Multipurpose Tree Species Research : Toward Practical Applications

Report of the Fourth MPTS Research Committee Meeting held June 17 - 26, 1991 in Kathmandu, Nepal

Forestry/Fuelwood Research and Development (F/FRED) Project

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1991

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Acknowledgments

We would like to thank Dr. Rishi Regmi, Head of the Department of Sociology and Anthropology, and Dr. Kailash Pyakuryal, Professor of Anthropology, Tribhuvan University, for hosting the meeting; Mr. Rajendra Joshi and the staff of the Forestry Research Division, His Majesty's Government of Nepal, for field trip arrangements; the meeting secretariat, led by Apinya Chaivanarasirikul, for valuable assistance; Mr. Shashi R. Bhandary, for hotel and travel arrangements; and the Network's sponsor, the U.S. Agency for International Development.

1. Background

The first meeting of an *ad interim* MPTS Research Committee took place in September 1986, in Bangkok, Thailand to discuss informally options for network activities, including collaborative research.

A second *ad interim* Research Committee met in December 1986 in Kuala Lumpur, Malaysia to design the first set of network field trials, which were established in the humid/subhumid tropics the following year, and to help prepare plans for future network development.

The first official MPTS Research Committee meeting was held in Kuching, Malaysia in April 1988, in conjunction with a meeting of the Network's Steering Committee. The main issues discussed at that time included the initiation of a program of small research grants, arrangements for twinning between institutions in the region, a travelling seminar focused on the network field trials, guidelines for collaborative research, and a protocol for the use of data from F/FRED-funded research.

In July 1989, the Research Committee met in Los Baños, Philippines, where major issues discussed included preliminary considerations regarding on-farm research, further social and economic research, plans for wood utilization research, and clarification of the role of the Research Committee.

In June 1990, the Research Committee met in Chiang Mai, Thailand. In addition to reviewing on-going activities, the Committee recognized the role of NGOs in adoption of MPTS technologies, and encouraged: work on strengthening the standard methodologies used in network research, the establishment of provenance trials of *Dalbergia sissoo*, and the preparation of information kits and manuals.

2. Executive Summary

Following opening remarks by Dr. Rishi Regmi, Head of the Department of Sociology and Anthropology, Tribhuvan University, Dr. Celso Lantican, Acting Team Leader of the Network Secretariat, Dr. Suree Bhumibhamon, the Committee's Chairman, and the Vice Chancellor of the University, Professor B.C. Malla, the meeting commenced with a review of on-going Network activities.

Regarding network trials, the 1987 series of trials in the Humid and Sub-humid Zone are now completed and an intersite analysis of the 36-month data will be prepared by the end of 1991. The trials in the Arid and Semi-arid Zone have been found to have irregularities in management. A meeting later in 1991 will review methods and more effective monitoring procedures. A second series of experiments in the Humid and Subhumid Zone is starting this year. International provenance trials of *Acacia auriculiformis* (in conjunction with CSIRO) and *Dalbergia sissoo* are 2 years and 1 year old, respectively. Winrock has published annotated bibliographies on these two species. Network Leucaena research has developed fast-growing hybrids with improved resistance to the leucaena psyllid.

The Committee recommended ways for making the results of the 1989 small research grants more broadly available. A second series of 27 grant awards was approved.

The Committee reviewed the transition of the applied social science and interdisciplinary components of the research program in the past year. The regional Farm and Village Forestry (FVF) study conducted in 1989 is being pursued with additional analyses and a review of methodology. Data on farmers' land-use patterns will be further explored using a geographical analysis system. From the study of farmers' tree-breeding objectives, a pilot project is starting in the Philippines to develop methods for involving farmers in tree improvement of *Artocarpus heterophyllus*. This forms part of the program in Extension Research and Development (ER&D).

The institutional twinning program now includes five educational institutions involved in joint research, training materials development, and exchange visits. Three universities agreed on a program of activities at a meeting in May 1991.

A regionally coordinated program of utilization research on non-wood MPTS products, to be conducted by national institutions, was outlined at a meeting in Taipei in January 1991. The detailed program proposal is now in preparation for submission to donor agencies.

The Committee noted the progress of the training program, and suggested that recent short-course participants be surveyed to determine the effectiveness of each course.

Plans for producing a manual for MPTS extension now call for authors on the Committee to meet in October 1991 to review draft chapters.

Topics identified as potential themes for future theme meetings include applications of indigenous knowledge of MPTS systems and processing and production of improved seeds.

Mr. Ruiz Tabora of the project's Global Research Systems staff demonstrated components of MPTSys, an upgrade of the project software IADSS 2.0., and received the Committee's views.

Following reports of the national MPTS research meetings for 1991, members described the status of their national MPTS programs. India, Indonesia, Malaysia, Nepal, the Philippines, Sri Lanka, and Thailand have national MPTS committees or secretariats; most have program plans for research and information exchange.

In working groups, the Committee examined issues of:

> **MPTS in Wood Industry** - summarized national policies and priority species, and suggested studies on the link between small farms and industrial needs.

MPTS for Fuelwood - identified policy makers as a key audience for information on future needs and technical options, to facilitate the implementation of national plans.

MPTS for Fodder - identified three production-based categories of fodder species for orienting a regional strategy for improving MPTS as fodder; listed the various uses of some species, noting country priorities within the regional context.

MPTS for Environment - identified research needed by policy makers on how MPTS can help address problems of environmental degradation.

MPTS for Food - determined areas of future research in light of FVF findings, including the need to investigate farmers' management of food trees for multiple products and processing technologies.

Motivation and Extension - identified means for motivating scientists, technicians, media workers, and farmers regarding MPTS technologies.

Information and Development - identified information needs for most of these same target 'motivation' audiences and related them to Network products.

Local Industry Centers - outlined this area of local value-added processing that can link farmer income with local and international markets, and research required.

Postgraduate Training - listed existing postgraduate forestry programs in the region and examined areas that need strengthening, preferably through training in the region.

Correspondence Training - proposed semi-structured courses for interested scientists, using interactive training tools, as a cost-effective means for training.

3. Minutes of the Meeting

June 18, 1991

1. Opening Ceremony

The Department of Sociology and Anthropology, Tribhuvan University, hosted the opening ceremony. Professor B.C. Malla, Vice Chancellor, Tribhuvan University, acted as chief guest.

1.1. Welcoming Remarks

Dr. Rishi K. Raj Regmi, Head, Department of Sociology and Anthropology, Tribhuvan University, welcomed the Committee. He noted that most farmers in Nepal have traditionally protected and maintained trees on common land, and collected tree products from forests. The introduction of cash crops has changed farmers' traditional management of trees. The present situation allows for a greater role for MPTS to meet farmers' needs.

1.2. Remarks by the Acting Team Leader

Dr. Celso Lantican, Acting Team Leader of the Network Secretariat, welcomed the Committee members and gave a brief summary of the present status of the F/FRED Project's activities in network development, research, training, and publications. He emphasized the increased attention on integration of social and biological sciences in F/FRED-supported research, recognizing that such integration is necessary to achieve the objective of relevant research and improved quality of life for poor farmers.

Dr. Lantican informed the Committee that the next Steering Committee meeting will be held in December 1991 in the Philippines. Dr. Lantican thanked the Vice Chancellor of Tribhuvan University for welcoming the participants in the opening program. He also thanked Dr. Rishi Regmi and his colleaques in the Department of Sociology and Anthropology for organizing the meeting.

1.3. Remarks by the Chief Guest

Professor B.C. Malla welcomed members of the Research Committee, and expressed interest in promoting MPTS for the livelihood of small farmers in rural areas. Socioeconomic studies are important in this respect. He also expressed support for the active role that NGOs play in promoting participation of poor farmers in rural development.

1.4. Remarks by the Chairman

Dr. Suree Bhumibhamon, Chairman of Research Committee expressed his thanks to the Department of Sociology and Anthropology, Tribhuvan University for hosting the Meeting. On behalf of the Research Committee, he thanked Dr. Kailash Pyakuryal, Dr. Rishi K. Raj Regmi, and the Chief Guest Professor B.C. Malla.

The Chairman summarized previous Research Committee meetings and the progress achieved in F/FRED's Phase 1.

1.5. Other Remarks from Winrock, A.I.D., and the Chairman of the Steering Committee

The Chairman conveyed messages from Mr. Tom Niblock, F/FRED Project Manager with Winrock International, Dr. Ian Morison, Project Officer with A.I.D./Washington, and Dr. Salleh Nor, Chairman of the Steering Committee, in wishing the Research Committee fruitful deliberations.

2. Appointing the Rapporteur

Following the Opening Ceremony, the Committee appointed Dr. Ahmad Said Sajap to be the meeting's Rapporteur.

3. Adoption of the Agenda

The Committee reviewed and adopted the agenda (Appendix 1).

4. Approval of the Minutes of the Last Meeting

The minutes of the June 1990 meeting in Chiang Mai were reviewed and approved by the Committee.

5. Review of Ongoing Network Program

5.1. Network Trials

5.1.1. 1987 Humid and Sub-humid Zone Trials

Dr. Kamis Awang, Network Specialist for the Humid and Subhumid Zone, reviewed progress of the trials. Field data collection has been completed but some data have not yet been submitted for intersite analysis. Cooperating scientists are urged to submit the data and complete their intrasite analysis and report. Intersite data analysis will be carried out as soon as all data have been received. The report is expected to be completed by October and published by the end of December. Cooperators interested in continuing studies related to the trials may apply for support through the small research grants program (see Appendix 2). Cooperators should also send copies of reports arising from the trials to the Network Secretariat, for a compilation publication.

5.1.2. 1989 Arid and Semi-arid Zone Trials

Dr. Anoja Wickramasinghe, on behalf of Prof. H.P.M. Gunasena, summarized the report on these trials. In visits to the 12 trial sites in India, Pakistan, Nepal, and Sri Lanka, Gunasena found irregularities in the conduct of the experiment (see Appendix 3). He recommends that:

(1) trials which have maintained minimum specifications according to the trials manual be extended until 1993 at minimum cost;

(2) an interim meeting of cooperators be held by mid-1991;

(3) the number of trials be increased and necessary arrangements for early establishment should be made;

(4) the Network Secretariat should arrange for closer monitoring of all trials.

The plan for an interim meeting of cooperators was approved; the meeting will take place September or October 1991 in Kandy, Sri Lanka. For closer monitoring, a project coordinator and/or national coordinators from the participating countries should be appointed.

5.1.3. 1991 Humid and Sub-humid Zone Network Trials

This new set of trials was designed by scientists in December 1990 after review of experiences with the 1987 trials and the results of the regional study on Farm and Village Forestry conducted in 1989. Collaborators are urged to follow the recommended procedures strictly (Appendix 4). The minimum data set should be collected to enable statistical intersite analysis. *Inga edulis*, the MPTS fruit species included in the design had to be removed from the design due to poor germination at all sites. The manual for conducting this project has been completed and will be distributed soon. It was suggested that a travelling seminar *cum* field tour be conducted during the trial period. Training should be conducted for technicians involved in the trials.

5.1.4. *Acacia auriculiformis* Provenance Trials

The Chairman reported on the excellent cooperation of the network participants in the international *Acacia auriculiformis* provenance trials. These trials were established in 12 sites in 8 countries, including sites supported by the Australian Council for International Agricultural Research (ACIAR). Data on 12- and 18-month growth have been recorded. F/FRED has published an annotated bibliography on *Acacia auriculiformis* in cooperation with ACIAR; the book was compiled by Mr. Khongsak Pinyopusarerk, and outlines research findings on *A. auriculiformis*, including its importance in the region. The Committee appointed Dr. Kamis Awang to lead a Consultative Group on Research and Development of *Acacia* (COGREDA), as described in Appendix 5. The Consultative Group will plan to meet for the first time in Phuket, Thailand in March 1992.

5.1.5. *Dalbergia sissoo* Program

The Chairman informed the meeting that *Dalbergia sissoo* trials were established at five sites in India, Nepal, and Pakistan. Mr. Narayan Hegde mentioned that insufficient germination might affect the design in India. An annotated bibliography on *Dalbergia sissoo* was prepared by Mr. Kevin J. White and published by Winrock-F/FRED. The meeting recommended that the new Team Leader explore ways for making the program on *Dalbergia sissoo* more dynamic.

5.1.6. *Azadirachta indica* and *Melia azedarach*

The Chairman reported on the present status of growing these two species in Thailand. Thai farmers have raised millions of seedlings throughout the country. The Committee agreed on the need for further programs on these two species and recommended that a regional workshop be organized, tentatively scheduled to be held in Kanchanaburi in early May 1992.

5.1.7. Tissue Culture Trials

The Chairman informed the meeting that the trials on tissue culture plantlets of MPTS, managed by Plantek International, have suffered delays. *Eucalyptus camaldulensis* has been planted in the field, while plantlets of *A. mangium* are still under preparation. Plantek International has had difficulties working with *A. auriculiformis* due to the expected windthrow of selected trees. Dr. Celso Lantican informed the meeting that Plantek International had proposed a no-cost extension of the project.

5.1.8. *Leucaena* Research

Dr. Fuh-Jiunn Pan briefed the Committee on the progress of work by the Taiwan Forestry Research Institute (TFRI) in breeding *Leucaena*, including breeding for resistance to the leucaena psyllid (*Heteropsylla cubana*). For other biocontrol of the psyllid, predators such as coccinelid beetles and entomopathogens have been proven effective.

Although F/FRED support for the leucaena psyllid control program has concluded, the *Leucaena* breeding program should be continued. Work at TFRI has broadened the pH range of fast-growing *Leucaena* through hybridization. Testing continues; an F7 selection should be available for distribution next year.

5.1.9. Small Research Grants Program

Dr. Lantican indicated that many final reports for projects commissioned in the 1988 series of small research grants have not been received by the Network Secretariat, despite several reminders to grantees. The committee urges small grants researchers to publish their findings in journals, as originally intended. Failing that, the Secretariat should gather the reports and summarize and/or compile them as small grant technical reports.

For the 1991 series, a total of 115 proposals were received. The Secretariat performed an initial screening; 50 proposals were sent for expert evaluation to biological and social scientists. Following the expert review, 27 proposals were selected for funding (Appendix 6).

The committee records its appreciation to Dr. Lantican for the advance notice in the call for announcements and promptness in administering this program.

5.1.10. Applied Social Science Studies

Dr. John Raintree, Network Social Scientist, outlined for the Committee the transition of social science and interdisciplinary activities from the project's Phase 1 to Phase 2, highlighting the increased focus in activity (Appendix 7).

Dr. Raintree reported on the status of follow-up to the Farm and Village Forestry study in Phase 1, conducted in a total of 26 villages in Bangladesh, Indonesia, Nepal, the Philippines, Sri Lanka, and Thailand. Phase 2 follow-up comes under the title Regional Comparative Studies. Data have been stored in the FVF database, which has been enhanced by the addition of a file selection and export utility. Some preliminary analyses have been completed, including a national analysis for the Philippines and a sub-regional analysis for South Asia, and others are underway. The survey methodology has been reviewed and preparations are underway for a consolidation workshop to be

held in the Philippines in November, where the focus will be on methodological issues and follow-up. Several new case studies have been commissioned, and the Network Secretariat has responded to a request for funding support for further national analysis of the Philippines data.

Results of the study of Farmers' Tree Breeding Objectives have also been collected and a summary analysis has been prepared for the region as a whole and for India. Using the data, comparative case studies have also been completed by Sri Lankan and Philippines scientists. Follow-up will come under the Phase 2 Interdisciplinary Studies Program, Extension Research and Development (ER&D).

To assist in understanding patterns in tree-use practices, a microcomputer-based geographic analysis system (MPTGAS) will be developed at regional and country levels. The most important finding from the FVF regional study thus far is the importance attached by farmers to multipurpose food trees (Appendix 8). As a follow-up to this finding, and to highlight the importance of MPT food species, the Network Secretariat is soliciting contributions for an MPTS Recipe Book (see *Farm Forestry News* 4(4):insert 1).

Marketing of MPTS Products is a new program focus. So far, case studies and market analyses have been commissioned in Indonesia, Malaysia, the Philippines, and Thailand. In due course a workshop will be held to report findings, review methods, and identify follow-up activities.

Economic research in Phase 2 will emphasize bioeconomic methods for researchers in network trials, and will be the focus of activities of the staff Forest Economist, Dr. Sompetch Mungkorndin, recently recruited to the Network Secretariat from the Faculty of Forestry, Kasetsart University, Thailand.

5.1.11. Interdisciplinary Studies

In response to the network's interest in on-farm research and extension, ER&D is the main focus of interdisciplinary research activities in Phase 2. The initial technical focus of this community-based research and development activity will be "Tree Improvement by Farmers' (TIBF)--an outgrowth of the earlier work on Farmers' Tree Breeding Objectives (TBO). A pilot project has been developed with the Visayas State College of Agriculture (ViSCA) focusing on jackfruit improvement with farmers in Cebu. The pilot project will set out to meet well-defined components of market demands for different fruit and timber characteristics. This project, the first in a TIBF sub-network, will also be the first in an *Artocarpus* Network. A sister project is planned for Sri Lanka, with other projects joining the network in due course. The Research Committee responded favorably to this development and recommended that an international workshop on Artocarpus be held.

Other projects in ER&D will focus on the sharing of experience and methodological innovations in participatory research.

June 19, 1991

5.2 Other matters

5.2.1 Institutional Twinning

Dr. Celso Lantican provided an update on the twinning program, which includes Kasetsart University Faculty of Forestry (KUFF), the Forestry Faculty of Universiti Pertanian Malaysia (UPM), and the College of Forestry of the University of the Philippines at Los Banos (UPLB). The first official meeting of the forestry deans took place on May 29, 1991 in Malaysia. Issues discussed and agreed upon during the meeting include collaborative research, training and development of educational materials, and extension (See Appendix 9). Activities proposed include:

(1) Organizing an international symposium on multipurpose tree species for rural livelihood, to be hosted by UPLB in June 1993.

(2) Preparing a book on social forestry by members of the respective faculties. Dr. Fernandez, UPLB, will act as the coordinator.

(3) Producing audio-visual presentations on social forestry and information on the three universities. Dean Niwat Ruangpanit, KUFF, is leading this activity.

(4) Conducting collaborative research on several timber species common to the three countries: *Eucalyptus camadulensis* and *Acacia crassicarpa*. Dr. Nik Mohamad Majid, UPM, will coordinate this activity. In addition to these activities, faculty members are encouraged to take part in research, teaching, and exchange visits to the other participating universities.

