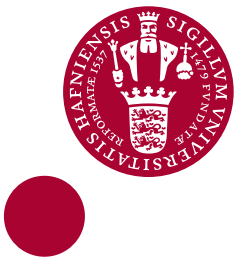

Conservation of valuable and endangered tree species in Cambodia 2001 - 2006 a case study

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Centre for Forest, Landscape and Planning, Denmark
Cambodia Tree Seed Project and
Forestry Administration, Cambodia

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Gene conservation stand of ***Xylia xylocarpa.***

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Preface

Natural forests of Cambodia represent major national assets in contributing to poverty reduction and sustainable livelihoods, national economic development, and biodiversity and environmental conservation. However, rapid degradation and loss of the resource base is resulting in diminishing access and low value forest products. Implicit for the future, is the erosion of genetic resources of many economically, and potentially valuable, indigenous tree species and a subsequent loss of quality planting material for use in tree plantings.

Within Cambodia, several indigenous tree species are listed by IUCN as vulnerable or endangered, and in particular, many distinct populations are threatened. The Royal Government of Cambodia has embarked on forest gene conservation involving the identified target species and their populations in a carefully planned network of designated and managed gene conservation areas, which in the future, will also serve as seed sources. To this end, the Cambodia Tree Seed Project funded through DANIDA, has been assisting the Forestry Administration since 2001, focussing on institutional strengthening and capacity building, achieving impressive results in a short period of operation, and in a newly emerging sector.

This case study documents the achievements in what is considered to be one of the few examples in the tropical part of the world, where the complete forest gene conservation process, from planning to implementation, has been successfully undertaken. It presents approaches taken and experiences gained from priority species identification, through the preparation of a forest gene conservation strategy and supportive legislation and regulations, implementation of conservation activities, to the initiation of a National Forest Gene Conservation Programme.

The case study was written as part of a collaborative partnership between the Forestry Administration (FA), Cambodia Tree Seed Project (CTSP), and *Forest & Landscape Denmark* (FLD). It is published within the FLD Development and Environment series and it is the hope, that the case study will inspire other countries to initiate gene conservation programmes.

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Acknowledgements

This publication stems from a collaborative agreement between the Forestry Administration, representing the Royal Government of Cambodia (RGC); the Cambodia Tree Seed Project (CTSP), funded through Danida; and Forest & Landscape Denmark (FLD).

Cambodia is one of the few countries in the tropics to have initiated a systematic forest gene conservation programme. In recognition of the achievements, and their value for other countries, this case study documents the approach adopted, experiences of implementation, the focus on training and raising awareness, and directions for institutionalisation.

Sincere thanks go to the authors, Mr. Soren Moestrup, Special Consultant, FLD, Mr. Arvid Sloth, Danida Technical Advisor, and Ms. Sarah Burgess, Consultant, for raising Cambodia's experiences in forest gene conservation to an international audience. Thanks are also due to staff of the Cambodia Tree Seed Project for their contributions, comments and suggestions, in particular, Mr. So Thea, Project Manager, and Mr. Uon Somol, Project Officer; and to Mr. Sok Srun, Administrative Officer, for his ongoing assistance to mapping and layout.

None of this could have been accomplished, of course, without the high level of commitment of these officers, advisors and consultants, working in a sometimes challenging, environment.

Abbreviations

APSARA	Authority for the Protection and Management of Angkor and the Region of Siem Reap
CBD	Convention on Bio Diversity
CFA	Community Forestry Agreement
CTSP	Cambodia Tree Seed Project
DANIDA	Danish Agency for International Development Assistance
DFSC	Danida Forest Seed Centre
FA	Forestry Administration
FLD	Forest & Landscape, Denmark
FMP	Forest Management Plan
FWSRI	Forest and Wildlife Science Research Institute
IPGRI	Internal Plant Genetic Research Institute
IUCN	International Union for Conservation of Nature
MAFF	Ministry of Agriculture, Forestry and Fishery
MoE	Ministry of Environment
NTFP	Non Timber Forest Products
RGC	Royal Government of Cambodia
US$	United States Dollar
WWF	World Wildlife Foundation

Contents

1 Introduction

Natural forest accounts for almost 60% of total land cover, according to official forestry statistics for Cambodia, but is under threat from a number of pressures including encroachment, over-logging, land conversion, and other human activities. However, a recent forest resource assessment by FAO (2005) indicates Cambodia to have lost more than a quarter of its remaining primary forest since 2000 (6.7% per year), and ranks the country third in the world for primary forest loss. Within this process, many indigenous species have been, and are continuing to be exploited and are listed as vulnerable or endangered. In particular, many distinct populations are threatened with extinction.

Whilst the forest of Cambodia may be disappearing faster than ever before, there is a recognised need for appropriate forest management to ensure sustainable development, guided by national policies and plans.

Forest gene conservation is fundamental to sustainable forest management. The Royal Government of Cambodia, through the Forestry Administration and Cambodia Tree Seed Project, supported by DANIDA, embarked on a forest gene conservation strategy in order to conserve the genetic diversity of useful and economically important tree species. A favoured method is to increase their use in tree planting activities, which will ease the pressure on natural populations and contribute to environmental conservation. A well-managed forest resource may contribute towards economic and social welfare, thus enhancing local and national development.

The National Forest Gene Conservation Strategy identifies and prioritises endangered tree species, defines conservation methods, defines the number of required conservation stands per species and their locations in the country, as well as management plans and protection measures required. Its implementation ensures that seed and planting material of desired tree species will be available, when a planting need arises in the country. And a planting need **will** arise, if not before, then when all the natural forest has gone!

Such a comprehensive and systematically prepared forest gene conservation programme has not been done in many tropical countries before. This case from Cambodia can serve as a guide for any country wanting to prepare and implement a forest gene conservation programme

The situation in Cambodia regarding the disappearance of the natural forest and the need for forest gene conservation is not unique - many other developing countries are in similar situations with a profound need for starting conservation of forest tree genes.

This report tries to document the process, the activities, the outcomes and the costs related to the forest gene conservation work done in Cambodia 2002-2006. This is in order to support other countries initiating forest gene conservation activities.

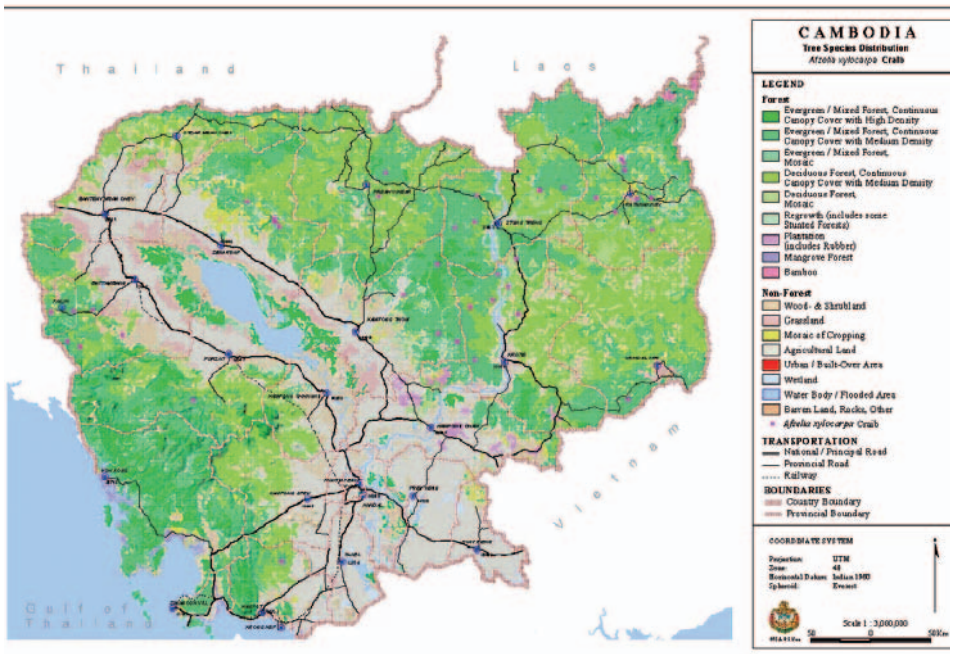
2 Planning approach for preparation of a national forest gene conservation programme

CTSP initiated the forest gene conservation activities in 2002 following the planning approach as outlined in Danida Forest Seed Centre (DFSC) 1997, Technical Note No.48: Planning National Programmes for Conservation of Forest Genetic Resources. The planning approach is elaborated further in FAO/IPGRI/DFSC, 2004, Volume I. Forest genetic resources conservation and management: Overview, concepts and some systematic approaches.

CTSP facilitated the following sequence of activities:

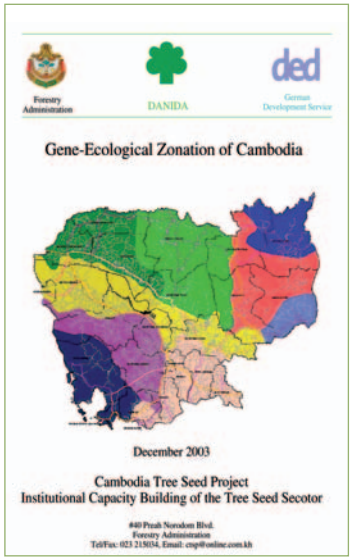
- Selection of priority species
- Assessment of their genetic variation
- Assessment of their conservation status
- Identification of conservation method
- Organisation and planning of conservation activities
- Preparation of management guidelines for the areas
- Preparation of management agreements with stakeholders
- Institutionalisation of the activities in the government structure

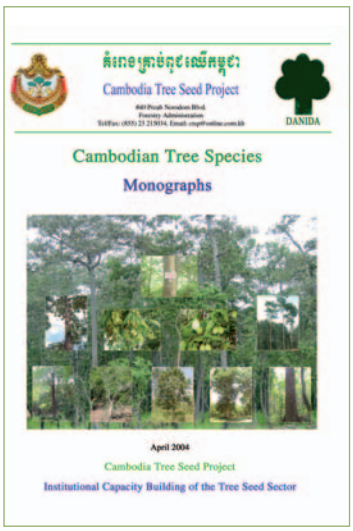
The products on this page were prepared as outcomes of the activities:



Species Distribution Map

The preparation and use of these outputs as well as training/awareness raising requirements are described in the following chapters.





