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ACHIEVING THE ITTO OBJECTIVE 2000 AND SUSTAINABLE FOREST MANAGEMENT IN THAILAND

Report of the Diagnostic Mission

Report submitted to the International Tropical Timber Council by the Diagnostic Mission established pursuant to Decision 2(XXIX) 2006

November 7, 2006

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Abbreviations and Acronyms

AEETC	Asian Europe Environmental Technology Centre
AIT	Asian Institute Technology
ASEM	Asia Europe Meeting
BAAC	Bank of Agriculture and Agricultural Co-operatives
BARC	Bank of Agriculture and Rural Cooperatives (Nepal)
C&I	Criteria and Indicators
CBNRM	Community Based Natural Resource Management
CEO	Chief Executive Officer
CF	Community Forestry
CITES	The Convention on International Trade in Endangered Species of Wild Fauna
cm	centimeter
CO	Certificate of Origin
CoC	chain-of-custody
DAE	Department of Agricultural Extension
DANCED	Danish Cooperation for Environment and Development
DANIDA	Danish International Development Assistance
DBH	Diameter Breast Height
DG	Director General
DKK	Danish Kroner
DLD	Department of Land Development
DMC	Department of Marine Coastal Resources
DNP	Department of National Park, Wildlife and Plant Conservation
DONP	National Park, Wildlife and Plant Conservation Department
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FECOFUN	Federations of Community Forest Users (Nepal)
FF	Forestry Faculty (KU)
FIO	Forest Industry Organization
FRC	Forest Research Center
FSC	Forest Stewardship Council
FSMP	Forest Sector Master Plan
GIS	Geographical Information System
ha	Hectare
ICRAF	World Agroforestry Center
IMFN	International Model Forest Network
INRCP	Integrated Natural Resources Conservation Project
IT	Information Technology
ITTC	International Tropical Timber Council
ITTO	International Tropical Timber Organization
IUCN	The World Conservation Union
JICA	Japan International Cooperation Agency
KD	Kiln dried
kg	kilogram
KPI	Key Performance Indicators
Ktoe	Kilo tonne oil equivalent
KU	Kasetsart University
KURDI	Kasetsart University Research and Development Institutes
m^3	cubic meter
MAI	Mean Annual Increment
MDF	Medium Density Fiberboard
MOAC	Ministry of Agriculture and Cooperatives
MONRE	Ministry of Natural Resources and Environment
NAREBI	National Resources and Biodiversity Institute
n.d	Not dated
NEA	National Energy Authority
NESAC	National Economic and Social Advisory Council

NESDB	National Economic and Social Development Board
NESDP	National Economic and Social Development Plant
NFP	National Forest Program
NTFP	non-timber forest product
NGO	Non-governmental Organization
NPV	Net Present Value
NRM	Natural Resource Management
OAE	Office of Agricultural Economics
ORRAF	Office of Rubber Replanting Aid Fund
ORRRF	Office for Rubber Research Revolving Fund
OTOP	One Tambon One Product
PA	Protected area
PEFC	Programme for Endorsement of Forest Certification
PFE	Permanent forest estate
Ph.D.	Doctor of Philosophy
PNG	Papua New Guinea
PNRE	Provincial Natural Resource and Environment
R	roundwood
RECOFTC	Regional Community Forestry Training Centre
REX	Reforestation and Extension Project
RFD	Royal Forest Department
RIC	Rural Income Per Capita
RMFP	Regional Model Forest Project
RRI	Rubber Research Institute
RRIM	Rubber Research Institute of Malaysia
RUP	ratio of urban to total population
s	processed product
SDR	Saw-Dry-Resaw
SFM	Sustainable Forest Management
STK	Certificate of forest land usufruct right
TAO	Tambon (sub-district) Administration
TAT	Tourism Authority of Thailand
TDRI	Thailand Development Research Institute
TEI	Thailand Environment Institute
TFSMP	Thai Forestry Sector Master Plan
THB	Thai Bath (1 US$ = 40 THB)
TIC	Teak Improvement Centre
TOF	Trees Outside Forests
US$	US Dollar
WEFCOM	Western Forest Complex
WRME	wood raw material equivalent
WWF	World Wide Fund for Nature