Other Twinning

Dr. Lantican mentioned that discussions of twinning between the Forest Research Institute Malaysia (FRIM) and the Taiwan Forest Research Institute (TFRI) have taken place and a Memorandum of Understanding is being drafted. Indonesia has also expressed interest in joining this program.

It was suggested that universities or research institutes in South Asia should look at the possibility of twinning arrangements with other institutes in member countries. Interest was reitereated in exchange visits of researchers in the Nepal Forest Research Division and the Thailand Royal Forest Department.

5.2.2. MPTS Utilization Research

Referring to recommendations from the last two research committee meetings regarding the need for a program of utilization research, Celso noted that a meeting was held in ROC (Taiwan) in January 1991 to develop a proposal for a coordinated regional plan of MPTS utilization research. Attended by representatives from Indonesia, Malaysia, Philippines, Republic of China and Thailand, the Taiwan meeting recommended that such a program focus on utilization of non-wood tree parts, such as bark, leaves, flowers, fruits, and seeds, and their potential use in products of food, feed, fertilizer, and chemical products. The meeting agreed on respective country priority areas; national components to the regional program are being prepared now. The components will be assembled and the proposal for MPTS Utilization for Small Farm Development (MUSFAD) will be submitted to donor agencies for funding (see Appendix 10).

5.2.3. Training Program

Dr. Lantican reviewed the F/FRED training program (Appendix 11). The program includes graduate and short-term trainings, provision of training materials/facilities, and technical assistance for curriculum development. To date, five out of six Ph.D. fellows have completed their course work and passed comprehensive examinations. They are now in various stages of theses preparation.

A total of 162 scientists have attended five short course offerings developed by the project in the last year. An inventory of existing training materials in Agroecosystems Analysis, Rapid Rural Appraisal, and Participatory Research is underway. Training materials for the course on Multivariate Methods for MPTS Research, prepared by Drs. Valera and Miren of UPLB, are being improved for use when the course is conducted in Malaysia in October 1991.

The Network Secretariat has committed to provide technical assistance for curriculum development to the Faculty of Agriculture, University of Peradeniya, Sri Lanka to develop a curriculum for agroforestry courses. The Institute of Agriculture and Animal Sciences, Nepal, has also received assistance in developing an agroforestry course.

F/FRED will continue its support for the Ph.D. fellows until completion; the Project should also search for funding for new fellowships. A number of short-term training courses are planned for the coming year. Inventory of training materials/ facilities and assistance for curriculum development will continue. Dr. Hsu-Ho Chung, TFRI, suggested that a survey on the effectiveness of the F/FRED short-term courses be undertaken.

5.2.4. Manual for MPTS Extension

Before discussing the MPTS manual, Mr. David Taylor requested Committee members to contribute articles, research summaries, and announcements for inclusion in *Farm Forestry News*, the newsletter, and *MPTS Research Notes*, the new series of bulletins, and to remind researchers involved with MPTS research in their respective countries to do the same.

Mr. Taylor requested the Committee to review options for preparation of a manual for MPTS extension (see Apendix 12) and decide on a course of action. Option A, a small meeting of authors with an editor and artist, was the consensus. The Chairman requested that the recommendations from the previous meeting in Chiang Mai be kept in mind. At the suggestion of Dr. Awang, the Committee requested that Mr. Taylor draft clear guidelines for manual authors. Using these guidelines, authors would draft detailed chapter outlines for review at a meeting in October 1991. Authors identified were:

Species selection and nursery practices	- Dr. Kamis Awang
MPTS in plantations	- Dr. Hsu-Ho Chung
MPTS in agroforestry	- Dr. Boen Purnama
Tending and propagation	- Dr. Fuh-Jiunn Pan
Harvesting	- Dr. Suree Bhumibhamon
Marketing and economics	- Dr. Charit Tingsabadh

It was also suggested that the manual would be most useful when produced in national and local languages; translation will be encouraged through local presses and scientists.

5.2.5. Relationship with the Proposed International Forestry Research Center

Members read communiques sent by Dr. Salleh Nor and Mr. Tom Niblock explaining the status of decisions on this issue. Given the uncertainties at this stage, the matter was not discussed in depth. Members will be informed on important developments of the proposal from time to time.

5.2.6. Identification of Theme Meeting Topics

Candidate themes of international meetings, such as the ones held in Thailand in 1987 and in Indonesia in 1989, were discussed. The Committee suggested that topics from the following list be developed as possible Network theme topics:

1. Indigenous knowledge of MPTS systems
2. Processing and production of improved seeds, in cooperation with the ASEAN-Canada Forest Tree Seed Centre in Muak Lek, Thailand
3. Multipurpose tree species for livelihood development
4. Cultivation of forest mushrooms using MPTS
5. Growth modelling of MPTS

The Committee was reminded that the next theme workshop, on the Role of NGOs in the Promotion of On-Farm Tree-Growing Technologies, will be held in Pune, India, September 24-27, 1991. Brochures for the workshop were distributed and members were invited to pass them on to NGOs considered to be active in both extension and research in MPTS and agroforestry.

5.2.7. MPTSys Development

MPTSys V3.0 is being developed as an improved version of the IADSS software package. By organizing the components into several subsystems for distribution, MPTSys will provide more customized support for information management and enhanced research analysis by different groups of end users. The menu-driven program's use of subsystems involves data and control linkages between system components. Mr. Ruiz Tabora explained in detail the use of the system's growth simulation model, MPTGro. This program enables a researcher to predict height, diameter, and foliage and wood biomass yields given site, soil and weather conditions and species allometric equations (see Appendix 13). The model includes a feature for determining the effect of varying levels of moisture stress.

6. Discussion of National Programs

6.1 Report on National MPTS Research Meetings

Indonesia *Boen Purnama*

The meeting for Indonesia was held on June 4-6, 1991, with a field trip on the first day. A national research program on MPTS was formulated covering four general areas: germplasm exploration and tree improvement, cultural techniques, utilization, and socioeconomic aspects. Priority species identified were: *Aleurites moluccana, Artocarpus heterophyllus Azadirachta indica, Paraserianthes falcataria, Parkia* sp., *Sesbania* sp., *Melia azedarach*, and *Cinnamomum* sp. About 60 participants attended, from: Forest Research and Development Center, Forest Products Research and Development Center, Food Crops Research and Development Center, Center for Agricultural Economic, Industrial and Medicinal Crops Research and Development Center, Nutrition Research and Development Center, Gajah Mada University, Bogor Agricultural University, and BIOTROP.

India *Narayan Hegde*

The meeting, co-sponsored by the National Wastelands Development Board, Government of India, and several international donor agencies was held on January 28-31, 1991 in Pune and attended by about 75 participants. Topics discussed included: requirements of small farmers for planting trees, technology for cultivation of MPTS as an income-generating activity, and extension and motivation of rural people for better participation in MPTS programs. Recommendations on research and technology, extension, education and motivation, infrastructure and policy with regard to MPTS were summarized in a brochure and distributed to various organizations involved in MPTS research and development throughout India.

Malaysia *Ahmad Said Sajap*

No meeting has been held yet for 1991; it has been rescheduled to October 1991.

Nepal *Kailash Pyakuryal*

A one-day meeting was held in September 1990. About 40 participants attended, from: the Institute of Forestry, the Department of Forest and Plant Science Research, the Institute of Agriculture and Animal Science, the Department of Sociology and Anthropology, the Department of Agriculture, the Department of Forests, Agricultural Project Services Center, USAID/Nepal, and other agencies. The meeting reviewed the status of MPTS-related research in biological and social sciences. Topics for future research and extension were identified in areas of fuelwood production, fodder and small timber from MPTS, information exchange, and promotion of MPTS. A National MPTS Networking Committee was formed in the meeting.

Pakistan *Shams Ur-Rehman*

No meeting has yet been held; it is scheduled to take place in October/November 1991.

Papua New Guinea

In the absence of the representative from Papua New Guinea, Dr. Hsu-Ho Chung, who represented the Research Committee to the PNG meeting in March 1991, described the proceedings briefly. About 20 participants attended the two-day meeting, held at the PNG Forestry Research Institute. Discussions focussed on on-going agroforestry research, particularly species mixes and sustainable land-use systems.

Philippines *Segundino Foronda, in absentia*

The national MPTS meeting was held in Tagaytay City, January 21-25. Forty-seven scientists attended; research results from small grants studies, FVF studies, and ongoing network trials were presented and discussed in open forum. A

national network structure and research agenda were agreed on, and an Executive Committee elected. The proceedings will be published.

Republic of China (Taiwan) *Fuh-Jiunn Pan*

The meeting for Taiwan was held on April 25, 1991. More than 90 participants, including scientists from: NTU, CHU, Pingtung Agricultural College (PAC), Cha Yi Agricultural College (CAC), Chinese Cultural University (CCU), Taiwan Forest Bureau, Sugar Cane Co., and other institutions involved or interested in MPTS research. The focus was on MPTS, particularly native tree species, for ornamental use.

Sri Lanka *Anoja Wickramasinghe*

On 5-7 April, 1991 the National Research Meeting took place, at which 21 papers on MPTS were presented. Over hundred scientists attended. Recommendations on MPTS research, national Network activities and training were made. These included the multi-locational testing of MPTS, on-farm forestry research, establishment of Network Secretariat, publication of MPTS Newsletter, and short and long-term trainings.

Thailand *Suree Bhumibhamon*

The meeting for Thailand has been postponed from March to October 1991. MPTS has been identified as an important element in the country's Seventh National Economic and Social Development Plan, and in government energy policy. As fuelwood and charcoal make up 83% of total wood consumption in Thailand, the October meeting will aim to produce information on fuelwood production that can inform policy makers' actions for supporting this sector.

6.2. National MPTS Research Updates

The committee emphasized the need for ensuring that national research programs sustain themselves; only with continuity will they eventually be beneficial to the rural poor. Effective mechanisms for strengthening the information flow, both downstream and upstream, will help.

Summary updates on the status of national MPTS research in each member country in Asia and the Pacific are presented below.

India *Prem S. Pathak*

Dr. Pathak described on-going research in India, with special emphasis on the multipurpose trees and shrubs research network. By the turn of the century, annual demands for wood and fodder would be 313 and 2,005 million tons, respectively. The deficit would be about 50%. Pathak highlighted activities at various institutions. At Jhansi, rangeland research is taking place under the Indian Council of Agricultural Research and its All India Coordinated Research Project on Agroforestry. The project covers the diagnostic survey and appraisal of existing farming systems and agroforestry practices, collections and evaluation of germplasm of promising species, and management practices of agroforestry system. National workshops on MPTS have been organized every year since 1988. Research thrust areas for India were also highlighted.

Indonesia *Yamin Mile*

Mr. Yamin Mile informed the meeting about Indonesia's National Program on MPTS Research and Development, which was presented at the national meeting earlier in June. The activities will be grouped in four areas: germplasm exploration and tree improvement, development of culture techniques, utilization research, and socioeconomic aspects. The program includes projects of long-, medium-, and short-term duration. Eight priority species have been selected for network activities. Programs on commodity studies and institional characteristics will also be supported. The program will be coordinated by the National MPTS Secretariat, which will soon be housed in the same building at FRDC with the new FAO-sponsored project on Agroforestry Networking in Asia and the Pacific. This should ensure coordination and mutual benefits.

Malaysia *Ahmad Said Sajap*

During the past year, activities carried out by the Malaysian MPTS Research Network, including the following:

- A course on Data Analysis and Interpretation, attended by 21 participants from various institutions, was conducted successfully by Dr. Foster Cady and Mr. Ruiz Tabora.

- The proceedings of a Workshop on Social Forestry in Malaysia were published. Copies were sent to the Network Secretariat and are still available upon request. The next issue of the MPTS-Malaysia Newsletter will be published soon. A national network development plan has been finalized, outlining steps for closer linkages at the institutional, national, and regional levels, and for fostering short-term training and publications. A memorandum of understanding between Winrock International and UPM has been signed.

In MPTS research, high priority is given to *Acacia mangium*; 40,000 ha have been planted to this species. Institutions involved include FRIM, UPM, and the forestry departments of Peninsular Malaysia, Sabah, and Sarawak. Although *Leucaena* is relatively less important in Malaysia, research on control of the leucaena psyllid (*Heteropsylla cubana*) and germplasm collections are in progress.

Nepal *Kailash Pyakuryal*

Dr. Kailash Pyakural stressed the need for national programs to be sustainable, including appropriate preparations for personnel transitions. Nepal has already received financial support from many donor agencies for forestry development projects, but they are not always coordinated. The Master Plan for Forestry Development will help; the National MPTS Committee hopes to play a role, especially through information exchange among various groups. The Committee will soon publish a newsletter for distribution to MPTS scientists in Nepal.

Pakistan *Shams-Ur-Rehman*

Dr. Shams-Ur-Rehman informed the Committee that Pakistan has been quite active in MPTS research, particularly on *Eucalyptus camaldulensis, Acacia nilotica*, and *Dalbergia sissoo*. However, Pakistan still needs to conduct more trials on these speceis, and needs to do more work in extension with farmers.

Philippines *Segundino Foronda, in absentia*

At the national meeting, scientists elected a seven-member Executive Committee with representatives from each region of the country. The network will update its directory, publish proceedings of national meetings, and encourage links through symposia and linkages with other networks. (report communicated by mail)

Republic of China *Hsu-Ho Chung*

Dr. Hsu-Ho Chung informed the meeting that the scientific gatherings organized by the Network have been beneficial to the participants. There is now a wider range of MPTS research interest in ROC, including tissue culture, utilization, and mushroom cultivation on fast-growing indigenous tree species.

Sri Lanka *Anoja Wickramasinghe*

Dr. Anoja Wickramasinghe pointed out the need for MPTS extension research and development in Sri Lanka. Many NGOs have engaged themselves in the planting MPTS but require better technical knowledge. More baseline data on farmers' needs and current practices are still required for promotion efforts to respond effectively.

Thailand *Suree Bhumibhamon*

MPTS activities in Thailand have been institutionalized under the National Research Council of Thailand. A Sub-Committee on Research and Development of MPTS in Thailand was established through this channel. During the

last half of 1990 and the first half of 1991, extension and awareness-raising efforts have included articles in newspapers and journals, and radio and television broadcasts. A new committee will be appointed soon to oversee the future network activities. A newsletter, *Man and Tree*, is planned for publication with partial support from the private sector. Dr. Celso Lantican conducted a short-term training course on Research Problem Identification and Proposal Preparation in March. During July 1-5, 1991, a course on Data Analysis and Interpretation will be conducted for Thai scientists at the Ministry of Science, Technology, and Energy (NECTEC) by Dr. Foster Cady, Mr. Ruiz Tabora, Dr. Celso Lantican and Dr. Suree Bhumibhamon.

7.0. Group Discussions

The Committee reviewed the presentations prepared by the working groups and approved them as revised in the following sections of the report.

8.0 Other Business

8.1 Venue of the Next Committee Meeting

The Committee agreed to organize the next Research Committee meeting in the Republic of China (Taiwan), tentatively scheduled for May 20-30, 1992.

8.2. Schedule for the Next Series of National MPTS Research Meetings

The Committee proposed a tentative program for the next series of national meetings. Since some countries have not yet had their 1991 meetings, the following list presents the schedule as two separate years.

Time period	Country	Representative
1991		
October		
	Malaysia	S. Rehman
	Nepal	H. Francisco
	Thailand	N. Hegde
November		
	Pakistan	Yamin Mile
1992		
January		
	India	F.J. Pan
March		
	Indonesia	Ismariah Ahmad
	Nepal	S. Foronda
April		
	Pakistan	A. Sajap
	Sri Lanka	H.H. Chung
May		
	Malaysia	A. Wickramasinghe
	Thailand	P. Pathak
June		
	ROC (Taiwan)	All Committee members
To be determined		
	Papua New Guinea	Suree Bhumibhamon
	Philippines	B. Purnama

Following the closing of the meeting by the Chairman, Dr. Lantican presided over the election of Committee Chairman and other representatives to the Steering Committee meeting in December. Dr. Suree Bhumibhamon was elected to continue as Chairman. Other representatives to the Steering Committee elected:

Mr. Narayan Hegde
Prof. H.P.M. Gunasena
Dr. Kailash Pyakuryal

9. Field Visits

9.1 Short Tour

On June 20, the Committee visited tree nurseries of the Forest Research Division near Kathmandu, and the Babar Mahal campus of Tribhuvan University (Appendix 14).

9.2 Post-meeting Tour

A post-meeting tour to the Terai included visits to: a sal (*Shorea robusta*) forest; network experiments conducted by FRD (semi-arid trial and *Dalbergia sissoo* provenance trial) at Shankar Nagar; Lumbini; and the Institute for Agriculture and Animal Science, the Chitwan campus of Tribhuvan University (Appendix 15).

Working Group Reports

MPTS in Wood Industry

The group discussion participants were:

Hsu-Ho Chung *Taiwan* (chairman)
Shams ur-Rehman *Pakistan*
Ismariah Ahmad *Malaysia*

Introduction

In discussing the topic, the outline below was followed:

a. National plan for industrial development
b. Species preferences
c. Relation to MPTS Research Network

The development of MPTS for wood industry has to consider regional differences in climate and vegetation type which later result in different end uses of MPTS.

The MPTS wood industry is focussed on large-scale plantations for industrial development. These can integrate links with small-farm plantations to meet wood industry needs for raw materials.

National Policy

National policy on wood industry for each participating country in the region is briefly described below. Forest land area available for timber production in each country is summarized in Table 1.

National policies tend to focus on the assessment of the industry from the perspective of raw materials supply and demand, rather than on future trends of wood industry development.

Indonesia

The natural policy has focussed on encouraging secondary sources and testing wood industry establishment.

To meet the wood industry's increasing demand for raw materials, especially the pulp and paper sector, the government has established forest plantations and intends to expand plantation area by as much as 1.5 million ha within 5 years.

India

The policy is to establish timber plantations through government cooperation with wood-based industries on degraded land and wastelands. Supply of timber for wood industry's raw materials is presently inadequate, falling short of demand by about 50%.

Malaysia

The Malaysian government encourages value-added wood-processing. It is predicted that supply will no longer be sufficient starting around the year 2000. To face the problem of raw materials, more aggressive reforestation programs and compensatory plantation programs have been started.

Nepal

Timber production is not adequate to meet the wood industry's demand for raw materials. For 1990/1991, a deficit of 248,000m^3 is predicted. To make up this deficit, plantations have been established; the total area planted as of 1986 amounted to 72,000 ha.