3 Developing a gene ecological zonation for Cambodia

Information on the genetic variation of the species - within and between geographical areas, is important in establishing an effective network of populations of the species to be conserved. It is normally assumed that similarity of agro-ecological conditions (growth conditions) in a given geographical area implies similarity in genetic constitution of flora in the same geographical area. In other words the establishment of an agro-ecological map of Cambodia will be identical to the establishment of a gene ecological map of Cambodia.

Definition of Gene Ecological Zones:

> An area with uniform ecological conditions that produces distinctive phenotypic or genetic characteristics within a tree species

A gene ecological zone is an area that exhibits **uniform ecological conditions and limited degrees of gene flow between surrounding regions**. Each gene ecological zone should be circumscribed in a manner that reflects the genetic homogeneity of plant populations.

3.1 Preparation of the Gene Ecological Zonation Model

A gene ecological zonation system can be prepared as one common system for all species considered, groups of similar species, or single species. Factors mostly used for zonation are natural vegetation, topography, climate and soil, as well as natural barriers to pollen flow and seed dispersal.

In Cambodia the Gene Ecological Zonation System was created with a variety of environmental data-sets, including several that are based on records and interpolations from 123 meteorological stations within and around the country (i.e., averages and ranges in temperature, rainfall, and length of dry seasons). This information was then correlated with databases that describe the topography of Cambodia, the age and chemical composition of its soils, soil fertility, and the natural distribution of vegetation types. As it appeared that many of these data sets were much too detailed to use in the delineation of gene ecological zones, the Cambodia Tree Seed Project has chosen to emphasise information that is most directly relevant to the processes of natural selection in the context of plant populations. These include the following environmental factors:

- Annual rainfall (using 200 and 600 mm range classes)
- Period of dry months (< 40 mm rainfall/ per month over a 4-month period)

- Temperature of coldest month (<16.5° Centigrade)
- Geological distribution of basalt, sand-silt stone, alluvial deposits, gneiss and schist, and complex substrates
- Soil Fertility (low, medium and high)
- Vegetation and Land Use (agricultural lands, shrub land, deciduous forest, evergreen forest and inundated/mangrove forest)

In order to visualise these multivariate factors in a geographical context, each measurable environmental parameter, according to a biologically relevant interval, was presented on maps of Cambodia in the same scale.

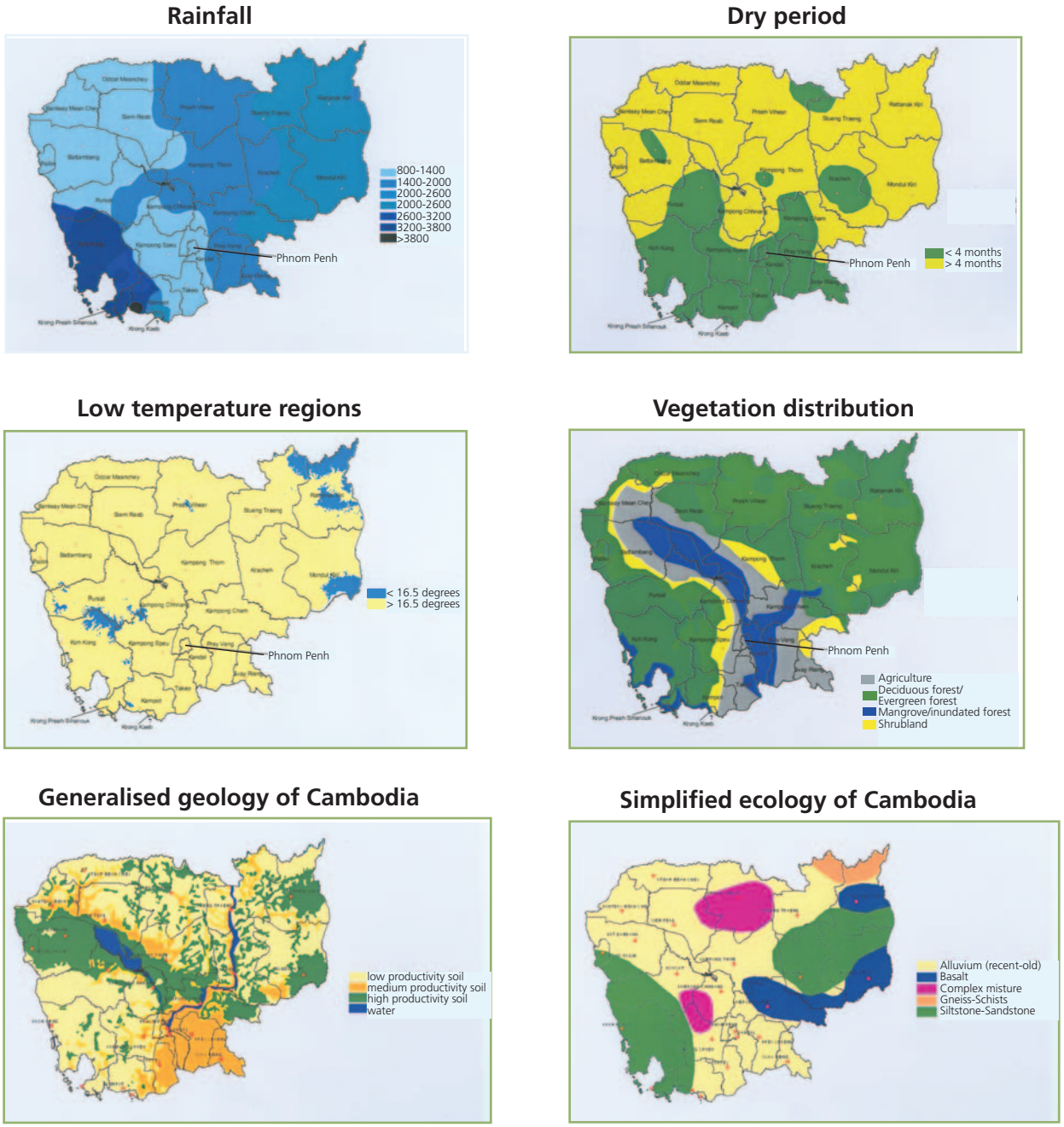


Figure 1. Data maps used for delineation of gene ecological zones.

These six simplified maps were overlaid electronically using the ArcExplorer software. A first draft could be drawn using computerised extrapolation. This draft was discussed among the most qualified people in Cambodia rep-

resenting the technical topics given by the six maps. These discussions led to some changes of the borders of the gene ecological zones. Relating computer extrapolation to empiric knowledge and experience is very important, as in the landscape there often exist physical features that the map will disregard, which the experienced technical officer will be aware of. After several computer extrapolations and discussions between the technical experts the final gene ecological map of Cambodia could be printed:

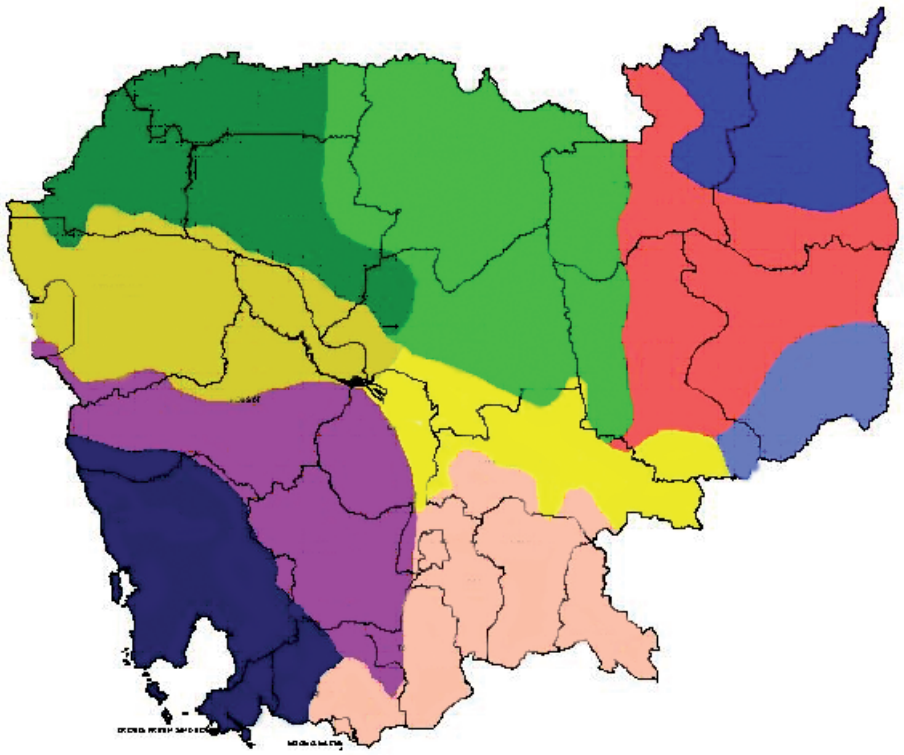


Figure 2. The final gene ecological map of Cambodia

The CTSP-report 'Gene Ecological Zonation of Cambodia' includes brief descriptions of the ten gene-ecological zones of Cambodia, including comments on the geographical, geological, climatic, and biological character of each zone. The descriptions include a listing of high priority tree species that occur in each zone and a summary of species distributions across gene ecozonal boundaries.

3.2 Use of the Gene Ecological Zonation Model

The gene ecological zonation model for Cambodia was developed in order to gain an overview of the genetic variation of forest tree species to be included in the Forest Gene Conservation Strategy prepared later. Also, it will serve as a practical guideline for seed and seedling transfer.

Based on the gene ecological zonation CTSP could ensure sufficient genetic variation of the species to be conserved by selecting conservation stands in appropriate ecological zones.

