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5. Author(s)
1. Yazmar, Melissa B.
2. Withington, Dale
3.

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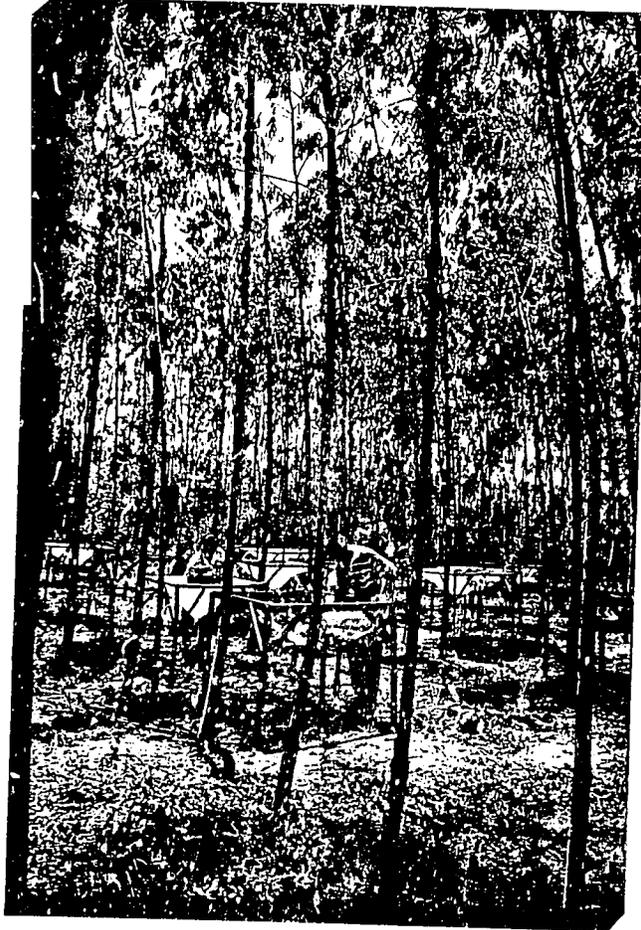
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WORK SHEET

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Multipurpose Tree Species

Research Network Field Trials



Forestry/Fuelwood

Research and Development

(F/FRED) Project

THE PROJECT

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

Funded by:

United States Agency for International Development

- Bureau for Science and Technology (Office of Forestry, Environment, and Natural Resources and the Office of Rural and Institutional Development)
- Bureau for Asia and the Near East (Office of Energy and Natural Resources).

The F/FRED project is designed to help biological and social scientists cooperatively address the needs of small-scale Asian farmers for fuelwood and other tree products. Through the MPTS Research Network, scientists exchange research plans, methods, and results on the production and use of multipurpose tree species (MPTS).

Through network trials, the project investigates the growth and yield of priority tree species and how resource-poor farmers use and need trees. Other activities include support of research, twinning relationships, workshops, and training programs.

Network participation is open to Asian forestry departments, forestry and agricultural research institutes, applied social science research institutes, and schools of forestry, agriculture and applied social sciences.

Cover photo by M.B. YAZMAN



M.B. YAZMAN

Nurseries play an important role in establishing experimental trials.

The F/FRED project is conducted by the Winrock International Institute for Agricultural Development, a private, non-profit U.S. organization.

NETWORK TRIALS

Determining which species to plant is a key question in the effort to help resource-poor farmers obtain the tree products and services they need. Field trials to determine biologically and socially appropriate species are commonly set up to find answers.

Many individuals and institutes have established such trials throughout Asia, and a picture of the environmental ranges, yield, and uses of many multipurpose tree species (MPTS) has been emerging. However, the picture is somewhat unclear because germplasm, experimental designs, and data measurement and analysis methods usually differ, making it difficult to compare results. There has also been some unnecessary duplication of efforts.

Network trials supported by the F/FRED project attempt to overcome these problems. Cooperators plant seeds from the same source in the same way and use similar methods of measurement and data analysis to ensure comparability of results. Such coordinated multi-location testing allows a more scientifically sound interpretation of experimental results and reduces the amount of work required of any individual participant.