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Markku Simula Takeshi Akaha Bipin Behari Yam Malla

EXECUTIVE SUMMARY

Objectives of the Mission

Within the framework of Decision 2(XXIX) of the International Tropical Timber Council (ITTC) entitled "ITTO Objective 2000", the Royal Thai Government submitted in 2001 an official request to the ITTC for the visit of a technical mission to Thailand in order to carry out a diagnosis of the forest management status in the country. The objective of the mission was to assist the Government in identifying those factors that prevent or limit the country's progress towards achieving Objective 2000 and sustainable forest management, and to recommend appropriate measures to overcome these constraints.

Development of the Mission

In January 2006 three local consultants completed a background document, which served as the basis of the work of the Mission. The Royal Forest Department was requested to inform the key stakeholder groups on the objectives and the conduct of the Mission and written comments on the main constraints to SFM were invited. The Mission was fielded from March 22 to April 8, 2006. After initial consultations with RFD, the Mission identified six main topics for detailed investigation as these were considered to be critical elements for the achievement of sustainable forest management (SFM) in Thailand. These were (a) conservation and management of natural forests, (b) community forestry (c) plantations, (d) industry and markets, (e) non-timber forest products, (f) public policies, and (g) institutional capacity. Field visits were made to five provinces and the preliminary findings were discussed in a stakeholder workshop at the end of the Mission. A total of about 125 people were consulted representing different stakeholder groups.

OVERVIEW OF THE CURRENT SITUATION

Policy and Institutional Framework

The Government of Thailand has established stringent laws towards the protection and conservation of forest areas including water and biodiversity. These include five main acts: Forest Control Act, (1941), National Park Act (1961), National Reserved Forest Act (1964), Wildlife for Preservation and Protection Act (1992), and Reforestation Act (1992). The Royal Forest Department (RFD), founded in 1896, is responsible for forests outside protected areas which are the responsibility National Park, Wildlife and Plant Conservation Department (DNP). The Department of Marine and Coastal Resources (DMC) has the authority over the mangrove and other coastal forests. All the departments are under the supervision of the Ministry of Natural Resources and Environment (MONRE). Several other agencies are also dealing with forests.

Land Use, Deforestation and Forest Cover

In 2001, the land use of the country was divided between agriculture or farmholding land (41%), forest (31%) and unclassified areas (28%). In 1961, the total forest area of Thailand was about 27 mill. ha covering over 53.3% of the country. Subsequently, forest areas were encroached for the purpose of slash-and-burn, shifting cultivation, land resettlement, dam and road construction, land reform for agriculture, etc. The annual rate of deforestation has been about 63,000 ha per year since 2000, or higher than in the 1990s. The current forest area is estimated at 16.8 million ha.

Forest Resources

There are two main types of forests in Thailand: (1) evergreen forest and (2) deciduous forest. The evergreen forest consists of the tropical evergreen forest, the pine forest, the mangrove forest and the beach forest. Tropical evergreen forest is found all over the moist part of the country. Tropical rain forest is common in the Southern and Eastern regions.

Permanent Forest Estate and Tenure of Forest Land

The area of permanent forest estate (PFE) reported in 1991 was 23.5 mill. ha, much of it already without forest cover. PFE had shrunk by almost 50% to 12.0 mill. ha in 2001. About 1.15 mill. ha of the original PFE has been converted to agriculture, 8.3 mill. ha to settlements and infrastructure, and 1.1 mill. ha to other uses. The balance now available comprises about 10 mill. ha of protected area and

1.9 mill. ha of plantations. The production PFE now is found only in planted forests on government land. Practically all the natural forests are owned by the state and managed by RFD, DNP or DMC. Privately owned forests are mostly plantations but not accounted as PFE. The Government has issued various types of tenure rights for people living in forest reserves.

