TREE SPECIES SELECTION IN THAILAND: VARIOUS SPECIES FOR VARIOUS PURPOSES

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ABSTRACT

A series of workshops across Thailand were conducted in September 1998 to identify priority tree species for different end-uses. Furthermore, estimates were *quantified* to the extent possible, in order to examine the *relative importance* of each species. The workshops resulted in a final list of 458 different species in four regions for five major end-uses, divided into a number of sub-end-uses. Most species were listed for several end-uses and in several regions.

Different end-uses and different regions identified different species. A pronounced interest for a greater number of species was seen in the quite deforested South, showing increasing species interest with diminishing forest resources. The demand for seedlings for soil and water conservation programmes will be concentrated in the North in the near future, although the total seedling demand for reforestation and planting seems fairly well distributed throughout the country. Species choice and rank clearly differ from region to region. There is very little correlation between number of end-uses for a particular species and its overall quantitative demand. Species number increases steadily from industry over local wood-use to non-wood-use and soil/water conservation. However, not surprisingly, for biodiversity and gene conservation end-uses, the registered number of species was the highest.

Results reflect new trends and attempts to handle "new" species. For the top species, *Eucalyptus camaldulensis* is still in overwhelming demand, except in the south, where rubber is preferred. Pines are only important in the North and are now less popular than before. Teak, yang, rubber, neem, bamboo and Australian acacias are all extremely important, although demand varies among the regions. There is substantial demand for indigenous hardwoods, varying from ornamentals, fencing and fruit trees to "classic" timber species. A new trend is the interest for mangrove species in the south and central Thailand.

BACKGROUND

Tree planting in Thailand still relies to a large extent on erratic seed supply. This is the situation in both the private and public sectors, despite tree improvement programmes, which have been ongoing for up to 30 years. However, there is clearly a growing concern

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about the importance of the quality of available seed and seedlings. Farmers and other seed users find, in practice, that it is difficult to procure well-documented seed of high quality (e.g. high vigour seed and germinants; good growth; productive, adapted material). There is an acute need to develop an integrated national tree seed programme to meet the demands of different tree planters. This involves use of improved genetic resources already developed as well as further genetic improvement, particularly of indigenous species.

Forest Genetic Resources Conservation and Management Project

Implementation of the Forest Genetic Resources Conservation and Management Project (FORGENMAP) is based on existing organisational structures in Thailand. Initiated in 1997, the project aims to:

i) ensure the presence of an effective, public seed supplying organisation;
ii) support community and co-operative based activities in order to make sustainable use of genetic resources, whilst, at the same time, protecting them;
iii) support the private sector and make its material and techniques generally available and
iv) support and promote biodiversity and forest rehabilitation.

FORGENMAP co-ordinates, procures and supplies seed to meet the demand for seed of better quality for the country as a whole. Furthermore it deals with the management of genetic resources, including domestication, biodiversity and conservation of forest tree species and provenances. The project has the immediate objective of providing seed and plant material of good genetic and physiological quality from selected seed sources of indigenous and exotic tree species. This plant material will meet present and future needs for tree seed in Thailand in a sustainable way by strengthening national institutional capacity. Danish support for the first phase of the project ends in September 2000, but a further two-year extension is now expected. Although the project was initially concerned purely with conservation of tree seeds and genes, the future focus will likely concentrate more on biodiversity and rehabilitation.

METHODS

As a primary step towards achieving its objectives, FORGENMAP conducted a series of four three-day workshops across Thailand in September 1998 to identify priority species for different end-uses. The approach of diversifying priority selection into different end-uses facilitated the workload and increased precision in the working groups. By diversifying the end-uses it was hoped that fewer species would be overlooked, forgotten or otherwise disregarded, which easily could happen in short, hectic workshops.

Delegate categories

A total of 153 delegates were convened at the workshops from the following major FORGENMAP stakeholders, representing 32 separate interest groups:

Table 1. Number of stakeholders represented at the four workshops held. Thirty-two different stakeholder groups were present.

