

1. Introduction

Until recently, Cambodia's forests, in general, have been managed under a concession system for timber extraction, over an area of 6.5 million hectares. Today, economically viable areas for logging are few.

In 2002, the Royal Government of Cambodia (RGC) began a process of forestry reform, and all logging was suspended from the beginning of that year. Whilst some concessionaires are preparing new management plans, others will terminate. RGC has no alternative management regimes in place for the abandoned areas, the lack of which will result in forest encroachment. Consequently, the forest gene pool is under pressure, and its conservation is urgent.

The forest reform process gives high priority to reforestation by the Department of Forestry and Wildlife (DFW), and the Armed Forces in the coming years. In addition, the significant contribution of local communities to national tree planting targets is recognised. A prerequisite for successful planting is the availability and use of good quality seeds.

Currently, the national tree seed sector is in the process of establishment, and is in an early phase of development. Knowledge of quality seed use and demand is limited, and policies and legal frameworks for the sector do not exist.

The development of a policy framework for the seed sector, will therefore, form an essential component of the forest reform process. In working towards this, an increased understanding of seed demand and use is required in order to better plan for the provision of good quality seeds. This seed demand survey provides the first step in the policy formulation process.

The objective of the study was to assess the demand for tree seeds, and the current status of the sector, with a specific focus on areas under the jurisdiction of the Department of Forestry and Wildlife. The activities undertaken during this process were:

- identification of tree seed suppliers, users and distribution mechanisms
- identification of existing and future needs/demands for indigenous and exotic seed and seedlings
- assessment of the willingness/ability of users to pay for quality seeds
- analysis of the status of the seed sector and identification of information gaps and constraints

It should be noted that tree seed source management and forest gene conservation is also relevant in protected areas and flooded forests, under the jurisdiction of the Ministry of Environment (Department of Nature Conservation and Protection) and Ministry of Agriculture, Forests and Fisheries (Department of Fisheries) respectively.

2. Methodology

The Reforestation Office of DFW maintains records of planting activities at their planting stations and nurseries. From these lists, staff of the Cambodia Tree Seed Project (CTSP) selected 16 stations across 8 provinces managed by DFW for inclusion in the study, based on the following criteria:

- the nursery/planting station was operational
- located in areas of low forest cover.

The planting stations and nurseries included in the survey are listed in Annex 1, and represent 44% and 50% of operational nurseries and planting stations respectively. Interviews with chiefs took place in Phnom Penh, as they are based in the Reforestation Office of DFW. Subsequently, the stations were visited to discuss nursery activities, seed collection and seedling distribution with staff posted there. The visits also served as observation and validation exercises. In addition, some nurseries managed by the provincial forestry offices were included, these are registered with DFW, but records of operation are not held at the central level.

The selection of nurseries managed by communities, pagodas and the private sector was more difficult, as they are unrecorded. It was decided therefore, that nurseries learnt of during the interviews in the provinces visited would be contacted. These included Concern Worldwide (Kampong Chhnang and Pursat), Sante Sena (Svay Rieng), BDFK (Kampong Thom), GTZ (Kampong Thom), FAO (Siem Reap) and British American Tobacco (Kampong Cham). In addition representatives of the military regions were interviewed.

An interview guideline was developed, which included data tables for quantitative data and open questions to capture qualitative data. The same interview guideline was used for communities, pagodas and the private sector. A slightly modified guideline was developed for the military, as they have no previous experience of tree planting.

The field visits were undertaken during January and February 2003, and interviews were conducted by the Consultant and a counterpart staff member of DFW/CTSP. Seed collection and seedling production activities were recorded for 2002, as the plans for the current year, particularly within the government sector, were still awaiting approval.

Information presented in this report is based on the results of the survey only, attempts were not made to extrapolate the data to a national level. Nevertheless, conclusions can be drawn from the information gained, and a base established for further consideration in the development of the tree seed sector. Detailed information collected during the interviews is presented in Annex 1 – 5.

3. Tree Seed Users

Five categories of tree seed users were identified as follows:

- Department of Forestry and Wildlife (DFW) and Provincial Forest Offices (PFO)
- Armed Forces
- Communities
- Pagodas
- Private Sector

All users require seeds of exotic and indigenous species to produce seedlings to satisfy a range of requirements for planting in reforestation and forest rehabilitation programmes, community forests, in and around villages, and along roadsides.

3.1 DFW/PFO

The forestry sector manages 14 tree plantation stations, and 18 nurseries producing seedlings for distribution to local communities, pagodas and government institutions. The records from 2002 indicate plantation of 275 hectares, and the production of 563,400 seedlings, as outlined in Tables 1 and 2. In addition to those listed in Table 1, are research/planting stations at Bak Sna and Kbal Chhay.

In Table 2, species are classified into long, medium, and short term rotation as follows:

- Long-term – *Aquilaria crassna*, *Dalbergia bariensis*, *Dalbergia cochinchinensis*, *Mitrella mesnyi*, *Dipterocarpus spp*, *Hopea spp*, *Azalia xylocarpa*, *Pterocarpus spp*, *Khaya senegalensis*, *Diospyrus decandra*, Coconut
- Medium-term – *Lagerstroemia speciosa*, *Artocarpus hetophyllus*, *Delonix regia*, *Annona squamosa*, *Sandoricum koetjape*, *Anthrocephalus chinensis*, Loerng reach, mango spp
- Short-term – *Cassia simea*, *Albizia lebbeck*, *Acacia spp*, *Albizia saman*, *Azadirachta indica*, *Eucalyptus spp*

Table 1 - DFW/PFO Tree Planting and Maintenance, 2002

Plantation	Species	Planting		Maintenance (ha)
		Density	Area (ha)	
DFW				
Romeas Hek	<i>Acacia</i>	2,500	25	150
Krosang	<i>Acacia</i>	2,500	25	80
Kamchay Meas	<i>Acacia</i>	2,500	20	
Bantaey Angkor	<i>Acacia</i>	2,500	25	155
Phnom Thmao				68
Tek Char				28
PFO				
Kampong Cham	<i>Tectona Grandis</i>	1,650	25	170
Siem Reap	<i>Dipterocarpus sp</i> , <i>Terrietia javanica</i>	1,000	25	220
	<i>Dalbergia cochinchinensis</i> ,	1,650	25	
Kampot	<i>bariensis</i>	2,500	25	39
Takeo	<i>Acacia</i>	2,200	25	130
Prey Veng	<i>Eucalyptus sp</i>	2,500	25	110
Mondulkiri	<i>Eucalyptus sp</i>	1,650	30	20
Svay Rieng	<i>Pinus sp</i>			10
Sihanouk Ville				50
Kampong Chhnang				15

Source : Reforestation Office, 2002, untitled

NB : 1st year maintenance covers replanting dead seedlings, land clearance around all the seedlings in the plantation, establishment of firebreaks, and payment for a permanent guard. Maintenance for the 2nd year and onwards is as the 1st year, except there is no replanting.