Management of Natural Forests
Four stages can be identified in Thai forestry: (i) early exploitation stage (from the mid-1890s to the early 1930s), (ii) expanding exploitation and management stage (from the 1930s to the early 1960s), (iii) forest exploitation decline stage (from the 1960s to the mid-1980s); and (iv) struggle towards sustainable management under a logging ban in natural forests (from 1989 onwards). The current forest management approach has had three main interventions: (a) expansion of designated protected areas, (b) expansion of the forest resource base by plantations, and (c) development of community forestry. There are no management plans for the Reserved Forest areas. In annual operational plans there are no provisions for silvicultural treatments. Emphasis in forest management is on patrolling, recreation and other services, and only limited research has been carried out.

Planted Forests
The total area of planted forests in 2000 was estimated at 2.81 mill. ha and there are another 2.0 mill. ha of rubber plantations. The main planted timber species are teak, eucalyptus, acacia and pine. Plantations were originally established by the Government and in the 1990s various plantation campaigns with government financing were implemented. More recently, farmers and private investors have started to plant forests.

Forest Production
No reliable statistics exist in the country on wood production. There are two main sources of industrial wood: eucalyptus plantations and rubber plantations. Due to the logging plan, there is practically no timber production in natural forests. The total volume of industrial roundwood production is estimated at 19 mill.m3/year.

Conservation of Biodiversity
Thailand is bestowed with rich floral, faunal and cultural diversity. The country houses approximately 7 % of the world flora and fauna and is considered a collective regional centre of botanical diversity. There are 15,000 plant species in the country, 4,600 vertebrate species and 83,000 invertebrate species. There is a large number of plant and animal species, which are endangered, rare or threatened. Many species have also been domesticated.

Socio-economic aspects
The Thai population totals 63 million inhabitants with an annual growth rate of 0.4%. The population density is 123 persons per km2. Eighty percent of the population lives in the rural areas. The poverty level is low and most people living in protected areas are experiencing high or medium level poverty. For the rural poor, fuelwood and non-timber forest products (NTFP) are important sources of livelihood. The accounted sectoral contribution to GDP of forestry has been declining and in 2003 it amounted only to US$ 120.5 million representing 0.1% of the total GDP. This does not take into account fuelwood and NTFPs. The declining trend in the GDP share is probably changing with increasing volumes of plantation wood maturing for harvesting.

DIAGNOSIS

Forest Conservation
Thailand has set up a target to have 25% of the country's total land area as protected areas while their present coverage is about 20%. The protected area (PA) system is comprehensive including 227 declared protected areas (11.3 mill. ha) under the control of DNP. Although extensive, the PAs contain disproportionate amounts of upland forest but very little lowland evergreen forest. However, the habitat coverage has been considered 'quite satisfactory' with 'no obvious gaps'. The PA network in Thailand is one of the best in Southeast Asia.

Out of the total 103 gazetted national parks, the Government had prepared master plans only for 55. Valid management plans exist only for 15 gazetted parks. Another 45 areas have been proclaimed but are not yet gazetted. Out of the 55 wildlife sanctuaries, only 25 have management plans under preparation. This shows that the pace of extending the PA network has well exceeded the capacity of the administration to bring these areas under effective management. In addition, management plans are not necessarily leading to improved protection as they often lack implementation.

The Thai conservation policy initially revolved around a "wilderness approach," which recommended total exclusion of people from protected areas. Such an approach is no longer possible in a country where a large population dependent on forest resources lives inside PAs. The key issue for the future of the PA network is how to deal with the 1.2 to 2 million people who are living within the protected areas. Delineation of the gazetted area boundaries has been criticized and the scientific basis of decisions has not been made public.

Cross-border forest complexes represent a particular priority in the maintenance of protected areas over broader landscapes which need to be conserved through integrated approaches including buffer zones, biological corridors, etc. and which should address the specific issues of border areas (immigration, trade in endangered species, illegal logging, etc.). Common approaches are necessary to bring the cross-border areas under effective protection and control.

Forest Reserves

The 1,221 national forest reserves covering an area of 23,4 mill. ha and managed by RFD form also part of the conservation system. Together with protected areas, they cover about 63.2% of the total area of the country. About 20% of the country 56,000 villages are located within forest reserves. Thailand has never had a long-term silvicultural management system despite the successful experiences developed in the neighboring countries with similar forest types. There are no records of national-level forest inventories.