Stakeholder groups	Part of country				Total	%
	North	North-East	Central, West, East	South		
RFD (FRO/ NRCO/ RO/ FPRO) (Share of Regional Offices / Reforest. and ext.)	21 (6)	18 (5)	23 (6)	14 (4)	76 (21)	51
NGO's with DANCED Support (CORD, CARE, IMPECT, PDA, KNCC, NKYF, FFF)	5	7	5	0	17	11
RURAL COMMUNITIES (In Co-operation with NGO's)	5	10	2	0	17	11
TREE FARMERS (Co-operatives and Private)	2	8	5	3	18	11
PRIVATE NURSERIES	1	2	2	0	5	3
INDUSTRIAL ENTERPRISES (with tree planting)	2	3	2	1	8	5
UNIVERSITIES (KUFF, CMU, MAEJO University)	5	0	0	1	6	4
SPECIAL PROJECTS (QSBG, HKK, ALRO,OEPP)	3	0	2	1	6	4
TOTAL DELEGATES	44	48	41	20	153	100

The major groups represented at the workshops were:

1. Farmers (small scale subsistence farmers and private land owners)
2. Enterprises engaged in tree planting for industrial purposes.
3. Communities, active in reforestation (associated with NGO's)
4. NGO's associated with tree farming and community forestry, including conservation
5. GOT/RFD (Government of Thailand, Royal Forest Department) agencies engaged in extension to farmers and communities
6. Representatives of major private nurseries as well as nurseries of RFD / Reforestation Office - Nursery Division.
7. Representatives of major agencies, Universities, RFD - Research Office, Conservation Office and projects involved in Biodiversity Conservation of Genetic Resources.

Provision of background material

Prior to the workshop, delegates were provided with numerous existing lists of priority species. This was meant to activate and support, but not limit the delegates. Although many organisations and institutes had issued such lists in the past, many of these covered only limited and conservative groups of few species. The following lists were distributed:

The Forest Research Office, 1998:
The Seed Management Programme (72 species)
The Gene Bank Conservation Programme (27 species)

The Reforestation Office, 1998:
The Economic Plantation Extension Programme (56 species)
The Community Forest Development Programme (75 species)

The CARE rural development based Programme, 1998:
The Rehabilitation of highland watersheds (32 species)
The Community Forest Development (7 species)

The OEPP, 1996:
Biodiversity conservation priority species of endemic angiosperms (36 species)

FAO / RAP, 1997:
Important priority or endangered Tropical SE Asia Palms (16 species)
Rattans (23 species)

The National Research Council, 1994:
Multipurpose tree species (16 species)

Specific end-uses

Working groups were formed in five "major end-use" groups, each considering specifically the following sub-uses, in order to cover all the demand, seen from all likely uses for tree planting:

Group1: Industrial Wood Uses
Energy wood, for industrial uses
Pulp and paper, MDF board
Flooring
Veneer and furniture
Sawn timber

Groups 2: Local Wood Uses
Fuel for local consumption

Tools
Handicraft
Construction
Agro-forestry

Groups 3: Non-wood products

Ornamental
Amenity (shade, fencing, etc.)
Fruit, fodder
Medicinal / Aromatic

Groups 4: Soil and Water conservation

Highlands
Lowlands

Groups 5: Biodiversity & Conservation of forest genetic resources

Biodiversity (in relation to ecosystems and ecotypes)
Conservation for genetic broadness to ensure flexibility and robustness in future plantings

Only the North and Central regions considered biodiversity and conservation of genetic resources, but all regions covered the other end-use groups. Delegates examined the lists in relation to major end-use categories. They were free to substitute or add new or more relevant species, based on local experience. This was a major reason for convening the workshop in four separate regions. Criteria on species choice, quality, quantification methods and modality of group operation were given. The groups were asked to consider a specific major end-use purpose within the end-use category of their group. Each group worked systematically: district by district, organisation by organisation, sub-use by sub-use. A group consisted typically of 5-15 delegates. They listed, quantified and summarised all species related to the end-use within their region only. If representatives of a delegate category were not represented in a group, the remaining delegates estimated species priorities on behalf of the organisation in order to obtain a complete picture.

RESULTS AND DISCUSSION

Participants were asked to identify priority species related to each end-use and to estimate seedling demand for each species. The seedling demand exercise was intended to provide an indirect and thus non-competitive ranking of the priority species. The results of the workshops enabled the author to analyse the future demand for seedlings and assess species priorities by main and sub-use. Comparisons among regions, their similarities and discrepancies, were feasible as well. Further analyses will enable us to identify trends in species choice as compared with previously released RFD species priority lists, which

developed from mainly ‘top-down’ approaches. In practice, the lists are already used to guide the identification of proper and sufficient seed sources.

The initial results identified over 500 species. This number was reduced by identifying species that were listed more than once by synonymous, local or spelling variations of the same name or by various names referring to different parts of the tree. The final list identified a total of 458 species identified in the four regions for the five end-uses. Almost every species was mentioned under more than one end-use and in more than one region. Of the final list, 188 species could not be identified by their scientific name, and many of these species were listed under the end-use category on biodiversity and gene conservation.