Pakistan

The national agricultural policy recently announced by the government emphasizes increasing forest cover by planting trees on private and state land, and in water catchment areas.

Philippines

Wood industry development forms part of the National Forestry Master Plan. Supply for the wood industry has dwindled, and is now becoming insufficient. Plantation programs are being launched.

Sri Lanka

The government has planned to reforest the country with a few broadleaf and coniferous trees species (e.g., *Pinus caribaea*). 225,000 acres area have been planted to this species already.

Thailand

The government has closed concession areas and the wood industry relies on imported wood. The government has developed a 35-years plan to increase production forest to 25%.

Republic of China (Taiwan)

Taiwan's wood industry plan covers establishment of lowland plantations to meet wood fiber industry needs, and application of stand improvement techniques to establish many long-rotation forests to meet the needs of the country's plywood and furniture industries.

Wood supply for the industry is far from adequate, with almost 90% of the needed material imported from abroad.

National Species Preferences

The species preferences in each country for a wide range of wood industry products (e.g., fiber industry and plywood, furniture) are presented in Table 2.

Relation to the MPTS Research Network

Brief descriptions of the past and present roles for MPTS in the wood industry are presented below.

Indonesia

Acacia mangium, Eucalyptus sp., *Sesbania grandiflora, Paraserianthes falcataria* and bamboo are considered MPTS. So far not much research has been done on these species to help wood industry. In fact, national research activities in tree improvement (tree selection, etc.), tissue culture, seed technology, and utilization need to be intensified in the future through the MPTS national and regional network programs.

India

In the past, the MPTS Research Network's activities in India have focussed on *Dalbergia sissoo, Eucalyptus* sp. and *Leucaena* sp.

The Network can help by encouraging a greater number of MPTS in farming systems, thereby increasing the source of raw materials for the wood industry and farmers' income.

Activities that should be undertaken include: study of processing techniques, reduction of industrial pollution, selection of superior germplasm, assistance in establishment of seed facilities, standardization of large-scale propagation, and development of commercially viable systems for raising, transporting, and establishing seedlings at low cost.

Malaysia

Acacia mangium has been planted as a large scale plantation for general utility timber and material for producing "downstream" products.

Nepal

Among MPTS, *Dalbergia sissoo* research would be most useful for Nepal. *D. sissoo* provides not only good furniture wood, but also fuelwood, small timber, and fodder with multiple management options.

Pakistan

A number of reforestation projects are in progress using a number of species, including *E. camaldulensis, A. nilotica*, and *D. sissoo*. Network trials help to exchange germplasm of

these species among the cooperators. Planting *E. camaldulensis* on a large scale may help to set up a forest-based industry.

Philippines

MPTS research has not extended much help to the wood industry so far. We should promote growing MPTS to supply raw materials for the wood industry.

Sri Lanka

The Network has brought foresters in the country together, including researchers from forestry development and universities. Findings are being published in the proceedings of the annual MPTS meeting.

Thailand

A breeding program for *Acacia, Melia, Azadirachta*, and *Eucalyptus* species is underway through the MPTS Research Network. The Network can help to improve breeding materials and to promote incentives for farmers to grow trees. Agroforestry practices are recommended.

Republic of China (Taiwan)

Results generated by the Humid Zone Network trials and *Leucaena* breeding research have proven valuable to the industry.

The present efforts on network trials, breeding, and management aspect of MPTS production should expand. Studies on the government's existing policy regarding large-scale MPTS plantation establishment in each country are also needed.

Recommendations

- Considering the unique nature of some MPTS as industrial wood-producing species enabling farmers to exchange wood for cash income, research should study government policies and incentives for encouraging farmers' participation.
- Socioeconomic and institutional studies should be conducted on the linkage between small plantations with activities of large-scale plantations to meet industrial needs.
- Studies should be conducted on the production of high-quality seedlings and on the development of efficient silvicultural systems to maximize the production quality and quantity of the desirable species.
- Studies should be conducted on the physical, chemical and mechanical characteristics of the species to improve existing uses and find new ones.
- In reviewing existing government policies relevant to the establishment of large-scale plantations for wood-based industries, emphasis should be placed on Environmental Impact Assessments (EIA).

Table 1. Land resources (in millions of ha).

Country	Total land area	Forested land	Productive forest
1. Indonesia	-	143	60
2. India	328	65	30
3. Malaysia	-	-	-
4. Nepal	14.7	6.2	-
5. Pakistan	-	-	-
6. Philippines	30	12	7.5
7. PNG	-	-	-
8. Sri Lanka	6.5	2.5	-
9. Thailand	51.3	14.4	9.0
10. Taiwan (ROC)	3.6	1.8	0.6

Table 2. Genera and species preferred for wood industry in each country.

Country	For fiber industry	Plywood, furniture and other uses
1. Indonesia	*A. mangium* *Eucalyptus* sp. *Paraserianthes falcataria* *Sesbania grandiflora* Bamboo *Pinus merkusii*	*Shorea* sp. *Dipterocarpus* sp. *Tectona grandis* *Dalbergia latifolia*
2. India	*Eucalyptus* sp. *Leucaena* sp. *Pinus* sp.	*Dalbergia sissoo* *Populus* sp.
3. Malaysia	*A. mangium*	*A. mangium* *Scaphium* sp. *Hopea* spp.
4. Nepal	*Eucalyptus* sp.	*Shorea robusta* *D. sissoo*
5. Pakistan	*Pinus roxburghii* *E. camaldulensis* *D. sissoo*	*D. sissoo* *A. nilotica* *Populus* spp. *Bombax ceiba*
6. Papua New Guinea	Information not available at the meeting	
7. Philippines	*Paraserianthes falcataria* *Eucalyptus deglupta* *Leucaena leucocephala*	*Eucalyptus* spp. *Swietenia* spp. (mahogany)
8. Sri Lanka	*Eucalyptus* spp.	Rattan *Artocarpus heterophyllus*
9. Thailand	Bamboo *Eucalyptus* *Acacia* *Pinus kesiya*	*Tectona grandis* (teak) *Acacia mangium* *Azadirachta* *Melia* *Pterocarpus macrocarpus*
10. Taiwan (ROC)	*Eucalyptus* *Leucaena* *Acacia*	*Cinnamomum* *Leucaena* *Acacia* *Eucalyptus*

MPTS for Fuelwood

Group discussion participants were:

Prem S. Pathak	*India* (chairman)
Celso B. Lantican	*F/FREC* (rapporteur)
Fuh-Jiunn Pan	*Taiwan*
Suree Bhumibhamon	*Thailand*

Background

Use of fuelwood for domestic and industrial energy is a practice evolved through social evolution. Forest destruction and land degradation has brought the region face to face with a growing crisis for quality fuelwood. The decreasing resources and increasing demand require fast-growing species that coppice profusely and are pest- and disease-free. Management principles for optimizing sustainable land productivity is a major research focus. The region's growing population faces serious fuelwood scarcity; to ameliorate this requires *in situ* plantings and improved management systems. The following summary brings into focus the problems, demands, resources, promising MPTS, and their R&D needs in each participating country.

Status of the Problem

National Policies

Many Asian countries lack a clear policy on fuelwood, although most have forest or energy policies. Long-term implementation plans are taking shape in some countries, as described below.

India

India has taken a policy decision on forest conservation with emphasis on biomass briquetting, use of gasifiers, and improved cook-stoves for optimizing energy-use efficiency and savings. Emphasis is on demonstration of energy plantations, social forestry, wasteland afforestation to improve these resources, and subsidiies for installation of biogas, purchase of solar cookers, and improved cook stoves.

Subsidies are also provided to small farmers for taking up plantation activities.

Indonesia

The rural energy program is part of a wider national energy program. The policy covers production of fuelwood diversification, increasing the efficiency of fuelwood use by introducing more efficient stoves and production of briquets and charcoal. Production is increased by introducing and planting fuelwood MPTS, especially on problem and critical land areas. Oil subsidy is also part of the government's plan to provide more energy alternatives to people.

Malaysia

Malaysian energy policy is strictly based on non-renewable resources such as gas and petrol. However, there are still rural areas where fuelwood is used in the home. Work on biogas use is being carried out by various institutions, and includes palm oil for production of ethanol.

Nepal

Low per capita income and underdevelopment has compelled most Nepalese to depend on fuelwood for cooking. Ninety percent of the country's fuelwood comes from forests. Population growth and the the depletion of forests have caused policy makers and the Government of Nepal to focus on the potential of hydroelectric energy for solving the energy problem.

Pakistan

Planting fuelwood species such as *E. camaldulensis, Dalbergia sissoo, Acacia nilotica*, and *Prosopis* spp. on farmlands has been the

goal of a Forestry Planning and Development Project since 1985. Further studies should identify suitable species for charcoal production.

Philippines

Fuelwood production is encouraged under the Social Forestry Program of the Department of Environment and Natural Resources. This is also addressed in the national Forestry Master Plan developed early in 1991.

Republic of China (Taiwan)

No policy on fuelwood exists. Most people use gas for fuel and other energy needs. For recreational purposes, charcoal is easily obtained from local plantations of *Acacia confusa*. Policy mainly focuses on timber production.

Sri Lanka

The national energy policy, as outlined by the Energy Commission, attempts to use local energy sources for both domestic cooking and industrial purposes. Seventy-four percent of domestic energy used is fuelwood, 80% of it generated from home gardens and common land. Industrial energy comes from two sources: fuelwood from rubber and coconut trees. Power for large commercial industries is planned to come from for coal or other thermal sources.

Thailand

Thailand has developed a program within its forest policy but it lacks a proper implementation plan. Energy policy emphasizes the importance of alternative energy sources, but again, an implementation plan is lacking. Consumption of fuelwood and charcoal in Thailand represents about 83% of total wood use.

Present and Estimated Future Requirements

A nation's fuelwood requirement depends on its population and economic situation. In most Asian countries the requirement is very high and likely to increase, even with the development of alternative energy sources. The expected trends in each country are presented below.

Indonesia

Fuelwood demand remains high. Although kerosene substitution is expected to reduce *per capita* fuelwood consumption, the high predicted population growth rate will result in high future demand for fuelwood.

India

In India, the current requirement for 240 million m^3 of fuelwood is likely to increase by the year 2000.

Malaysia

The fuelwood requirement in Malaysia is related to a number of small, rural-based industries, which require wood for tobacco-curing, food, fish-drying, brick and pottery production, and rubber sheets drying.

Nepal

Fuelwood remains the main energy source in Nepal, with the equivalent of more than 4 million tons of coal used annually from 1985-1989. This amount is four times the total agricultural residues and six times the total animal waste. The fuelwood requirement is increasing mainly for household uses. The recent energy crisis in the country also caused more industrial use of fuelwood.

Pakistan

Pakistan's fuelwood requirement is increasing due to its increase in population, although the use of natural gas has reduced the pressure on forests to some extent.

Philippines

The need for fuelwood is likely to increase with the country's increasing population (the fastest rate in Asia). More fuelwood is used for domestic uses and power generation.

ROC (Taiwan)

National fuelwood sources are adequate for the current domestic use of charcoal and small-

industry needs, and are expected to remain so for the next 20 years.

Sri Lanka

Fuelwood is the main source of domestic energy, requiring 8.5 million trees annually. About 2.5 million trees are needed for the industrial sector and 90% of non-household use. The supply is limited. Pressing demands on resources for crop production, along with population growth has caused a retreat of trees from farmlands and common areas. In planning fuelwood production, attempts must be made at the household level for use by the household.

Thailand

The nation's fuelwood requirement is increasing with population growth and industrial expansion. People in some parts of Northeast Thailand will face fuelwood shortages. Most local industries have no long-term plan for fuelwood supply. It is important to develop alternative energy sources to substitute for fuelwood, as indicated in the forest policy.

Sources of Availability and Deficit

The position for each country is described below.

India

Twenty percent of the fuelwood requirement is met by forests; the rest comes from public lands, community forests, and farm lands. About the equivalent of 60 million tons is met from animal dung, depriving crop lands of organic matter for fertility. About a 50% deficit is expected in the coming years, although efforts to popularize improved cook stoves and charcoal are continuing. The problems for resource-poor people is alarming.

Indonesia

Fuelwood is still a major energy in rural areas. Per capita consumption is about 0.5 m^3 per year. The major fuelwood sources are home gardens, public lands, and forest lands. A kerosene subsidy has to some extent reduced fuelwood consumption, but fuelwood will remain important in the future.

Malaysia

As noted above, most energy needs are met by gas and kerosene.

Nepal

Biomass, including fuelwood, agricultural residues and animal dung, are the natural energy sources in Nepal, providing 94% of total energy consumption. There are no substitutes.

Pakistan

Fuelwood required by farmers comprises 90% of the fuelwood demand. Trees like *Prosopis* are excellent colonizers with good fuelwood characteristics. Large scale plantation on marginal land is required to overcome the problems.

Philippines

Fuelwood in the Philippines comes from a number of sources: natural forests, woodlots, and coconut plantations. Most of the fuelwood requirement is satisfied by natural forests and coconut plantations. Availability of electricity, LPG, and kerosene in many parts of the country has reduced fuelwood demand.

Republic of China

There is almost no domestic consumption of fuelwood, except in some village areas where bamboo is planted for production of bamboo shoots. In these areas, farmers gather wood from nearby forests to cook bamboo shoots before delivering them to factories where they are processed for other purposes. Local forest products, however, are limited. More than 95% of timber wood is imported from Southeast Asian countries and the United States.

Sri Lanka

Over 90% of the fuelwood demand is for the use of rural populations. The annual consumption is about equivalent to 1.1 tons wood per capita.

Biomass used represents about 75% of the total energy. More than 80% of fuelwood used is produced by non-forest resources and home gardens.

Thailand

Fuelwood and charcoal are still the major sources of energy and will remain so in the future, particularly in rural communities. LPG, mini-hydroelectric plants, biogas, wind energy, and hydrothermal sources are used to a limited degree. Solar energy has good potential but requires more research and development. Thailand has to import coal to meet its needs. Planting of MPTS can be encouraged on land unsuitable for farming, which amounts to about 6 million ha.

Efforts to Meet the Deficit

Efforts to meet the deficits noted above include increasing the biomass production through energy plantations, introduction of agroforestry into farming systems, social forestry programs, optimization of fuelwood efficiency (by improved cook stoves, wood briquets, glassifiers, charcoal production), and alternatve sources of energy (LPG, kerosene, biogas). Efforts in each country are described below.

India

India has a massive social forestry program in each state. At the national level, the National Mission on Wastelands Development coordinates efforts to regenerate at least 5 million ha each year to provide woody plant resources. Several departments, including the Department of Non-Conventional Energy Sources, are helping to develop solar energy, biogas, improved cook stoves, and other non-conventional sources. The Indian government is subsidizing plantation activities, biogas programs, and purchases of solar energy appliances.

Indonesia

To meet the fuelwood deficit, the government has implemented a program on fuelwood production through agroforestry and other social forestry programs. Fuelwood production is increased by expanding fuelwood plantations on critical and marginal lands, and encouraging tree planting in home gardens.

Malaysia

There is not a fuelwood deficit in Malayia due to the availability of efficient and inexpensive substitutes.

Nepal

The following programs aim at achieving forestry development: the community and private forest tree programs; the National and Leaseholder forestry programs; the wood-based industry programs; the medicinal and aromatic plants, and other minor forest products program; the soil conservation and water management program; and the conservation of ecosystems and genetic resources. In addition, there are numerous support programs.

Pakistan

Presently efforts are underway to cover more arid area under suitable fuelwood tree species. Plantations established to date on farmland will help to stabilize the country's charcoal industry. Farmers have started forestry nurseries to raise energy plantations.

Philippines

Fuelwood production efforts focus on: backyard plantings, community forestry, agroforestry, development of efficient cooking stoves, and use of industrial wastes (e.g., charcoal briquets from rice hulls).

ROC (Taiwan)

The country has coped with the same problems that many ASEAN countries are now facing by starting gas imports 25 years ago to reduce wood consumption for cooking.

Sri Lanka

Efforts to meet rural wood energy requirements are varied. Farmers woodlots and community

woodlots are restricted to a few districts (Budulla, Rajricipura and Munarajala); likewise, programs for promoting efficient woodstoves are limited to a few areas. Fuelwood remains the cheapest source of energy. Homegarden development programs appears to be the most widely visible and popular among farmers.

Thailand

Village woodlots have been established. Trees with good coppicing ability, such as *Eucalyptus camaldulensis* were previously recommended with varying success. Native, fast-growing trees are recommended at present. Dendrothermal plantations is a government program. Some small cottage industries have started to grow trees for energy consumption. Cooking stoves are being improved. Other potential sources of energy are mini-hydro, solar energy, wind energy, agricultural waste, biogas, and gasohol. Programs on alternative energy are now being highlighted.

Preferred MPTS for Fuelwood Production

Selection of a species for fuelwood requires consideration of a number of factors, the major ones being:

1. Heating value of the wood. This is affected by wood density and the nature of extractives present. In general, high-density wood gives higher calorific values.
2. Fast growth rate for early harvesting
3. Coppicing ability
4. Adaptability to new environments
5. Resistance to pests and diseases
6. Ease of harvesting
7. Ease of splitting

A priority list of fuelwood species identified by each country follows.

India

With its varied agroecological, climatic, and edaphic regimes, India has a selection of species that could be prioritized based on their adaptability and production. For each major zones, high-priority species could be:

Arid Zone: *Prosopis cineraria, P. juliflora, Tecomella indulala, Zizyphus* spp., *Azadirachta indica, Eucalyptus camaldulensis, Acacia tortilis*

Semi-arid Zone: *Acacia nilotica, A. tortilis, Albizia lebbek, A. amara, Prosopis juliflora, Azadirachta indica, Eucalyptus hybrids, camaldulensis, Leucaena leucocephala*

Humid Zone: *Albizia lebbek, A. procera, Paraserianthes falcataria, Leucaena leucocephala, Acacia mangium*

Central Indian Plateau: *Albizia amara, A. lebbek, Acacia nilotica, Prosopis juliflora*

Eastern and Western Coastal Region: *Casuarina equisetifolia, Leucaena leucocephala, Prosopis juliflora*

Temperate Himalayan Region: *Ficus* sp., *Alnus* sp., *Salis* sp.

