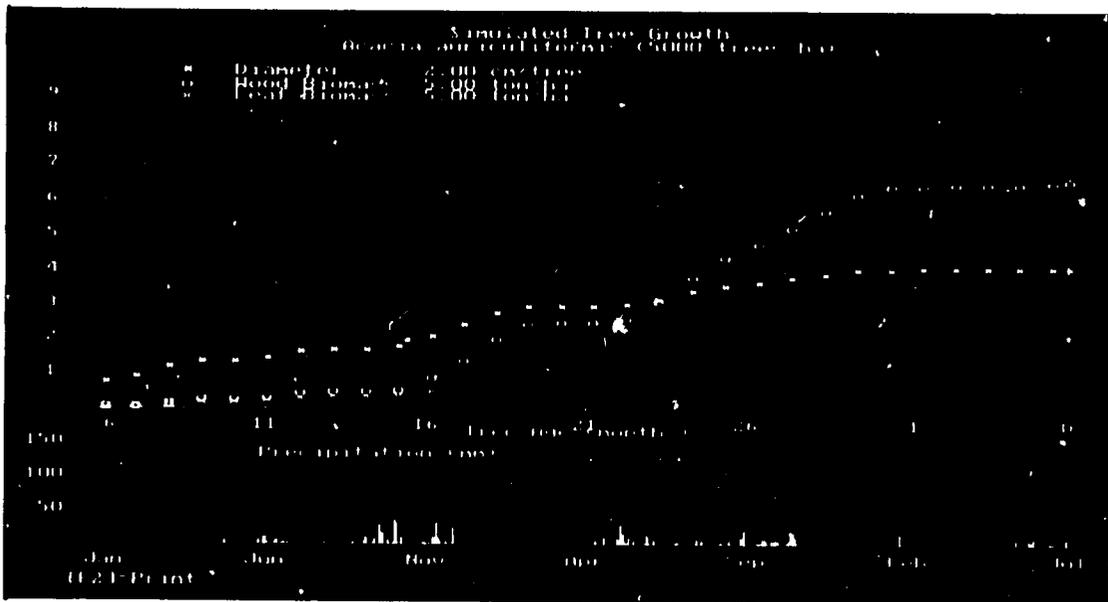


Figure 5. MPTGro, the growth simulation component of the MPTSys package, models reduced growth of *Acacia auriculiformis* due to water stress. Precipitation data on which the simulation is based appears at bottom.

Training

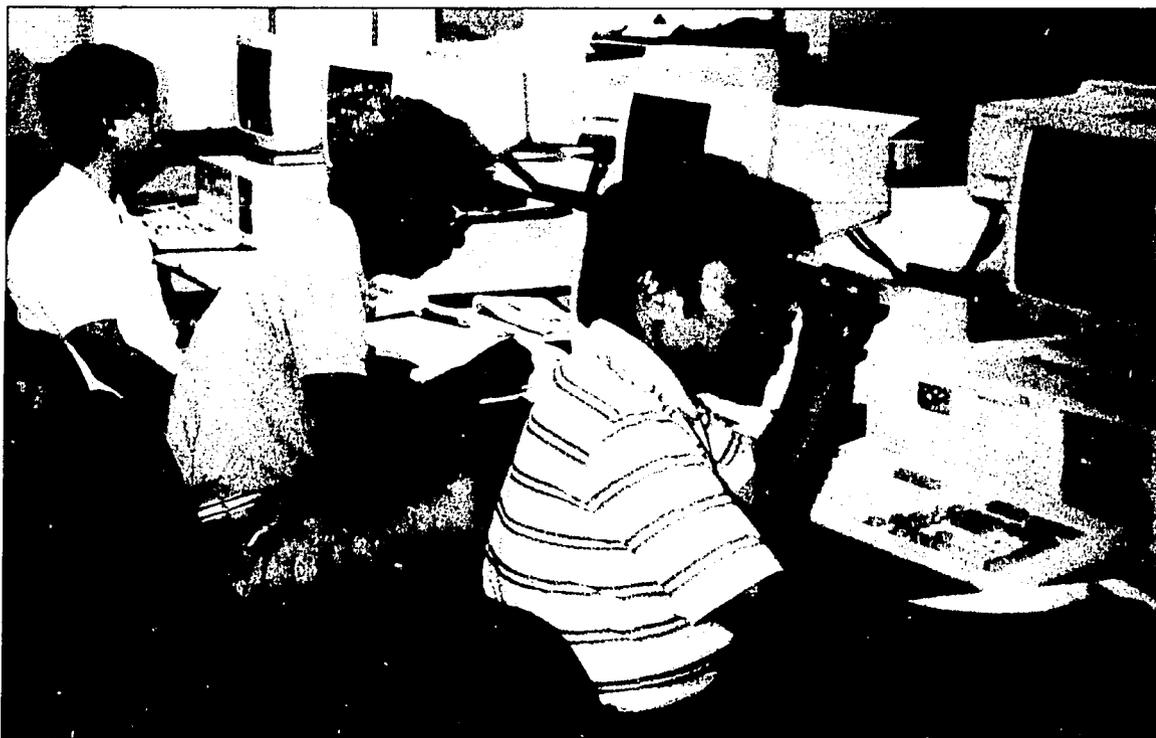


Photo: R. Tabora.