A pronounced desire for a greater number of species lies in the mostly deforested South. This indicates an increasing species interest with diminishing forest resources. Soil and water conservation programmes in the North will consume a huge quantity of seedlings in the near future. However, total reforestation and planting needs seem fairly well distributed throughout the country. Species choice and rank clearly differs from region to region. There is very little correlation between the number of end-uses for a particular species and its overall quantitative demand. Of the five categories of end-use identified, each contained more than 100 species. However, the highest number of species was associated with biodiversity (see below).

i) Industry 109 species
ii) Local 125 species
iii) Non-wood 157 species
iv) Conservation 167 species
v) Biodiversity 200 species

End-use groups 1 to 4

In each of the four major regions of Thailand, species were ranked according to seedling demand (Table 2). Only the top 25 are presented in this paper, and the actual seedling demand created requires further analysis. The species not included in the table (those of rank 26 and less) are numerous and far from unimportant. For the species shown, a few points are clear; *Eucalyptus camaldulensis* is still in considerable demand, except in the South, where rubber is the preferred tree. Pines are only important for the North and seem less popular compared with earlier priorities. Teak, yang, rubber, neem, bamboo and Australian acacias are all extremely important, although varying from region to region.

Many species of indigenous hardwoods are in demand, varying from ornamentals, fencing and fruit trees to ‘classic’ timber species. The requirement for mangrove species in the south and central regions is a new trend.

The top 25 species for each of four major end-uses are presented in Table 3. Each end-use has a very distinct species choice, especially within the first six ranked species, which are almost unique in each case. The interest in biodiversity and conservation species was considerable, but participants could not quantify it in terms of seedling demand. Many of the species in this category were identified solely as components of natural forest systems.

End-use group 5: Biodiversity and Gene Conservation

A list of 200 species was drawn up for biodiversity and gene conservation (not included in the proceedings, but available from the author). Of these, about 100 were proposed by the North and Central region respectively, indicating almost no species overlap between the two regions. The large number of individual tree species suggested by the participants indicates an overwhelming interest and concern for biodiversity and conservation. However, although about 200 species were named, seedling demand was still relatively low in comparison to the other end-uses, reflecting little or no interest in most of the species when decisions are made concerning forestation and planting programmes. This may reflect a lack of knowledge on handling, propagation, storing etc., due to the severe lack of research on these species. It may also indicate the participants' desire to plant only species of known practical use, even in projects where conservation is the main objective. Thus, although the importance of a diverse range of indigenous species was acknowledged, forest managers clearly felt unable or unwilling to use these species in practice. A valuable outcome of this workshop would be that some of these suggested species are researched more fully, allowing them to be promoted and more easily utilised in the future.

Weaknesses

The present survey is not scientific and has, to some extent, the characteristic of being an academic exercise. The stakeholder groups as a whole represent users or influential parties who, as such, have an important opinion on priority species and level of demand. However, the representation was not consistent from workshop to workshop. The absolute figures given without a clear mandate are not directly usable. However, their relative values are less questionable, because they do not possess one-sided errors. Only limited information was gained on the requirements for seedlings for biodiversity and conservation, although a long list of species was compiled.

Lessons learnt

Reliable, absolute figures are difficult to obtain from workshops such as the ones described. The criteria and modality of group operation must be very clear to avoid misunderstandings and to make effective use of time. Delineation of the country into regions becomes delicate, when it comes to actual species and seedling estimates. Formation of groups with more than five persons seemed to amend the more extreme estimates before convening into plenary discussions. An investigation like the one in question is not scientific due to a number of uncontrollable factors. The composition of delegates is decisive. Results like the ones presented are, however, useful in different ways. Firstly, they may be instrumental in forming a forest policy, initiating planting programmes and allocating funding for expressed needs. Secondly, they act as a well-defined starting point for the project in question. Thirdly, they may be useful in guiding development of gene conservation, seed procurement, forest research, plant (seedling) production units, tree improvement and biodiversity conservation.

Table 2. Priority species for each of four major regions of Thailand, ranked in order of seedling demand.