The system of gene ecological zonation and gene conservation stands can be used for many other purposes:

- Availability of seed
- Matching seed source to planting site
- Planning tree improvements activities
- Botanical studies
- Silvicultural 0-plots
- Ecological plots
- Phenological plots
- Hydrological plots
- Extension/education plots

The computer software (ArcExplorer) generates information about specific locations that can be selected using series of queries, and exported to Excel or visualised on a screen. Much of the information relates to maps, and can be accessed or printed out in this format.

Specific Costs for the preparation of the gene zonation

	US$
• Manpower, FA:	15 000
• Adviser process, meetings, technical facilitation	20 000
• Consultants:	30 000
• Utilities/meetings/data:	8 000
• Printing:	4 000
• CD-roms:	1 000
• Distribution:	1 000
Total	79 000

Information regarding annual average rainfall (classes 200mm/600mm/average), length of dry seasons (4 month intervals), minimum temperature (lower of higher than 16.5°C), soil fertility (low, medium and high fertility), geology (sand-siltstone, gneiss-schists, basalt, old/ new alluvium, complex mixture) and types of vegetation (agriculture land, shrub land, deciduous forest, evergreen forest, mangrove/inundated forest), as well as the number of inhabitants and size of the administrative area, can be studied at province, district and commune level.

There are a total of 8220 specified areas in the model.

4 The National Forest Gene Conservation Strategy

Before the gene ecological zonation was finalised, CTSP began preparation of the forest gene conservation strategy (2001). The strategy is based on the overriding principle 'conservation by use through a participatory approach'. This resulted in the identified conservation stands also being considered as potential seed stands. Mother trees were identified and marked in each conservation stand. When no tree planting takes place, no seed is needed and the stands will mostly function as conservation stands. When tree planting starts in Cambodia, seed can be collected from the same areas for direct use in nurseries, or to establish additional seed stands for larger scale seed production.

Tree species are best conserved within their natural habitat, but in some circumstances the natural forest cannot be protected. Therefore, it may be necessary to establish conservation stands outside their present distribution range.

Responsibility for forest management lies with the Ministry of Agriculture, Forests and Fisheries (MAFF), and the Ministry of Environment (MoE, for protected areas). MAFF/Department of Fisheries manages flooded forests. The implementation of the forest gene conservation strategy rests with MAFF.

The regulatory framework for the forest gene conservation strategy includes: Forest Policy Statement (2002), Forest Sectoral Plan (2001), Forestry Law (2002) and Forest Concession Sub-Decree (1999).

4.1 Preparation of the Gene Conservation Strategy

It was decided that the strategy should be developed in collaboration between stakeholders to better reflect the national development goals in relation to bio diversity, environmental, and socio-economic issues.

The first meeting on the Forest Gene Conservation Strategy was held in September 2001. It established a multi-disciplinary working group to develop the strategy, and identified future steps for action.

All members of the Working Group were officially appointed by RGC:

- MAFF: Forestry Administration/Cambodia Tree Seed Project (6)
- Danida forestry advisor (1)
- Ministry of Health (medicinal plants) (1)
- Ministry of Environment (2)

- Royal University of Phnom Penh (2)
- Royal University of Agriculture (1)
- IUCN (1)
- WWF (1)
- Concern Worldwide (1)
- Danida Forest Seed Centre, as consultant (1)

4.2 Selection of priority species

Based on available information, potential uses, and IUCN conservation criteria, the working group identified 34 indigenous species as endangered or threatened. The 34 species were ranked and allocated priority status for forest gene conservation.

Table 1. Priority tree species for gene conservation

Nº	Priority Tree Species	Assessed Level of Threat
1	*Dalbergia oliveri* Gamble ex Prain	5
2	*Aquilaria crassna* Pierre	5
3	*Dalbergia cochinchinensis* Pierre	5
4	*Gardenia angkorensis* Pit.	5
5	*Afzelia xylocarpa* (Kruz.) Craib	5
6	*Pterocarpus macrocarpus* Kurz.	5
7	*Dysoxylum loureiri* Pierre	5
8	*Diospyros crumenata* Thwaites	5
9	*Lasianthus kamputensis* Pierre ex Pit.	5
10	*Diospyros bejaudii* Lecomte	4
11	*Fagraea fragrans* Roxb.	4
12	*Dasymaschalon lomentaceum* Finet & Gagnep	4
13	*Shorea cochinchinensis* Pierre	4
14	*Hopea helferi* Brandis	4
15	*Pinus merkusii* Jungh & de Vriese	4
16	*Garcinia hanburyi* Hook.f.	4
17	*Cinnamomum cambodianum* Lecomte	4
18	*Sterculia lychnophora* Hance	4
19	*Cananga latifolia* Finet & Gagnep.	4
20	*Albizia lebbeck* (L.) Benth.	4
21	*Hopea odorata* Roxb.	4
22	*Tarrietia javanica* Blume	3
23	*Diospyros pilosanthera* Blanco	3
24	*Hopea ferrea* Lanessan	3
25	*Xylia dolabriformis* Benth.	3
26	*Fibraurea tinctoria* Lour.	3
27	*Shorea hypochra* Hance	3
28	*Shorea vulgaris* Pierre ex Laness.	3
29	*Diospyros nitida* Merr.	3
30	*Cassia garretiana* Craib	2
31	*Dipterocarpus alatus* Roxb. G. Don	2
32	*Anisoptera costata* Korth.	2
33	*Melanorrhoea laccifera* Pierre	2
34	*Artocarpus chaplasha* Roxb.	1

Information on the distribution, biology and protection status of a species is essential to define effective conservation measures. Such information was not readily available in Cambodia and the working group initiated a com-

prehensive literature search, workshops, and many working sessions with selected experts to collect empiric data and experience which was analysed and compiled, for each priority species. Information is available on:

- Distribution and habitat
- Ecological zonation
- Botanical description
- Flowering and fruiting habit
- Fruit and seed description
- Seed handling
- Sowing and germination
- Current situation including conservation status based on local information
- Uses
- IUCN classification

Based on this information, monographs for the 21 priority species and digitized distribution maps were prepared.

Information on Cambodian tree species is limited. Available documentation has been compiled into monographs for each of the 21 priority species.

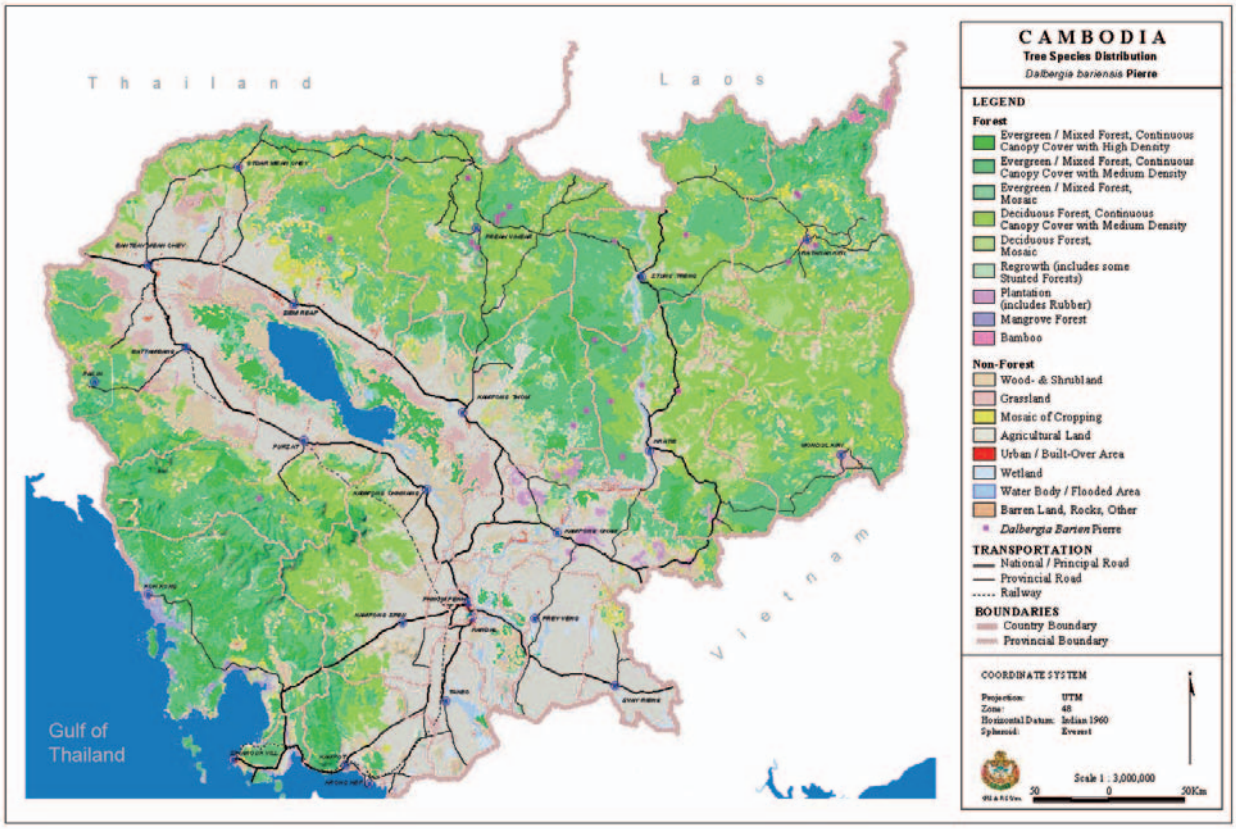


Figure 3. Distribution map for Dalbergia oliveri.

4.3 Selection of conservation method.

Conservation of forest genetic resources can be described as evolutionary or dynamic when the genetic composition of tree species changes over time, allowing for adaptation to changing environmental conditions. Static conservation, on the other hand, is used to maintain specific genetic compositions.

In-situ conservation is conducted at the site of origin and is the principle method for the conservation of forest genetic resources, whereas *ex-situ* conservation takes place outside the native habitats of the populations. *Ex-situ* is a more expensive approach, sometimes necessary in the case of rapid forest loss and degradation. *Ex-situ* activities generally complement *in-situ* conservation.