Courses on Data Analysis and Interpretation include hands-on experience with microcomputers for each participant.

The Network's training program aims to improve the capability of scientists in Asia to design and conduct research on multipurpose trees. This is done through short courses, development of training materials, and support for selected postgraduate study.

Short Courses

In-country, short-term courses organized by the Training Specialist at the request of participating institutions are central to the Network's training program. Course offerings were determined based on needs assessments conducted in the course of discussions with Network institution heads, participants of previous F/FRED training courses, and Research and Steering Committees. Courses offered on a country basis are more cost-effective and allow for more useful, location-specific examples and exercises than regional courses. In addition, they promote linkages among scientists from different institutions within the same country. Table 8 lists short courses conducted in 1991.

The course on Research Problem

Identification and Proposal Preparation employs the format of the Network's Small Research Grants program as a practical exercise. To conduct the course on Technical Writing and Presentation, experts from the Regional English Language Center in Singapore were engaged.

Courses on Data Analysis and Interpretation conducted by F/FRED's Global Research Systems staff stressed hands-on microcomputer data analysis with increasingly complex data sets. These courses used a unified modeling approach to give summary mean and slope statistics and standard errors from which experimenters could interpret results directly. In the process, participants became familiar with the use of FMOD (precursor to MPTStat), a statistics and graphics analysis package developed especially for analysis of MPTS experiments.

Other training activities included assistance by Network Secretariat staff in the Fourth Certificate Course in Community Forestry, at the Regional Community Forestry Training Center (RECOFTC) in Bangkok. Secretariat staff led instruction on multipurpose tree species, networking, and information exchange.

Table 8. Network short courses conducted in 1991.

Course title	Country	Timeframe	Participants
Multivariate Statistical Methods for MPTS Research	Malaysia	October 21- November 2	15
Data Analysis and Interpretation*	Thailand	July 1-5	21
	Republic of China (Taiwan)	September 16-20	22
Research Problem Identification and Proposal Preparation	Papua New Guinea	January 28-31	20
	Thailand	March 20-22	15
	Republic of China (Taiwan)	April 22-24	15
Technical Writing and Presentation	Papua New Guinea	February 1-8	20**
	Indonesia	October 2-11	35

*Conducted by the Global Research Systems Staff. **Same participants as in the January 28-31 course.

Training by Correspondence

To respond to the growing interest in courses organized by F/FRED, the Training Specialist announced in November that courses conducted by correspondence would be offered. Enrollment for the first course in Research Problem Identification and Proposal Preparation took place in December. The Training Specialist, with the help of other Network staff and instructors, will monitor students' performance of exercises and progress. Over 100 applications were received for the course, which will run from February to June 1992.

Training Materials

A sourcebook of existing reference materials on research methods involving applied social sciences was prepared for use in future Network courses and as a reference. The sourcebook covers methods of: agroecosystems analysis, case study, experimental method, historical method, participatory research, policy research, process documentation, rapid rural

appraisal, sociometric method, and survey research.

In addition to the handouts and assignments used in the 'roving' courses, training materials were developed, including interactive software presentations.

Postgraduate Studies

The six Ph.D. students sponsored by F/FRED continued their home-country research in 1991, with supervision by the Network Secretariat staff and advisors from Michigan State University and their home institutions. One of the six did not pass the qualifying examination, but was awarded a Masters degree. The rest, from Bangladesh, Indonesia, Nepal, the Philippines, and Thailand, will prepare their dissertations for defense in 1992.

At its June meeting, the Research Committee prepared a status report on postgraduate study programs and needs in the participating countries (Bhumibhamon et al., pp. 40-44). It also made recommendations to funding agencies, governments, and F/FRED on how to address these needs.



Photos: D. Taylor.

In a group exercise, Thai course participants (above) identify a research problem and develop a proposal. The full group is shown at right with instructors Celso Lantican (standing, far right) and Cleofe Torres (seated, far right).