Table 2 – DFW/PFO Nursery Seedling Production, 2002

Nursery	Quantity of Seedlings		
	Long-Term	Medium-Term	Short-Term
Phnom Thmao	10,000	7,000	40,000
Bek Chan	15,000	8,000	40,000
Tek Char	1,000	2,000	10,000
O Sandan	1,000	2,000	20,000
Phnom Atharos	1,000	2,000	10,000
Kamchay Meas	1,000	2,000	30,000
Romeas Hek	1,000	1,000	30,000
Krang Yov	2,000	3,000	20,000
Phnom Chisor	2,000	3,000	19,400
Rolang Ken	6,000	5,000	20,000
Toul Domnak	6,000	4,000	30,000
Takeo		2,000	40,000
Prey Veng	1,000	2,000	30,000
Svay Rieng	1,000	2,000	30,000
Kampot	1,000	2,000	20,000
Kampong Speu		2,000	40,000
Kampong Chhnang		2,000	30,000
Rattanakiri	2,000	2,000	

Source : Reforestation Office, 2002, untitled

JICA supports several DFW/PFO nurseries to undertake seed demand assessments with the local communities, seedling production, and monitoring of management and survival rates. During the survey, examples were found at Romeas Hek, Kamchay Meas, Toul Domnak, Kbal Chhay and Phnom Atharos.

3.2 Military

Since the recent ending of the civil war, the armed forces have become involved in country development. One of the tasks allocated by the government is to participate in tree planting in co-operation with MAFF. The country is divided into 6 military regions, and each has established a Development Office, which will manage tree planting activities, and will be staffed by 3 soldiers.

Each year, each region will plant approximately 500 hectares, in 2003, a total of 2,200 hectares will be planted throughout the country. Appropriate planting sites will be identified with MAFF, which will be under forestry jurisdiction. Species have not yet been selected, but the military will work in close co-operation with the Reforestation Office of DFW to identify suitable indigenous species. Once species are identified, the seeds will be located through DFW and CTSP.

The military began tree planting activities in 2002, through a pilot project of 200 hectares in Phnom Kulen National Park, Siem Reap Province.

3.3 Communities

Discussions were held with 3 organisations involved in tree planting activities with communities. Each has different experiences resulting in different approaches to community based forest management.

In Siem Reap, *FAO's* seedling production programme supports the production and planting of 100,000 seedlings each year. In the past, *FAO* supported nurseries within community forestry areas, but they were not successful. The natural regrowth in community forests is good, and *FAO* is now considering management of these areas, and therefore, the need for seedlings is not so great. *FAO* supports 3 PFO nurseries.

GTZ, in Kampong Thom, tried to promote village seedling production, where every family would have several trees behind their house, which would later be planted in a community level activity. However, people were not willing to participate, and tree planting activities are likely to be dropped from the project. Instead, forest locations for protection and rehabilitation through natural regeneration will be identified.

Concern Worldwide supports community forestry in Kampong Cham, Kampong Chhnang and Pursat. In the past, *Concern* produced seedlings for communities in a large station, but since 1999, when the community forestry programme began, village nurseries were promoted to improve community capacity. Interviews took place with communities in Pursat and Kampong Chhnang, in the 4 sites all members of the villages participate in tree planting activities.

3.4 Pagodas

Three pagodas were visited during the survey. Viel Pagoda (Pursat) nursery has been operational since 1999, and is supported by *Concern Worldwide*. Wahyu Pagoda (Kampong Thom) established a nursery in 1997 in order to promote forestry extension activities and to raise awareness of the benefits of forestry. Sante Sena established a nursery at Prey Chlak Pagoda (Svay Rieng) in 1994.

3.5 Private Sector

Tree seed use within the private sector is limited and generally linked to the pulp industry and private planting concessions.

However, during the survey, three categories of private tree seed users were identified. Plant nurseries on the outskirts of Phnom Penh mostly sell ornamental and flowering plants, but generally stock some seedlings of indigenous forest species, which are bought from private producers. Small-scale seedling nurseries are established at private houses, where seeds are collected or purchased from local people, and the seedlings sold to communities, organisations and local markets.

The third category of large-scale seedling producers concentrates on British American Tobacco (BAT), which has been operating in Cambodia for 6 years. It has a large reforestation programme which focuses on the production and distribution of seedlings, to contribute to addressing the problems of deforestation within the country. As a tobacco producer, the company in several areas uses large amounts of wood for their curing process, and the reforestation project aims towards sustainability of the resource.

The nursery in Kampong Cham was established in 2000 with a capacity to produce 1 million seedlings per year. In addition, there is a mobile nursery in Chouk that is capable of producing 240,000 seedlings per year.

4. Demand for Seeds and Seed Suppliers

4.1 DFW/PFO

The demand for seed from the stations and nurseries interviewed during the survey, is detailed in Annex 1. The gaps in information generally reflect the level of person interviewed, for example, the managers could discuss the species, areas planted, seed sources and prices. On the other hand, the nursery workers knew the species and sources of seeds obtained locally. It was found that whilst DFW plans matched the activities of the planting stations, at some of the nurseries, additional seedling production was complemented with self collected seeds, or financial support from JICA.

Planting stations select species in accordance with the conditions of the planting sites, and to provide shade for later plantings of indigenous species, soil improvement, and pulp for the paper industry.

In nurseries supported by JICA an assessment of requests is conducted within the local community. Generally, local communities prefer fast growing species, which can be used as boundary markers to provide shade, poles and fuelwood, and fruit trees. Pagodas and schools favour *Dipterocarpus alatus*, *Hopea spp* and some acacia. However, the nurseries cannot always satisfy all the demands, in terms of species or amounts, as some species are very difficult to source, seeds are often of poor quality, and production is according to DFW plans.

Nursery activities are planned according to the quantity of seedlings required. However, seeds are purchased by weight, and in general, the nursery chiefs and staff are unable to convert between the two types of measurement. In many cases, calculation of seed demand is not conducted, seeds are obtained and then calculations made as to how to plant them, or, any seeds obtained are planted.

When seeds are purchased from local communities, either the nursery workers transport the seeds, or, villagers take the seeds to the nurseries. Seeds from Vietnam are collected from the supplier at the border. There is no customs tax, or import regulations. Seeds sourced from CTSP are collected from the project office.

Seeds are not always tested for quality. Local people are advised on the best mother trees to collect from, but if the nursery workers do not see the seed source, it is difficult to evaluate the seed quality. Instead, the seeds are planted and their quality is determined as they grow.

Acacia seeds purchased from Vietnam have certificates showing the date of seed collection, the amount of seeds/kg, and guarantees a germination rate of over 70%. Seed sources cited were private companies in the southern part of the country.

4.2 Military

As a new activity for the military, the only experience gained to date has been through the pilot project in Siem Reap. Species were selected following advice from DFW according to seed availability.

Table 3 – Seed Demand of Region 4, 2002 – 2003

Year	Seed Demand		Supplier	
	Species	Amount	Source	Price/kg
2002	<i>Hopea odorata</i> <i>Dipterocarpus alatus</i> <i>Azelia xylocarpa</i> <i>Anisoptera costata</i>	Total of 110,000 seedlings	PFO nurseries within Siem Reap Province	Free
2003	<i>Azela xylocarpa</i> <i>Pterocarpus spp</i> <i>Dalbergia cochinchinensis</i> <i>Acacia</i>	unknown unknown unknown 2kg	Anlong Veng Srey Noi, Siem Reap Srey Noi, Siem Reap DFW (Australia)	2kg rice 2kg rice 2kg rice unknown

The Head of the Development Office will transport the seeds by car. A seed store has been prepared to keep the seeds as per CTSP techniques. Seeds are not tested for quality, other than through monitoring the germination rate.