Sub-temperate Lower Hills and Gangetic Plain: *Acacia nilotica, Albizia lebbek, Azadirachta indica, Melia azedarach, Leucaena leucocephala, L. diversifolia*

Eastern Himalayan Zone: *Acacia mangium, A. auriculiformis, Paraserianthes falcataria, Albizia lebbek, A. procera*

Edaphic Types:

Sandy soils: *Acacia nilotica*

Rocky, gravelly plateau soils: *Acacia tortilis, Albizia amara, Hardwickia binata*

Saline sodic soils: *Prosopis juliflora, Acacia nilotica, A. tortilis*

Ravines: *Prosopis juliflora, Dichrostachys cinerea, Acacia nilotica*

Indonesia

Western region: Kesambi, *Leucaena leucocephala, Calllandra calothyrsus, Acacia auriculiformis, A. mangium*

Eastern region: *Acacia* spp.

Malaysia

Rhizophora apiculata, Hevea brasiliensis, mixed species from natural forests.

Pakistan

Eucalyptus camaldulensis, Dalbergia sissoo, Acacia nilotica, Prosopis cineraria, Prosopis juliflora

Philippines

Leucaena spp. Casuarina spp. Gliricidia sepium, Acacia auriculiformis, Eucalyptus spp.

Republic of China

Acacia hybrid (*A. mangium* X *A. auriculiformis*), *A. confusa, Eucalyptus camaldulensis, Leucaena* spp. (*L. diversifolia* X *L. leucocephala*), *Lagerstroemia subcostata*

Sri Lanka

Leucaena spp., *Acacia auriculiformis, Gliricidia sepium*

Thailand

Eucalyptus camaldulensis, Rhizophora apiculata, Azadirachta indica, Combretum sp., *Leucaena leucocephala, Acacia auriculiformis*, bamboo

Research and Development Efforts

Although fuelwood is frequently discussed in many forums, systematic research and development is rather slow. Many organizations (international, national, regional, government, and non-government) have addressed the issue. Activities underway include:

1. Species trials/provenance trials
2. Biomass production management
3. Study of energy characteristics
4. Densification/briquetting/gasification
5. Extension of tree-planting programs in rural areas
6. Socioeconomic aspects

These efforts, however, are not comprehensive. For some species none of these research activities are being conducted; for those where we have one effort, others are lacking. Fuelwood research should be undertaken in totality to have greatest effect.

Recommendations

1. Develop national plans for fuelwood production. These plans should include:

- o definition of fuelwood requirements
- o production targets,
- o strategies to meet targets, including species to be used, areas available for planting, planting schemes, approaches (e.g., home garden, village, industrial plantations)

FAO's Rural Wood Energy Development Programme (RWEDP) and F/FRED should assist countries to prepare these plans.

2. Prepare an inventory of research on fuelwood conducted to date in Asia, with particular emphasis on national priority species. The *Compendium of National Research on Multi-purpose Tree Species, 1976-1990*, published by the Network Secretariat this year, should be expanded to include more countries.

3. Develop a research program on fuelwood patterned in structure after MUSFAD, but focussing on biological and production aspects. Site adaptability of different species should be the program emphasis. The program might be coordinated by the Network Secretariat in consultation with RWEDP.

4. Encourage local institutions to set up training programs on fuelwood growing and charcoal production. Disseminate information on efficient cooking stoves. F/FRED and RWEDP should intensify their efforts on these activities.

MPTS for Fodder Production

The group discussion participants were:

Rajendra Joshi	*Nepal* (chairman)
H.P.M. Gunasena	*Sri Lanka*
Narayan Hegde	*India*
Sompetch Mungkorndin	*F/FRED*

Status of Fodder Production

Livestock is an important component of the farming system in Asia, and cattle is the major component in most of the countries. Goat is the next important category of livestock, while buffaloes ar also important in countries like Nepal, India, Pakistan, Thailand and Indonesia.

In most of the countries except Republic of China farmers own large number of livestock than what they can feed on their farm, with an intentions to generate more income from these animals. This has resulted in shortage of fodder and feed, particularly during the dry season and in the absence of adequate supply of fodder a tendency of indiscriminate tree grazing on public lands has been developed by the farmers.

The potential of MPTS in augmenting the fodder shortage has not been fully realized so far in many countries. However, in countries like Nepal (Table 1), where the fodder scarcity is server in winter, trees are the only source of green fodder. Farmers lop the branches from the following tree species grown either on their field bunds or on community land, to mix with paddy straw and other agricultural wastes.

In most of the network countries, tree fodder is used in dry periods when other sources are not available (Tables 2 and 3). Hence, there is a potential to promote the use of MPTS as a more

Table 1. Important MPTS lopped for fodder in the hills of Nepal.

	Species	Local name
1.	*Artocarpus lakoocha*	Badahar
2.	*Ficus meosicordata*	Khanyu
3.	*Ficus auriculate*	Nimaro
4.	*Ficus gaberrima*	Nimaro
5.	*Ficus lacor*	Kavro
6.	*Brassiopsis indica*	Katus
7.	*Schima wallichii*	Chiloni
8.	*Prunus carosioides*	Prune
9.	*Bauhinia variegata*	Koiralo
10.	*Dendrocalamus strictus*	Bans

regular source of fodder in the region. Based on the nature of fodder and feed production, MPTS could be grouped into following three categories:

1. MPTS for continuous supply of fodder
2. MPTS for occasional supply of fodder, without effecting the growth
3. MPTS produce fodder and feed other than forage

Recommendations

1. Undertake a survey on the available research and indigenous knowledge on the use different fodder trees for livestock feeding among network member countries.
2. Prioritized the fodder tree species based on ecological adaptability, biomass yield, coppicing ability, nutritive value, socio-economics, farmer acceptance including wider uses of such species.
3. Identify superior germplasm of prioritized species for seed/planting materials production, for distribution among researchers and to the endusers.
4. Develop appropriate and socio-economically acceptable integrated farming systems including the potential for the tree species, to optimize production and farm income.
5. Develop effective training and extension program to popularize fodder species among farmers through national and regional organizations, including the Department of Livestock Development.

Table 2. Species commonly used for fodder in each network country.

Countries	*L.l.*	*G.s.*	*A.n.*	*E.i.*	*A.h.*	*P.s.*	*C.c.*	*D.s.*	*S.*
India	√	√	√	-	√	√	-	-	√
Indonesia	√	-	-	-	√	-	√	-	√
Malaysia	√	-	-	-	√	-	-	-	-
Nepal	-	-	-	-	-	-	-	√	-
Pakistan	√	-	√	-	-	√	-	√	√
Philippines	√	-	-	-	-	-	-	-	-
ROC (Taiwan)	√	-	-	-	-	-	-	-	-
Sri Lanka	√	√	-	√	√	-	-	-	-
Thailand	√	-	-	-	-	-	-	-	-

Species codes: *A.n.* = *Acacia nilotica*, *L.l.* = *Leucaena leucocephala*, *G.s.* = *Gliricidia sepium*, *E.i.* = *Erythrina indica*, *A.h.* = *Artocarpus heterophyllus*, *C.c.* = *Calliandra calothyrsus*, *D.s.* = *Dalbergia sissoo*, *P.s.* = *Prosopis cineraria*, *S.* = *Sesbania* spp.

Table 3. Altitude ranges and use patterns of common fodder tree species.

Species	Alt-itude	Commonly Used	Occasion-ally Used	Feed Other Than Foliage	Other Uses
Albizia amara	L	*	-	-	F,S
Artocarpus heterophyllus	L	-	*	-	FO,T,Fr
Artocarpus lakoocha	H/L	*	-	-	B,F,H,O
Albizia saman	L	-	-	*	Fl,O,M
Albizia spp.	H/L	-	*	-	T,P,FO
Azadirachta indica	L	-	-	*	F
Bambusa spp.	L	-	*	-	FO
Bauhinia variegata	H/L	*	-	-	Fr
Calliandra callothyrsus	L	*	-	-	F,S
Dalbergia sissoo	L	-	*	-	T,F,Fr
Erythrina indica	L	*	-	-	F,H,S
Ficus auriculata	H/L	*	-	-	Fr
Ficus bengalensis	L	-	*	-	T,Fl
Ficus glamorala	L	-	-	*	
Ficus religiosa	L	-	*	-	R
Ficus semicordata	H/L	*	-	-	F1
Grewia optiva	H/L	*	-	-	Fl,T
Gliricidia sepium	L	*	-	-	F
Leucaena leucocephala	L	*	-	-	F,H,S
Madhuca indica	L	-	-	*	T,Fl,FO
Melia azedarach	H/L	-	*	-	R
Michelia champaca	H/L	-	*	-	T,Fl,O,M
Moringa oleifera	L	-	*	-	T,F
Morus alba	H/L	*	-	-	Fr,T
Pithecelobium dulce	L	-	-	*	FO,F
Prosopis cineraria	L	*	-	*	F,Fr,Sl
Prosopis juliflora	L	-	-	*	F
Sesbania sp.	L	-	-	*	T,F,M,O,C,FO
Schima wallichi	H/L	-	*	-	T,F
Shorea robusta	L	-	*	-	T,F,P
Terminalia spp.	L	-	*	-	T,F,C

Use codes: T = Timber; F = Fuelwood; Fl = Flowers; Fr = Fruit; C = Chemical; O = Oil; R = Religious; M = Medicinal; S = Shade; H = Hedge; B = Bees' honey; FO = food; S1 = silk; P = pods.

MPTS and the Environment

The group discussion participants were:

Charit Tingsabadh	*Thailand* (chairman)
David Taylor	*F/FRED*
Kamis Awang	*F/FRED*
Ahmad Said Sajap	*Malaysia*

The group considered the major environmental issues in the network countries and assessed how national efforts were dealing with them, how MPTS might contribute to solving these problems, and how the Network might support these efforts.

Problems

Major environmental problems in the regions are:

Pollution arising from urban/industrial and rural/agricultural development.

In urban areas, pollution of air and water is rapidly increasing, and has reached critical levels in some places (for example, Bangkok). CO_2-emission-related issues have now become topics of keen public interest.

In rural areas, unsafe use of chemical fertilizers and pesticides to increase agricultural yields has led to soil and water pollution as well as health problems experienced by farmers.

Degradation of the countryside is continuing due to inappropriate farming practices in environmentally sensitive areas. Soil erosion and watershed degradation occur on a wide scale.

Problem areas under conditions of saline, acid, or waterlogged soils, sand dune areas, etc., require special farm systems.

National Priorities

The group considered that while these problems are common to countries in the Network, the extent of and the priorities attached to each problem may vary. It is up to the national MPTS Research Committees to determine which are relevant to their country.

The current national policies and plans vary in scope, and updates on information regarding national environmental efforts (e.g., in which sectors relevant policies appear) would be useful.

Role and Contributions of MPTS

MPTS can contribute in important ways to the solution of the environmental problems above. Research is needed, however, on many issues.

Pollution

Impact of environmental pollution on MPTS growth

How does a polluted environment affect growth of MPTS (e.g., growth on former tin-mining sites, in urban areas with air pollution)?

Effects of MPTS on the environment

At the micro-environment level, what are the effects of planting MPTs on soil chemistry and moisture? What are each species' allelopathic interactions with other crops? To some degree, work in this area has been done for *Eucalyptus* due to the controversy of planting programs in some countries; what about for other MPTS?

At the macro-environmental level, what contributions can MPTS make to problems of

pollution and global climate change (e.g., CO_2, SO_2 changes)? Controlled laboratory experiments should be undertaken to assess and model these.

What are the social/economic/cultural effects of MPTS where they have been adopted as a result of planting programs? From the Phase I Farm and Village Forestry study, we have some knowledge of how farmers use trees. A logical next step might be to consider how farmers view and use introduced MPTS. A regional study, along the lines of the FVF study, could compare experiences of species introduction and promotion programs in network countries.

Degradation of the Countryside

MPTS in farming systems

Incorporation of trees, especially MPTS, into farming systems can help improve the rural and farm environments by substituting for chemical inputs, by reducing erosion, etc. Many improved farming techniques are now widely promoted, with MPTS often being important elements of the proposed systems. Two questions may be asked: (1) What is the result of adopting these new farming systems; (2) What are the appropriate ways to introduce them to small-scale farmers? The first question relates to analysis of the trade-offs between improved yields and other benefits as a result of erosion control vs. increased requirements for labor and other inputs. The second question requires study of extension experiences with MPTS in particular.

Problem Areas

Tree-breeding research on *Leucaena* spp. by the Taiwan Forest Research and others has extended the plant's range on problem soils and pH conditions. Similar work can be used for other species and other problem soils.

Role of the MPTS Research Network

The group considers that the current program of review papers (e.g., annotated bibliographies), theme meetings, and small research grants are appropriate means for addressing the research issues described above. Particular suggestions for these areas are summarized in Table 1.

Table 1. Summary recommendations for the MPTS Research Network.

Problem Area	Issues	Research Topics	Suggested Network Action
Pollution	Urban/industrial pollution produces a toxic growing environment	Pollution effect on MPTS growth Impact of MPTS on environment (e.g., CO_2-fixation, tin tailings) - lab work - field work	Small grants
	Agriculture-based pollution (unwise chemical use)	MPTS as green manure and organic substitutes for chemical pesticides	
	General	Production of list of recommended MPTS for planting under conditions of stress	Review papers
Degradation of countryside	Deteriorating environment for farming and human settlement	MPTS in improved farming systems (e.g., alley cropping)	Small grants
	MPTS ability to improve the soil and farm environment	MPTS/fruit trees vs. other farm trees	Small grants
		How are MPTS being introduced and used in network countries?	Small grants
		Health/social/cultural problems experienced by farmers growing MPTS (e.g., A. auriculiformis ban in several Indian states)	Small grants
		- cost/benefit analysis - review of extension methods and experience	Small grants Review papers
Problem soils	Saline soils Acid soils Sand dunes Water logged soils	Matching species to site conditions	Small grants
National policy and plans	What are the problems and priorities in network member countries? How are they organized?	Status and implementation	Review papers

MPTS for Food

The group discussion participants were:

John Raintree *F/FRED* (chairman)
Anoja Wickramasinghe *Sri Lanka* (rapporteur)
Kailash Pyakuryal *Nepal*
Yamin Mile *Indonesia*

The group concentrated on three aspects: (1) the role of MPTS in solving food problems; (2) the findings of the Farm and Village Forestry (FVF) study with respect to the MPTS/food relationship; (3) future research needs.

The Role of MPTS in Food Systems

The group identified five major roles for MPTS in food systems:

1. MPTS as a direct source of food
2. MPTS as a source of fodder for animals which produce food
3. MPTS as a means of improving and sustaining food production through various roles in agroforestry systems (e.g., soil conservation, fertility improvement, windbreaks)
4. MPTS as a source of cash income to purchase food
5. MPTS as a source of domestic energy for cooking food

Within these five areas, the direct and indirect contributions of MPTS to household food security were discussed. The possibility of increasing their contribution through development of appropriate processing technologies was noted.

Findings of the FVF Study

The findings of the survey of FVF practices, conducted in 26 villages in 6 countries, highlight important aspects of the MPTS/FOOD connection:

1. Multipurpose food trees are the top priority type of MPTS for farmers. The top three MPTS as reported by farmers in the survey are fruit trees. One hundred and fifty out of approximately 450 total MPTS (33%) mentioned by farmers in the survey were reported to have important food uses.
2. Farmers view such trees as multipurpose species. In addition to their food use, farmers also use them for fuel, fodder, building materials, craft materials, industrial raw materials, etc.
3. There is a high degree of variation between countries regarding species used for different purposes. Therefore, analysis of the use of multipurpose food trees has to take account of the local context.

Future Research Needs

1. Investigate how farmers manage multipurpose food trees to obtain multiple products. Preliminary observations indicate that management practices vary among species within the region, as well as among different farmer communities, depending on needs, knowledge and land-use intensity.
2. Investigate the socioeconomic correlates of the preference for multipurpose food

trees vs. multipurpose non-food trees, with particular attention to 6 key variables:

gender
land size
wealth
ethnic or cultural identity
access to off-farm forest resources
site characteristics

3. Catalog the various existing food uses of MPTS.

4. Investigate and, if possible, improve the traditional food processing and preserving technologies by which tree products are converted to human food and preserved for extended periods.

5. Investigate the potential for matching the nutritional profiles of various MPTS with diagnosed nutritional needs of communities.

Motivation and Extension for MPTS

The group discussion participants were:

Narayan Hegde	*India* (chairman)
Suree Bhumibhamon	*Thailand*
Yamin Mile	*Indonesia*
Rajendra Joshi	*Nepal*

Background

The ultimate goal of the MPTS Research Network is to popularize cultivation of MPTS among resource-poor farmers. Thus motivation and extension of the persons involved in promotion of MPTS should be an important component of the Network.

MPTS promotion is very different from traditional production forestry in its approach to involve people in cultivating fast-growing trees for their own benefit and that of the community. This concept is relatively new and promotion has been hindered by the following constraints:

1. Lack of communication between scientists and extension workers
2. Limited opportunities for scientists to exchange information and ideas
3. Funding for long-term research projects is not assured
4. Difficulties in collecting superior germplasm from other sources
5. Difficulties in obtaining adequate planting material/seeds
6. Limited opportunities for training field workers and farmers
7. Lack of full awareness among farmers of benefits and comparative advantages of various MPTS

Thus it is necessary to identify the scope for motivating persons involved in MPTS promotion and extension.

Whom to Motivate

For promoting MPTS, it is necessary to motivate policy makers, administrators, scientists, field technicians, extension workers, publicity media, and farmers.

How to Motivate

Although the techniques of motivating people in different categories vary, the basic tools of motivation are information and incentives. The methods of motivation are listed below.

Policy Makers and Administrators:

1. Send recommendations of national MPTS meetings and MPTS highlights, particularly noting their impact on the economy, agriculture, and environment.

Scientists:

1. Provide research grants, particularly for on-farm studies.
2. Provide opportunities for participation in advanced training and workshops.
3. Encouragement publication of papers.
4. Strengthen the cooperative links with other scientists and organizations.

Field Technicians and Extension Workers:

1. Invite them to national and regional meetings.
2. Distribute field manuals, handouts, posters, and audio-visual aids.
3. Provide training and field visits.
4. Award recognition and medals.

Publicity Media:

1. Provide relevant literature and success stories.
2. Write popular articles.
3. Assist in producing audio-visuals.

Farmers:

1. Supply booklets in local languages on benefits, profitability, and methods of production.
2. Set up field demonstrations and exhibitions.
3. Organize village meetings and film shows.
4. Use mass media and radio to highlight the benefits of MPTS.
5. Orient community leaders to promote MPTS.
6. Organize village-level training and workshops on MPTS production and product development, through local NGOs and field technicians.
7. Promote establishment of local organizations to market the produce.
8. Assist in procuring good quality seeds and planting material.
9. Recognize good farmers with awards.