In response to these recommendations, the Network Secretariat proposed to the Steering Committee in December a plan for Masters degree training at universities in the region. Building on the twinning relationship involving UPM, KUFF, and UPLB, the program would provide two-year fellowships to study in fields related to production and utilization of MPTS. Initially, four fellows from the 'twinning' institutions would study at UPLB, with thesis research to be done either at

UPLB, the student's home institution, or another Network institution. Through arrangements with UPLB, Network Secretariat staff and other qualified scientists in the Network, particularly scientists from the other two 'twinning institutions,' would serve on the students' guidance committees.

The Steering Committee endorsed this proposal and the new fellowships program will begin in 1992.

Theme Workshops and Network Meetings

The Role of NGOs in On-farm Tree Growing

Presentations and discussion at the international workshop on the Role of NGOs in Promoting On-farm Tree-growing Technologies identified ways in which research organizations like the MPTS Research Network could better support non-governmental organizations (NGOs).

The workshop was co-sponsored by F/FRED, IDRC, FAO, and NFTA, and hosted by BAIF Development Research Foundation in Pune, India. It included 29 presentations from NGOs, research agencies, and government departments in India, Indonesia, Philippines, Sri Lanka, and Thailand. NGO participants were chosen on the basis of experience with field activities with tree-growing.

The workshop resulted in recommendations under three categories: technical support, government policy and cooperation, and networking and linkage with other research and education programs. From these, the Network Secretariat identified four follow-up activities on a pilot basis:

1. Masters thesis research by students in network institutions conducted at an NGO project site, on a topic co-directed by the NGO
2. Making improved seeds from network-supported seed orchards available to farmers through NGOs
3. Field-day visits by farmers to on-station Network experiments. Farmers would be invited to comment on adjustments needed to account for farm conditions.
4. Small grants for process documentation of near-complete or just completed NGO on-farm projects that involve either successful or failed linkages to research programs.

The first activity is being developed with the faculty of UPLB in conjunction with the Ford-funded UPLB Program for Upland NGOs and the Upland NGO Assistance Committee.



Photo: D. Taylor.

Narayan Hegde explains an exhibit of Leucaena products, including charcoal, animal feed, and newsprint, to workshop participants at BAIF's Urulikanchan research station in Maharashtra, India.

At the national level, MPTS network coordinators were requested to invite workshop participants to participate in the 1992 series of annual meetings.

The workshop also provided an opportunity for informal contacts with groups that might be suitable partners in Network ER&D activities. Throughout 1991 the Secretariat staff made visits in participating countries with this objective. An FAO-sponsored consultation on local organizations, held in Chiang Mai, Thailand, provided another occasion for such contacts.



S.C. Rajbhandari, National Herbarium of Nepal, demonstrates his technique for in vitro excision of shoots for inexpensive mass propagation of trees and other plants. At left is Shams-ur-Rehman, Research Committee member from Pakistan.

Photo: D. Taylor.

Research Committee

In June, the Research Committee met in Nepal to review activities of the regional Network and its member national networks. Working groups also assessed the research and policy situations in each country regarding the roles of MPTS in providing fodder, fuelwood, food, and materials for post-harvest processing and marketing. The Committee also identified degree

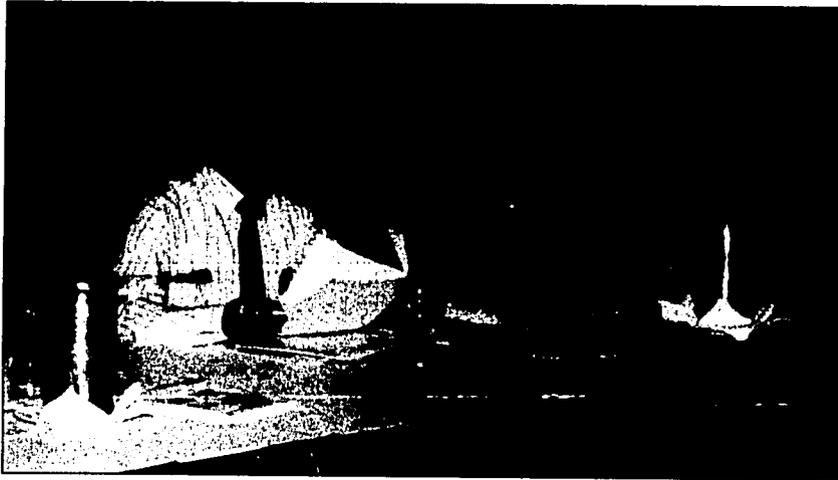
training needs for each country to develop national research capacities. The Committee's report relates its specific recommendations for Network actions in these areas, and suggests several new initiatives to strengthen research and development to ensure that results are available to farmers. The importance of national plans and synthesis of results for informed government policy were stressed.

A Research Committee working group assesses country policies regarding MPTS in wood industry.

From left to right: Ismariah Ahmad (Malaysia), Shams-ur-Rehman (Pakistan), Hsu-Ho Chung (ROC), and Boen Purnama (Indonesia).