Rank	North		South		Northeast		Central	
	Scientific Name	Uses[1]	Scientific Name	Uses	Scientific Name	Uses	Scientific Name	Uses
1.	*Eucalyptus camaldulensis*	1, 2	*Hevea brasiliensis*	2	*Eucalyptus camaldulensis*	1, 2	*Eucalyptus camaldulensis*	1, 2
2.	*Pinus kesiya*	1, 4	*Azadirachta excelsa*	1,2, 3	*Azadirachta indica siam.*	1, 2, 3	*Bambusa* spp.	1, 2, 4
3.	*Tectona grandis*	1, 2	*Acacia mangium*	1, 2	*Pterocarpus macrocarpus*	1, 2	*Hevea brasiliensis*	1
4.	*Prunus cerasoides*	4	*Dipterocarpus alatus*	1,2, 4	*Tectona grandis*	1, 2	*Calamus* spp.	2, 4
5.	*Betula alnoides*	3, 4	*Eucalyptus camaldulensis*	1	*Acacia mangium*	1, 2, 3	*Alstonia scholaris*	1, 2, 3
6.	*Azadirachta indica siam*	1, 2, 3, 4	*Hopea odorata*	1, 2, 4	*Albizia saman (Samanea s.)*	1, 2, 3	*Azadirachta indica siam*	1, 2
7.	*Peltophorum dasyrachis*	1, 2, 4	*Avicennia* spp.	1, 4	*Bambusa* spp.	1, 2, 3	*Pterocarpus macrocarpus*	1, 2, 4
8.	*Acacia mangium*	1, 2, 3, 4	*Rhizophora apiculata*	1, 4	*Alstonia scholaris*	1, 3	*Thyrsostachys siamensis*	1, 2, 4
9.	*Acacia auriculiformis*	1, 2, 3	*Rhizophora mucronata*	1, 4	*Xylia xylocarpa (X. kerrii)*	1, 2, 4	*Hopea odorata*	1, 2, 4
10.	*Michelia floribunda*	1, 2, 4	*Fagraea fragrans*	2, 4	*Pithecellobium dulce*	2, 3, 4	*Tectona grandis*	1
11.	*Castanopsis acuminatissima*	4	*Melaleuca leucadendra*	1, 2	*Afzelia xylocarpa*	1, 2	*Lagerstroemia tomentosa*	2, 3
12.	*Bambusa* spp.	1, 2, 4	*Dialium cochinchinense*	1, 3	*Cassia siamea*	2, 3	*Casuarina junghuhniana*	1, 2
13.	*Albizia saman (Samanea s.)*	1, 2	*Rhizophora* spp.	2	*Euginia cumini*	3, 4	*Acacia mangium*	1
14.	*Dipterocarpus alatus*	1, 2, 4	*Parkia speciosa*	3, 4	*Dipterocarpus alatus*	1, 2	*Dipterocarpus alatus*	1, 2, 4
15.	*Thyrsostachys siamensis*	1, 3	*Bambusa* spp.	1, 2, 3	*Hopea odorata*	1, 2	*Dendrocalamus strictus*	2
16.	*Toona ciliata*	4	*Casuarina equisetifolia*	1, 2, 4	*Acacia auriculiformis*	1, 2, 3	*Casuarina equisetifolia*	1, 2
17.	*Pterocarpus macrocarpus*	1, 2, 4	*Alstonia scholaris*	1, 3	*Calamus* spp.	2, 3	*Bambusa nana*	2
18.	*Combretum quadrangulare*	1, 2	*Toona ciliata*	1, 2	*Peltophorum pterocarpum*	2, 3	*Toona ciliata .*	2, 4

Rank	North		South		Northeast		Central	
	Scientific Name	Uses[1]	Scientific Name	Uses	Scientific Name	Uses	Scientific Name	Uses

19.	*Peltophorum pterocarpum*	2, 3	*Mangifera caloneura (M. pentandra)*	1	*Mimusops elegi*	3	Yah Fag (Gramineae family)	4
20.	*Bauhinia variegata*	4	*Mimusops elegi*	1	*Dalbergia oliveri*	1, 2	*Rhizophora* spp.	1
21.	*Cassia siamea*	2, 3, 4	*Sandoricum koetiape*	1	*Leucaena leucocephala*	2, 3	*Xylia xylocarpa (X. kerrii)*	1, 4
22.	*Alstonia scholaris*	2, 3	*Alstonia spathulata*	3	*Dalbergia cochinchinensis*	1, 2	*Holoptelea integrifolia*	4
23.	*Leucaena leucocephala*	1, 3	*Shorea* spp.	4	*Peltophorum dasyrachis*	1, 3	*Tamarindus indica*	2, 4
24.	*Gmelina arborea*	2	*Albizia saman (Samanea s.)*	1, 2	*Tamarindus indica*	2, 3	*Afzelia xylocarpa*	1, 4
25.	*Dendrocalamus asper*	2	*Intsia palembanica*	2, 4	*Albizia lebbeck*	2, 3	*Leucaena leucocephala*	1

[1] 1 = Wood industry 2 = Local wood consumption 3 = Non-wood uses 4 = Soil and water conservation

Table 3. Priority species for each of four end-user groups, ranked in order of seedling demand.