The working group decided, based on an analysis of pros and cons, that *in-situ* conservation should be the primary conservation method, supported by *ex-situ* conservation when needed.

Within the natural forests of Cambodia, in-situ conservation is the preferred option, to be complemented, in some circumstances, by ex-situ conservation.

4.4 Identification of the conservation stands

The number of stands to be conserved and their geographical distribution are identified through a comparison of gene ecological zones with the species conservation status. The identification process may follow the principles below (DFSC, 1997).

1. Overlay the gene ecological zones with:

    - Past and present geographical distribution of the species
    - Occurrence of the species in ongoing planting programmes and pro tected areas
    - Location of provenances/populations of proven value

2. Consider factors affecting genetic variation, conservation status, and the conservation investment requirements

    - Type of distribution area
    - Reproduction and dispersal biology
    - Differences between past and present distribution
    - Size and geographical location of past and ongoing planting pro grammes, and origin of the planting material used
    - Possible effects of selective logging/felling in each zone

- Occurrence of populations in protected areas
- Degree of threats
- Land tenure and associated options and costs

3. Decide on appropriate geographical distribution and number of areas per zone to be sampled for conservation of genetic resources of selected species.

The number of populations selected for conservation in each zone should generally be higher for out breeding species with scattered distribution, insect pollination, and limited seed dispersal, assuming larger genetic variation between populations than for species with continuous distribution, wind pollination and wide seed dispersal. Factors to consider in stand selection include (FAO/IPGRI/DFSC, 2004):

- Abundance of target species and presence of key associated species
- Low level of risk/threats (including secure land tenure)
- Committed and adequately staffed management agency
- Support from local people, owners and users of the area
- Compact shape of area and presence of forest buffer zone
- Possible opportunities to conserve other priority species
- A minimum of 2 stands in each gene ecological zone.

CTSP began to establish gene conservation/seed stands early in 2004. The first stands were selected based on accessibility and level of knowledge available about the species. By the end of 2005, 35 stands of 20 high value tree species from the natural forest had been established, at 16 different locations and within 6 of the 10 gene ecological zones (ref. table 2 on page 22). The sizes of the stands vary from 4 to 117 hectares.

Specific costs for the preparation of the Forest Gene Conservation Strategy

	US$
• Manpower, FA:	10 000
• Adviser: process facilitation, technical co-ordination:	15 000
• Consultants:	30 000
• Utilities/data/seminars:	10 000
• Printing:	5 000
• CD-roms:	3 000
• Distribution:	2 000
Total Costs	75 000

5 Establishment and protection of the conservation stands

Forest gene conservation stands are established at the locations illustrated in figure. 4 below, mapped according to their GPS points. They are referred to throughout this section by the name of the nearest village, with further key information presented in Table 2 on page 22.

All except one of these stands are established *in-situ* within the processes described below. Forest gene conservation at Kbal Chhay is *ex-situ*, and is addressed in Section 5.5.

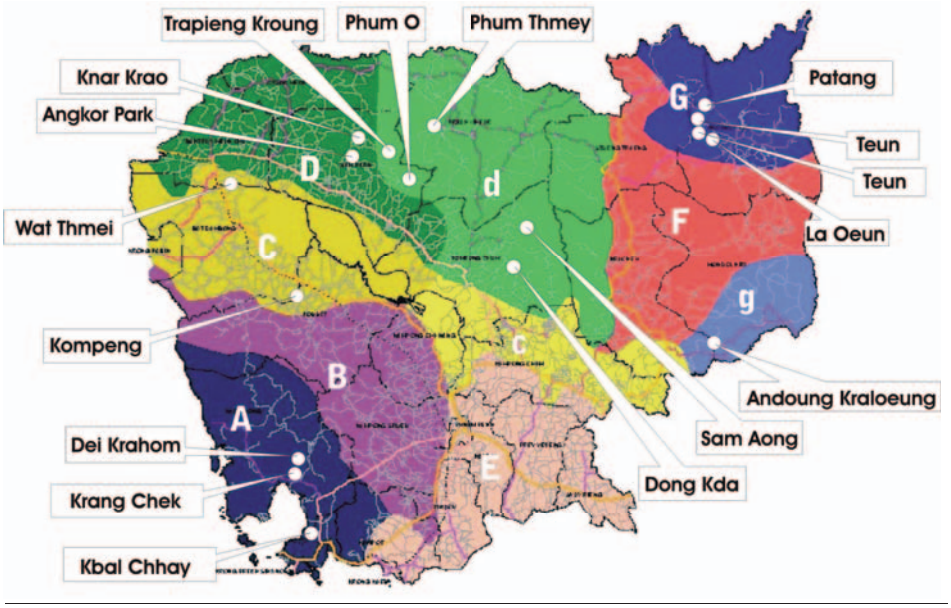


Figure 4. Location of forest gene conservation areas in Cambodia.

5.1 The participatory approach

Local people are often those best placed to manage local resources, and participatory approaches to natural resource management have a potential to contribute both to poverty reduction towards sustainable livelihoods, and sustainable forest management. The Forest Gene Conservation Strategy identifies participatory approaches as essential for *in-situ* activities through the integration of conservation and local development efforts.

Participatory approaches to forest gene conservation are being explored, in several locations, to assess their potential, and to secure access to resources contained therein, for respective local people. Local knowledge of forest resources is demonstrated during field visits to forest gene conservation areas with community representatives, which in Krang Chek, often result in the collection of various fruits, vegetables, and vines, with detailed explanations of their properties and uses as food or medicines.

Such approaches are clearly not suitable in all cases. By their very nature, remaining stands of endangered tree species are located in remote areas of natural forests, and hence, far, and not easily accessible from communities. The distance between the community and the forest gene conservation area, however, is not necessarily a good indicator of their willingness to travel to the site for conservation purposes. For example, villagers are currently managing forest gene conservation areas at distances of 4 km (Kompeng), 8 km (Phum O), 5 km (Dei Krahom). Table 2, on page 22, indicates that others live in closer proximity to forest gene conservation areas (Phum Thmei 1 km, Patang 1 km, Trapieng Kroung 1.5 km) but are reluctant to participate in their management. Motivations for participation are further explored below.

Motivation

Participatory approaches to forest gene conservation can only be sustained if the participants themselves perceive clear benefits for their efforts. Experiences to date suggest that motivation for participation be linked to ownership, immediate economic benefit, and cultural/spiritual significance. Lack of incentive is often cited as the main reason for rural people not to involve themselves in forest gene conservation, and whilst sometimes linked to a perception of forest resource abundance, it is more often related to monetary incentive. This can be illustrated drawing on the experiences of project collaboration with the World Food Programme (WFP), which provided food support to community members in Sam Aong in return for their participation in the management of a forest gene conservation stand. Members were organised into groups of 5 people each which patrolled on a 10-day rotation basis. Following re-strategising within WFP, this area was not longer considered a priority, and the support lost. Whilst the community members still access the conservation area and surrounding forest to collect forest products for sale, they will also report any illicit activities to local foresters, but are no longer prepared to conduct regular patrols of the conservation area. The management of this area, within a former forest concession, has subsequently been re-allocated to the Forestry Administration, with, on average, four monitoring trips each month.

Statue for Protection of Tree Species in the Forest Gene Conservation Stands in Kompeng

Wherever possible, forest gene conservation areas are established within broader community forest settings, and integrated into ongoing community development activities. Community forestry provides a mechanism for formal recognition of rural people as resource managers, offers contributions to sustainable livelihoods through increased income from the sale of forest products and improved food security, and allows for wider buffers of protection for the forest gene conservation stands. In Kompeng, the hill upon which the forest gene conservation stand is located is of great significance to the local population as a site of many historical battles, and therefore, a potential tourist area.

Table 2. Forest gene conservation areas and management types

Forest GCA No.	Species	Area (ha)	Number of Mother Trees Marked	Year of Establishment	Gene Ecological Zone	Distance to Nearest Village	Management Type	Management Agreement
1	*Dalbergia bariensis*	12.5	78	2001	d	1km Phum Thmey	FA Triage	Prakas
2	*Sindora cochinchinensis*	117	97	2000	d	5km Sam Aong	FA Triage	Prakas
3	*Tarrietia javanica*	117	39					
4	*Shorea hypochra*	117	22					
5	*Shorea guiso*	117	19					
6	*Dipterocarpus costatus*	117	396					
7	*Anisoptera glabra*	117	323					
8	*Pterocarpus macrocarpus*	20	83	2002	d	8km Phum O	Participatory	Prakas and CFA
9	*Azadirachta indica*	50	90		C	In Wat Thmei village	Private	Verbal
10	*Pinus merkusii*	104	72	2002	d	20km Dong Kda	FA Triage	None
11	*Fagraea fragrans*	104	72					
12	*Dalbergia bariensis*	21	21	2002	G	1.5km Teun	FA Triage	Prakas
13	*Pterocarpus macrocarpus*	21	20					
14	*Xylia xylocarpa*	21	22					
15	*Afzelia xylocarpa*	18	27	2002	G	1km Patang	FA Triage	Prakas
16	*Dalbergia bariensis*	18	41					
17	*Pterocarpus macrocarpus*	18	14					
18	*Afzelia xylocarpa*	20	26	2002	G	1.5km Teun	FA Triage	Prakas
19	*Dalbergia bariensis*	20	17					
20	*Sindora cochinchinensis*	20	7					
21	*Hopea ferrea*	30	88	2002	G	4km La Oeun	FA Triage	Prakas
22	*Dalbergia cochinchinensis*	50	121	2002	D	6km Khnar Krao	FA Triage	None
23	*Dipterocarpus alatus*	20	43	2001	D	Angkor Park	APSARA	Verbal
24	*Pterocarpus macrocarpus*	100	160	2004	d	1.5km Trapieng Kroung	FA Triage	None
25	*Xylia xylocarpa*	100	141					
26	*Sindora cochinchinensis*	100	87					
27	*Haldinia cordifolia*	100	62					
28	*Toona sureni*	4	26	2004	g	8km Andoung Kraloeung	FA Triage	None
29	*Scaphium macropodum*	10	78	2004	A	2hrs Krang Chek	Participatory	Towards CFA
30	*Sindora cochinchinensis*	18.5	37	2005	A	5km Dei Krahom (Krang Chek)	Participatory	Towards CFA
31	*Dalbergia cochinchinensis*	18.5	26					
32	*Dalbergia bariensis*	18.5	37					
33	*Pterocarpus macrocarpus*	18.5	33					
34	*Sindora cochinchinensis*	96	45	2005	C	4km Kompeng	Participatory	Towards CFA
35	*Dalbergia bariensis*	96	69					

(Prakas: Ministerial Declaration, Triage: Lowest Level of Forestry Administration)

Strong relationships between stakeholders are fundamental in participatory approaches. Recent discussions with two groups of people living in close proximity to a forest gene conservation area illustrates this, as both groups fall under the jurisdiction of the same forestry officials. One group described their relationship as very good, as the forestry officials are supportive of its community forestry activities. The other group told a very different story, highlighting worsening relations, due the perception of them by local authorities as encroaching into the forest area.