Photo: D. Taylor.



Salleh Mohd. Nor, Steering Committee chair, leads review of issues. At right are Sara Tisch (Winrock) and Frances Korten (Ford Foundation-Manila).

Photo: F/FRED.

Steering Committee

The December meeting of the Steering Committee reviewed the Network program, the Research Committee's report, and six issues papers concerning the Network's mandate, strengthening national institutions, a new postgraduate fellowships program, and further activities with NGOs.

The Committee awarded the 1991 MPTS Scientific Achievement Award to Dr. Fuh-Jiunn Pan for his research on breeding *Leucaena* for greater pest resistance and a wider range of site conditions and end products. The award includes a research grant.

The Committee, composed of seven senior Asian biological and social scientists, re-affirmed the Network's priority on the production role of trees for market and household uses. In emphasizing the capacity of trees to provide

commodities to farmers, the Network aims to complement the work of ICRAF and other organizations already studying nutrient cycling, soil erosion, and the dynamics of agroforestry systems.

The Committee strongly endorsed the Network's current program and mandate. It expressed the view that in providing farmers with management alternatives for MPTS, the Network is making a critical contribution to the broader issue of natural resource management. (For further information see Taylor 1992.)

Other Meetings and Network-Supported Participants

In 1991, the Network funded travel by network participants both within the region and to meetings or training outside the region as shown in Table 9.

Suree Bhumibhamon (Thailand) makes a point during the Steering Committee meeting in Manila. Beside him are John Cool (Winrock), Kailash Pyakuryal (Nepal), and John Raintree (Winrock).



Photo: F/FRED.

Table 9. Project-sponsored participant travel in 1991.*

Participant	Home Country	Destination(s)	Meeting or Training
Sheikh Ali Abod	Malaysia	Philippines	Study tour under UPM-KUFF-UPLB twinning program (July)
Suree Bhumibhamon	Thailand	France	World Forestry Congress (September)
Woon Weng Chuen	Malaysia	Canada, U.S.A.	Workshop on Valuing Natural Resources, Workshop on Financial and Economic Analysis of Agroforestry Systems (July)
Hsu-Ho Chung	Taiwan (ROC)	Papua New Guinea	PNG national MPTS meeting (March)
Herminia A. Francisco	Philippines	Thailand	Symposium on Forestry Economics Research (March)
Lim Hin Fui	Malaysia	India, U.S.A.	India national MPTS meeting (January), Workshop on Financial and Economic Analysis of Agroforestry Systems (July)
H.P.M. Gunasena	Sri Lanka	Philippines	Philippines national MPTS meeting (January)
Adelina Manas	Philippines	Taiwan (ROC)	MUSFAD planning workshop (January)
C. Manoharachary	India	Thailand	Second Asian Conference on Mycorrhizae (March)
Habsah Marjuni	Malaysia	U.S.A.	Short Training on Publishing (April)
Aminuddin Mohd.	Malaysia	Taiwan (ROC)	MUSFAD planning workshop
Fuh-Jiunn Pan	Taiwan (ROC)	Sri Lanka	Sri Lanka national MPTS meeting (April)
Boen Purnama	Indonesia	Taiwan (ROC)	MUSFAD planning workshop
N. Raman	India	Thailand	Second Asian Conference on Mycorrhizae (March)
Niwat Ruangpanit	Thailand	France	World Forestry Congress (September)
Nor Aini Ab. Shukor	Malaysia	Sabah (Malaysia)	Workshop on International <i>Acacia auriculiformis</i> Provenance Trials (June)
Songkram Thammincha	Thailand	Taiwan (ROC)	MUSFAD planning workshop
Anoja Wickramasinghe	Sri Lanka	India, Thailand	ODI Workshop on Socioeconomic Aspects of Tree-Growing by Farmers (March), FAO Workshop on Conducting Gender Analysis (December)

*does not include staff travel, Network theme workshops, or Committee meetings.