Rank	1. Industrial Wood Uses	2. Local Wood Uses	3. Non-Wood	4. Soil/Water Conservation
1.	Eucalyptus camaldulensis	Hevea brasiliensis	Azadirachta indica siamensis	Prunus cerasoides
2.	Tectona grandis	Eucalyptus camaldulensis	Alstonia scholaris	Betula alnoides
3.	Acacia mangium	Bambusa spp.	Eugenia cumini	Pinus kesiya
4.	Azadirachta indica	Acacia mangium	Mimusops elegi	Peltophorum dasyrachis
5.	Pinus kesiya	Dipterocarpus alatus	Pithecellobium dulce	Castanopsis acuminatissima
6.	Pterocarpus macrocarpus	Azadirachta indica siam.	Cassia fistula	Michatia floribunda
7.	Acacia auriculiformis	Tectona grandis	Samanea saman	Dipterocarpus alatus
8.	Dipterocarpus alatus	Pterocarpus macrocarpus	Azadirachta excelsa	Toona ciliata
9.	Bambusa spp.	Azadirachta excelsa	Melodorum fruticosum	Hopea odorata
10.	Samanea saman	Cassia siamea	Aquilaria crassna	Pterocarpus macrocarpus
11.	Alstonia scholaris	Peltophorum pterocarpum	Peltophorum pterocarpum	Bauhinia variegata
12.	Hevea brasiliensis	Samanea saman	Cassia siamea	Parkia speciosa
13.	Hopea odorata	Hopea odorata	Leucaena leucocephala	Rhizophora apiculata
14.	Azadirachta excelsa	Acacia auriculiformis	Millingtonia hortensis	Rhizophora mucronata
15.	Afzelia xylocarpa	Xylia xylocarpa	Lagerstroemia spp.	Yah Fag (Gramineae family)
16.	Mangifera spp.	Rhizophora spp.	Wrightia religiosa	Eugenia cumini
17.	Peltophorum dasyrachis	Calamus spp.	Bambusa spp.	Shorea spp.
18.	Casuarina equisetifolia	Afzelia xylocarpa	Sapondias pinnata	Azadirachta indica siamensis
19.	Casuarina junghuhniana	Dalbergia oliveri	Tamarindus indica	Bambusa spp.
20.	Hopea ferrea	Alstonia scholaris	Acacia auriculiformis	Xylia xylocarpa
21.	Xylia xylocarpa	Wrightia tomentosa	Acacia mangium	Persea kurzii
22.	Leucaena leucocephala	Fagraea fragrans	Lagerstroemia tomentosa	Intsia palembanica
23.	Toona ciliata	Dalbergia cochinchinensis	Thyrsostachys siamensis	Pra Dong Leuat (sci. name unknown)
24.	Mimusops elegi	Melaleuca cajuputi	Alstonia spathulata	Hopea ferrea
25.	Sandoricum koetiape	Albizia lebbeck	Calamus spp.	Cassia siamea

The interest and demand for these findings has been expressed from many levels. Valuable side effects from the species prioritisation process have been:

i) liaison with private sector (difficult to reach for a government-based project!);
ii) establishment of new contacts;
iii) exchange of information and
iv) the discovery of bottlenecks in seed availability (supply) and in expression of seed and seedling needs.

From a regional perspective, Thailand is now in a position to compare and relate seed procurement and seed demand at a practical level to neighbouring countries. This could save duplicating efforts on minor species by co-ordination and making use of species already taken care of. For maintenance of gene conservation and biodiversity point, regional co-ordination may be even more needed. Further information and a full summary of the workshop results, including list of priority species, are available from the project.

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QUESTION AND ANSWER

David Lamb

I am interested in the list of species in the soil water conservation group. Can you comment on whether your species on top of the list share anything in common from those at the bottom in terms of watershed protection?

Anders Pedersen

I have not yet tried to analyse different species, or why they are ranked as such. However, I can forward the entire list for further analysis.