Social science studies examine how farmers use trees and which species and characteristics they prefer. A computerized information system allows network participants to store and analyze trial data, as well as obtain information on other MPTS trials, specialists and references. Through the network, scientists and researchers have access to soil and climate descriptions and have the opportunity for combined statistical analysis. Data generated through F/FRED funded activities is shared with due regard to proprietary interests.

Information generated from the trials will help people make better decisions about which trees to plant and how to manage them. Additionally, these network activities

will enhance regional cooperation, continuing long after the project ends. Working on common problems and the sharing of results provides a forum for peer review and strengthening of scientific communication.

MPTS NETWORK INSTITUTIONS

| | |
|------------------------------------|--|
| India: | Botany Department, University of Delhi National Institute of Wasteland and Rural Development The Bharatiya Agro Industries Foundation |
| Indonesia: | Agency for Forestry Research and Development Forestry Research and Development Centre |
| Malaysia: | Forest Research Institute of Malaysia Universiti Pertanian Malaysia |
| Nepal: | Forest Survey and Research Office, Department of Forests Institute of Agriculture and Animal Science Institute of Forestry |
| Pakistan: | Pakistan Agriculture Research Council Pakistan Forest Institute |
| Philippines: | Central Mindanao University Department of Environment and Natural Resources Ecosystems Research and Development Bureau University of the Philippines, Los Banos Visayas State College of Agriculture |
| Republic of China (Taiwan): | Department of Forestry, Chinese Culture University Taiwan Forest Research Institute |
| Singapore: | Plantek International |
| Sri Lanka: | Forestry Department |
| Thailand: | Center for Applied Economics Research Chulalongkorn University Social Research Institute Kasetsart University Royal Forest Department Thailand Institute of Scientific and Technological Research |

F/FRED TRIALS

Humid and Sub-Humid Tropical Areas

Following the guidelines of a 1984 workshop sponsored by the International Union of Forestry Research Organizations (IUFRO) in Kandy, Sri Lanka, MPTS network trials examine priority species in two climatic zones. Trials began with the humid and sub-humid tropical zone (more than 165 rainy days per year) in 1987 with 3-year trials established at 15 sites.



K.G. MACDICKEN

A *Leucaena* hybrid, K743, is one of the priority species for humid and sub-humid tropics.

The F/FRED staff worked with Asian researchers and administrators to select three priority species: *Acacia auriculiformis*, *Acacia mangium*, *Leucaena* spp.

Trial cooperators also included two provenances of each of the two *Acacia* species and two types of *Leucaena* – one from psyllid resistant *L. diversifolia* parent trees and one from an F₂ hybrid of *L. diversifolia* and *L. leucocephala*. Growth rates are assessed under three management methods to better simulate how farmers use trees:

- lopping lower branches (for timber production)
- pollarding at 1 m above the ground (for forage production)
- control

To ensure the comparability of results, cooperators received identical seedlots, manuals and videos on establishment and maintenance, and training on measuring trees and data collection and analysis techniques. Soils were examined to help match MPTS requirements to soil characteristics and to help improve modeling. F/FRED provided the funding for this support.

Institutions with established trials:

| | |
|-----------------------------|---|
| Indonesia: | Forest Research and Development Centre |
| Malaysia: | Forest Research Institute of Malaysia Faculty of Forestry, Universiti Pertanian Malaysia |
| Pakistan: | Punjab Forest Research Institute |
| Philippines: | Ecosystems Research and Development Bureau Visayas State College of Agriculture |
| Republic of China (Taiwan): | Chinese Culture University Taiwan Forest Research Institute |
| Thailand: | Thailand Institute of Scientific and Technological Research Faculty of Forestry, Kasetsart University Royal Forest Department |



M.B. YAZMAN

The Royal Forest Department in Thailand conducts MPTS field trials with F/FRED support.

Arid and Semi-Arid Areas

Trials for these areas were designed by researchers at an F/FRED meeting March 21-25, 1988, in Kathmandu. Fuelwood and fodder were determined as the greatest general needs of small-scale farmers, and the trials were designed with priority given to these products with other goods being secondary.