Role of the MPTS Research Network

Given the scope for motivation and extension, th MPTS Network can help with the following activities:

1 Develop technical aids such as manuals for MPTS production, highlights on the economics of different MPTS, and production of videos, films, and slides or MPTS production and processing.

2. Update the directory of MPTS scientists and experts.
3. Organize trainers' training.
4. Assist member countries to establish MPTS national networks, newsletters, anc organize regional training courses.
5. Coordinate germplasm exchange among cooperators.
6. Recognize individuals who contribute to MPTS promotion with certificates and medals.

Information and Development

The group discussion participants were:

Ismariah Ahmad	*Malaysia* (chairman)
P.S. Pathak	*India*
J.B. Raintree	*F/FRED*
D.A. Taylor	*F/FRED*

Implied in the discussion paper by Lim Hin Fui is the recognition that information needs to be channeled in two directions to ensure that each audience (for example, scientists and farmers) receive relevant and useful information. For MPTS-related information, there are four distinct audiences with different information needs:

researchers
planners and administrators
extension workers
farmers

These four groups may have some information needs in common, but they may need it for different reasons. One example of this is marketing information, an often-neglected area which all groups need for better technological development.

Researchers of various disciplines need information on MPTS product markets so that they can better focus their efforts to improve technologies, germplasm, and utilization technologies for different end-products.

Planners need better information on market structures so they can develop more responsive price structure policies and/or subsidies.

Extension workers need information on local markets so they can advise farmers about potential outlets for products and avert farmer frustration with saturated markets.

Farmers need information on local markets for obvious reasons -- to have the option of timing harvests for better prices or to exploit competition among buyers rather than be exploited by them.

In addition to marketing information, these four audiences need other types of information to improve the research-development process.

Researchers need: (1) information on participatory research methods and their relative advantages and limitations; this will help them to obtain (2) information on farmers' situations and priorities (including relevant policies or rules that restrict or encourage tree-growing); and (3) evaluation of their innovations by monitoring farmers' adoption rate.

Planners need from researchers: (1) information on technical possibilities and their likely social and economic effects, and (2) information on social and market forces and situations affecting adoption of technical innovations.

Extension workers need: (1) training in how to obtain information from farmers to feed into research and the problem-solving process (in many situations, however, training alone will not address the institutional problem of lack of incentive); and (2) clear information on government rules affecting tree-growing as described above.

Farmers need: (1) information on technical options, generally from extension workers; (2) state rules affecting tree-growing options (NGOs may often be better channels for this information than government extension agencies);

(3) information on buyers for their produce and price fluctuation -- this may come either through formal guarantees (e.g., industry contracts with guaranteed prices) or from extension workers; (4) information on where to go for more information on particular support programs (e.g., agriculture extension may have different program of supports than the forestry extension agency).

Farmer focus groups may speed technical change as group learning is generally faster than individual learning, and it provides a forum for the discussion among peers that is necessary for technology adoption.

Recommendations for the Network

1. Researchers should receive training and materials on various participatory research methods, as planned by the Network Secretariat.

2. Researchers in the Network need to review results of network experiments and determine the farmer groups for which they are most relevant.

   In converting these results to farmers' decision-making terms, researchers will need assistance from extension communications experts. The manual for MPTS extension will be one channel for this.

3. Results from the marketing studies planned by the Network -- as well as other socioeconomic study results -- will need to be put in terms that planners and extension workers can use in programs with farmers.

4. The Network should consider if an intermediate medium of information exchange between, researchers and extensionists will be necessary to make the benefits of tools such as MPTGro available for use with farmers.

5. Because policies vary from country to country, national MPTS networks should take the role of feeding technical information to the appropriate government and planning agencies to ensure informed policies. Researchers will need assistance from communications specialists in how to present this information. BAIF's printing and distribution of national meeting recommendations is a good example of this.

MPTS and Local Industry Centers

The group discussion participants were:

Charit Tingsabadh	*Thailand* (chairman)
Shams-ur-Rehman	*Pakistan*
Fuh-Jiunn Pan	*Taiwan*
Ahmad Said Sajap	*Malaysia*

Definition of Local Industry Center (LIC)

The elements of an LIC are:

local people -- growers and processors
local supply of raw materials, wood and non-wood
local product

The market, by contrast, can be either local or not, including national and export markets. To limit the market to local demand would limit the opportunity for development of tree-planting and increasing income.

Types of Products that are applicable for LIC development include:

Wood	furniture decorative items wood carvings small timber uses charcoal and briquettes *but not pulp, which falls under large-scale industrial processing.
Non-wood	medicinal and aromatic products, essential oils, leaf meal, food, others

National Issues Relevant to LICs are, for example:

Taiwan

- Furniture making is a major export industry, but it faces a shortage of raw material locally, and high labor costs.

Pakistan

- Furniture making in remote hilly areas is hindered by the problem of transport of the finished product to urban markets.
- The main wood supply for the furniture industry comes from farmland and irrigated plantations of *Dalbergia sissoo*.
- The market value of wood for furniture is 20 times that of fuelwood.

Malaysia

- Although there is currently an adequate supply of materials for the Malaysian wood industry, the prediction of a timber shortage by the mid 1990s has led to large-scale plantations of *Acacia mangium* and other species. With wood-based industries expanding, skilled local personnel are in high demand.

Thailand

- The furniture industry is well developed for export markets, but depends on non-forest sources and imports.

Role of MPTS in Processing

For processing high-valued products like furniture, wood properties need to be better understood. MPTS have properties distinct from commercial species that are not yet well known among processors.

Once an LIC is established, smallholders can become its suppliers of raw material. Examples are oil palm refineries and rubber wood saw mill/furniture factories.

Research Questions with Reference to MPTS

Areas for research on MPTS and industrial processing are:

- wood properties
- yields of MPTS for furniture-grade timber
- processing techniques for industrial users of MPTS, such as seasoning, drying, finishing, etc. MPTS widely used for furniture include *Juglans regia* and *Eucalyptus* spp. in Pakistan, *Albizia* spp. in many countries.
- evaluation of MPTS harvesting costs
- processing techniques for non-wood parts, such as bark, leaves, flowers, fruits, and seeds for making products such as preserved foods, feed, fertilizer, and chemical products (see Appendix 10)
- regulations and promotion schemes related to wood-based industries, with emphasis on local entrepreneurs and local employment generation.

  (For example, Malaysia requires mill operators to be certified by the government. The government provides training for operators to meet the standard for certification.)

Recommendations for Network Activity

The MPTS Research Network can support:

- sharing of information and experience through study tours and exchange of germplasm.
- small grants support for selected research projects.
- development of training materials/ technology transfer in processing techniques that can be done at the farm level. This would be a logical follow-up on the kind of extension/technical support provided under Phase I related to growing and taking care of the planted trees.

Postgraduate Programs

Group discussion participants were:

Hsu-Ho Chung *Taiwan* (chairman)
H.P.M. Gunasena *Sri Lanka*
Sompeth Mungkorndin *F/FRED*
Boen M. Purnama *Indonesia*

Background

Many postgraduate degree holders in fields related to MPTS are active in each network country. Currently, they work in academic, research, or other institutes, and in administration. Some of them remain involved in MPTS-related work, such as social forestry and agroforestry. The number of these postgraduate degree holders, however, is still insufficient to manage the growing requirement for MPTS activities in research and development.

Research areas for which it is important to strengthen MPTS program include the following, in order of priority:

Forest management: silviculture, agroforestry, economics, extension, etc.

Technology and utilization of wood and non-wood materials: anatomy, mechanics and physical properties, pulp and paper, wood chemistry, composite materials, and processing technologies

Forest biology: genetics, breeding, tissue culture, biotechnology, pathology, entomology, ecology, biodiversity, etc.

Other areas, including watershed management, recreation, wildlife, etc.

The relative importance of each research area depends on each country's programs on MPTS and the number of postgraduate degree holders already available in each country.

Existing Conditions

Number of Postgraduate degree holders

The approximate number of postgraduate degree holders for each country is shown in Table 1, along with the number of postgraduate degrees still needed to achieve a 'critical mass' of educated professionals in which progress in the field is carried forward by internal developments.

From the numbers in Tables 1, it is evident that the current number of degree holders is far short of that needed to attain "critical mass" for efficient research and education in the different countries.

Current postgraduate programs

Table 2 lists the postgraduate programs bestowing MS, Ph.D., or both, in the network countries.

Training, location and funding agencies

Priority areas for each country are presented in Table 3. Table 4 shows the proportion of postgraduate degrees earned overseas and within each country. Table 5 shows the funding sources for postgraduate programs in each country.

Recommendations

1. National and international funding agencies should allocate appropriate funding to support much-needed postgraduate training in each country.

2. National and international funding agencies should coordinate more closely

to enhance postgraduate programs.

3. Governments should provide incentives to encourage teaching, administrative, and research staffs to pursue postgraduate training in forestry- and agroforestry-related fields.

4. To use limited funds more efficiently, postgraduate students should be trained in academic institutes in the region. Exchange of postgraduate trainees through institutional arrangements should also be encouraged.

5. Prepare a roster of postgraduate degree holders in the region, listing their specializations. This may be used for arranging exchange visits through institutional arrangements among countries in the region to improve postgraduate training programs.

6. F/FRED should seek funding from international donors to continue the existing postgraduate training program.

Table 1. Availability of postgraduate-trained experts in MPTS-related fields, by country.

Country	Aca MS	Inst. Ph.D.	Res. MS.	Inst. Ph.D.	Others MS.	Others Ph.D	Total
India	----------Information Not Available----------						
Indonesia	15 (20)	10 (50)	10 (20)	10 (16)	4 (15)	2 (20)	66 (126)
Malaysia	5 (20)	10 (20)	25 (35)	15 (20)	-	-	65 (95)
Nepal	----------Information Not Available----------						
Pakistan	-	-	(100)	60 (50)	-	-	60 (150)
Philippines	50 (50)	35 (50)	30 (40)	20 (36)	30 (30)	5 (15)	170 (221)
ROC (Taiwan)	20 (25)	50 (60)	20 (40)	36 (20)	-	-	126 (145)
Sri Lanka	16 (NA)	3 (NA)	15 (NA)	1 (NA)	-	-	35 (NA)
Thailand	25 (25)	30 (50)	50 (25)	5 (50)	50 (50)	10 (20)	140 (220)

Figures in parentheses represent the estimated 'critical mass' for that field in each country.

Table 2. Postgraduate programs in forestry and agroforestry offered in the region.

Country	Fields	Universities	Degrees Offered	Language of Instruction
India	Forestry	YSP University of Horticulture and Forestry at Solan, Himal Pradesh	M.S., Ph. D.	English
		Punjab Agricultural University	M.S., Ph. D.	English
		Ludhiana University of Agricultural Science in Dharwahd	M.S., Ph. D.	English
		NEH University - Mizoran	M.S., Ph. D.	English
	Agroforestry	YSP University of Horticulture and Forestry at Solan	M.S., Ph. D.	English
		Punjab Agricultural University	M.S., Ph. D.	English
		Ludhiana University of Agricultural Science, Dharwad	M.S., Ph. D.	English
		NEH University - Mizoran	M.S., Ph. D.	English
Indonesia	Forestry	Bogor Agricultural University	M.S., Ph. D.	Indonesian
		Gadjah Mada University	M.S., Ph. D.	Indonesian
		University of Hasannudin	M.S., Ph. D.	Indonesian
	Agroforestry	Bogor Agricultural University	M.S., Ph. D.	Indonesian
		Gadjah Mada University	M.S., Ph. D.	Indonesian
Malaysia	Forestry	University Pertanian Malaysia	M.S., Ph. D.	English
	Agroforestry	University Pertanian Malaysia	M.S., Ph. D.	English
Papua New Guinea	Forestry	Technology Univ. of Papua New Guinea	M.S., Ph. D.	English
	Agroforestry	Technology Univ. of Papua New Guinea	M.S., Ph. D.	English

Table 2. Continued

Philippines	Forestry	University of the Philippines at Los Banos (UPLB)	M.S.,	Ph. D.	English
		Araneta University	M.S.,	Ph. D.	English
	Agroforestry	UPLB College of Forestry	M.S.,	Ph. D.	English
Sri Lanka	Forestry	Univ. Peradeniya	M.S.,	Ph. D.	English
		Univ. Sri Jayawardenepure	M.S.,	Ph. D.	English
	Agroforestry	Univ. Peradeniya	M.S.,	Ph. D.	English
		Univ. Sri Jayawardenepure	M.S.,	Ph. D.	English
Taiwan (ROC)	Forestry	National Taiwan University	M.S.,	Ph. D.	English
		National Chun-Hsin University	M.S.,	Ph. D.	English
	Agroforestry	N/A	M.S.,	Ph. D.	English
Thailand	Forestry	Kasetsart University	M.S.,	Ph. D.	English/Thai
	Agroforestry	Kasetsart University	M.S.,	Ph. D.	English/Thai
		Chiang Mai University	M.S.,	Ph. D.	English/Thai
		Mae-Jo Institute of Technology, Chiang Mai	M.S.,	Ph. D.	English/Thai

Table 3. Priority training needs.

Country	Forest Biology	Forest Management	Low Technology	Watershed Management and others
India	2	1	1	2
Indonesia	2	1	1	2
Malaysia	1	1	1	2
Pakistan	3	1	3	4
Philippines	1	2	3	4
Sri Lanka	1	2	4	3
ROC (Taiwan)	1	1	1	1
Thailand	1	1	1	2

Note: 1 = highest priority, 2 = second priority, and so on.

Table 4. Estimated percentage of in- and out-of-country training.

Country	Within Country	Overseas
India	NA	NA
Indonesia	30	70
Malaysia	30	70
Nepal	NA	NA
Pakistan	80	20
Sri Lanka	10	80
Philippines	70	30
Taiwan	60	40
Thailand	90	10

Table 5. Funding sources for postgraduate training programs in each country.

Country	German	SEARCA	Nation-al	CIDA	USAID	FAO	ODA	SWISS	World Bank	IDRC	FINNI DA
India			x		x		x	x			
Indonesia			x		x	x					
Malaysia			x		--						
Nepal					x	x	x		x	x	x
Pakistan			x		x	x					
Philippines			x		x		x				
Sri Lanka			x		x		x		x	x	x
Taiwan			x								
Thailand	x	x	x	x	x					x	x

Training by Correspondence

Participants in the group discussion were:

Kallash Pyakuryal *Nepal* (chairman)
Anoja Wickramasinghe *Sri Lanka*
Kamis Awang *F/FRED*
Celso Lantican *F/FRED*

The aspects of the issue considered by the group were: background, training needs, teaching materials and mechanisms for evaluation.

Background

The F/FRED Project's short-term training program has helped to enhance the capability of many young scientists in Asia to design, establish, manage, and analyze MPTS research. To date, close to 600 scientists in the network have particiated in F/FRED-developed training courses covering various topics.

However, the Secretariat continues to receive many queries from many of the participating countries about possible participation in F/FRED-supported training courses. There are also queries from outside the region. These queries indicate the growing interest among young Asian scientists in MPTS research.

Over the remainder of the F/FRED project, many more courses will be offered to benefit many MPTS researchers. However, classroom courses can only accommodate a small proportion of those who require training. To help solve this problem, a new component of training by correspondence is proposed to be added.

Correspondence courses could be of two types:

(1) Unstructured - Researchers raise specific questions about design analysis through letters and these will be answered or referred by the Training Specialist to scientists with appropriate expertise.

(2) Structured - Scientists register as trainees for selected topics. A certificate of completion will be given to the participants after they have satisfied the requirements of the course. Announcements will be made by the training coordinator as to what courses are available for correspondence training

Training needs

Unstructured course topics will be determined by the interest and needs of the researchers.

Structured program should be limited to a few selected areas, such as:

1. Design and analysis of field experiments
2. Statistical methods for social scientists
3. Participatory research

Teaching materials

Correspondence courses may make use of:

1. Letters
2. Audio-visual techniques
3. Computer desktop presentations transferred on diskettes
4. Handouts
5. Handouts with accompanying tape

To promote development of these facilities, it is necesary to strengthen the Network Secretariat. The group recommended a training coordinator to prepare/update a database on MPTS experts in the region, prepare training materials, and also communicate with the participants.

Evaluation Mechanisms

Student evaluation will be based on the performance of the trainees/researchers. A minimum 70% grade must be obtained for passing.

Number of Researchers

Number may vary between 50 to 60 and the duration will be for 6 months.

The program could be expanded in collaboration with other agencies/institutions in the region, such as IDRC, FAO, GTZ. and others.

Recommendations

It is recommended that the MPTS Research Network Secretariat explores other donors who are also interested in supporting MPTS correspondence courses.

Appendices

Meeting Agenda

MPTS Research Committee Meeting
Blue Star Hotel, Kathmandu, Nepal

June 18

Opening Ceremony
- Opening remarks by the Acting Team Leader
- Opening remarks by the Chairman
- Welcome remarks by the Vice-Chancellor, Tribhuvan University

Adoption of the Agenda
Approval of minutes of the last meeting (Chiang Mai, Thailand)
Matters arising from the minutes of the last meeting
Review of ongoing programs
- Network trials
  - 1987 Humid and Sub-humid Zone (Kamis Awang)
  - 1989 Arid and Semi-arid Zone (H.P.M. Gunasena)
  - 1991 Humid and Sub-humid Zone (Kamis Awang)
  - *Acacia auriculiformis* provenance trials (Suree Bhumibhamon)
  - *Dalbergia sissoo* provenance trials (Shams-ur-Rehman)
  - *Azadirachta indica* and *Melia azedarach* research (Suree Bhumibhamon)
  - Tissue culture trials (Suree Bhumibhamon)
  - Psyllid resistance and improvement of *Leucaena* species (F.J. Pan)
  - Small research grants program -- 1989 series (Celso Lantican)
  - Farm and Village Forestry Study (John Raintree)
  - Farmers' Tree-Breeding Objectives (John Raintree)
- Other matters
  - Twinning (Celso Lantican)
  - Regional Program for MPTS Utilization Research (Celso Lantican)
  - Manual for Extension of MPTS (David Taylor)
  - Relationship with the Proposed International Forestry Research Center
  - Identification of theme meeting topics
  - MPTSys Development (Ruiz Tabora)

June 19

Report on National MPTS Research Meetings
- India (Narayan Hegde, P.S. Pathak)
- Indonesia (Boen Purnama, M. Yamin Mile)
- Malaysia (Ahmad Sajap, Ismariah Ahmad)
- Nepal (Kailashy Pyakuryal, Rajendra Joshi for Kedar Prajapati)
- Pakistan (Shams-ur-Rehman)
- Papua New Guinea (presented by Hsu-Ho Chung)
- Philippines (Segundino Foronda, Herminia Francisco -- unable to attend)
- Republic of China (Hsu-Ho Chung, Fuh-Jiunn Pan)
- Sri Lanka (H.P.M. Gunasena, Anoja Wickramasinghe)
- Thailand (Suree Bhumibhamon, Charit Tingsabadh)

Update on National Programs of MPTS Research (same presenters)

June 20

Visit to nurseries of the Forestry Research Division; Tribhuvan University Department of Anthropology and Sociology; and the National Herbarium and Botanical Garden

June 21 Group discussions
- MPTS in Wood Industry
- MPTS for Fuelwood
- MPTS for Fodder
- MPTS and the Environment
- MPTS for Food

June 22 Group discussions
- Motivation and extension of MPTS
- Information and Development
- Local Industry Centers
- Postgraduate Training Programs
- Training by Correspondence

Other business

Election of the Chairman of the Research Committee

Election of other Steering Committee members

June 23-25 Post-meeting field visit to the Terai

1987 Humid/Sub-humid Zone Network Trials

Kamis Awang

Background

A standardized series of field trials in the humid and sub-humid zone of Asia was established in 1987, following a planning meeting held in Kuala Lumpur, Malaysia in December, 1986. The following features were incorporated in the planning:

- o common design and standardized methodology;
- o common minimum data set to be collected;
- o common germplasm;
- o the same experiment on multiple sites;
- o thoroughly described soils and climate at each site;
- o data exchange and professional interaction between participants;
- o intersite combined analysis of data.