4.3 Communities

FAO Seedling production for 2002 is indicated in the table below, and detailed in Annex 3. Local community requests are gathered through forestry extension activities within the villages, monthly NGO meetings, and monthly district meetings. Many request more than they need, and FAO visits the sites to assess the demand, the planting sites and the species.

Table 4 – Seedling Production by FAO, 2002

Year	Seedling Production		Seed Supplier	
	Classification	Amount	Source	Price
2002	Timber	63,905	Angkor Park	unknown
	Fuelwood	36,614	Local people	unknown
	Fruit	24,776	Local people	unknown
	Other	3,350	Local people	unknown

Acacia is bought from Vietnam and Australia. There are no methods to test seed quality, more are collected than can be planted, they are germinated in seedbeds, and the best seedlings selected for planting.

In Kampong Thom, GTZ have found seed sources to be fairly accessible, *Dipterocarpus alatus* and *hopea spp* can be found at the pagoda, and other *Dipterocarps* are in reach. Mother trees are well protected, as they are located in spirit forests. Other species are difficult to find. Fruit trees are also popular and are produced from seeds.

Seed demand for selected villages in Pursat and Kampong Chhnang is illustrated in Table 5 below.

Table 5 - Seedling Production by Communities, 2002

Village	Seedling Demand		Seed Supplier	
	Species	Amount	Source	Price
Pursat Araing	<i>Hopea spp</i>	280	Concern	free
	mango	250	collected	-
	jackfruit	150	collected	-
	<i>Acacia</i>		Concern (2 grammes of seed)	free
Chieng Pleung	<i>Acacia</i>	200	Concern	free
	mango	50	Concern	free
Kampong Chhang Tropeang Trach	<i>Acacia/ Eucalyptus</i>	1,300	Concern	free
Andong Chros	<i>Acacia</i>	2,000	Concern	free
	<i>Eucalyptus</i>	2,500	Concern	free
	<i>Dipterocarpus alatus</i>	<1,000	collected	-
	fruit		collected	-

Acacia and *Eucalyptus* are fast growing, provide construction wood, fuelwood, shade/shelter, and cover the forest quickly. The villagers anticipate an increased demand for poles, which will be managed through a rotation system. They expressed a desire to plant indigenous species in the future, but they are difficult to grow, and the seed difficult to find.

Seeds provided by Concern are collected from the DFW plantation (*Acacia*), and the pagoda and provincial office (*hopea spp*), or purchased from local people, who collect seeds from around the provincial authority offices. Concern delivers the seeds to the village nurseries. Other seeds are collected from around the village. Seeds are generally of poor quality. *Acacia* seeds are tested by floating them in water, and those that sink are planted. Mango seeds are cut to examine whether they are still alive.



4.4 Pagodas

The demands for seed for 2002 are shown in Table 6 below.

Table 6 - Seedling Production by Pagodas, 2002

Pagoda	Seedling Production		Seed Supplier	
	Species	Amount of Seedlings	Source	Price
Viel Pagoda	<i>Dipterocarpus alatus</i> <i>Hopea spp</i> <i>Acacia</i> <i>Fruit</i>	Total of 1,000	Concern Collect, pagoda Concern Collect, pagoda	free - free -
Wayhu Pagoda	<i>Dipterocarpus alatus</i> <i>Hopea spp</i> <i>Acacia</i> <i>Fruit</i>	5,000 3,000 20,000 1,000	Collect Collect Collect Local people	free free free 1 seedling
Prey Chlak Pagoda	<i>Acacia</i> <i>Azadirachta indica</i> <i>Albezia lebbeck</i> <i>Melaleuca cajeputi</i>	Total of upto 150,000	Collected around the pagoda or bought from local people	-



At Viel Pagoda, indigenous species form 20% of the total. The species are selected for shade, wood and fruit. In 2003, more species are planned, although any changes in production depend on requests from the local community. Seeds are examined for size and moisture to determine their quality.

Monks at Wayhu Pagoda plant all the seeds they collect, they do not know how to assess seed quality, and never consider it. If people want fruit trees, they give fruit to the pagoda and the monk save and plant the seeds.

At Prey Chlak Pagoda, local species form about 50% of the total. Requests for *Hopea spp*, *Dipterocarpus alatus*, *Dipterocarpus intricatus* and *Anisoptera costata*, have also been received, but the supply of seeds is limited, due to the difficulties in finding seeds suitable for the area. Seeds bought from local people are poor quality even though the monks seek good mother trees. The monks cannot assess seed quality when people bring them, other than to monitor the germination rate. Local people give fruit to the monks, who keep the seeds, and grow seedlings to return to the local people. Seed availability also depends on the climate, for example, last year was hot with late rain, and it was not possible to care for the seedlings.

In Svay Rieng, demands are changing, reflecting peoples' views. They are more aware of the importance of tree planting. Now, they see a need to plant, and there is a lot of private tree planting. In the past they liked *Bambusa*, but now prefer *Acacia* and fruit trees.

4.5 Private Sector

Due to the limited seedling production within the private sector, this section focuses on British American Tobacco (BAT).

Table 7 – Seedling Production by BAT, 2002

Year	Seedling Production		Seed Supplier	
	Species	Amount of Seedlings	Source	Price (r/kg)
2002	<i>Acacia</i>	600,000	DFW	unknown
	<i>Eucalyptus</i>	13,000	DFW	unknown
	<i>Azairachta indica</i>	70,000	Local people	5,000
	<i>Leucaena leucocephala</i>	3,500	Collect, nursery	free
	<i>Fruit</i>	7,000	Local people	6,000



Seedlings are produced to user demand. Seeds obtained are sown according to the annual plan, they cannot be tested for quality other than through the germination rate. Production plans are now changing towards longer-term species, in reflection of the company's vision and long-term commitment. Around Kampong Cham, the demand for short-term species has largely been met, and longer-term species can be brought into focus.

5. Seedling Use and Distribution

5.1 DFW/PFO

Planting stations use seedlings produced exclusively within the plantation, either for new planting or for maintenance of previously planted areas. According to planting station chiefs, seedling survival rates in the plantations are monitored by teams from MAFF/MEF, and found to be at least 90%.

Seedlings produced in nurseries are distributed, free of charge, according to requests, and include local communities, pagodas, schools, roadside plantings, organisations, government institutions, other provinces, and Arbour Day ceremonies. Within JICA supported nurseries, workers provide tree planting advice when seedlings are collected, and request completion of a form to enable future monitoring. Whilst the survival rates vary across the country, they generally indicate a high survival rate when seedlings are planted around houses in comparison to those planted in public places, which reflects the different levels of protection accorded to the planting sites. Otherwise, seedlings are not monitored after



they have left the nursery, and within the nursery, guesses are made of the germination rates.

5.2 Military

All seedlings produced will be planted in the designated area. In 2002, a total of 110,000 seedlings of indigenous species were required to plant 195 hectares. Acacia will be planted in 2003 in order to provide shade for the native species raised in the nursery for planting the following year. There is a plan to monitor the survival rate, but it has not yet been conducted.

5.3 Communities

Seedlings produced by FAO are planted in farm forest sites. Those within villages supported by Concern Worldwide are planted in bare areas within the community forest, around houses and along roadsides.