In arid zones (less than 550 mm of annual rainfall), four species will be tried in two cutting regimes. Three species, *Prosopis cineraria*, *Prosopis juliflora* and *Acacia nilotica*, are network priority species. The fourth will be a local species selected by



N.G. MACDICKEN

For the Nepali farmer, fuelwood and other MPTS products are critical for survival.

Firewood harvesting practices are important considerations in MPTS research.



M.B. YAZMAN



K.G. MACDICKEN

Acacia nilotica is a valuable MPTS for intercropping in arid and semi-arid areas.

each participant. The two cutting regimes are a control and pruning at the beginning of winter up to one-third of the height until pruning covers a stem height of 2 meters.

The same cutting regimes will be used in the semi-arid zone (between 550 - 1,200 mm of annual rainfall) experiment, and four species also will be included. *Eucalyptus camaldulensis*, *Acacia nilotica* and *Dalbergia sissoo* are the network priority species, and participants will select one local species.

The network has sites to be planted by institutions in India, Pakistan, Nepal and Sri Lanka. Participants will receive a similar package of support as that provided to the humid zone network.

Germplasm Collection

Seed is one of the least expensive yet most important inputs into tree planting projects. Poor quality seeds can lead to failure in the nursery or the field, and different provenances have to be collected and tested to ensure the best possible match between genotype and environment at different sites.



K.G. MACDICKEN

Proper seed collection and handling ensure good genetic material for field trials.

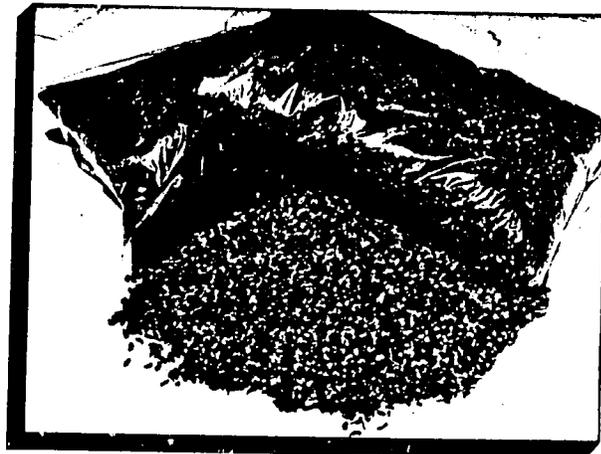
F/FRED has provided support for the following germplasm collection and production efforts:

- Seed collection expeditions for *Acacia auriculiformis* and *Acacia mangium* were co-sponsored with the Commonwealth Scientific and Industrial Research Organization of Australia (CSIRO).
- The Nitrogen Fixing Tree Association in Hawaii was contracted to help network participants set up seed orchards of *Leucaena* species and hybrids resistant to *Heteropsylla cubana*, an insect pest.
- The Faculty of Forestry at Kasetsart University, Thailand, has been funded for field collections of *Melia* and *Azadirachta*, which are priority species in the humid and semi-arid networks, respectively.
- Germplasm collection of the priority species is being collected in the arid and semi-arid network trial programs.



K.G. MACDICKEN

A good seed source is a key factor in genetic improvement of MPTS.



M.B. YAZMAN

F/FRED supports collection, processing, and distribution of MPTS seed for research.



K.G. MACDICKEN

Materials identified and collected with F/FRED support are evaluated in field experiments.

Provenance Trials

Provenance trials are conducted when a single species has been selected for study over a wide geographic region and there is evidence of genetic differences in yield, site specificity, or resistance to stresses between tree populations. Such trials ensure that the best germplasm is used for a particular site.

International provenance trials of *Acacia auriculiformis* will be established at 10 sites in cooperation with the Commonwealth Scientific and Industrial Research Organization of Australia (CSIRO) Division of Forest Research and the Australian Centre for International Agricultural Research (ACIAR) in 1989. These trials will utilize germplasm of 25 provenances collected in Papua New Guinea and northern Australia.

Tissue Culture

Tissue culture is a promising form of vegetative propagation that involves growing plants from single cells or small clumps of tissue. Potential advantages of this method of propagation include uniformity of the plantlets, freedom from disease, large-scale production from only a few plants, and potential growth, vigor, and yield increases.