The network trials set out to serve three specific purposes:

1. to enhance the knowledge of growth rates, site requirements, and management practices of several priority MPTS through the generalization of experimental results that multi-location testing allows;
2. to provide a focus for network development similar to that used by successful agricultural research networks;
3. to help improve and standardize research methodologies used in forestry research.

The experiment design selected was a randomized complete block with four replications comparing two provenances of three species, under tree management practices. The three management practices were:

- o pollarding at 2 meters at the age 24 months;
- o pruning up to 50% of the total stem height at age of 18 months;
- o no cutting at all

The species and genotypes included in the trials were:

Species	Provenance-seedlot
Acacia auriculiformis A. Cunn ex Benth.	Morehead, Queensland, No. 15477; Bensback Balamuk, Papua New Guinea, No. 15648
Acacia mangium Willd.	Iron Range, Queensland, No. 15677; Boite, Papua New Guinea, No. 15642
Leucaena diversifolia Schlecht) Benth.	Hawaii hybrid KX3 Hawaii K156

F/FRED Research Support

F/FRED has provided the following support to facilitate the research:

1. Sponsorship of meetings at which Asian scientists developed a standardized field trials methodology.
2. Provision of funding through professional service agreements with every collaborator participating in the trials.
3. Supply of germplasm for the trials.
4. Provision of guides to experiment establishment and measurement (including a training video).

5. Soil characterization survey of 12 of the sites.

6. Provision of microcomputers to a number of the institutions involved.

7. Provision of the Information and Decisions Support System (IADSS) software which contains:

   primary databases for organizing, storing and retrieving research information and data

   research support databases for storing information on references on priority species, MPTS specialists worldwide, soil and climate.

   a graphics and data analysis package called F/FRED Models (F/MOD)

8. Provision of training on mensuration, data collection and analysis (including the use of IADSS for analysis of the minimum data set).

9. Organization of a field tour and travelling seminar for two weeks (October 1988) for collaborating scientists, during which the standardized methodology was refined.

10. Organization of a Workshop on Data' Analysis and Interpretation (at GRS) to promote better use of IADSS and FMOD

11. Technical advice through site visits by staff members.

Current Status

Field data collections as stipulated in the standardized methodology have now been completed for all the sites. However, there are still some foliar and soil analyses that need to be done for a few sites.

The co-operators are now in the process of preparing an integrated report with the help of Network Secretariat and Global Research Systems. We hope to finalize the report before the end of the year, as indicated in the work schedule attached.

The Network Secretariat has not yet received all the data required for intersite analysis. Cooperators are strongly encouraged to send their data as soon as possible.

In 1990, the Research Committee made some recommendations on what could be done for those who are interested in continuing their individual trials. They are again encouraged to use the sites for further study as outlined in the report of the Chiang Mai meeting.

Status of Arid and Semi-Arid Zone Trials, December 1990

H.P.M. Gunasena

The objectives of these two network trials are:

(1) To increase knowledge of growth, site requirements and management practices of priority multipurpose tree species (MPTS) suitable to meet the needs of the small farmers for fuelwood, fodder any other tree products in arid and semi-arid regions of Asia

(2) To provide a focus for network development

(3) To help improve the methodologies used in forestry research

The details of experimental design, measurements to be taken, etc., are given in the *Field Trials Manual for Multipurpose Tree Species*, Second Edition, by C. Buford Briscoe (1990).

The species tested are:

Arid Zone	**Semi-Arid Zone**
Acacia nilotica	*Acacia nilotica*
Prosopis cineraria	*Dalbergia sissoo*
P. pallida	*Eucalyptus camaldulensis*
+ Locally selected species	+ Locally selected species

A cutting treatment was specified for both zones, with each trial to have three replicates. The IADSS package for data entry and analysis has been provided to the cooperators. Some of them have also received training in the use of the system.

In November-December 1990, I visited the trial sites in India, Nepal, Pakistan, and Sri Lanka. The status of those trials is described below.

There is a total of 12 semi-arid trials (India - 4, Nepal - 5, Pakistan - 2, Sri Lanka - 1). Some of these cannot be used in pooled, intersite analysis, as they show much deviation from trial specifications and/or exhibit poor growth. In spite of initial difficulties in establishment associated with poor seed germination and pest damage, others are growing satisfactorily. All these trials have been planted in July-September 1989, except the trial conducted by the Pakistan Forest Institute at Sialkot, which was planted in March 1990. Therefore, most of these trials are beginning to show their adaptation to different soil and climatic conditions. This is clearly shown in the growth of the species in the field. Some dominate others.

In the six arid zone trials, the one at BAIF Development Foundation, India has not followed specifications. That conducted by the Indian Forest Service at Annanthapur could not be visited, and unfortunately reports are not available on this trial. Of the other four trials in Pakistan, the one in Tandojam is yet to be planted, while the other three are in very good condition. As in the Semi-arid zone trials, species differences are obvious. These trials are of the same age as those of the Semi-arid zone.

Regarding management of both sets of trials, several cooperators are following procedures other than those outlined in the manual. Some of the trials have been pruned while the others have been allowed to grow without pruning. Some have collected data at six-month intervals, others are still planning to collect data even after the conclusion of the first year. These differences are apt to arise in many network trials; close monitoring could have prevented some of these variations. Another serious problem is in the actual collection of data, in that some cooperators are not foresters (e.g., agronomists and plant physiologists), and therefore unfamiliar with such basic measurements as DBH and management practices such as pruning.

In general, the trials are yet too young and immature and in particular as the forest tree species exhibit deceptive growth initially. The

actual response to any particular environment therefore could be seen only after establishment phase, in the next 2-5 years. These trials therefore will yield meaningful data only if they are extended at least for three years. Most of the cooperators agreed that an extension is desirable. This could be done at a cost of between US$500 - 1,000 per year per trial site.

It was also apparent that there is an urgent need for an interim meeting of all cooperators to reviev and discuss the preliminary results of these trials, the deviations from design specifications, to make changes where necessary, and to ensure a firm grasp of data collection and tabulation procedures. Such a meeting would not only catalyze network activity, and make it stronger but also make cooperators to have a firm commitment on their part to generate authentic data. This meeting should be scheduled as early as possible, preferably before mid 1991. It is also very essential that the meeting should be attended by those actually engaged in the implementation of the trials as a means to discuss field problems.

Table 1. Summary of 1989 Network Trials.

Country/Organization	Date of Planting	Remarks
A. Semi-Arid Zone		
India		
1. Madurai Kamaraj University, Madurai	December 1989	Local seeds of E. camaldulensis used. Good trial.
2. ICRISAT, Hyderabad	August 1989	Local seeds of E. camaldulensis and D. sissoo used. Poor trial. Cannot be used in analysis.
3. Indian Forest Service Hyderabad	August 1989	Damage by cattle and insects. Trial satisfactory.
4. Tata Energy Research Institute, Delhi	August 1989	E. camaldulensis spaced 2m x 2m. Intercropped with mustard, poplars, bamboo. Trial in good condition.
Pakistan		
5. Pakistan Forest Institute, Peshwar	March 1990	Not visited. According to Dr. Shams, the trial is in good condition.
6. Punjab Forest Institute Faisalabad	March 1990	Only 4 D. sissoo from seed supplied by F/FRED. Good trial. One-year old seedlings were used.
Nepal		
7. Forest Research Division, Kathmandu	July 1989	Good trial.
8. Institute of Forestry, Pokhara	August 1989	Not visited. According to reports, trial is good.
9. Institute of Forestry	August 1989	Not visited. According to reports trial is good.
10. Inst. Agriculture and Animal Science, Rampur	September 1989	Melia lopped by villagers for feeding goats. Good trial.
11. Inst. Agriculture and Animal Science, Rampur	September 1989	Melia lopped by villagers for feeding goats. Very poor growth of A. nilotica. Otherwise, trial is good.

Table 1. Continued.

Country/Organization	Date of Planting	Remarks
Sri Lanka		
12. Forest Department Comm. Forestry Project, Badulla		Trial not up to specification. Presently abandoned.
B. Arid Zone		
India		
1. BAIF Development Foundation, Pune	July 1990	Not according to trial specification. Cannot be used in analysis.
2. India Forest Hyderabad	July 1990	Not visited.
Pakistan		
3. Atomic Energy Research Center, Tandojam	Not planted	Seedlings ready for field establishment in December '90.
4. Pakistan Forest Institute, Peshawar	January 1990	Only 62' plants per plot instead of 96. Trial is good.
5. Pakistan Agric. Research Council & NARC	July 1989	P. cineraria show very poor growth. Trial is good.
6. Punjab Forestry Research Institute, Faisalabad	March 1990	Best trial although only 48 plants per plot. One year old seedlings were used.

1991 Humid and Sub-humid Zone Network Trials

Kamis Awang

Background

Following the recommendation of the 1990 Research Committee meeting, a group of Asian scientists representing various disciplines of biological and social sciences met in Cha-am, Thailand December 9-16, 1990 to plan a second set of network trials in the humid/sub-humid zone. After reviewing experiences in the 1987 humid/subhumid trials and the results of the Farm and Village Forestry study, the following consensus was reached.

The trials will include:

- o common design and standard methodology;
- o common minimum data set to be collected;
- o common germplasm to be used;
- o the same experiment on multiple sites;
- o thoroughly described soils and climate at each site;
- o data exchange and professional interaction among participants, and
- o intersite combined analysis of data.

The trials should serve the following broad objectives:

(1) to further increase knowledge of growth, site requirements, and management practices of priority MPTS, including a species producing an edible fruit, to meet the needs of small-scale farmers in Asia for fuelwood, fodder, food and small timber;

(2) to provide a focus for network co-operation and expansion,

(3) to help improve and standardize forestry and agroforestry research methodology.

Experiment Description

Specific Objectives

a. To evaluate environment and treatment interactions

b. To estimate the economic yield of food, fodder, fuelwood and small timber from MPTS at farmgate of MPTS under different farmer-oriented management practices.

c. To formulate recommendations for improved farming practices.

Experimental Design

The participants at the Cha-am meeting agreed on a randomized complete block design with 4 replications, using a factorial arrangement of 3 species X 2 varieties/ provenances X 3 management treatments.

Species	Varieties/provenances
Inga edulis	Talamanca
	Sarapiqui
Leucaena hybrid	K 636
	KX 1
Acacia auriculiformis	Wenlock, Qld.
	Bensbach, PNG

Management treatments:

Control - receives no special treatment.

Pruning - removes all live and dead branches with a pruning saw at age 12 months, up to 50% of total height. The same trees are pruned again at 24 months to 50% of the new total height.

Thinning - removes half the trees, systematically selected at age 24 months.

Minimum Data Set

One time information

- o Site description
- o Past climatic record
- o Soil characterization

Field measurements

- o Height at 6, 12, 18, 24, 30 and 36 months
- o Diameter at breast height (dbh) at the same intervals
- o Basal diameter (10 cm above ground), same intervals
- o Diameter at upper levels for pruned trees, measured at 12, 24, and 36 months.
- o Biomass measurement
- o Pruning biomass at 12 and 24 months separated into 2 fractions, woody and foliage.
- o Above ground biomass at 12, 24 and 36 months, separated into 3 fractions, stem, branches and twigs, foliage, flowers and fruits.
- o Specific gravity of wood at 36 months.
- o Labor input, manhours per plot required to prune and thin, and the number of trees treated.
- o Daily records of maximum and minimum temperatures, precipitation and relative humidity at the site.

Present Status

To date, the Secretariat has received confirmation of involvement of 27 sites, as follows:

Costa Rica	2
Indonesia	2
Malaysia	2
Philippines	6
Republic of China	3
Sri Lanka	4
Thailand	8
Total	27

Another 1-2 sites in Malaysia and 1-2 sites in Indonesia are expected to join soon. Seeds of all genotypes were to be sent to cooperators in April. Unfortunately, cooperators in Malaysia, the Philippines, and Thailand indicate that no germination was obtained for *Inga*. In view of this, the species will be dropped from the trials. Consequently, the objectives of the trials must be slightly modified, omitting the food component since *Inga* is the only species in the original design that produces edible fruit.

A manual which provides guidelines for research collaborators has been prepared and is being distributed. It outlines the experiment, standard procedures to follow, minimum data set to be collected, and methods for maintenance of trials.

Consultative Group on Research and Development of *Acacia* (COGREDA)

Rationale

The MPTS Research Network has already supported various research activities on *Acacia* species through network trials, germplasm collection and testing, small grants, and network research coordination. The Research Committee acknowledges that there is a considerable amount of other work done or currently underway in the region with these species, both nationally funded and supported by other donor agencies. Taking stock of these activities and their outputs would be helpful in defining future directions for network efforts. A consultative meeting on this genus is therefore proposed.

A consultative group should have representatives from: Indonesia, Malaysia, Philippines, Republic of China (Taiwan), Sri Lanka, Thailand, ACIAR, and FINNIDA. It should be chaired by Kamis Awang, Network Specialist.

Time and Venue

The meeting is proposed to be held in March 1982 in Phuket.

Terms of Reference

The meeting should:

review existing research on *Acacia* species in the region

define pressing research areas for future network activities

develop strategies for promotion of research and development in the growth and use of *Acacia*

Grantees in the 1991 Small Grants Program

Proponent	Institution	Country	Title of Proposal
Tree Improvement and Propagation			
S. K. Roy	Botany Section, Institute of Life Sciences	Bangladesh	Vegetative propagation, genetic improvement and agroforestry techniques for MPTS
M. Yamin Mile	Forest Research and Development Centre	Indonesia	Direct seeding experiment of Acacia mangium and A. auriculiformis for low input small farm use
I. C. Dutta, S. Haque and S. P. Sah	Institute of Forestry	Nepal	Increasing the biomass of D. sissoo and soil improvement for small-farm use on degraded sites
Celsa A. Quimio	Department of Forestry	Philippines	Breadfruit seedling production through vegetative propagation and tissue culture and its importance to farmers
Frederick Corey, Jr.	College of Forestry	Philippines	Resistance of different Leucaena lines and species to the psyllid (Heteropsylla cubana Crawford)
Tree Physiology			
Damrong Pipatwattanakul	Faculty of Forestry, Kasetsart University	Thailand	Genetic variation in leaf morphology and photosynthesis of MPTS in 1987 humid and sub-humid trials
Silviculture, Management for Fodder and Fuelwood			
Justino M. Quimio	Department of Forestry	Philippines	Management of Acacia mangium, A. auriculiformis and Leucaena hybrid (KX3) at a typhoon-prone area for fuelwood production
Mary Jean G. Bulatao	Farming Systems and Soil Resources Institute	Philippines	Evaluation of some species of fodder tree legumes for increased backyard animal production systems in the Philippines
H.P.M. Gunasena	Faculty of Agriculture, University of Peradeniya	Sri Lanka	Evaluation of Leucaena germplasm for biomass productivity and fodder value under different agro-ecological conditions
Siriphong Pattannavibul	Thailand Institute of Scientific and Technological Research	Thailand	Monitoring and evaluation of MPTS grown under different conditions in Thailand
Insect and Disease Control			
Ahmad Said Sajap	Faculty of Forestry, UPM	Malaysia	The population dynamics and interaction of insect pests and their natural enemies in an agroforestry system
Ruth Sara Guzman	College of Forestry, Isabela State University	Philippines	Economic utilization of the posticidal derivatives of neem (Azadirachta indica A. Juss) for small-farm use

Grantees, continued.

Mercedes D. Masipiquena	College of Forestry	Philippines	Forest insect pests and their control using multipurpose tree species-based botanicals
MPTS for Adverse Sites			
L. L. Relwani	BAIF Development Research Foundation	India	Performance of tree species in saline soils and arid environment
Nik Muhamad Majid	Faculty of Forestry, UPM	Malaysia	The potential of agroforestry practice in the rehabilitation of ex-tin mining land in Malaysia
C. Pracad Upadhyaya	Institute of Forestry	Nepal	Agroforestry for sustainability and maintaining productivity in soil erosion prone areas of Nepal
MPTS in Farming Systems			
N. G. Hegde	BAIF Development Research Foundation	India	On-farm study to evaluate the impact of windbreak on crop production
Blesilda Calub	Farming Systems and Soil Resources Institute	Philippines	On-farm evaluation of multipurpose trees for silvo-pastoral systems in marginal hillylands
Apolonio S. Sito	College of Agriculture and Forestry	Philippines	Multipurpose tree species rotationally interplanted to agricultural crops in La Union
Honorio M. Soriano, Jr.	Institute of Forestry	Philippines	Soil fertility and productivity aspects of alley cropping agroforestry scheme using (MPTS) leguminous trees as hedgerows
Luciano C. Bato	Ecosystems Research and Development Service	Philippines	Integration of multipurpose tree species with food, medicinal, and aromatic crops in an alternate strip agroforestry system
Land Tenure and Extension Issues			
Fanindra Thapa	Institute of Agriculture and Animal Science	Nepal	Establishment of multipurpose tree stands on small holdings, Chitwan, Nepal
Cleofe S. Torres	Institute of Forest Conservation, UPLB	Philippines	Integrated approach for assessing adoptability of MPTS among small-scale farmers: a test of methodology
Audimar Bangi	Visayas State College of Agriculture	Philippines	Dynamics of MPTS adoption and non-adoption by small-scale farmers in selected upland communities in Central Philippines
Jonas Garcia Bautista	Center for Social Research in Small Farmer Development	Philippines	Multipurpose tree species as an open access resource: a study of the informal property rights governing the use of MPTS in the rural villages of Central Visayas, Philippines
Mary Ann Pollisco-Botengan	Highland Agriculture and Resources Research and Development Co.	Philippines	Household labor allocation and the production, maintenance, and utilization of MPTS in two integrated social forestry program sites of the Cordillera Region
Marketing of MPTS Products			
Victoria M. de Padua	College of Agriculture and Forestry	Philippines	Marketing of MPTS products and by-products in La Union

Program Outline: Applied Social and Interdisciplinary Studies

Report of Progress

Figure 1 shows the transition of activities from Phase 1 to Phase 2, and the relationship of program components.