Survival rates of the planted seedlings are monitored. In Pursat, a higher survival rate is observed in the seedlings planted around houses than those planted in the community forest, whilst in Kampong Chhnang, the survival rate was thought to be higher in the community forest. In the latter case, guards are employed to protect the community forest.

5.4 Pagodas

From Viel Pagoda, seedlings are distributed free of charge. *Dipterocarpus alatus* and *Hopea spp* are planted around the pagoda, and the local communities plant *Acacia* and fruit. In 2002, the survival rate in the pagoda was only 30% due to the lack of rain, and 60% within the local community.

During 2001 – 2002, seedlings were planted around Wahyu Pagoda, the school, and along the roadside to Prey Kub Pagoda. The demands of the local community are met, although they do not always collect the seedlings they requested. The monks do not sell seeds, but if PFO request them, the pagoda sometimes receives money, although there is no agreement beforehand. If the trees are planted in the forest they are not protected, but if they are planted around the house they are. Survival rates are 60% for *Hopea spp* and *Dipterocarpus alatus*, and over 60% for *Acacia*.

In Svay Rieng, seedlings are planted in Sante Sena's 500 hectare plantation at a rate of 5 – 10 hectares per year. Seeds are also sold to pagodas and schools, and given to local people if their request is small. Of those seeds purchased from local people, only about 50% grow.

5.5 Private Sector (BAT)

Seedlings are distributed free of charge. Users include TRIP, provincial authorities, military, schools and pagodas. The military have requested seedlings for their plantation, which BAT is happy to fulfill. Requests for seedlings must be submitted with

a planting plan, and the nursery staff check the selected planting areas before the seedlings are released.

BAT has a monitoring system and hires people from the local community to care for the seedlings planted along the roadside, the survival rate here is 50 – 60%. In addition, they receive feedback from TRIP on their plantings.

6. Experience of the User

6.1 DFW/PFO

In general, nursery managers have studied forestry at university, received training from DFW/CTSP, joined study tours, and gained experience through their work.

Nursery workers, on the other hand, have a lot of experience in their work, are knowledgeable of species and seed treatment. They are not involved in planning and do not receive training. They work according to the instruction of the managers for collection, planting and distribution of seeds and seedlings.

Some long term nursery staff attended courses in nursery techniques, organised by DFW and taught by a Vietnamese expert. In areas of JICA support, workers are trained in nursery techniques.

6.2 Military

The military has limited experience in tree planting, other than that gained in Phnom Kulen. Therefore, training has been requested from DFW, which has begun. At least 20 officers have already received training in nursery establishment with DFW/CTSP. The Head of the Agriculture Office is keen to forge greater co-operation between the armed forces and DFW/CTSP in order to overcome some of the foreseen difficulties in relation to the lack of experience.



6.3 Communities

Tree planting activities are fairly recent in Pursat and Kampong Chhnang. Concern Worldwide provides ongoing support to the Village Forest Management Committees, and provide training in nursery development, planting techniques, and community forestry concepts.

6.4 Pagodas

Mr. Tech Khun, the Head Monk of Viel Pagoda, has worked in the nursery since 2000, and has received some training by Concern in nursery techniques. The monks at Wahyu pagoda have received some training in nursery techniques, and concepts for participatory management. The Venerable Nhem Kim Tong established Sante Sena, and has participated in a CTSP workshop.

6.5 Private Sector (BAT)

The workers at the nursery have both been employed since 2000. Neither has undergone training, but gained experience at the nursery. They work according to the instructions of the Nursery Manager.

7. Seed Quality and Certification

7.1 Seed Source Assessment

There are a variety of methods for obtaining seeds, and the methods of quality assessment vary accordingly. The only seeds that are certified are those that are sourced outside the country. Given the poor germination rates, the authenticity of some of the certificates is questionable.

7.1.1 Self-collection

Where nursery managers collect seeds they can select good mother trees, and test the seeds by cutting them to see if they are still alive.

7.1.2 Purchase from local people

In this case, nursery managers advise local people on the selection of good mother tree. This is the most common method of obtaining seeds, however, without seeing the seed source, it is difficult to evaluate the quality.

7.1.3 Obtain from friends in other provinces

This method is much like that above, in that without knowing the seed source, the quality of the seed is difficult to assess.

7.1.4 Obtain through DFW

This method is used for *Acacia* and *Eucalyptus*. Currently, DFW purchases seeds from Vietnam for distribution to the planting stations and nurseries, but the quality has been found to be very low in comparison to those planned for the future. Seeds imported from Australia and Thailand follow import regulations as outlined below.

7.1.5 Purchase from Vietnam

Several nursery managers were found to practice this method. Seeds purchased from Vietnam are *Acacia* and *Eucalyptus*, they are accompanied by certificates showing the date of seed collection, the amount of seeds/kg, and a guarantee of germination rate higher than 70%. This method does not follow importation regulations, as they are brought into the country in small amounts by car, or are collected at the border from suppliers.

7.2 Seed Assessment

In many cases, the quality of the seeds themselves is not tested, either because the user does not know how to test, or they are not concerned with the quality.

The germination rate within seedbeds is the only process known to these producers. However, a higher number of seeds are planted than are required, in recognition of the fact that the seeds are poor quality.

Where seed quality is tested, it is by cutting the fruit, and if over 50% of the seeds are still alive, they are collected. Further assessment is through monitoring the germination

rate in the seedbeds. To test acacia seeds, they are floated in water, and those that sink are planted.

It is apparent that the quality of seeds could be improved greatly following the identification of, and distribution from, appropriate seed sources, thereby saving financial and human resources currently used to take care of large amounts of seed/lings that will not germinate, or will not be used.

8. Importation Channels and Regulations

As indicated above, official and informal channels of importation exist. Purchases from Thailand and Australia, by the Reforestation Office, are regulated by the supplier as well as by the receiver. The first step is to undertake tests of the proposed planting sites to ensure compatibility with the site of origin. CISIRO (Australia) and FOGENMAP (Thailand) issue phytosanitary certificates for the seeds, consignment notes and seed certificates. From the Cambodian side, approval for the import is needed from MAFF, who submit a letter to the Customs Department to allow clearance for the seeds.

Chapter 8 of the recently adopted Forest Law covers the importation of timber products and NTFPs, and is therefore of relevance to the seed sector. Specifications for imports will be determined by sub-decree. License requirements will be determined by RGC, and issued by the Ministry of Commerce. Imports will be subject to tax payable to the national budget. Importation of such products without an appropriate license falls under Class II forest offenses, and subject to 1 to 5 years imprisonment and a fine within the range of 10 – 100 million Riel.

9. Willingness/Ability to Pay for Seeds

Budgets for all users included the purchase of seeds, but none had a specific line allocation. Instead, the costs are included under nursery development, or material costs. However, most users considered seed expenditure to be a small proportion of the overall nursery budget, ranging from 2% (Kampong Cham PFO) – 10% (Reforestation Office, AKECU, and BAT). Those people interviewed with responsibility for budget management were generally in agreement that their budgets would cover the costs of good quality seeds.

9.1 DFW/PFO

Whilst there is no specific seed budget, it is estimated by the Reforestation Office that 10% of the annual budget for nursery activities is allocated to seed expenditure. The increased budget will cover the purchase of good quality seeds. The Reforestation Office is keen to obtain seeds of native species from CTSP seed sources, and willing to pay for the purchase and importation of the best quality *Eucalyptus camaldulensis*.