Valuation

Forest gene conservation areas are managed to offer a diversity of forest products and services, but this is not sufficient to sustain participatory management. Full environmental valuations indicate the value of biodiversity to often outweigh financial values of timber and non-timber forest products, thereby validating forest conservation as the most economic management option. However, whilst there are mechanisms in place to ensure that monetary benefits of managing and protecting these resources accrue to the farmer/tree manager, there remains little incentive for forest gene conservation in itself.

Angkor Park was internationally recognised as a World Heritage Site in 1995, and is protected and managed by APSARA (authority for the protection and management of Angkor and the region of Siem Reap), which also provides mechanisms for national and international collaboration in activities under its jurisdiction. A small area within the park has been designated for the conservation of *Dipterocarpus alatus*, which is probably afforded the best protection of all forest gene conservation areas established to date. Its existence, within the wider setting of Angkor Park, is clearly valued highly in economic terms, illustrated by the ever increasing number of visitors willing to pay entrance fees, and consequently, the increasing annual revenue that can be used for ongoing and future conservation.

Local people are often those best placed to manage local resources. However, participatory approaches to forest gene conservation can only be sustained if the participants themselves perceive clear benefits for their efforts.

5.2 The establishment process

Local levels of Forestry Administration are asked to identify potential forest gene conservation areas based on criteria defined within the Forest Gene Conservation Strategy. Following this, the proposed sites are further assessed by members of the Cambodia Tree Seed Project, and discussions are begun with communities that are situated close by.

An exception to this was the establishment of the forest gene conservation area in Krang Chek, in which project staff members were invited to visit a community forest with representatives of its management committee,

supporting organisation (American Friends Service Committee), and local forestry officials. Here, the establishment of the forest gene conservation areas occurred simultaneously to the preparations towards a community forestry agreement. This meant that the conservation area was planned into the community forest from the outset, and provides a good example of establishment. It followed the following process:

- Preliminary visit to assess and discuss the potential for forest gene conservation with community representatives and forestry officials
- Participatory land use planning, as part of the community forestry development identified and set aside special management areas for two forest gene conservation areas covering five species
- Establishment of the forest gene conservation areas, with community representatives and forestry officials, using GPS to map the boundaries and red paint to physically demarcate the site. Within the site, lines were marked out, and each line assessed for good potential mother trees of the identified species, which were allocated a numbered metal tag, and recorded on a data collection sheet.
- The forest gene conservation areas were registered, GPS data and tree information entered into the database within the project office, and copies returned to the community forestry committee.
- The forest gene conservation areas were mapped and addressed within the community forestry management planning process.

In the case that there are no communities within the immediate vicinity or no interest demonstrated in forest gene conservation, sites are established under the management of decentralised levels of Forestry Administration.

Mother tree marked and tagged

Registration on to data collection sheets

Current status

Thirty-five forest gene conservation stands, amounting to a total area of 691 hectares, comprising 20 endangered tree species (including 6 priority species) have been established to date. Five species are conserved in more than one gene ecological zone, whilst other priority species are not yet conserved anywhere. To date, and as illustrated in Table 2, on page 22, the majority of forest gene conservation areas fall within D/d zones, followed by G/g zones, representing those areas with the best remaining forest stands.

5.3 Management of the conservation stands

In consideration of the remoteness of many potential forest gene conservation stands, two options for their management are adopted within Cambodia, although both require the same level of detailed stand management plan.

- Participatory approaches, described in detail above
- Management by the Forestry Administration, where participatory approaches are not feasible.

Structure, roles and responsibilities

Optimal conservation management draws on the strengths, whilst minimising the weaknesses of, the range of different stakeholders, which could include the Forestry Administration (central and local levels), and other local authorities, communities, supporting organisations, the private sector, and APSARA, as outlined in Table 3.

Table 3. Responsibilities of different stakeholders

Stakeholder	Responsibilities
Forestry Administration	Identification of potential forest gene conservation areas Technical support to establishment, management planning, implementation and monitoring Awareness raising Develop appropriate supportive legislation and regulations Direct management, where participatory methods are not feasible
Community	Forest gene conservation Evaluation and monitoring
Supporting oorganisations	Mobilisation, organisation Technical expertise and assistance Training
Commune Council	Integration of forest gene conservation into commune development planning Liaison with Forestry Administration and supporting organisations for technical and financial support
Private sector	Conservation of species within agricultural landscapes
APSARA	Conservation of species within Angkor Park and the region of Siem Reap

Current management approaches

As indicted above, a number of approaches to forest gene conservation are being piloted, and are presented in Table 4 on the following page. Each one requires a slightly different type of agreement as illustrated.

Table 4. Types of management agreements

Type of management	Type of area	Management incentive	Management agreement	No. of FGC areas
Participatory	Within community area	Immediate economic benefit Cultural significance	Community for. agreements, Ministerial declarations	8
Private	On agricultural land	Wide range of tree products	Verbal	1
Forestry Administration	Within natural forest, but: remote from communities, or communities not interested	Part of mandate	Ministerial declarations	25
Protection authority	Within World Heritage Site	Conservation Cultural significance Global significance Tourism	None, APSARA has sole authority	1

Stand management plans

Each forest gene conservation area should have its own management plan, as outlined in the Forest Gene Conservation Strategy, ideally as a component of a broader forest, protected area, or community forestry management plan, and at a minimum should contain:

- Basic information, such as maps, boundaries, tenure status, managers, history, environmental characteristics
- Reference information, including inventories, census and ecological/genetic studies
- Description of roles, responsibilities and rights of all involved in the management and use of the forest gene conservation area and its resources
- Work plans and budgets for management and monitoring
- Assessment of potential risks and threats and contingency plans to deal with these

The project is working towards this, but currently only basic information is available.

Threats

Some forest gene conservation areas are under threat from encroachment (increasing population searching for land, agricultural conversion, military development, land speculators), and by illegal logging of the high value timber to be found there, neither of which can effectively be addressed by local populations. Areas under highest threat, therefore, are likely to be those with higher population density, or proximity to good roads. These areas include Trapieng Kroung, Knar Krao, and Sam Aong. Even where community management appears assured, fear is expressed that the community will be powerless to act against powerful elites (business, or individuals), a common risk in Cambodia.

In general, forest gene conservation areas are considered to be fairly safe by their managers, although the surrounding forest is under higher pressure. At a local level, people in Sam Aong use the natural forest, but avoid the forest gene conservation areas as they are aware of their status. However, there was no consideration of conservation measures for the natural forest due to an abundance of resources.

Land use decisions, especially in relation to agricultural concessions, taken externally to forest gene conservation activities could negatively affect those areas. However, to the extent possible, protection agreements have been reached for the forest gene conservation areas, but to varying levels. These are further outlined, with examples, in Section 5.4 below.

5.4 Management agreements

As indicated in Table 4, on page 26, the type of management agreement differs according to the type of management. Whilst a number of agreements have been formalised, some are still in process, but are not necessary in all cases. Examples of agreements reached can be found in Appendix 3.

Ministerial declarations

Signed by the Minister for Agriculture, Forests and Fisheries, ministerial declarations provide recognition and protection status for forest gene conservation areas. They are of permanent validity that can be over-ridden only by new ministerial declarations affecting the same area that must refer to existing protection measures. They are at a higher level within the legislative hierarchy than community forestry agreements.

Community forestry agreements

The Community Forestry Sub-Decree determines rules for the establishment, management and use of community forests in providing official recognition to communities as managers of the forest resources. Of relevance for forest gene conservation, its objectives include:

- To establish procedures to enable communities to manage, use and benefit from forest resources, to preserve their culture, tradition and improve their livelihoods
- To provide an effective means for a CF community to participate in the reforestation, rehabilitation and conservation of natural resources, forest and wildlife

Community forestry agreements are written agreements between communities and the Forestry Administration that grant and protect the community's rights within any specific area to access, use manage, protect and benefit from forest resources in a sustainable manner. They are effective for 15 years from the date of approval, but are renewable. Once such an agreement is reached, forest gene conservation areas can be specifically addressed within the Community Forestry Management Plan.

To date, no community forestry agreements have been formulated within Cambodia, as guidelines for their development have only recently been approved. However, a number of community forests have been informally established, and are in the process of submitting applications, and preparing management plans. At Krang Chek and Dei Krahom, 5 forest gene conservation stands are identified and mapped within the community forestry management plan, and the community is working with FA and CTSP to develop special management procedures.

Mapping the forest gene conservation area

Community forestry management planning

Verbal agreements

Written agreements are relevant only for areas within the jurisdiction of the Forestry Administration. Within other areas, for example, in the privately owned agricultural plots within Wat Thmei village, verbal agreements were made with individual farmers, when their trees were registered. Discussions held during the establishment of the forest gene conservation area were documented as minutes.