Regional Comparative Studies

Farm and Village Forestry Practices

Results of FVF study from the Philippines, Thailand, Indonesia, Sri Lanka, Bangladesh and Nepal have been collected and stored in a computerized data base.

FVF database management software has been enhanced by addition of a file selection and export utility.

Case studies have been received from Philippines (5/5), Thailand (2/4), Sri Lanka (1/1) and Nepal (2/2); case study not received from Bangladesh.

National summary analysis has been received from Philippines; none received from Thailand.

Comparative analysis has been completed for South Asia region (Nepal, Bangladesh, Sri Lanka) (Wickramasinghe).

Regional summary analysis is nearly completed (Mehl).

Regional comparative analysis is in progress (Raintree).

Farm Forestry News article, "Asian Farmers Prefer Multipurpose Food Trees," appeared in 4(4).

Survey methodology has been reviewed by an independent consultant.

Preparations have been made for a consolidation workshop (Philippines, 11/91).

Study of Farmers' Tree-Breeding Objectives

Country summary of results have been received from India (Raganathan).

Composite summary of results from India, the Philippines, Thailand, Indonesia, Sri Lanka, Bangladesh, and Nepal (Lert and Ranganathan) was printed as Report No. 10.

Site specific reports received from Philippines (Ponce) and Sri Lanka (Wickramasinghe), printed as Reports Nos. 16 and 17.

Preparations for consolidation workshop (Sri Lanka) are underway.

New Case Studies and Comparative Analyses

Comparative analysis of farm and village land/forest use practices in the Philippines (Francisco)

Comparative analysis of land tenure and forest/land use systems in selected Philippine villages (Penalba)

Farm and forest land use practices in upland farms of laguna and Oriental Mindoro (Philippines)

Socio-cultural values and women's role in growing multipurpose tree species in the Nepal Terai

Indigenous management of two multipurpose tree species in the mid-hills of Nepal

Geographic Analysis System (MPTGAS)

GAS software evaluation
Regional system
National systems (Philippines, others)

Miscellaneous

MPTS Recipe Book announced

Marketing of MPTS Products

New Case Studies and Analyses

Overview of MPTS Product Marketing in Malaysia

Role and demand for MPTS in cottage industries in North, Northeastern and Central Thailand

A study of the market structure of selected ipil-ipil (*Leucaena leucocephala*) end-products in Mindanao

Market analysis for small-scale MPTS production in the Southern Tagalog Region of the Philippines

Bioeconomics

Concept introduced in a paper presented at the Philippines theme meeting, November 1990 (MacDicken and Raintree).

Farm Forestry News article "Exploring the Realm of Bioeconomics in MPTS Research" (Raintree, MacDicken & Roos) appeared in 4(3).

Participants in the 1991 Humid/Sub-humid Zone Network Trials adopted a bioeconomic metric, agreeing to record labor data.

Dr. Sompetch Mungkorndin, the economist recruited for Network Secretariat in Bangkok, will coordinate application of bioeconomic methodology in the network trials.

The MPTS Research Network will be represented at the Agroforestry Economics Workshop in Honolulu, July 1991 (staff economist + three sponsored participants).

Extension R & D

Development and Application of ER & D Methods (integration of MPTS into farming systems)

- Action research social forestry project among residents of Mt. Makiling Forest Reserve, Los Banos, Philippines
- Extension R & D project in a resettlement areas near Kandy, Sri Lanka
- Community-based screening of MPTS at Hang Dong Secondary School, Chiang Mai, Thailand

Tree Improvement by Farmers

An *Artocarpus* Network will begin with a pilot project conducted on Cebu, Philippines (ViSCA).

Plans for the Future

Regional Comparative Studies

Conduct a workshop to consolidate the results of the network study of Farmers' Tree Breeding Objectives in September 1991 in Kandy, Sri Lanka.

Conduct a workshop to finalize and publish the results of the Farm and Village Forestry Practices in November 1991 in the Philippines.

Identify research gaps and sponsor case studies and comparative analyses of the socioeconomic and biological correlates of land- and tree-use practices in Asia region.

Develop and maintain a geographic analysis system to assist in analyzing land-use patterns and bicycle correlates of MPTS usage.

Marketing of MPTS Products

Expand the range of marketing case studies and analyses.

Consult with network participants to plan further activities.

Bioeconomics

Develop bioeconomic methods for MPTS experimenters.

Develop methods to assess the socioeconomic context of the MPTS network trials, and identify recommendation domains for research results.

Extension R & D

Implement and backstop ER & D pilot projects in Philippines, Sri Lanka and Thailand.

Provide information support and training opportunities.

Facilitate interaction among network participants through workshops and study tours.

Identify potential projects for future network expansion.

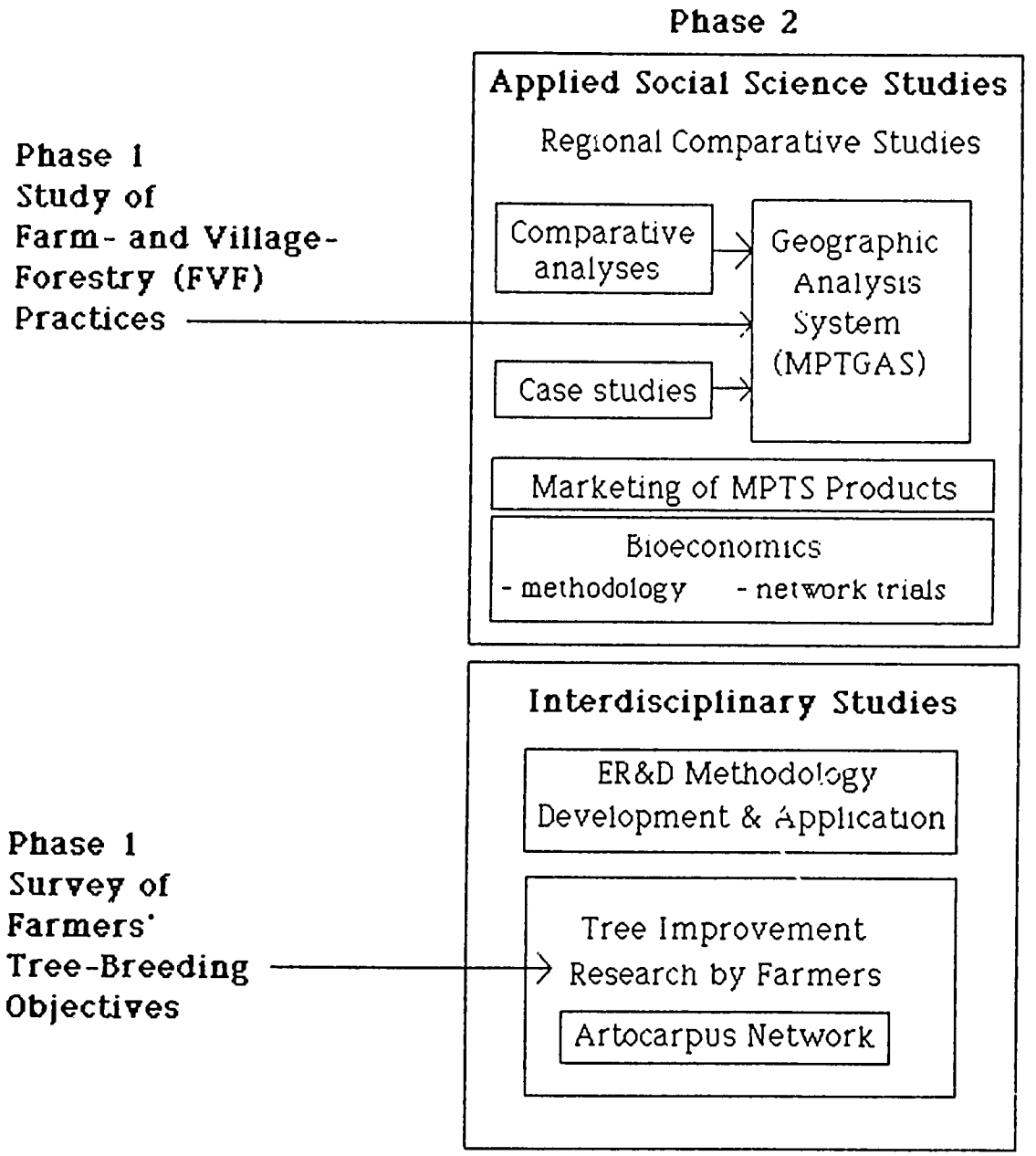

Figure 1. Relationship of program components and transition from Phase 1 to Phase 2.

Multipurpose Food Trees: An Unsuspected Cornucopia?*

J.B. Raintree

According to the findings of the MPTS Research Network's study of Farm and Village Forestry (FVF) Practices, the multipurpose trees most preferred by farmers in Asia are those that produce food as one of their products. Farmers in the 26 study villages were asked to specify which species they prefer for each of several use categories. The following table ranks the most frequently mentioned species.

Table 1. The MPTS Top Ten (most frequently mentioned by villagers in the FVF study).

Rank	Species
1	*Mangifera indica*
2	*Artocarpus heterophyllus*
3	*Cocos nucifera*
4	*Albizia falcataria*
5	*Shorea robusta*
6	*Leucaena leucocephala*
7	*Castanopsis indica*
8	*Prunus cerasoides*
9	*Schima wallichii*
10	*Psidium guajava*

Four of the 10--including the top three--are well known fruit trees and all but three of the ten were reported as having at least locally important food uses by farmers in the FVF study.

But are they really MPTS? Table 2 shows the data on the top three trees.

There can be no question about it. These are multipurpose trees.

It makes sense when you think about it from the farmer's point of view. If you were a small farmer concerned about food security for your family, which would you prefer. . . a fuelwood or timber tree that *also* produced food or one that didn't?

One of the most surprising findings to come out of the study is that farmers (and scientists?) in different countries have very different ideas about the uses of the trees. This becomes very clear if we compare perceptions of fodder and fuelwood values.

The differing views that people in different countries have of these trees reminds one of the tale of the "Three Blind Men and the Elephant." Clearly, there is more to these trees than any of us are aware.

Other FVF data showed that farmers in some countries seem to value a tree like jackfruit more as fodder than as human food. this seems to be the case in Sri lanka and especially in Bangladesh, where even mango was mentioned more often as a fodder than as a fruit tree. Also in Bangladesh, where jackfruit is virtually a staple food, it is reported to be more highly valued as a timber than a fruit tree. Similarly, farmers in the study villages in Indonesia reported coconut to be more important as a source of fuel than food. These "fruit trees" are truly multipurpose trees in the eyes of the farmers, but which purposes they are valued for depends on which kind of farmer you are talking to. National differences are striking!

At this point the FVF findings are only indicative of the larger pattern of farm and village tree uses in Asia, but already they raise interesting questions for research. For example:

1. *How do farmers manage their fruit trees so as to obtain the multiple products they desire?* We know very little about this. A recent review of

*A slightly different version of this article appeared in *Farm Forestry News* 4(4):insert 1.

Table 2. Rank order of use and frequency of mention as first or second choice species for that use.

Mango		Jackfruit		Coconut	
Food	558	Food	387	Food	229
Fodder	117	Fodder	166	Fuelwood	222
Fuelwood	117	Timber/cons	95	Handicrafts	99
Timber/cons	79	Fuelwood	49	Timber/cons	94
Charcoal	26	Industrial	26	Charcoal	81
Industrial	7	Handicrafts	8	Industrial	41
Handicrafts	4	Charcoal	7	Fodder	31
Other	17	Other	24	Other	3

Table 3. The most frequently mentioned species for fodder and fuelwood in each of six countries of Asia (frequency of mention appears besides species code; see Manual No. 1 or 2 for species codes).

Fodder

Bangladesh	Indonesia	Nepal	Philippines	Sri Lanka	Thailand
MANGIN 117	ALBIFA 173	FICUGL 98	LEUCLE 132	ARTOHE 25	ORYZSA 108
ARTOHE 103	MAESEM 77	FICULA 97	PASPCO 69	EXACTR 29	GRASS 71
ORYZSA 67	LEUCLE 76	FICUNE 76	COCONU 31	MUSASA 7	IMPECY 17
SACCOF 42	ARTOHE 38	PRUNCE 65	IMPECY 25	MUSAAC 6	ARUNPU 15
TRITVA 34	GLIRSE 30	ARTOLA 53	ZEAMAY 8	PERSGR 1	ISEISI 15

Fuelwood

Bangladesh	Indonesia	Nepal	Philippines	Sri Lanka	Thailand
MANGIN 77	ALBIFA 279	CASTIN 181	PINUKE 186	EXACTR 24	SHOROB 157
CORCCA 48	COCONU 101	SCHIWA 143	LEUCLE 177	MADHLO 17	SHORSI 98
SYZYCU 43	MAESEM 62	ALNUNE 95	GLIRSE 162	MUSAAC 16	TAMAIN 88
ACACNI 42	SCHINO 41	FICUGL 74	COFFAR 109	GAREAR 15	IRVIMA 44
ARTOHE 32	LEUCLE 36	BETUAL 65	COCONU 100	COCONU 12	DIPITU 28
PHOEDA 32	SWIEMC 36	FICULA 64	SHORPO 44	PONGPI 12	MANGIN 26

the literature (Roos 1991) revealed that there was very little published information on multipurpose management of fruit-producing species.

2. *What about the food uses of other MPTS?* The FVF database reveals that no less than 150 of approximately 400 species mentioned by the farmers in the study villages have important food uses. The Nitrogen Fixing Tree Association has carried out some studies of food producing FGNFTS.

3. Most of us are aware that you can eat the young leaves and shoots of *Leucaena leucocephala*, but how many of us have ever tasted the excellent tempeh than is made from mature leucaena seeds? It is only in one small area in the Gunung Kidul region of Java that this use is known, and where the weedy pantropical

variety of leucaena is grown, harvested, stored and sold in the market when prices are right just like any other grain legume (Raintree 1980, Whiting 1981). *How many other nutritionally and economically significant local MPTS-feed processing technologies are there out there waiting to be discovered?*

The Network Secretariat has invited newsletter readers to send in entries for compilation in an "MPTS Recipe Book" (see Annex) to bring out the wealth of information on the food uses of MPTS. Once we realized how small farmers were thinking about multipurpose trees, the idea of an "MPTS Recipe Book" was almost inevitable!

We have also made jackfruit the focus of a Network on Tree Improvement by Farmers. Not only is it the All Time Number 2 Tree in the MPTS Hit Parade, but it also turns out to be--in view of its potential significance--one of the most overlooked and scientifically neglected of tree species! What a feast this could be for the astute researcher!

Now, bearing all this in mind and given that we are already trying to do something about it, the final question I would pose to the participants in the MPTS/FOOD Discussion Group is . . .

4. *What else should the MPTS Research Network be doing about the MPTS/FOOD connection?*

References

Raintree, J.B. 1980. Leucaena tempeh. Newsletter, League for International Food Education. 1126 Sixteenth Street, NW, Washington DC, 20036, U.S.A.

Roos, R. 1991. Non-Fruit Production of Tropical Fruit Trees in South and Southeast Asia. Unpublished MS Thesis. Wageningen University and Winrock-F/FRED.

Whiting, M.G. Food uses of leucaena seeds 1. Tempeh lamtoro, preparation and toxicity. Leucaena Research Reports 3: 100-101.

Annex. *Network Invites Your MPTS Recipes*[*]

The Network Secretariat invites you to put your knowledge where your mouth is to help assemble an MPTS recipe book. The book of recipes will provide a culinary reminder of an often ignored use of farm trees, and fill a vacuum (some say craving) for this type of knowledge. We would like to receive as many recipes that use multipurpose trees as your household can send us.

Entries must use products of tropical trees for which there are at least two other uses. Recipe authors will be acknowledged next to their contribution, and will receive a free copy of the book.

Entries should include:

(1) name of dish,

(2) place of origin (district, region, country)

(3) scientific and common names of tree species used

(4) other uses of the tree besides food (e.g., fuelwood, medicine, fodder, handicrafts, construction, tools)

(5) type of dish (snack, main dish, salad, side dish, dessert),

(6) list of ingredients and measurements (please define measurements other than metric or teaspoon, tablespoon, cup, etc.)

(7) directions for cooking

(8) directions for serving

Please send all entries to: MPTS Recipes, c/o the Network Secretariat.

* *Announced in Farm Forestry News* 4(4): insert 1.

Summary of the First Meeting of Forestry Deans Involved in the F/FRED Twinning Program

On May 29, 1991, the deans of the three forestry educational institutions involved in the twinning program met at the Faculty of Forestry, Universiti Pertanian Malaysia, to discuss areas of potential collaboration. Participating at the meeting were: Dr. Niwat Ruangpanit, Dean, Faculty of Forestry, Kasetsart University (KUFF), Dr. Virgilio A. Fernandez, Dean, College of Forestry, University of the Philippines at Los Banos (UPLB), Dr. Wan Sabri Wan Mansor, Head, Department Forest Management, Faculty of Forestry, (UPM), and Dr. Nik Muhamad Majid, Deputy Dean, Faculty of Forestry, UPM.

This first official meeting discussed activities to be organized jointly by the three institutions under the twinning program of F/FRED. Regarding collaborative research, teaching (training) and extension, the following activities were agreed upon.

International Symposium on MPTS for Rural Livelihood

UPLB will host the jointly-organized workshop, to be held either in Manila or Los Banos in mid-January, 1993.