During the logging period inventories were regional or local in scale and they contained data only on teak. However, any sustainable silvicultural management requires data on the potential of stands in terms of their future growth and yield. Silvicultural systems could be based on species-specific and site-adjusted selection systems or conversion methods to convert the existing stock into a natural-like forest. However, silvicultural treatments such as thinnings are not allowed because of the logging ban and therefore hardly any revenue can be generated for this state-owned huge asset. What is allowed is the production of NTFPs.

In order to develop appropriate silvicultural systems in Thailand, it would be necessary to establish permanent sample plots for monitoring growth and yield of different forest types. Knowledge on the phenology and physiology of key indigenous species should be improved on aspects like seed production, shade tolerance/light requirements and responses to competition, liberation and other treatments. There is also need for further research on taxonomy.

The main management goal in forest reserves is conservation. As large areas do not have forest cover they have become *de facto* common public lands that are encroached by expanding agricultural activity. These areas would need to be brought under management to guarantee their health and vitality. However, the logging ban impedes any silvicultural improvement, as the necessary treatments would involve liberation harvesting. In Thailand, there is an erroneous perception that setting aside is the only way to effectively protect forests. With the current conservation paradigm, Thailand is implementing a non-optimal conservation strategy, which ignores the economic value of timber as one of the outputs of sustainable forest management. The economic value of lost opportunities could be assessed based on the available yield estimates to guide future policy decisions.

The Mission is fully aware that this is politically a most sensitive issue in Thailand. Any policy changes should be part of a broader process involving all the stakeholder groups at different levels. Necessary background information on the options, their impacts and consequences should be generated before such a consultation process becomes meaningful.

Watershed Management

Since the last 20 years the strategy in watershed management has been to maintain or create a protective forest cover for the protection of soil and water but the implementation concept has changed over time. The past top-down planning and implementation with costly large-scale reforestation have been substituted by diversified approaches. Low density planting minimizes costs and maximizes impacts, which is particularly useful in degraded lands. Alternative land-use and agricultural practices have been introduced to discourage shifting cultivation and landscape-level approaches have also been introduced. The government delivery system of support has suffered from inefficiencies, lack of adequate technical knowledge, and limited involvement of local people. Partnership arrangements between authorities and local communities are still poorly developed. Greater attention to traditional rules, regulations and practices would enhance the feasibility of interventions. Best results on the ground are probably achieved when villagers have instituted a clear set of rules and regulations to control access and use rights aimed at regenerating the natural forest while allowing controlled use of the resources.

Mangroves

Promotion of integrated watershed management programs and redesign of farming systems on the principles of ecology, economics and employment generation are needed in the mangrove area. Capacity building programs are also necessary for local communities on the state-of-the art of post-tsunami agronomic, ecological and livelihood rehabilitation measures drawing on the accumulating experience. Investing in environmentally sound development and sustainable management of the coastal environment will, in the long run, be more cost-effective than restoring human lives and ecosystems after a catastrophe. Bioshielding requires a combination of mangrove and terrestrial systems

Community Forestry

Forest resources have been an integral part of Thailand's rural life, involving all aspects of local people's activities, In addition to some 1.2 to 2.0 million people living in and around the protected areas, another 20 to 25 million people live nearby the national forest reserves and use them for forest products. As early as in the 1970s, community (or village) forestry has been tried as a strategy for sustainable forest. Some 11,400 villages (or 15.5% of all the villages) are involved in managing community forests in the country, of which about a half are reported to have formally registered their community forests. They cover 200,000 ha or 1.2 % of the total forest area.

RFD has identified and promoted a variety of means to support local communities to manage their forests, albeit at pilot scales, so that these could be scaled up. However, without an enabling regulation, the future of these community forests is insecure, as RFD is not in a position to provide in writing any guarantee that these forests will definitely continue to be under community management. Besides, the area under community forests is so small and the speed at which they are established so slow that no significant positive impact has been achieved on poverty reduction and the management of the country's forest resources as yet.