Trials will be established at several sites to compare growth of tissue-cultured plantlets to seedling progeny from the same parent stock of *Acacia mangium*, *Acacia auriculiformis*, *Leucaena leucocephala*, *Eucalyptus camaldulensis*, and *Dalbergia sissoo*.

Responsible organizations and the species each will test:

- Tata Energy Research Institute, India, *L. leucocephala*
- Royal Forestry Department, Thailand, *A. auriculiformis*
- Forest Research Institute of Malaysia, *A. mangium*
- Department of Medicinal Plants, Nepal *D. sissoo*, *E. camaldulensis*
- Department of Environment and Natural Resources, Philippines, *E. camaldulensis*

SOCIAL COMPONENTS

Even if trees can grow well in an area, farmers will not plant them unless they can be managed to produce needed products and services. Therefore, five studies of on-farm use of MPTS are being conducted in conjunction with network trials.

In Indonesia, Malaysia, the Philippines, and Thailand scientists are investigating farmers' uses and preferences for trees and the characteristics of trees preferred by farmers for different uses. These four studies concentrate on the priority species in the humid and semi-humid network trials and their potential for introduction and expanded use in the study areas.

In Thailand, the fifth study is a preliminary description and analysis of major social, economic and cultural factors that affect farmers' production and use of trees.

Information from the socio-economic studies will be combined with growth and yield data from the field trials to provide F/FRED system users with an integrated analysis of the potential of MPTS for small-scale farmers.



To improve small-farm production of MPTS, researchers must understand how farmers use trees.

C.B. MEHL

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INFORMATION SYSTEMS

Several databases have been created by F/FRED staff to allow participating scientists to manage, analyze and interpret data from the network trials and other MPTS research. Each is designed to easily be used by people with no previous computer or database management experience, and training programs are available. These databases operate on IBM-compatible micro-computers and are available to network participants.

Experiment Database: This is the prime residence of data collected on soil characteristics, climate, and tree growth and yield from the network trials. The database provides a mechanism for network scientists to store, organize, analyze and share information.

Summary Database: This will incorporate information from MPTS network trials and research results from other agroforestry projects around the world.

MPTS Specialist Database: This will provide users with quick access to names and addresses of individuals with specific skills and experience who are active in MPTS management, research and training. A network directory includes these specialists and people in the project's general mailing list.

The Bibliography Database: This database provides access to international references on a select group of MPTS. Information initially will be obtained from CAB ABSTRACTS, a commercial database maintained by the Commonwealth Agricultural Bureau, and participants will be able to add citations of other references.

Data from the network trials and summary databases will be used to develop simulation models that can help predict which species will do well in different soils and climates. This will reduce the need for field trials in many locations.

PUBLICATIONS

Through its publications series, the F/FRED project staff keep network participants informed of recent research and technical developments related to the field trials. These include a regional plan for leucanea psyllid control, biotechnology feasibility studies, social science case studies on farmers' preferences and uses of MPTS, and papers on the modeling of growth and yield of MPTS. In addition, manuals on field trial establishment and database use are available to network participants, and a quarterly newsletter, *Farm Forestry News*, is published by F/FRED.

Coordination and management of databases is conducted by the F/FRED Global Research Unit in Hawaii.

Publications are distributed by the F/FRED Project Management Office in Arlington, Virginia, U.S.A. and the F/FRED Coordinating Unit in Bangkok, Thailand.

For more information:

**F/FRED Coordinating Unit
Faculty of Forestry, Kasetsart University
P.O. Box 1038
Kasetsart Post Office
Bangkok 10903, Thailand**

tel: 66-2/579-1977

66-2/561-1041

**tx : 4900008037 MPT UI
(USA Country Code)**

**F/FRED Global Research Unit
University of Hawaii
P.O. Box 186
Paia, HI 96779, U.S.A.**

tel: 808/579-8481

tx : 4900008339 DBS UI

**F/FRED Project Management Office
Winrock International Institute
1611 N. Kent St., Suite 600
Arlington, VA 22209, U.S.A.**

tel: 703/525-9430

tx : 248589 WIDC



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