5.5 *Ex-Situ* conservation

In-situ is the preferred option for forest gene conservation, where it is possible to ensure sufficiently high protection of the induvidual conservstion areas/ stands. When protection is not possible in the natural forest, *ex-situ* conservation can be considered. *Ex-situ* conservation is often combined with forest tree improvement work.

Kbal Chhay Protected Watershed (see figure 4) was selected as an appropriate *ex-situ* cum tree improvement site due to its official conservation status (through Sub Decree). Three types of activities are ongoing:

- Seed orchards for 7 species
- Provenance trials for 4 species
- Species elimination trials for 21 species

The individual plots are regularly measured and the data recorded within a computerised database. Detailed analysis of the data will be done when sufficient data sets have been recorded.

More trial sites in other ecological sites will be identified in the near future. Provenance trials are also being conducted at the Royal University of Agriculture in Phnom Penh.

6 Capacity building, training and awareness raising

Forest gene conservation involves numerous disciplines, including management, participatory approaches, genetic knowledge, analytical knowledge, GIS-tools, biological and silvicultural knowledge, analysis, planning and evaluation. In short, forest gene conservation, just like other areas of natural resource management, poses complex challenges. Naturally, such a cross-disciplinary activity highlights the gap in capacity at present compared to what is required to prepare a cost-efficient forest gene conservation programme.

The Cambodia Tree Seed Project was faced with the fact that the capacity for forest gene conservation had to be built from the very beginning, not only technically, but also institutionally, managerially and financially. Capacity building has, therefore, been the central element of the Cambodia Tree Seed Project, taking the shape of training courses, long/short term studies, on the job training, coaching, feed-back sessions, following up, etc.

A range of approaches has been adopted and include classroom sessions, learning by doing, coaching, study tours/field visits, workshops and seminars, within various settings (national, regional, international) and therefore, using Khmer in some cases and English in others. Capacity building has always targeted specific and pre-assessed learning levels i.e. »skills«, »knowledge« and/or »attitude« and the approach has been much built on values, concepts and beliefs.

Training activities undertaken may be divided into the following categories:

A: specific technical training courses as, for example, forest gene conservation methodologies, seed procurement, tree improvement, reproduction biology, seed collection and treatment, tree climbing, gene conservation stand establishment, gene conservation stand management, ecological zonation, domestication of indigenous species, tree planting, nursery establishment, identification of priority species, forest gene resource conservation, seed testing, seed certification course, rehabilitation of degraded stands, marketing of non timber forest products, training in provenance trials.

B: courses of general character as, for example, use of GPS/GIS tools, word processing, spreadsheet and data base programmes, training needs assessment, use of internet, web page design, participatory land use planning, participatory rural appraisals, research experimental designs, accounting, extension training, economic valuation, monitoring and evaluation, English language.

C: attitudinal, management courses, and policy formulation as, for example, critical thinking, general management, project management and evaluation, project formulation, HRD courses, extension training, training of trainers, conflict resolution, management of tree seed programmes, policy support and development.

Table 5 (below) presents the number of participants in different types of training courses and demonstrates the shift towards other target groups as capacity within counterpart and national level groups developed.

Table 5. Participants in training events

Year	Workshops, Study tours, Specialist and general courses	No. of Participants	Target Groups			
			Forestry Administration	National	Provincial staff	Other stake-holders
1999	International	2	X	X		
	National	0	X	X	X	
2000	International	9	X	X	X	
	National	117	X	X	X	
2001	International	18	X		X	
	National	131	X	X	X	
2002	International	26	X	X		
	National	446	X	X	X	X
2003	International	32	X		X	X
	National	636	X	X	X	X
2004	International	17	X	X		
	National	267	X	X	X	X
2005	International	32	X	X	X	X
	National	636	X	X	X	X
Total	International	113				
	National	1853				

The impact may be summarised as follows:

⇒ Core staff and 50-75 other selected field staff equipped with significant technical skills and knowledge, and in addition, some significant attitudinal changes in favour of participatory approaches and initiatives coupled with an ability to obtain further knowledge.

⇒ A far reach for awareness of the importance and the value of indigenous tree species and the importance of conserving their populations before they become too eroded.

⇒ A far reach for technical knowledge to all levels of the Forestry Administration, community members, NGOs, the armed forces and the private sector.

⇒ Upgraded teaching skills and knowledge at the Royal University of Phnom Penh, Royal University Agriculture and Preak Leap National School of Agriculture, for lectures ensuring that knowledge of forest gene conservation is obtained by all graduates.

The massive training offered has enabled staff of the Forestry Administration and other key stakeholders to progress within respective fields more openly and much more confidently.

7 Institutionalisation of forest gene conservation activities

CTSP will terminate at the end of June 2006 and to ensure sustainability and continuation of its activities in general and the forest gene resource activities in particular, institutionalisation at central level of FA as well as field level is needed.

Institutionalisation at central level of FA: Most of the FA-staff working in the CTSP, including the daily manager, are assigned from the Forest and Wildlife Science Research Institute (FWSRI) within FA, see figure 5, on page 32. When CTSP terminates these key staff members will return to this institute. From an institutionalisation and sustainability point of view this is important, and it is equally important that all the equipment from the small CTSP-seed laboratory will follow the staff and the same goes for computers, library, registers, all published material, etc. The home page, *www.treeseedfa.org* should be kept open and updated. This in it self will not necessarily ensure sufficient financial means to continue the CTSP-activities at the present level, but it will ensure that the very well developed knowledge base related to use and conservation of forest genetic resources will be kept as a unit/group within FA. The group will be nested in the FWSRI-office.

To continue the forest gene conservation activities at a minimum level the following has to be done:

i) maintain the stands already established, through maintenance of established management agreements;
ii) establish additional stands so that a minimum of 2 stands of each of the 21 priority species

exist in the two gene ecological zones holding the major part of the natural distribution area for the species in question. This set-up requires up to a total of 84 conservation stands. A minimum conservation programme can not establish the required number of stands. Establishment of three stands per year is regarded as being the minimum in order to have an active conservation programme.

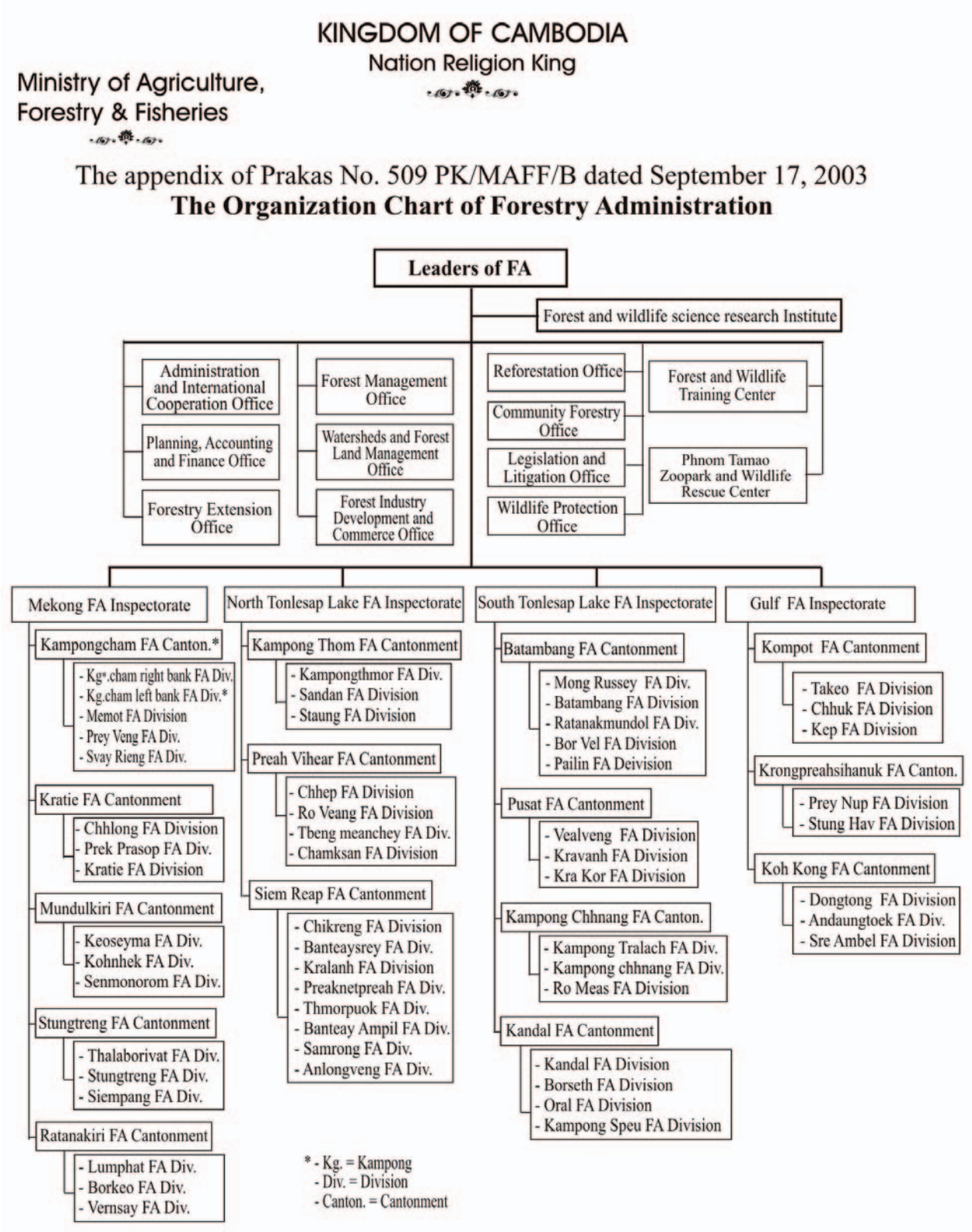


Figure 5. Organogramme of Forest Administration (FA 2004)

Annual costs for continuing a minimum forest gene conservation programme

	US$
• Maintenance of existing conservation stands (35):	2 000
• Establishment of additional stands (15), 3 per year:	10 000
• Administration:	3 000
• Information/extension service:	3 000
• Publications:	3 000
Total Costs	21 000

The total government budget for FA (central and de-centralised parts) for 2005 amounts to US$2.3 million. Considering its size, it is not possible to suggest an institutional setting within FA which will ensure the financial means needed to continue forest gene resource conservation activities at an appropriate minimum level.