At provincial levels, however, the ability to pay is less clear. Whilst planting stations and nurseries apply for budget allowances according to their plans, they are often drastically reduced at the central level during the approval stage. Therefore, nursery managers are not in a position to pay high prices for seeds.

Discussion in Kampong Thom revealed the latter case and was thought that consideration could only be given to the purchase of good quality seeds in the future if :

- a budget is available, and the price of good quality seeds is not too different from those of poor quality
- if large areas of land were available for reforestation.

9.2 Military

Nursery costs for Phnom Kulen form less than a third of the tree-planting budget, but there no further breakdown to allow identification of a seed budget. The budget for tree planting will be allocated from the Ministry of Economy and Finance, as part of the overall reforestation budget. This will cover the cost of good quality seeds, and the military will follow the advice of CTSP in sourcing seeds.

9.3 Communities

Communities are reliant on their supporting organisation to purchase seeds that cannot be collected from around the community land. Given that seed expenditure forms a small percentage of the overall budget for seedling production (3 – 4% for Concern Worldwide), and the use of good quality seeds provides many benefits, it is reasonable to assume that donors would enable their budgets to cover the costs of good quality seeds.

9.4 Pagodas

Pagodas generally collect seeds or receive them free of charge, so it is difficult to envisage an ability to pay for good quality seeds. Viel and Wahyu Pagodas have small budgets, the latter donated by local people during ceremonies and festivals. Sante Sena have a budget, of which seed expenditure is estimated to be 5%, and expressed a desire for good quality seeds. However, it was noted that it remained necessary to purchase seeds from local people, even though the quality is poor, in order to encourage them to collect and plant seeds.

9.5 Private Sector (BAT)

BAT estimates 10% of the total nursery budget to be allocated for the purchase of seeds, and could support better quality seeds. The value of good quality seed is realised and demonstrated through model farmers who use good quality tobacco seeds within the country.

10. Future Requirements and Constraints

10.1 Overview of Legislation and Strategies Affecting the Tree Seed Sector

Article 59 of the Forestry Law states that "people, armed forces, and authorities of all levels shall have the obligation to assist in tree planting and reforestation". Article 61 covers the rules for granting rights to plant trees in the permanent forest reserve, which will consider the social and environmental impacts of proposed species. A prakas will be issued to encourage individuals to plant and maintain tree plantations on private land (Article 46). Importation of seeds is covered in Articles 73 and 98.

The draft Community Forestry Sub-Decree establishes a legal framework for public participation in sustainable forest resource management. Community forestry plans will detail activities for the defined area, and will be appropriate to address plantations, nurseries and seed source conservation.

The Second Five-Year Plan for the Forestry Sector (2001 – 2005) supports ongoing efforts in nursery establishment, selection of appropriate species, expansion of reforestation schemes and community forestry. It requires DFW to “establish tree seed banks through the foundation of seed quality selection and maintenance centres, and seed source forest stands in major forested areas throughout the country” in order to “ensure the most effective reforestation in terms of economic benefit, genetic conservation, environmental protection and service role”.

10.2 Government Plans

In the past, government planned reforestation of 500 hectares per year, but due to late arrival of budget allocations, the work could not be successfully completed. However, the ongoing forest reform process has significantly raised the priority for reforestation and requires the active participation of forestry officials, the armed forces and local communities. To support the relevant activities, the budget allocation has 3 fold. Funds will be contributed by a range of ministries, to the Ministry of Economy and Finance, to be channeled through MAFF, to the Reforestation Office of DFW.

Three million hectares of degraded forest land will be released through the cancellation of forest concessions. Although management plans have yet to be developed for these areas, reforestation and forest rehabilitation will play a significant role, where the focus will be on the supply of wood for the domestic market. Annual government plans for reforestation will be implemented through DFW and the Military. In addition, procedures are currently being drafted by MAFF for private sector plantations. At the local level, a huge increase in demand for community forestry is expected following approval of the sub-decree.

At the government level, there are no long-term plans in place for reforestation, neither in terms of geographical location nor management regimes, posing a major constraint to planning for seed supply of appropriate species. Once areas have been planted, there are no plans for their future management. Within the new forestry administration, all plantation sites will be managed by the Division level. The Central level will continue to plan, provide technical assistance and funds.

10.3 User Plans

Within all annual plans, acacia and eucalyptus form the greatest percentage of production. The research indicates that, outside of plantations dedicated to these species, the situation will change over time due to the following reasons:

- acacia is planted initially on each plantation plot to provide shade for the later planting of native species
- once nurseries have met the demands for short-term trees, they will be able to refocus towards longer-term species

None of the users within the survey were found to have long term plans for tree planting activities. Without exception, they operate solely on annual plans for seed collection, seedling production and distribution.

10.3.1 DFW/PFO

Nursery managers prepare annual plans and budgets for submission to the Reforestation Office of DFW. The actual work of DFW/PFO planting stations and

nurseries is dependent on the budget allocation from DFW, often resulting in a reformulation of the workplan after approval.

In 2003, DFW plan for the plantation of 1,625 hectares through their planting stations (Reforestation Office, 2002, untitled). Species will be selected according to the conditions of the planting site, but will focus on *Eucalyptus camalduleus*, *Tectonis grandis* and *Dipterocarp spp.*

The nurseries will produce 1.3 million seedlings for distribution, consisting of a mix of exotics, natives and fruit. The potentially large contribution to reforestation from community planting is recognised, and DFW will continue to distribute seedlings free of charge. Alternatively, communities with a high demand for seedlings will be encouraged to establish nurseries, where DFW provides the seeds and technical assistance.

DFW have sourced seeds for planting in 2003 as below.

Table 8 – Seeds Obtained by DFW for 2002

Species	Amount	Source
<i>Azelia xylocarpa</i>	2 tons	Rattanakiri
<i>Dalbergia cochinchinensis</i>	200kg	CTSP seed source
<i>Dipterocarpus alatus</i>	1 ton	CTSP seed source
<i>Hopea spp</i>	500kg	Along Route 3
<i>Eucalyptus camalduleus</i>	15kg	CSIRO/FOGENMAP
<i>Acacia spp</i>	0.5 ton	CSIRO/FOGENMAP
<i>Tectonis grandis</i>	3 tons	Kampong Cham, Pailin
<i>Pinus spp</i>		Vietnam

The following constraints and considerations are noted:

- Plans are prepared by the nursery managers, which are submitted to the Reforestation Office for approval. The Reforestation Office determines the species that will be included in the plans, and the Director of DFW issues the final approval. Budgets are allocated to nurseries accordingly, which generally results in reformulation of the plans. To date, plans for 2003 have not been approved, indicating a continuation of past failures as relevant activities cannot be conducted until the budget is allocated.
- Staff members work according to the instruction of the nursery manager. They give no consideration to past or potential future changes in requests for different species or amounts of seedlings, nor the ways in which their role may change.
- Many requests for seedlings cannot be met, reasons for this include the fact that seedlings are produced in accordance with the DFW plans only, or due to difficulties in sourcing seeds for indigenous species. However, to encourage community participation in tree planting, greater consideration needs to be given to their requirements.
- Nursery managers and staff expressed a desire for assistance to improve seed quality, and for training on seed testing, nursery management, etc. In relation to the former, the main concern was that it would not be possible to access CTSP seed sources due to the distance and costs involved in collection, as usually only a small amount of seeds are needed.
- Only in Kampong Thom, was there evidence of consideration for future tree planting strategies. Here, options were identified as reforestation, community

forestry, or enrichment. The latter was identified as the most appropriate, there is no land available for reforestation as all the province is under land restriction through forest or agricultural concessions, or national parks. There is little interest for community forestry at present due to the uncertainty of land rights, and because the province remains fairly heavily forested. This example highlights the importance of good site selection for tree planting activities, in terms of management regimes and participants.