Publications

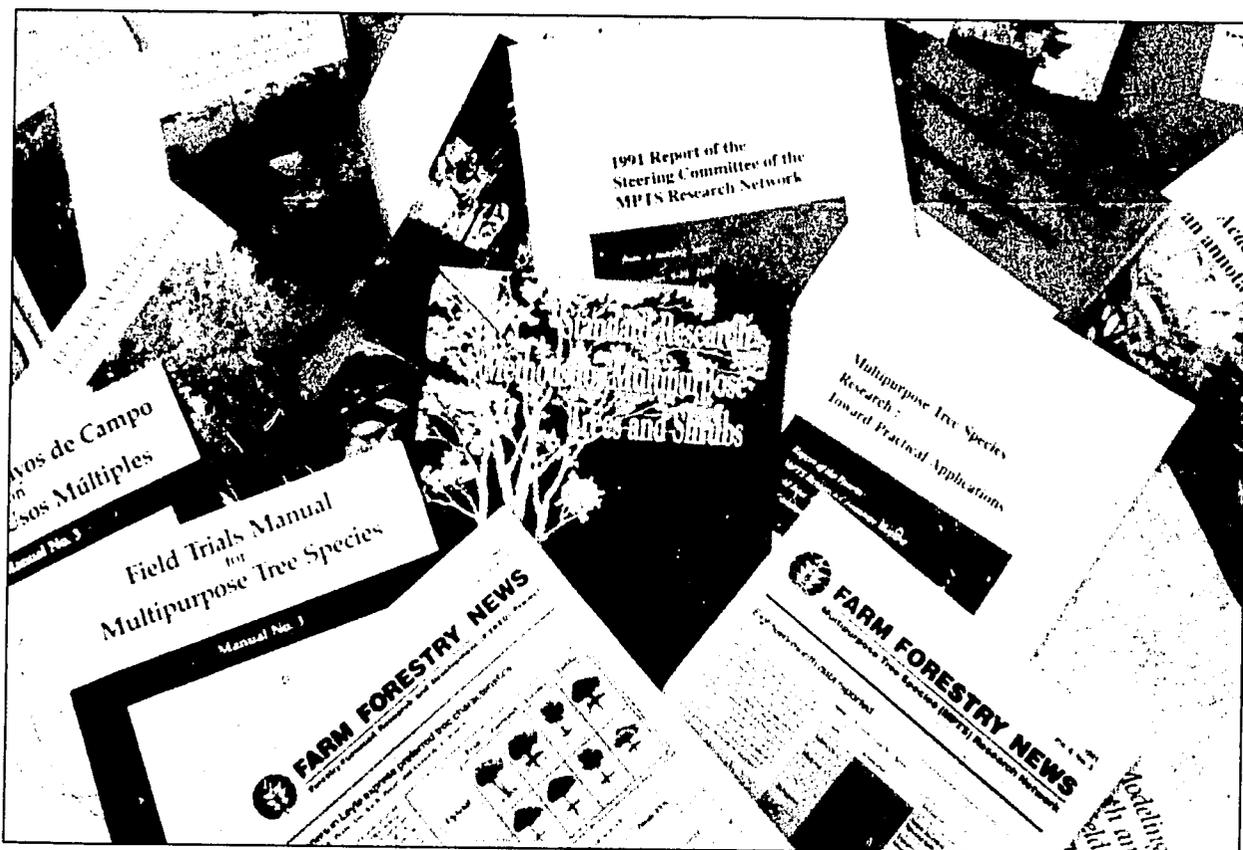


Photo: N. Adams.

Assorted F/FRED publications.

The F/FRED Project publishes documents for global and regional distribution. Publications intended for global audiences, including *Farm Forestry News* (the Project's quarterly newsletter), manuals on standard methods, technical volumes, and general project information, are prepared by the publications staff at the F/FRED Project Management Office in Arlington, Virginia. Publications intended primarily for scientists in the MPTS Research Network and others in Asia are prepared and distributed by the Network Secretariat publications staff in Bangkok.

Project publications in 1991 included three Research Series Reports, two species bibliographies and compendiums, one manual, one handbook, one special report by the Research Committee, one workshop proceedings, five research bulletins, three issues of *Farm Forestry News*, and one project progress report.

Responding to the results of a 1990 reader survey, *Farm Forestry News* in 1991 featured more articles on research results. A new department, MPT Views, was created to provide a forum for discussing issues and problems related to MPTS research. The newsletter continued to highlight the capabilities of Network institutions. Each issue also focussed on selected species descriptions, including *Sapium sebiferum*, *Prunus cerasoides*, *Artocarpus heterophyllus*, *Erythrina poeppigiana*, *Inga edulis*, and *Prosopis cineraria*.

The Network Secretariat launched a bi-monthly series of research bulletins, *MPTS Research Notes*, as recommended by the Research Committee in 1990. Five issues contained research results from India, Malaysia, Pakistan, Philippines, the Republic of China (Taiwan), Sri Lanka, and Thailand. Topics included provenance trial results; farmers' perceptions of risk and management

options; standards for vegetative propagation; and farmers' preferences and strategies for using trees to obtain income, food, and fuel.

Two manuals prepared in 1991 for publication in 1992 focussed on standard research methods and extension, respectively. The first manual presents recommended standards and alternative approaches for scientists who want to plan and conduct field research on MPTS. The second manual is intended to help extension workers advise farmers on options for growing and selling multipurpose tree crops.