In order to ensure best possible sustainability and continuation of the present CTSP-activities within FA, the CTSP-staff assigned from the Forest and Wildlife Science Research Institute (FWSRI) shall return to this institute when CTSP terminates mid 2006. Other staff should follow to maintain a coherent active resource base. All seed lab. equipment, computers, registers, library, published material, etc., shall follow the former CTSP-staff to FWSRI. It is also important to keep the CTSP home page (*www.treeseedfa.org*) active after mid 2006.

Institutionalisation at field level of FA: Following the Independent Forestry Sector Review of 2004, and in line with the Forest Law (2002) and the Declaration on the Organisation and Functioning of Forestry Administration (2004), the Forest Management Office is preparing Forest Management Plans (FMP) at division level in the FA-set up. This process includes the preparation of a guideline to be used by the division offices, which will be ready for use by the end of 2005.

The FMPs will include management guidelines for all land under control of FA (approximately 40% of the total land area of Cambodia and 67% of the forest area), including community forests, concession forests, FA-managed forest, protected forest areas, reserved forest areas, and non-forest production areas.

Almost all the forest gene conservation areas established by CTSP are in land areas controlled by FA. A possible way to ensure continued management and protection of these areas and make room for establishment of additional areas, is to ensure forest gene conservation activities and seed source establishment are sufficiently covered by the guidelines for preparation of FMPs. CTSP has provided inputs to the preparation of the guidelines. Future FMPs will include descriptions on how forest gene conservation/seed source activities will be part of common forest management practices for all areas under control of FA.

This model for institutionalisation of forest gene conservation activities at local level, within the FA-structure, will not necessarily ensure that sufficient financial means will be available to continue the activities at the present level. However, it will ensure that conservation activities become part of common forestry management practice in the forest areas under FA-control.

In order to ensure continued management and protection of the established forest gene conservation areas/seed sources, and to make room for establishment of additional areas, Forestry Administration will ensure, that major aspects of forest gene conservation are included in the guidelines for preparation of forest management plans at division level.

8 Discussion and future prospects

RGC has done an outstanding job regarding conservation of forest gene resources for future use. The conservation programme is prepared according to high systematic and technical standards. The conservation programme is not yet completed, there are still a number of species to be conserved and a good number of conservation stands to be established, - *in-situ* as well as *ex-situ*.

The Forestry Administration in Cambodia is fully aware of the importance of continuing the conservation programme and in the future the conservation programme will be maintained and expanded to include more of the highly endangered tree species from the natural forest of Cambodia. The Forest and Wildlife Science Research Institute under the Forestry Administration will be responsible for the conservation programme. It is recognised and appreciated, that the RGC will not be in a position to provide the full financial input needed to develop and to obtain the full benefits from the conservation programme.

If the conservation programme should be continued and maintained in an optimal way, it is important that the donor community realises and accepts their responsibility and supports the programme not only verbally, but also financially. The support needed is little, but the future benefits will be tremendously large.

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Annex 1

Example of Forest Gene Conservation Area Registration Sheet
Cambodia Tree Seed Project

(A) SEED SOURCE INFORMATION SHEET

a) Species Information **Date of assessment:** *31/03/05*

Seed source reference no. (one letter and three digits): .....
Gene Ecological zone: C
Provenance name: .....Origin: .....
Species (botanical):*Dal bariensis* Common name: *Neang Noun* Species code:
Seed source for other species (indicate seed source no.)

b) Location description

Seed source location:
Province *Pursath* District: *Phnom Kror Van* Commune: *Prorgnil*
Village: *Kompeng*
Name of Map and sheet no: *5733 U.T.M*……..
UTM coordinates :Starting point :*03 74 329, 13 70 194*.Ending point: *03 74 163,13 69 804*
Geographical coordinates: Latitude:.....N, Longitude:.....E,
Altitude:.....m.a.s.l

c) Seed source classification

☐ Unclassified, ☐ Identified stand, ☐ Selected stand, ☐ Seed production area,
☐ Provenance seed stand, ☐ Seed orchard, ☐ indicate type, ☐ ESSO, ☐ SSO, ☐ CSO

d) Type and ownership

Type of seed source:
☐ Forest concession, ☐ Protected forest/forest reserve, ☐ Species mgt. areas,
☐ Private forest, ☐ *Community forest*, ☐ National park or wildlife reserve
Seed source owner: ☐ Government, ☐ Private, ☐ and Other:.....
Name and address of owner/administration: *Mr Seng Visal, chief of FATriage in Division Learch and Mr Roth Chang, chief of Prorgnil Forest Community*

Collection permit: ☐ *Not required*, ☐ required, indicate authority:.....
Collection contacts:.....

e) Climatic records or estimates (optional)

Nearest weather station: Pursath, Latitude: 12° 33' N, Longitude: 103° 51' E
Altitude:.....m.a.s.l, Distance from site(Km):.....
Rainfall regime: ☐ Raining season (which month):.....

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall, mm	4,8	0,0	217,6	20,5	143,4	116,9	77,2	256,0	212,5	173,6	14,4	22,0
Temperature	22,5/ 34,3	21,9/ 36,6	24,1/ 36,9	25,9/ 38,3	25,4/ 38,3	25,3/ 35,8	24,7/ 39,5	25,0/ 36,5	24,6/ 34,3	24,5/ 33	21,9/ 32,1	21,6/ 32,6

Mean annual rainfall (mm): 104,9 Mean annual temperature,0C: 29,8
Length of dry season (<60mm) (indicate month) 5 months (Jan, Feb, April, Nov and Dec)
Absolute min. temperature,0C and month: 21,6, Dec
Absolute max. Temperature,0C and month: 39,5,July

f) Site description

Terrain:
Flat: ☐
Slope: ☐ Flat or gentle (<5%), ☐ Intermediate (5-10%), ☐ Steep (11-45%), ☐ Very steep
Aspect: ☐ North, ☐ East, ☐ South, ☐ West, ☐ Variable,
Soil type:
Texture: ☐ Sand, ☐ loamy sand ?,☐ Sandy loam, ☐ Silty clay, ☐ Clay?
Other information:.....
.....

g) Stand description (estimation)

Total area 96 hectares, No.of tree per hectare:....., No.of tree in stand:.....69.....
Of target species only: No.of tree per ha: 0.7 , No.of trees in stand:
Height range, m: , Diameter range, cm:

Type of stand: ☐ Natural undisturbed stand, ☐ Logged/secondary forest
☐ Plantation, Planted year,....., ☐ Unknown,
Maturity of stand: ☐ young stand, ☐ Mature stand, ☐ Over mature stand
Species composition: ☐ One species, ☐ Associated species, pls. Indicate: Sindora coshinchinensis, Dalbergia cochinchinensis, Pter. macrocarpus, Xylia xylocarpa, Afzelia xylocarpa, Tlong, Tbeng....
Inventory data attached Yes/No:.....

h) Assessment of marked mother trees in seed source

Stem form: 4, Branching: 4, Growth 3, Health: 4, Other, pls.
Indicate:.....
.....
Score codes: 1.Very poor, 2. Poor, 3. Fair, 4. Good, 5. Very good,

i) Seed production

Name and distance nearest provincial forest office: *Prorgnil Triag of forest Administration*
Accessibility road, ☐ *2WD*, ☐ *4WD*, Remarks: *Mostly all kinds of transportation means.*
Walking distance from nearest road accessible by 4WD, Km: *Around 1 km*
Other information. *Seed Source Area located in the Kampoulbey mountain of Prorgneal forest community, Pursath Province.*

j) Accessibility

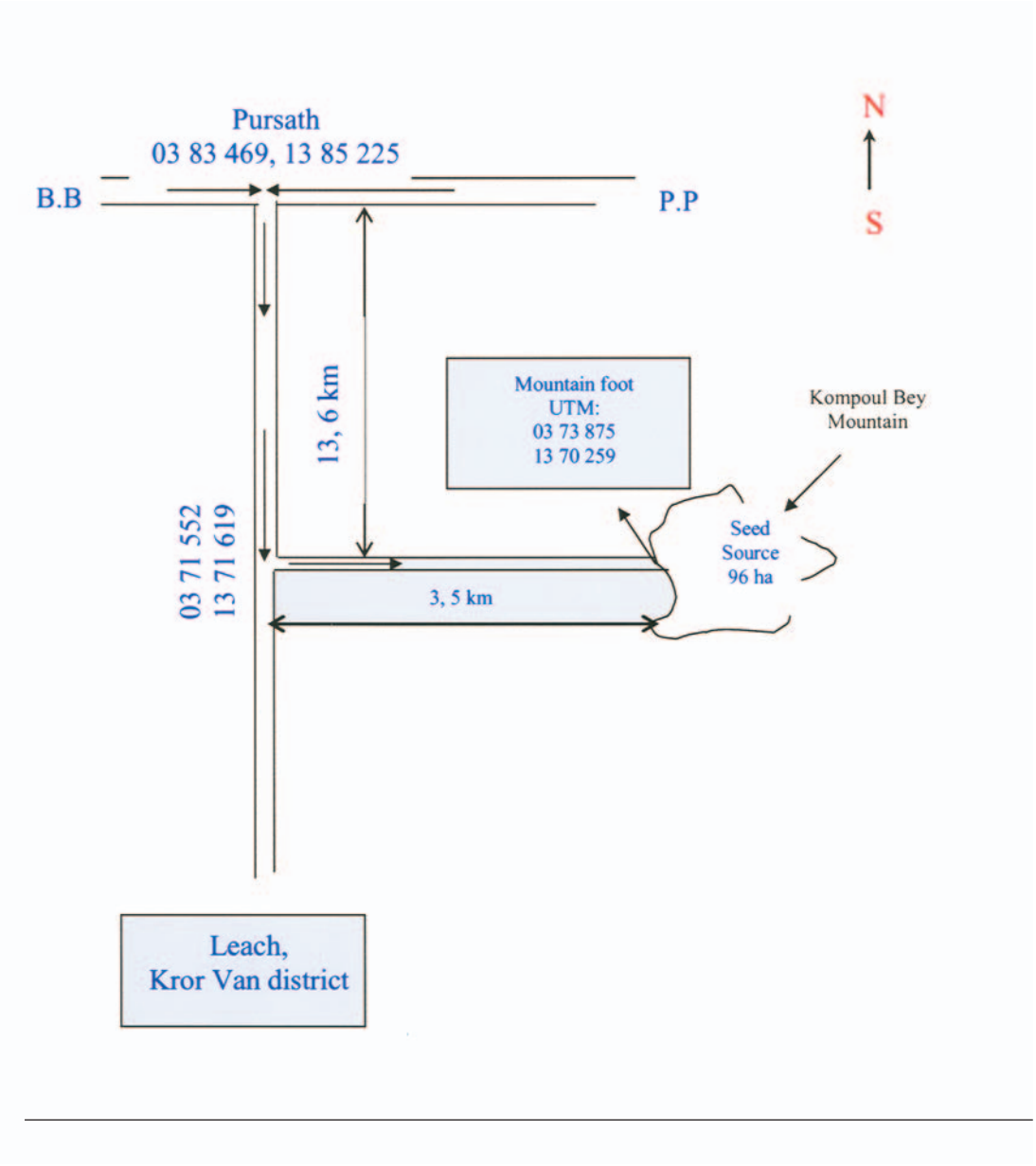
Flowering period (start): *May- June,* Peak:.....
Fruit ripening period (start): *July-October*, Fruit peaking period (collection): *Nov'-January*
Harvestable fruit production (estimated):.....Kg/ha