10.3.2 Military

The military is expected to become active in national reforestation activities (see Government Plans, above). It is expected that Regional Development Offices will prepare annual plans for submission to the Head of the Army and experts from DFW. Plans have not yet been approved for 2003, and there is no longer term planning. During the research, a number of concerns were voiced as below:

- Tree planting areas will be identified with MAFF and will be under the jurisdiction of DFW. The identification process is not expected to be part of a broader land use management exercise. Local communities are unlikely to be involved other than as hired workers.
- Region 3 identified plantation sites in Takeo, Kampong Speu and Kampong Som, and the Prime Minister has approved the plan. The locations are in degraded forest areas, and were selected without the participation of local communities.
- A lot of manpower is available for tree planting and maintenance, but several provinces reported problems in the past in relation to land grabbing and clearance. Therefore, the new activities are viewed with mistrust. In addition, it seems far from clear where the responsibility will lie for maintenance and protection of the plantation.
- The military lack experience in nursery management and plantation techniques.
- Interviews indicated that the tree planting was envisioned as the easier part of the process, with difficulties expected in protection and maintenance.

10.3.3 Communities

FAO participates in the development of the district development plan, an integrated plan, that includes tree planting, and most of the districts submit requests. Concern Worldwide encourage the development of forest management plans. According to the experience of the communities, they may have an annual operational plan only, or a longer-term management plan. Plans are always developed in a fully participatory manner. The communities visited currently have operational plans, where VFMCs prepare the plans based on discussions with villagers, for submission to Concern Worldwide.

A recent study of community forestry in Cambodia (DFW/CGFP, 2002, An Assessment of Ongoing Community Forestry Initiatives in Cambodia) found 57 initiatives covering 228 community forests, on 83,000 hectares, across 18 provinces. Future demand is expected to increase exponentially with the adoption of the Community Forestry Sub-decree.

Constraints to community participation in tree planting include:

- A lack of incentive by local communities to plant forest trees on state land, due to the uncertainties related to land/resource use rights. The proposed community forestry sub-decree does not go far enough to improve the situation, because it

- allows only a relatively short term lease, of 15-years, or the time required from tree planting to harvesting.
- In forest rich areas, for example, Kampong Thom, replanting is not viewed as an economically viable option, given the abundance of resources in the province.
- In other areas, the potential demand for tree seeds is huge, but methods of sourcing seeds are limited.
- A lack of staff at DFW to process, manage and coordinate the expected increase in applications.

Other considerations concerning tree planting voiced during the research are listed below.

- The villages supported by Concern Worldwide decided to produce their own seedlings rather than obtain them from PFO because they wanted to gain skills in seedling production in order to better fulfill their requirements, as the PFO could not always provide enough seedlings or did not have the required species.
- Within community seedling production, seeds of desired species are not always available, due to the heavy degradation of the surrounding areas.
- Survival rates suggest that trees planted around houses receive better care than those planted in the community forest, indicating higher incentive for tree management at a private level.
- *Acacia* is most usually promoted for firewood and housepoles, and are popular over the short term. However, no evidence was found of families using this species for cooking, although their preferred species are indigenous species growing around the village. Likewise, for construction, the preferred species are also indigenous species previously abundant in the area.
- Concern Worldwide recognised a gender perspective in species selection, where women prefer fast growing trees, as they provide a quick benefit, whereas men also like native species, as they are good for the future. Gender differences are also seen in the management of seedlings, with men planting around the village, and women taking care of the seedlings.

10.3.4 Pagodas

Viel Pagoda does not plan for production, but plants the seeds that are obtained. Wahyu Pagoda has no long-term plans, but will continue to plant traditional species. The only evidence annual planning was at Sante Sena, in collaboration with local communities.

All pagodas were concerned that they were not always able to obtain seeds of their selected species. Pagodas will be able to benefit from the ongoing DFW commitment to distribute seedlings free of charge.

10.3.5 Private Sector

In terms of the private sector, this study covers only one large-scale nursery, that of British American Tobacco. Whilst seedling production has focused mainly on short rotation species, plans are changing towards longer-term species, reflecting the company's vision and long-term commitment. BAT is discussing expansion of their seedling production activities to other provinces. BAT's policy of free seedling distribution is likely to continue.

BAT expressed great interest in providing assistance/finance to reforestation projects, and cooperation in the establishment of demonstration sites for long term species.

In the future, private/commercial plantations will feature highly in reforestation plans, and are likely therefore, to add significantly to seed demand within the country.

10.4 Ongoing and Future External Support

Ongoing support within DFW to reforestation and forest rehabilitation include:

- JICA - seedling production for community distribution
- AKECU – strategy development for the rehabilitation of logged over areas
- CTSP – in-situ and ex-situ forest gene conservation, training and extension
- DANIDA – Kbal Chhay watershed project
- CGFP – policy support
- CSIRO – demonstration plot of 6.5 hectares for *Acacia crassicarpa*

In addition, a wide range of IOs, NGOs, projects and government institutions provide assistance to community forestry activities.

In view of the increased priority for reforestation within national government plans, and the ongoing commitment of RGC to forest sector reform, it can be envisaged that donor support to the sector will continue. However, future support will be subject to the results of the proposed donor review of the forestry sector.

11. Conclusions

It is not possible to estimate future demands for seeds because none of the tree seed users within the survey have long term plans for tree planting activities, they operate solely on annual plans for seed collection, seedling production and distribution. On an annual basis it is also difficult to match seed demand with seedling production, because requests are submitted to nurseries in the form of quantity of seedlings, whereas seeds are collected and traded by weight, and in general, the nursery staff are not able to convert between the two.

However, each year, tree seed users need seeds of exotic and indigenous species to produce seedlings to satisfy a range of requirements for tree planting in reforestation and forest rehabilitation programmes, community forests, in and around villages, and along roadsides.

Species selection and seedling production by nurseries associated with DFW planting stations and military plantations is in accordance with the size and conditions of the planting sites. Seedlings are used exclusively within the plantation sites, either for new planting or maintenance of previously planted areas.

The private nursery managed by BAT produces seedlings according to formal requests by a range of tree planters. Private/commercial plantations will feature highly in future reforestation plans, suggesting an increase in seedling production within the private sector.

DFW nurseries are managed in a top-down manner, with annual seedling production for distribution to communities and pagodas planned at the central level. In contrast,

community nurseries prepare annual plans with the participation of tree planters, and are often established because those managed by DFW/PFO do not provide seedlings of the desired species, or in sufficient amounts. It is necessary therefore, to encourage greater cooperation between DFW nurseries and community tree planters to ensure that seedling requirements are met.