The second of three handbooks in the Winrock-Oxford & IBH series funded by F/FRED was published and distributed to scientists in Asia and elsewhere. *Biophysical Research for Asian Agroforestry*, edited by M.E. Avery, M.G.R. Cannell, and C. Ong, was published in India under an arrangement that ensures scientists in Asia greater access to inexpensive, high-quality publications. The book contained 14 chapters by internationally recognized scientists, including an early chapter on "Orienting Agroforestry Research Toward Social Objectives."

A mid-year progress report described the Network's activities in tree improvement research. The F/FRED Publications Manager, Ms. Norma Adams, prepared a booklet on the Project's history and achievements that will be published in 1992. Press releases from the Network Secretariat featured Network activities.

National Network Publications

In 1991, the Network Secretariat made a greater attempt to promote publications by the national MPTS networks. Proceedings of the national MPTS research meetings in Indonesia, the Republic of China (Taiwan), and Sri Lanka were distributed to key Network scientists in other

countries. The Project sponsored these publications in conjunction with the annual meetings. Through a policy that supports national-language publication with English-language abstracts, the Project promotes in-country application of findings while ensuring that findings cross national and linguistic borders.

Publication of national newsletters is similarly encouraged. The second issue of *MPTS-Malaysia*, which was initiated in 1990, was published in December 1991 and distributed throughout Malaysia and to Network scientists in other countries. Its purpose is to inform scientists of biophysical and social-science research on MPTS in Malaysia, and announce activities of the national MPTS network.

Translation

For greater comparability of research across regions, F/FRED publications are considered for translation into languages other than English. When funds for translation are unavailable, the Project encourages co-publication, by which national publishers receive assistance in producing inexpensive local-language editions. This policy is especially useful for materials intended for use in extension.

Library Development

The Project's Management Office streamlined its service of providing key forestry journals and books to Network institutions by developing a voucher system in cooperation with Winrock International's Agribookstore. The vouchers allow Network libraries to obtain needed references from a single source without the delays or problems associated with foreign currency exchange.

Looking Ahead

Although the end of the A.I.D.-Winrock cooperative agreement in May 1995 is still several years away, the six objectives of the Network's program already promise to be achieved. These are:

- Research on the selection, management, and improvement of MPTS
- A research program based on a species approach by ecological zones as an important means of addressing regional forestry/fuelwood problems
- Network development and support to address common problems related to forestry/fuelwood research across the Asia region
- Integration and collaboration of the biophysical and social sciences in MPTS research
- Balance and use of interdisciplinary approaches, as appropriate to specific studies
- Better information management for enhanced research analysis, publication of results, and decision-making regarding growth and use of MPTS

Achievement of these objectives will help realize the program's broader goals: meeting the basic needs of developing countries for tree products, better land and water resource management, and increased employment and income.

By the end of the cooperative agreement, the Project will also have produced five of the six specific outputs planned at its start. These were:

1. A developed MPTS Research Network in Asia
2. Genetically improved and acceptable MPTS for farmers in Asia
3. A database system for use in work with MPTS in Asia
4. Publication of MPTS field data and general newsletters
5. Professionals trained in MPTS research and development
6. Provision for the Network's sustainability

The last item, Network sustainability, poses problems unless long-term financial support becomes available from a consortium of donor agencies, or unless the Network program is taken up by another institution. A transition period of continued albeit reduced support by A.I.D. may be needed to achieve either of these possibilities.

Network Papers, Publications, and Major Articles in 1991

- Abod, S.A., P.M. Tahir, L.M. Tsai, N.A.A. Shukor, A.S. Sajap, and D. Manikam, eds. 1991. *Recent Developments in Tree Plantations of Humid/Subhumid Tropics of Asia*. Proc. of a regional symposium held June 5-9, 1989, in Serdang, Malaysia. Serdang: Universiti Pertanian Malaysia.
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- Awang, Kamis. 1991a. A guide for research cooperators in the 1991 humid and subhumid zone Network trials. Manual No. 4 in the MPTS Research Series. Bangkok: Winrock International-F/FRED.
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- Awang, Kamis, Suree Bhumibhamon, Boonchoob Boontawee, Foster Cady, Ken MacDicken, Mohd. Lokmal B. Ng. Ngah, Fuh-Jiunn Pan, Bunyarit Puriyakorn, Justino Quimio, Romeo Raros, Komar Soemarna, Djoko Wahjono, and Kamol Wisupakarn. 1991. Eighteen-month data reported. *Farm Forestry News* 4(3):1-6.
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- Bhumibhamon, Suree, Ahmad Said Sajap and David A. Taylor, eds. 1991. *Multipurpose Tree Species Research: Toward Practical Applications*. Report of the Fourth MPTS Research Committee meeting, held June 17-26, 1991 in Kathmandu, Nepal. Bangkok: Winrock International-F/FRED.
- Cady, Foster B. 1991. Experimental design and data management of rotation experiments. *Agron J.* 83:50-56.
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- de los Angeles, Marian S. 1991. Forest/land-use practices in the Philippine uplands: national-level analysis based on eight villages. In Proc. Fourth Annual Meeting of the Philippine MPTS Research Network, Jan. 29-31, 1991, Tagaytay.
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- Gunaseena, H.P.M., ed. 1991. *Multipurpose Tree Species in Sri Lanka: Research and Development*. Proc. of a workshop held April 5-7, 1991 in Kandy. Peradeniya: Faculty of Agriculture, University of Peradeniya.
- Gunaseena, H.P.M. and H.M.G.S.B. Hitinayake. 1991. Alley cropping with *Gliricidia* and *Leucaena* in Sri Lanka. *MPTS Research Notes* 1(2):1-2.