k) Labour availability

Name(s)of neares tvillage: *Kompeng forest community*
Distance from seed source to nearest village: *5km*
Available laborers: *People, living in the Kompeng Village, Purtsath Province.*

l) Other information (management recommendations, observation etc,)

(C) MAP OF SEED SOURCE (typographical or sketch map)



Annex 2

Example of Ministerial Declaration

Department of Forestry and Wildlife
Cambodia Tree Seed Project
40 Norodom Blvd, Phnom Penh, Cambodia
Tel.: (855) 23 215034;Email: ctsp@online.com.kh

Guideline for development of a declaration

1. The need of declaration

Declaration is a jurisdiction tool to secure seed sources in forests under the control of the Ministry of Agriculture, Forestry and Fisheries (MAFF). The declaration is normally issued by MAFF.

If a seed source established inside a national park or any other protected areas, which is under the authority of the Ministry of Environment, a co-declaration between the two ministries is needed.

2. Formulation process

The Department of Forestry and Wildlife (the Cambodia Tree Seed Project) is responsible for the formulation and processing of the declaration. The steps in formulating a declaration can be summarized as the following:

- Review of existing declarations to get ideas.

- Review of forestry law and other relevant regulations.

- The making of declaration (see an example in the Annex 1). The main part of a declaration is the responsibilities of concerned parties. The writer has to be clear about who do what under their authorities. It is simpler if a seed source is inside an authority of MAFF compared to the one under the control of MOE. However, one must think that is it worth to make a declaration for an area, which is already secured by Royal Decree?

  It is also important to note that the declaration is always attached with a map(s) of the proposed area drawn by GIS group. The map can be topographical or/and administrative with a scale ranging from 1: 10 000 to 1: 100 000 according to the size of the seed source. However, to make it simpler the maps should suit the A4 size paper in landscape or portrait. A sketch map is not acceptable.

- Number of declaration: the declarations developed by province, as an example: if there are three new seed sources that have been established in Mondul Kiri, they must be put in one declaration.

It is wise to develop and process a group of declarations at one time rather than develop and process one by one. In this case one group of declarations was processed in one year.

- Subsequent to finish the first draft the declaration must be submitted to the Vice Head of DFW (who is in charge of CTSP), together with formal letter asking to organise a meeting.

- A meeting: to get suggestions/recommendations for correction, before sending to MAFF, the proposed declarations are put for discussion among the heads and vice heads of the offices under DFW for giving recommendations for correction.

Other relevant stakeholders, such as a representative from forest office of the host province or a representative of the forest concession where the seed source is located, should be considered for invitation. The minimum number of participants should be 10 and the maximum around 30. To avoid wasting time the meeting should be run in one morning or the maximum in one day.

- Revision of the declarations: After the meeting the declarations must be immediately revised according to the decision of the meeting.

- Resubmission: the final drafts of the declarations submitted again to the Head of DFW and request for submitting to MAFF.

3. Processing the proposed declaration to MAFF

The submission of the proposed declarations to MAFF is attached with a formal letter, to the minister, from the head of DFW (see an example in Annex 2). The proposed declaration is submitted to the administration office of MAFF. From there it will be processed until the minister. There can be a call for a meeting to defence the proposed declaration if it is necessary.

4. Who can make and process a declaration?

Any body who has background and has working experiences in forestry at least three years. However, in this case any counterpart of CTSP can do this work.

5. Distribution of declaration

After the declaration been approved and signed by the minister of MAFF it must be copied and sent to the recipient institutions as cc in the declaration itself for notification or taking action.

Kingdom of Cambodia
Nation Religion King

Ministry of Agriculture
Forestry and Fisheries
No: ..... FA. MAFF

DECLARATION
on
Seed Source Establishment of *Pinus mercusii* and *Fagraea fragrance*
in Kampong Thom Province

MINISTER OF THE MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES

- Seen the constitution of the Kingdom of Cambodia,
- Seen Royal Decree No.NS/RKT/1198/72 dated 30 November, 1998 on the formation of the Royal Government of Cambodia;
- Seen Royal Krom No.NS/RKM/0196/13 dated 24 January 1996 on the declaration to use the law on Establishment of the Ministry of Agriculture, Forestry and Fisheries;
- Seen Royal Krom No.NS/RKM/0802/016 dated 31 August, 2002 on the declaration to use the Forestry Law;
- Seen The Sub-decree No. 17 BK dated 07 April 2000 on the Organisation and

  Functioning Structure of the Ministry of Agriculture, Forestry and Fisheries;
- Pursuant to the request of the Head of the Forest Administration.

IT IS HEREBY DECIDED

Article 1: Establish a seed source area of *Pinus mercusii* and *Fagraea fragrance* with an area of 104 hectares located in Kampong Thmar Forest Administration of Kra Year Commune, Santuk District, Kampong Thom Province. The boundaries of the seed source are defined in an annexed topographical map with a scale of 1:50 000 and the UTM co-ordinates of A (05 31 601; 14 09 923), B (05 31 325; 14 10 745), C (05 31 043; 14 10 721), D (05 30 283; 14 10 363), E (05 30 275; 14 09 986), F (05 30 382; 14 09 750), G (05 31 368; 14 09 755) in a closed polygon. The objectives of establishing the seed source are conservation and study the genetic resources and collection of seeds for reforestation programs.

Article 2: The establishment and management of the seed source are under the authority of the Forest Administrations with the following responsibilities assigned to:

- The Central Forest Administration has the duty to co-ordinate, research study, extension and provide technical training in management techniques, maintenance and collection of seeds of *Pinus mercusii* and *Fagraea fragrance* in this area.
- The District Forest Administration of Kampong Thom (Kampong Thmar Division) has the duties to manage, to maintain and to collect seeds including the prevention of forest fire and the cracking down effectively all illegal activities in the seed source.

Article 3: General secretaries, Director of the Department of Administration, Director of the Department of Personnel and Human Resource Development, Director of the Department of Planning-Statistic and International Cupertino, Director of the Department of Accounting and Finance and Director of Forest Administration shall be responsible for the implementation of this declaration.

Article 4: Any regulations with a meaning contradictory to this declaration considered invalid.

Article 5: This declaration shall become judicial with effect from the date of the signature.

Phnom Penh, Date:.....

Minister

CC:
- The Council of Ministers
- Ministry of Economy and Finance
- Ministry of Environment
- Ministry of Land Management and Construction
- Kampong Thom Municipality

"to be informed"
- All institutions under the Ministry of Agriculture, Forestry and Fisheries

"for information"
- As stated in article 3 "for taking action"
- Document- File

Annex 3

Example of a Verbal Agreement

Kingdom of Cambodia
Nation Religion King

Minute
On
Seed Source Establishment of *Azadirachta indica*

On January, 6, 2002, officials of the Forestry Administration (Cambodia Tree Seed Project) co-operated with Bonteay Meanchey Forestry Administration, Phnom Touch Commune Council and the Chief of Wat Thmey Village to establish a Seed Source of *Azadirachta indica* (Khmer Name: Sdaov) in Wat Thmey Village, Phnom Touch Commune, Mongkul Borey District, Bonteay Meanchey Province.

Participation:

1. Mr. **So Thea** Deputy of the Forestry and Wildlife Science Research Institute, (CTSP Manager).
2. Mr. **Moy Rotha** Official of The Forestry Administration (CTSP official).
3. Mr. **Leung Sarath** Official of Bonteay Meanchey Forestry Administration.
4. Mr. **Eng Gnuon Seng** Commune Council of Phnom Touch.
5. Mr. **Mol Sonn** Chief of Wat Thmeay Village.

A. Objective: The objective of the Seed Source is to conserve genetic resources of *Azadirachta sp.* in the area, and to supply seed for planting programmes in other areas of the country.

B. **Area:** A 50 hectare square is demarcated. The trees, by nature, are scattered.

C. M**arking technique:** Within clumps of trees (at least two), one was selected, and its diameter and height (DBH) recorded. Each selected tree is identified with a numberplate and ringed with red paint. The Seed Source consists of 90 trees belonging to 23 families in the commune.

D. Signboard: A signboard was erected on a path to the seed source.
The task of seed source establishment was completed on the same date as above.