Field Text on Social Forestry

The three institutions agreed to jointly prepare a field text on social forestry. Comments on the proposal are to be submitted to Dr. Fernandez by July 31, 1991. UPLB will act as the coordinating center.

Audio-visual Information

Members agreed to produce audio-visual documentation in the form of a slides package on (1) social forestry and (2) information on the three universities' programs in forestry. Dr. Ruangpanit of KU will coordinate the project.

Research Collaboration

A joint research effort will be initiated on *Eucalyptus camaldulensis* and *Acacia crassicarpa*, two timber species of common interest to the three countries. Research on *Eucalyptus* will cover: (1) silviculture and management (KU), (2) utilization (UPLB), and (3) biological aspects (UPM). Provenance trials of *Acacia crassicarpa* will be initiated at the three institutions. Proposals on *Eucalyptus* need to be submitted by July 31, 1991. Dr. Kamis Awang will provide the experimental design and seeds for the *Acacia* project, with UPM coordinating the experiments. Other research projects should also be initiated.

Training

Two types of training visit programs were discussed:

(1) Faculty members with students: Faculty members are encouraged to serve their sabbatical at any of the 'brother' institutions. Visits of short-term duration either for teaching or research purposes are also encouraged. Another area of cooperation is joint supervision of graduate degree programs.

(2) Student exchange visits: Forestry students from the three institutions are encouraged to arrange short-term visits. The host institution should find avenues to provide local transportation and accommodation.

Other

Exchange of publications is encouraged, either on a personal basis or through the libraries.

The next meeting will be held in 1992 in the Philippines.

Research Program Summary
MPTS Utilization for Small-Farm Development (MUSFAD)

Indonesia, Malaysia, Philippines, Republic of China, and Thailand are participating in this coordinated program proposal, being coordinated by Celso Lantican at the Network Secretariat.

Rationale

In Asia, farmers plant trees not only to meet their household needs for tree products, but also to gain additional income through the sale of raw materials. This is especially true where fuelwood is not scarce or where fuelwood substitutes are relatively cheap.

Little research has been done on the utilization of MPTS, particularly on non-wood tree parts such as bark, leaves, flowers, fruits, and seeds, in making products such as food, feed, fertilizer, and chemical products.

Regionally-coordinated research on the utilization of non-wood parts will help identify new uses and improve production of already known products from MPTS. Such research could pave the way for new or improved small- and large-scale enterprises that use MPTS as raw materials which would favor tree growers with an expanded market for multipurpose trees. Developing processing industries that use MPTS as raw materials would not only encourage farmers to plant trees but would also create new jobs and provide greater inputs to other sectors of the economy.

Program Objectives

1. Identify existing uses of non-wood parts of selected MPTS;
2. Develop cost-effective processing techniques to improve the quality of existing products derived from non-wood parts of these species;
3. Evaluate the suitability and economic potential of utilizing non-wood parts of selected MPTS for various products (e.g. food, feed, fertilizer, agrochemicals, industrial chemicals);
4. Develop equipment/processes for utilizing non-wood parts of selected MPTS that are suitable for village or small-farm use.
5. Identify existing methods of harvesting non-wood parts of selected MPTS and to improve their efficiency and cost effectiveness.
6. Identify effective ways of marketing products from non-wood parts of MPTS.

Species to be Studied

Acacia auriculiformis
Acacia mangium
Artocarpus heterophylla
Azadirachta indica
Eucalyptus camaldulensis
Eucalyptus deglupta
Gliricidia sepium
Leucaena diversifolia
Melia azedarach
Pithecellobium dulce
Sesbania spp.

In addition, each participating country will include one or two local species of *Cinnamomum*, a genus well known for producing essential oils.

Problem Areas and Non-Wood Parts to be Studied

The program will focus on three problem areas:

- harvesting of non-wood parts (bark, leaves, flowers, fruits/seeds);
- basic properties of non-wood parts,

including intraspecific variation; and

- o utilization of non-wood parts (including product development, improvement, economics, and marketing) for food, feed, fertilizer, essential oils, agrochemicals, dyes, industrial chemicals, and other uses.

Program Structure

Each participating country will have its own country program focussing on species identified during the utilization research program development workshop held in Chitou, Taiwan. Each national program will be composed of several projects. Each project will be composed of several studies.

The assignment of species to the participating countries is shown in the attached table.

The projects to be developed under the country programs will be selected from the following:

- o Harvesting
- o Basic properties and intraspecific variation
- o Food
- o Feeds
- o Fertilizers
- o Essential oils
- o Agrochemicals
- o Dyes
- o Industrial chemicals
- o Special uses

The studies to be proposed under each project should be in support of the objectives identified in the Chitou workshop (details available from the Network Secretariat). In selecting the studies to be included in each project, the following criteria will be used to determine priorities:

- o relevance to small-farm use
- o economic significance
- o support for sustainable land use

Training Program Report

Summary of Accomplishments (July 1990 - June 1991)

Graduate Training

- Five of the six fellows completed their course work requirements and passed their comprehensive examinations. One of the fellows (from SRL) failed the comprehensive examination. However, his work at MSU was accredited towards an MS degree.

- Four fellows (BGD, NEP, PHI, THA) returned to their home countries to work on their theses. The fellow from INA was allowed to work on her thesis at MSU. With the exception of the fellow from the Philippines whose experiment has a duration of two years, all fellows working on their theses in their home countries will return to MSU within the next six months to write and defend their theses.

Short-Term Training

A total of 162 scientists attended five short courses developed by the project. The courses, the countries where they were offered, and the number of participants (NP) that attended them are indicated below:

Course code	Country	NP
DAI	MAL	21
DAFEX	INA	18
MULTIVAR	PHI	15
RPIPP	PNG	20
	ROC	16
	THA	14
TECWRITE	INA	16
	SRL	20
	PNG	20

The project provided financial support for one participant (from Thailand) to attend a course on microcomputer applications in forest pest management held at the Washington State University from January 21 - February 8, 1991.

Training Materials/Facilities

- Work was started on the preparation of an inventory of existing training materials for social science research techniques, particularly for participatory research, rapid rural appraisal, agroecosystems analysis, and statistical methods.

- A draft set of training materials for multivariate methods was prepared by Dr. Jaime Valera and Dr. Ana Miren-Intal of UPLB. The draft is presently being improved in preparation for the MULTIVAR course to be offered in Malaysia in October, 1991.

- Work on final revisions of the training materials for research problem identification and proposal preparation has started.

Assistance for Curriculum Development

- A commitment was made to provide technical assistance to the Faculty of Agriculture, University of Peradeniya, Sri Lanka, in the development of a curricular program in agroforestry.

- Acting on a request, improvements were proposed on two agro-forestry courses to be developed by the Institute of Agriculture and Animal Sciences, Nepal.

Upcoming Activities

Graduate Training

- Support for the PhD fellows will continue until their programs of study have been completed.

- Search for support for new graduate fellowships will continue.

Short-Term Training

- Development/co-sponsorship of short courses will continue. The courses planned to be offered within the next twelve months are the following:

DAFEX	INA	Jan 1992
DAI	ROC	Sep 1991
	NEP	?
	THA	Jul 1991
FINECON	SRL	?
INFOMAN	MAL	May 1992
PARTRES	PHI	Feb 1992
	IND	?
MULTIVAR	MAL	Oct 1991
RRA/AA	THA	?
TECWRITE	INA	Jul 1991

- Support for participation of MPTS scientists in relevant courses developed by other organizations will continue.

Training Materials/Facilities

- Work on inventory of existing training materials for social science research will be completed.

- A booklet on useful software for MPTS research will be developed.

- Training materials on courses offered will be published. To be completed within the next 12 months are the following:

  Designing a research proposal
  Design and analysis of field experiments
  Multivariate methods for MPTS research

- Preparation of computer-based presentations on the following topics will be started:

  design of species/provenance trials
  rapid rural appraisal
  agroecosystems analysis
  tree improvement

Assistance for Curriculum Development

- Technical assistance will be provided to the University of Peradeniya for the development of an agroforestry curriculum.

Course codes:

DAFEX = Design and Analysis of MPTS Field Experiments
DAI = Data Analysis and Interpretation
FINECON = Financial and Economic Analysis for MPTS Research
INFOMAN = Information Management for MPTS Research
MULTIVAR = Multivariate Methods for MPTS Research
PARTRES = Participatory Research Methods
RPIPP = Research Problem Identification and Proposal Preparation
RRA/AA = Rapid Rural Appraisal and Agroecosystems Analysis
TECWRITE = Technical Writing and Presentation

Planning a Manual for MPTS Extension

Background

At the 1990 Research Committee meeting in Chiang Mai, the Committee agreed that a manual on MPTS production should be prepared for use in extension and training.

The target audiences are extensionists and development workers in need of technical information; literate farmers would also be able to use the manual. The Committee outlined sections on:

Species selection and nursery practices
MPTS in plantations
MPTS in agroforestry
Tending and propagation
Harvesting
Marketing and economics

Following the Committee's recommendations, the Network Secretariat (NS) reviewed a selection of existing extension materials on tree-growing and noted relevant references for the new manual. Several organizations, including CARE, ICRAF, and World Neighbors, gave their permission to use excerpts with appropriate credit.

In November, Committee members who had drafted the section outlines were requested to draft the sections. To date, only a draft for the section on Marketing and Economics has been received by the Chairman and NS. Many Committee members simply do not have the time necessary for preparing a manuscript *gratis* -- while the information is basic, writing it clearly and simply for an extension audience is not simple and requires time and thought.

Options for Action

At this meeting, the Committee is asked to review the following alternatives for producing the manual and decide on a course of action.

A. Identify a group of 4-5 committee members as section authors to meet in Bangkok with an artist and editor for 3-4 days to draft sections of the manual.

B. Identify an expert in extension communications with experience in forestry to draft the manual sections using the Committee's outline and existing extension materials as references. This person would work with an artist and editor to develop all sections, and contact Committee members and other experts as needed to fill-in knowledge gaps.

C. Defer preparation of a manual and instead support distribution of existing manuals developed by other organizations.

If either A or B are followed, a prototype section should be pretested with one or more development workers to ensure the style and layout are clear and understandable. Using the results of the pretest, the manual would be completed.

Map and Table Appendix

One suggestion for the manual is to include, if there is adequate information on agroclimatic zones of recommendation, an agroclimatic map of the region with a corresponding table of species characteristics and uses. The Committee is requested to comment on the feasibility of such an appendix, and make any necessary changes to the plan.

MPTGro Overview

A computer model, MPTGro (multipurpose tree growth simulation model) has been designed by the F/FRED Global Research Systems staff in the United States. MPTGro is designed to predict yield and biomass allocation of tropical MPTS (multipurpose tree species) under various farmer-controlled managements, soil types, and climate conditions. Tree growth rate is based on the stage of stand development. Allocation among wood and foliage is dependent on species-specific growth measurements.

Users can quantify tradeoffs between species and planting density in terms of wood and foliage biomass and stem diameter production. If the model's drought stress component is used, effects of different planting dates, weather patterns, and soil conditions on tree growth are evaluated.

MPTGro is menu-driven, fast running, and requires minimum user input. Model components include a plant input file with the species-specific allometric (relations between diameter and woody biomass and leaf area) and growth function parameters, the simulation module, and output. To simulate moisture stress, input files for soil and weather information are needed. These files can be generated from the Soil and Climate databases of MPTSys.

The simulation component daily updates tree growth and allocation with a continuous feedback interaction between tree growth and stand development. From an initial diameter, tree leaf area (LA) and woody biomass (WB) are calculated from the allometric regressions. LA is then multiplied by tree density to calculate the stand LAI (leaf area index). Wood growth per unit of ground area (current annual increment, CAI) is predicted as a function of LAI and then reduced due to water stress if necessary. The woody biomass increment of a tree is CAI/stand density. This increment of growth is added to the previous tree woody biomass to give an updated tree woody biomass. The allometric are used again to calculate a new tree diameter. The new LA is estimated and the above steps are repeated daily. Initial diameter, planting density, and specific leaf weight (used to predict leaf biomass) are input from the user before simulation. While simulating, a graphic representation of tree and stand growth is displayed on the screen simultaneously.

Throughout the run of the model, output of diameter and wood and foliage biomass is available. These values are periodically written to a tree growth text file. With drought stress, precipitation and stress factor values also are written to a drought stress text file. The GRAPH option plots various simulation scenarios for further evaluation and interpretation.

Using experiments conducted on Maui, Hawaii, allometrics for *Acacia auriculiformis, Leucaena diversifolia*, and *Gliricidia sepium* and the relationship between CAI and LAI were measured. Other species allometrics are available from the literature. Current work focuses on standard methodology for determining allometric coefficients for additional MPTS based on a minimum data set of field measurements. The user's manual, including the physiological background for modeling, a tutorial, mechanics of using the computer model, and interpretation of model output, is being developed.

Field Visit to FRD Nursery and Tribhuvan University

On June 20, the Research Committee visited the Forestry Research Division's nursery at Chalanakhel, first stopping by Swayambhunath Temple. At the nursery, Mr. Rajendra Joshi and nursery staff described the ongoing production and research activities.

As part of a program launched in 1973 to improve the Kathmandu Valley, the nursery produces seedlings of *Melia azedarach, Pinus roxburghii, P. caribaea, Ficus semicordata, Alnus nepalensis*, and *Shima wallichii* for local demand. Seedlings are raised in polyethylene sacks using a medium of topsoil and compost. Research activities at the nursery include studies of germination, improved seedling quality, media suitability, and pest and disease control. Studies have been published in the Forestry Information Bulletins. Additional species not mentioned above include *Quercus* spp., *Pinus patula, Eucalyptus globulus, E. citriodora, Acacia mangium, A. crassicarpa, A. nilotica, Ficus* spp., and bamboo.

The Committee next visited Tribhuvan University's Kirtipur campus. Tribhuvan University (TU) is a multi-campus university that opened in 1960. TU's 165 campuses are spread throughout the country; 5,500 instructors teach 120,000 students. His Majesty the King Is Chancellor of the University, and appoints the Vice-Chancellor, Rector, and Registrar. With 9,000 students, the Kirtipur campus is the central campus, offering postgraduate studies in various subjects. TU contains five technical institutes and four faculties. Included among them is the Institute of Agriculture and Animal Science, located in Rampur, Chitwan. Other subjects covered include engineering, social sciences and humanities, commerce and management, and education. The University contains four research centers: the Center for Economic Development and Administration (CEDA), the Centre for Nepal and Asian Studies (CNAS), the Centre for Educational Research and Innovative Development (CERID), and the Research Centre for Science and Technology (RECAST). These centers conduct basic and applied research and provide on-the-job training.

In the afternoon, the Committee received a tour of the Royal Drug Research Laboratory by the Director General, Dr. S.B. Malla, and his staff. The laboratory is under the Ministry of Forests and Soil Conservation, and conducts research on plant extractives and essential oils, including studies of indigenous herbal medicine. The laboratory has screened over 700 species for medicinal extractives. The laboratory's scientists have developed a number of products for commercial production. The laboratory has developed a process for extracting essential oil from *Eucalyptus camaldulensis* and separating out impurities to increase cineole content. The scientists at the laboratory have found higher cineole content for this species than previously reported. Products have been developed from *Adhatoda vasica* and other MPTS as well.

At the National Herbarium and Plant Laboratories in Godawari, Committee members received an informative tour by Dr. S.C. Rajbhandari, head of a team of 12 scientists developing practical, inexpensive techniques of mass-propagation of plants. The basic approach being tested involves micro-multiplication of excised shoots *in vitro*, which are rooted in sand boxes and transplanted into poly bags after 10-15 days. For certain species, they have found optimum rooting under conditions of: 20-32°C temperature in greenhouse, with 55-70% relative humidity, and 10,000 - 30,000 lux sunlight. Agricultural crops such as potato and banana have been successfully multiplied, as well as ornamentals such as orchids and carnations. Among tree species, *Eucalyptus camaldulensis, Dalbergia sissoo*, and *Ficus lacor* have met with success ranging from 70 - 80%. The estimated cost is comparable to that of seedlings produced from seeds. The simple technique can be easily adopted for large-scale production, states Dr. Rajbhandari, and could be applied to other MPT species. The Committee applauds his hard work.

Post-meeting Tour

The post-meeting tour, June 23-25, included research sites and institutions in the Terai, as well as a visit to Lumbini, the birthplace of the Lord Buddha, Siddhartha Gautama (born 623 B.C.). The first day involved travel to Naryangarh, near Chitwan National Park. After dinner at the Narayani Safari Hotel, the Committee members enjoyed -- and took part in -- a demonstration of local dance.

On June 24, the Committee visited first a natural sal (*Shorea robusta*) forest that had been degraded by heavy pressure for fodder from nearby villages. The need for a management plan and sensibilization of villagers to the consequences of rapid forest destruction was explained.

Next, the Committee visited the Shankar Nagar experiment station, Rupandehi District, of the Forestry Research Division (FRD), Department of Forestry and Plant Research, Ministry of Forestry and Soil Conservation. There, under the supervision of Mr. Rajendra Joshi, FRD is conducting one Semi-arid Zone Network Trial, and one of two sites included in the international *Dalbergia sissoo* provenance trials conducted by scientists in the MPTS Research Network.

The Semi-Arid Zone trial, in which four species (*Acacia nilotica, Dalbergia sissoo, Eucalyptus camaldulensis,* and *Albizzia procera*) are being studied under two cutting management regimes (pruning and control), is proceeding well. The trial was established in July 1989. The costs of establishing and managing these trials have been borne solely by FRD, in the interest of participating in network research.

The species x management trials were planted at the design-specified spacing of 1 x 10 m. At 17 months, *E. camaldulensis* showed significant differences in average height compared to the other species. *E. camaldulensis* and *Albizzia procera* showed significant differences in diameter at 10 cm above ground level compared to the other two species.

The *Dalbergia sissoo* provenance trial was established at the site in July 1990. It has experienced problems of germination of several of the Pakistan seedlots, and poor survival due to late receipt of seeds. The trial will be assessed in November 1991 to see if re-establishment is necessary. The other FRD-managed *D. sissoo* provenance trial is at Tarahara, in the eastern Terai region.

The Committee then took lunch at the Lumbini Garden Guest House, and received a tour of the Lumbini site and the Mayadevi Temple there. The site, birthplace of the Lord Buddha, Siddhartha Gautama, is a revered site of pilgrimage for Buddhists.

Before returning to Kathmandu June 25, the Committee visited the Institute of Agriculture and Animal Science of Tribhuvan University, located in Rampur, Chitwan.

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