Seedlings produced in nurseries are distributed free of charge, but all nurseries emphasised difficulties in sourcing some of the required species. In general, local communities prefer short rotation species and fruit, whereas pagodas and schools favour *Dipterocarpus alatus* and *Hopea spp.* Currently, indigenous species form a small percentage of total seedling production, with the vast majority comprised of *Acacia spp* and *Eucalyptus spp.* However, users expect their seed demands to change as short-term rotation requirements are met.

Whilst survival rates vary across the country, they are generally higher when seedlings are planted around houses, in comparison to those planted in public places, which reflects the different levels of protection accorded to the planting sites, and indicates a higher incentive for local tree management at a private level.

The quality of seed is recognised by all users to be poor. Indigenous tree seeds are usually purchased from local people, and therefore, quality cannot be assessed other than through the germination rate, resulting in wasted resources. It is apparent that the quality of seeds could be improved greatly following the identification of, and distribution from, appropriate seed sources. Some exotic species sourced from outside the country are certified, but are often imported through informal channels. In the future, imports of tree seeds will be strictly regulated according to the Forestry Law.

Those people interviewed with responsibility for budget management estimated seed purchases to account for less than 10% of the overall nursery expenditure. It was generally agreed that the budgets could cover the costs of good quality seeds, provided that they could be accessed locally. Large nurseries, such as DFW/PFO and BAT will continue to distribute seedlings free of charge, which will greatly assist those with little or no financial support.

The significant contribution of community tree planting to national reforestation targets is recognised, and will be supported by DFW. Currently, local communities have little incentive to plant trees on State land due to the uncertainties related to land/resource use rights. Where community forestry agreements are in place, forest rehabilitation through natural regeneration takes preference over tree planting activities in areas of perceived forest resource abundance.

A major concern for tree planting by the military is the process of site identification, expected to be within degraded forest areas. Local communities are unlikely to be involved in this process, yet experience indicates that they depend upon such areas for their livelihood. It is reasonable therefore, to expect land use conflicts to arise in some areas. In those areas that have fallen victim to land grabbing by the military, this new activity is viewed with mistrust.

Of highest concern in aiming to ensure the future supply of good quality seeds of appropriate species is the lack of long-term planning for reforestation. At the government level, increased budgets will support a dramatic expansion of reforestation

activities, but consideration has yet to be given to the geographical location of planting sites, appropriate forest management regimes and rehabilitation strategies. At local levels, a comprehensive assessment of land use is essential to identify areas suitable for tree planting and to determine appropriate species.

The identification of appropriate species for reforestation activities guide the process of forest genetic conservation and the management of tree seed sources. This study has indicated the identification of seed sources as an initial step towards ensuring the supply of good quality seeds. Of additional importance to seed users is assess to good quality seeds through an efficient and reliable distribution system.

References

DFW/CGFP, 2002, An Assessment of Ongoing Community Forestry Initiatives in Cambodia

DFW/Reforestation Office, 2002, untitled papers relating to plans for planting stations and nurseries

RGC, 2001, Forestry Law (draft)

RGC, 2001, The Second Five Year Plan for the Forestry Sector, 2001 – 2005

RGC, 2002, Sub-Decree for Community Forestry (Draft)

គំរោងគ្រាប់ពូជលើកម្ពុជាបានធ្វើការប៉ាន់ស្មានពីតំរូវការគ្រាប់ពូជសំរាប់ថ្នាលបណ្តុះ នៅក្នុងការសិក្សា ប្រមូល
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លើសពីការប៉ាន់ស្មានពីមុនទៅទៀត ។

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ឆ្លើយតបទៅនឹងបណ្តាតំរូវការដាំលើ ក្នុងកម្មវិធីដាំព្រៃឡើងវិញនិងស្តារព្រៃលើ សហគមន៍ព្រៃលើ ការដាំនៅក្នុង និង
ជុំវិញភូមិ និងតាមដងផ្លូវ ។

ការជ្រើសរើសពូជនិងការផលិតកូនលើរបស់ថ្នាលបណ្តុះ រួមមានស្ថានីយ៍ដាំលើរបស់នាយកដ្ឋានរុក្ខាប្រមាញ់ និង
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នៅក្នុងទីចំការ ទីកន្លែងដាំថ្មី ឬដាំជួសក្នុងចំការមុនៗ ។

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ថ្នាលបណ្តុះរបស់នាយកដ្ឋានរុក្ខាប្រមាញ់គ្រប់គ្រងតាមបែបផែនការលើចុះក្រោម ព្រោះថាការផលិតកូនលើប្រចាំ
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រុក្ខាប្រមាញ់និងអ្នកដាំលើសហគមន៍ ដើម្បីធានាឱ្យឆ្លើយតបតាមតំរូវការកូនលើ ។

កូនឈើដែលផលិតបានពីថ្នាល ត្រូវបានចែកចាយដោយឥតគិតថ្លៃ ប៉ុន្តែថ្នាលបណ្តុះទាំងអស់បានបញ្ជាក់ពីការ
លំបាក ក្នុងការផ្តល់ប្រភេទពូជឈើដែលគេត្រូវការ ។ ជាទូទៅ សហគមន៍មូលដ្ឋានចូលចិត្តប្រភេទពូជឈើហូបផ្លែនិងរយៈ
ពេលខ្លី ទន្ទឹមនេះ វត្តអារាមនិងសាលារៀនចូលចិត្តប្រភេទឈើទាលនិងគគីរ ។ បច្ចុប្បន្ន ប្រភេទពូជក្នុងស្រុក មានតែមួយ
ភាគតូចនៃការផលិតកូនឈើសរុប ដែលភាគច្រើន គឺប្រភេទអាកាស្យានិងអីកាលីបទុស ។ ក៏ប៉ុន្តែ អ្នកប្រើប្រាស់រំពឹងថា
តំរូវការគ្រាប់ពូជរបស់គេ នឹងប្តូរជាតំរូវការប្រភេទរយៈពេលខ្លី ត្រូវទទួលបានការឆ្លើយតប ។

ខណៈដែលអត្រាកូនឈើរស់មានខុសៗគ្នានៅទូទាំងប្រទេស ជាទូទៅ វាមានអត្រាខ្ពស់ កាលណាគេដាំវានៅតាម
ជុំវិញផ្ទះ បើប្រៀបធៀបទៅនឹងការដាំនៅតាមទិសាធារណៈ ។ នេះឆ្លុះបញ្ចាំងឱ្យឃើញពីកំរិតខុសគ្នានៃការការពារទឹកក្នុង
ដាំកូនឈើ ហើយនេះបានបង្ហាញថា គ្រឿងលើកទឹកចិត្តខ្ពស់ជាងចំពោះការគ្រប់គ្រងកូនឈើនៅមូលដ្ឋានរបស់ឯកជន ។