- Hoamuangkaew, W., L. Medema and L. Chuntanaparb. 1991. Yield and financial analysis of *Azadirachta indica* A. Juss. *Journal of Tropical Forest Science* 3(1):72-79.
- Lantican, Celso B. In press. Tropical forest: trends and hopes. In Proc. of a workshop on Tropical Forests. Bangkok, Thailand: ASEAN Agricultural Development Planning Council.
- Lantican, Celso B. and David A. Taylor, eds. 1991. *Compendium of National Research on Multipurpose Tree Species, 1976-1990*. MPTS Bibliography and Compendium Series No. 3. Bangkok: Winrock International-F/FRED.
- Lim Hin Fui. 1991. Trees for cash, food, and fuel in a Malaysian forest community. *MPTS Research Notes* 1(2):2.
- Lim Hin Fui and Woon Weng Chuen. 1991. Marketing of agroforestry produce by small farmers: some Malaysian experience. Paper prepared for the MPTS Research Committee meeting in Kathmandu, Nepal.
- Luangviriyasaeng, V., K. Pinyopusarek, and E.R. Williams. 1991. 12-month growth of *Acacia auriculiformis* provenances in Thailand. *MPTS Research Notes* 1(3):1-2.
- MacDicken, K.G. and J.B. Raintree. 1991. An overview of multipurpose tree species. In *Research on Multipurpose Tree Species in Asia*, proc. of an international workshop held in Los Baños, Philippines, November 19-23, 1990, ed. D.A. Taylor and K.G. MacDicken; 5-16. Bangkok: Winrock International-F/FRED.
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- Ponce, Eliseo, Lucylen Ponce, and Leonarda Maurillo. 1991a. Preferred characteristics of multipurpose trees: a case study with lowland and upland farmers in Leyte, Philippines. MPTS Research Series Report No. 15 (formerly 17). Bangkok: Winrock International-F/FRED.
- _____. 1991b. Rediscovering the Philippine home garden: focus on the multipurpose tree species. In Proc. Fourth Annual Meeting of the Philippine MPTS Research Network, January 29-31, 1991, Tagaytay.
- Pyakuryal, Kailash. 1991. Defining a forester's role: conflicting perceptions in Nepal. *Farm Forestry News* 4(3):7-10.
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- _____. 1991c. Recognizing women at the forefront of tree farming. *Farm Forestry News* 4(4):3.
- _____. 1991d. *Artocarpus* in Sri Lanka: rice tree of the rural poor. *Farm Forestry News* 5(1):9-10.
- Woon Weng Chuen and Lim Hin Fui. 1991. Incorporating marketing costs in financial analysis for MPTS research. Paper prepared for an International Workshop on Financial and Economic Analysis of Agroforestry Systems, July 1991, Hawaii, U.S.A.
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Network Institutions

Participation in the Network takes place at both the institutional and individual levels. While institutional membership in the Network (arranged through formal Memoranda of Understanding or Letters of Agreement) is not a prerequisite for taking part in Network research, training, or workshops, it can make for smoother cooperation administratively. Formal membership also entitles an institution to receive all F/FRED publications and library development support.

As implementing agency, Winrock International has been flexible in developing formal Network agreements to accommodate differences in country research frameworks. In some countries, many institutions are interested to enter formal agreements. In other countries, agreements with one or two key agencies permit participation by a range of institutions.

The institutions below had formal agreements for Network participation in 1991.

Bangladesh

Institute of Forestry
University of Chittagong
Chittagong

India

BAIF Development Research Foundation
'Khamdenu' Senapati Bapat Marg
Pune 411 016

Department of Botany
University of Delhi
Delhi 110 007

National Institute of Wastelands and Rural
Development
8, Pt. Pant Marg
New Delhi 110 001

Indonesia

Agency for Forestry Research and Development
Jl. Gunung Batu
P.O. Box 66, Bogor

Malaysia

Faculty of Forestry
Universiti Pertanian Malaysia
43400 Serdang

Forest Research Institute Malaysia
P.O. Box 201, Kepong, Selangor
52109 Kuala Lumpur

Nepal

Department of Forestry and Plant Research
Thapathali, Kathmandu

Department of Sociology and Anthropology
Tribhuvan University
Kathmandu

Institute of Agriculture and Animal Science
Central Campus
Rampur, Chitwan

Institute of Forestry
P.O. Box 43
Hariyokharka, Pokhara

Pakistan

Atomic Energy Agricultural Research Centre,
under the
Pakistan Atomic Energy Commission
P.O. Box No. 1114
Islamabad

Food and Agriculture Division
Ministry of Food, Agriculture and Cooperatives
Government of Pakistan
Islamabad

Philippines

College of Agriculture and Forestry
Don Mariano Marcos Memorial State University
Rosario, La Union

College of Forestry
Central Mindanao University
Musuan, Bukindon

College of Forestry
Isabela State University
Cabagan, Isabela 1303

College of Forestry
University of the Philippines at Los Baños
College, Laguna 4031

Forest Products Research and Development
Institute
College, Laguna 4031

Ifugao State College of Agriculture and Forestry
Nayon, Lamut
Province of Ifugao

Ministry of Natural Resources
Visayas Avenue, Diliman
Quezon City

Paper Industries Corporation of the Philippines
Bislig, Surigao del Sur

University of Eastern Philippines
University Town, Catarman
Northern Samar

Visayas State College of Agriculture
8 Lourdes Street
Pasay City 3129

Republic of China (Taiwan)

Taiwan Forestry Research Institute
53 Nan-Hai Road
Taipei 10728, Taiwan

Singapore

Plantek International, Inc.
Unit 59-A, Block 1
Science Park Drive
Singapore Science Park
Singapore 0511

Sri Lanka

Faculty of Agriculture
University of Peradeniya
Peradeniya

Forest Department
P.O. Box 509
Colombo 2

Thailand

Chulalongkorn University Social Research Institute
Chulalongkorn University
Phyathai Road
Bangkok 10500

Faculty of Economics and Business Administration
Kasetsart University
Bangkhen, Bangkok 10900

Faculty of Forestry
Kasetsart University
Bangkhen, Bangkok 10900

Thailand Institute of Scientific and Technological
Research
196 Phahonyothin Road
Bangkhen, Bangkok 10900

F/FRED Project Staff in 1991

Name	Position/Discipline	Month Joined (Left)
Network Secretariat Bangkok, Thailand		
Dr. Rick J. Van Den Beldt	Field Team Leader/Agronomy	August 1991
Dr. John B. Raintree	Network Social Scientist/Anthropology	August 1990
Dr. Kamis B. Awang	Network Specialist/Tree Physiology	June 1991
Dr. Celso B. Lantican	Training Specialist/Silviculture	May 1988
Dr. Sompetch Mungkorndin	Forest Economist	April 1991
Mr. David Taylor	Research Information Specialist	August 1987
Mr. Wichan Preecha	Computer Specialist	May 1991 (January 1992)
Ms. Vilai Suansutjarit	Office Administrator	July 1989
Ms. Apinya Chaivatanasirikul	Secretary	September 1987
Ms. Chalamporn Rangaratna	Publications Assistant	May 1988
Ms. Leela Wuttikraibundit	Secretary	August 1986
Mr. Chedsada Thanakan	Clerk/Office Assistant	October 1990
Ms. Achara Maisuwannakul	Accounting Assistant	August 1991
Ms. Nuchanat O-Charoen	Travel Coordinator	September 1991
Mr. Supreecha Karnchanashas	Driver	January 1987
Mr. Damrong Intamara	Driver	March 1987
Mr. Komson Kaingpradoo	Driver	June 1986
Ms. Sanjan Thongchang	Coffee Lady/Cleaner	April 1990
F/FRED Project Management Office Arlington, Virginia, U.S.A.		
Mr. Thomas C. Niblock	Project Manager	September 1985
Ms. Norma R. Adams	Publications Manager	September 1985
Dr. Foster B. Cady	Global Research Systems Director/Biometrics	September 1985
Dr. John Cool	Winrock Senior Associate/Social Science	April 1991
Mr. Ruiz Tabora	Systems Programmer	June 1987
Ms. Julie Pak	Systems Programmer	August 1986 (October 1991)
Mr. Damien Kam	Systems Programmer	June 1988 (January 1992)
Ms. Rita Butler	Publications Assistant	November 1989
Ms. Joan Bouwes	Administrative Assistant	August 1990
Ms. Alycia Montanye	Secretary	March 1991 (August 1991)