បញ្ហាគុណភាពរបស់គ្រាប់ពូជវិញ អ្នកប្រើប្រាស់គ្រាប់ពូជទាំងអស់ទទួលស្គាល់ថាពិតជាអន់មែន ។ ជាធម្មតា
ប្រភេទ ពូជក្នុងស្រុក គេទិញពីប្រជាជនជនបទ ដូច្នេះហើយ ទើបគុណភាពរបស់វាមិនអាចវាយតម្លៃបាន ក្រៅពីតាមរយៈ
រាប់អត្រា ដំណុះ ដែលបណ្តាលឱ្យខ្លះខ្លាយធនធាន ។ នេះបង្ហាញឱ្យឃើញច្បាស់ថា គ្រាប់ពូជត្រូវតែធ្វើការបង្កើតគុណភាព
ជាបន្ទាន់ តាមរយៈការធ្វើអត្តសញ្ញាណប្រភពផលិតគ្រាប់ពូជ និងការចែកចាយគ្រាប់ពូជមានគុណភាពសមស្រប ។ ប្រភេទ
ពូជក្រៅស្រុក ខ្លះមានប្រភពនៅក្រៅប្រទេសមានលិខិតបញ្ជាក់ តែជារឿយៗ ត្រូវបាននាំចូលតាមរយៈក្រៅផ្លូវការ ។ ក្នុង
អនាគត ការនាំចូលគ្រាប់ពូជឈើ នឹងមានការត្រួតពិនិត្យតឹងរឹង បើយោងទៅតាមច្បាប់ព្រៃឈើបច្ចុប្បន្ន ។

អ្នកដែលបានធ្វើសំភាសន៍ សុទ្ធតែអ្នកទទួលខុសត្រូវលើការគ្រប់គ្រងថវិកាប៉ាន់ស្មានការទិញគ្រាប់ពូជ ដែលគិត
ទៅមានតិចជាង១០% នៃចំណាយការងារថ្នាលសរុប ។ ជាទូទៅ គេឯកភាពថា ថវិកានេះប្រហែលជាអាចទិញគ្រាប់ពូជ
គុណភាពល្អបាន ដែលមានប្រភពនៅជិតថ្នាលរបស់ពួកគេ ។ ថ្នាលបណ្តុះធំៗ ដូចជារបស់នាយកដ្ឋានរុក្ខាប្រមាញ់/ការិយា-
ល័យរុក្ខាប្រមាញ់ខេត្ត និងក្រុមហ៊ុនថ្នាំជក់អង់គ្លេស-អាមេរិកាំង នឹងបន្តចែកចាយកូនឈើឥតគិតថ្លៃ ដែលនឹងជួយបាន
ច្រើនចំពោះអ្នកទាំងឡាយណាដែលមាន ឬ គ្មានការឧបត្ថម្ភហិរញ្ញវត្ថុបន្តិចបន្តួច ។

ការរួមវិភាគទានយ៉ាងសំខាន់របស់សហគមន៍ក្នុងការដាំឈើដើម្បីស្តារព្រៃឈើជាតិឡើងវិញ ត្រូវបានពួកគេ
ទទួលស្គាល់ ហើយត្រូវតែមានការគាំទ្រពីនាយកដ្ឋានរុក្ខាប្រមាញ់ ។ បច្ចុប្បន្ន សហគមន៍មូលដ្ឋានមានការលើកទឹកចិត្តតិច
តួចក្នុងការដាំឈើលើដីរដ្ឋ ដោយសារតែភាពមិនច្បាស់លាស់ទាក់ទិននឹងសិទ្ធិប្រើប្រាស់ដីធ្លី/ធនធាន ។ នៅទីណាដែលមាន
កិច្ចព្រម ព្រៀងសហគមន៍ព្រៃឈើ ការស្តារព្រៃឈើតាមរយៈដំណុះធម្មជាតិ ល្អជាងធ្វើការដាំឈើក្នុងតំបន់ដែលគេយល់
ថាមានធនធានព្រៃឈើសំបូរទៅហើយនោះ ។

ការជំពាក់ទាក់ទងដ៏ធំមួយនៃការដាំដើមឈើរបស់កងទ័ព គឺជាដំណើរការមួយនៃការធ្វើអត្តសញ្ញាណទីដីដាំដុះ
ដែលគេរំពឹងថា កំណត់យកតែដីនៅក្នុងតំបន់ព្រៃរេថវិលប៉ុណ្ណោះ ។ សហគមន៍មូលដ្ឋាន ហាក់ដូចជាមិនទាន់មានបញ្ហាអ្វី

ពាក់ព័ន្ធ ក្នុងការងារនេះទេ ព្រោះថាមិនទាន់មានព័ត៌មានបង្ហាញថា ពួកគេពឹងផ្អែកលើតំបន់ព្រៃឈើទាំងនេះសំរាប់ជីវ-
ភាពរបស់ពួកគេនៅឡើយ ។ ប៉ុន្តែនាអនាគត ប្រហែលជានឹងអាចមានទំនាស់ប្រើប្រាស់ដីធ្លីកើតឡើងនៅតំបន់មួយចំនួន ។
តំបន់ដែលមានទំនាស់កើតឡើងពីការចាប់យកដីសំណាក់កងទ័ពនោះ សកម្មភាពថ្មី ឃើញថាជាការយល់ច្រឡំនឹងគ្នា ។

កង្វល់ខ្លាំងបំផុតក្នុងការប៉ុនប៉ងធានាផ្គត់ផ្គង់គ្រាប់ពូជគុណភាពល្អនៃប្រភេទពូជសមស្របនាអនាគត គឺកង្វះខាត
នៃការធ្វើផែនការរយៈពេលវែងសំរាប់ដាំព្រៃឈើឡើងវិញ ។ នៅថ្នាក់រដ្ឋាភិបាល កំណើនថវិកា និងជួយពង្រីក សកម្មភាព
ដាំព្រៃឈើឡើងវិញបានយ៉ាងច្រើន ប៉ុន្តែការពិចារណានេះមិនបានគិតដល់ពីទីតាំងភូមិសាស្ត្រនៃទីកន្លែងដាំ របបគ្រប់គ្រង
ព្រៃឈើសមស្រប និងយុទ្ធសាស្ត្រស្តារព្រៃឈើឡើងវិញ នៅឡើយទេ ។ នៅថ្នាក់មូលដ្ឋាន ការវាយតម្លៃទូលំទូលាយមួយ
លើការប្រើប្រាស់ដីធ្លី មានសារៈសំខាន់ ដើម្បីធ្វើអត្តសញ្ញាណតំបន់ដែលសមស្របសំរាប់ដាំដើមឈើ និងកំណត់បានច្បាស់ពី
ប្រភេទពូជសមស្របក្នុងការដាំ ។

ការធ្វើអត្តសញ្ញាណប្រភេទពូជឈើសមស្របសំរាប់សកម្មភាពដាំព្រៃឡើងវិញ នាំទៅដល់ដំណើរការអភិរក្ស
សេនេទិចព្រៃឈើ និងការគ្រប់គ្រងប្រភេទផលិតគ្រាប់ពូជឈើ ។ ការសិក្សានេះបានបង្ហាញថា ការធ្វើអត្តសញ្ញាណប្រភេទ
ផលិតគ្រាប់ពូជ ជាជំហានចាប់ផ្តើមឆ្ពោះទៅរកការធានាផ្គត់ផ្គង់គ្រាប់ពូជគុណភាពល្អ ។ សារប្រយោជន៍បន្ថែមដល់អ្នកប្រើ
ប្រាស់គ្រាប់ពូជ គឺអាចទទួលបានគ្រាប់ពូជគុណភាពល្អតាមរយៈ ប្រព័ន្ធចែកចាយប្រកបដោយប្រសិទ្ធភាពនិងជឿទុកចិត្តបាន ។