The main reason for the slow progress is the inadequate legal framework in spite of efforts to issue Community Forestry Bill. Several versions, have been drafted, but the approval has been on hold due to difficulty in reaching a consensus as views differ particularly on the clause that would allow community forests in protected areas. The other reasons include conflicts and politics of various interested groups. The deep mistrust concerning local communities' capacity to manage forests among civil servants and some NGOs, who see villagers as the main cause of forest degradation, is one of the main reasons for holding community forestry back. In addition to excluding communities from the management of protected areas, there are strong views among authorities against allowing community forestry beyond the degraded sites within the national forest. If community forestry is to make any meaningful contribution to the country's forest resource management and poverty alleviation, there has to be a fundamental shift in the overall thinking on the rationale and purpose for community forestry policy and program. Local communities should be seen as assets of human capital for improving the country's forest resources, not only as threats for their degradation.

Rubberwood

The existing rubber plantations, with a theoretical potential of wood supply of about 21 mill. m^3/year, are the main source of industrial timber in Thailand. Revenue from wood is additional to farmer and

helps finance rubber replanting cost. At the national level, the total stumpage revenue of the smallholders from rubberwood is estimated at US$ 35 to 60 mill. Wood production can be a particularly attractive option for the poor North and Northeast regions where latex productivity is well below the national average.

The current policies and institutional arrangements of the rubber sector do not adequately take into account the potential offered by rubberwood production. There is little coordination between the promotion of production of latex and that of utilization of rubber trees as a source of wood raw material. Comprehensive economic analyses on the feasibility of rubber tree planting for wood, either alone or together with latex, do not exist to guide policy design although growing rubber trees for timber can be an economically attractive option for farmers. Lacking information on timber yields, RFD is promoting sub-optimal planting of rubber trees exclusively for timber production with the same clones and with the same plantation densities that are used to yield maximum latex production. Even more serious is the lack of information on potential rubberwood supply at provincial level, which makes the promotion of rubberwood processing difficult representing a source of risk for firm-level investment decisions.

Timber Plantations

Since the 1989, logging ban, timber production in Thailand has shifted from natural forests to planted forests. But plantation of timber species has progressed slowly due to a series of constraints. Most of farmers are indebted and therefore, they have to obtain quick returns, and even a five-year rotation with eucalyptus is often too long for them. There is a need to adjust the law so that farmers can be allowed to harvest, transport and sell plantation timber on their own private lands without any permission, including reserved species. This would remove uncertainty related to the right to harvest at the end of the rotation.

The technical basis of plantation development is still relatively shallow. Studies should be carried out to diversify plantation sites and species for improved economic returns. Forest Plantation Promotion Centers should continue the monitoring and establishment of experimental plots for periodic measurement, etc. This could be done in partnership with industry and linked to training of farmers as both parties have common interest in plantation development.

Teak

The area of natural teak forest in Thailand decreased from 2.3 million ha in 1954 to about 150,000 ha in 2000. During the same time, the private and public sectors have established only 836,000 ha of teak plantations. Small logs from teak plantations can already be used for furniture, carving, building construction, household utensils, toys, poles and posts, etc. Apart from genetic improvement, practically no research has been done regarding teak in spite of the fact that the species was the mainstay of the forestry sector for more than 100 years. There should be registered sources of teak seeds and planting material for large-scale plantations and smaller landowners. There is also a need to have adequate systematic research on quality planting material, increased productivity, and economic feasibility of teak plantations to support their expansion.

No survey and no management plans exist on teak plantations in the country. There is a need to have a database regarding these plantations which need to be registered anyway before harvesting can be allowed as teak is reserved species. The information would also assist in policy design, planning and marketing of plantation teak, etc.

Eucalyptus

Eucalyptus plantations cover about 480 000 ha of which 10% is in paddy fields. Wood production is estimated at 7 mill. m^3/yr. Most (70-80%) of eucalyptus produced is used by the paper and pulp industry, 10-15% goes for charcoal and 5% for construction poles, etc. Manufacturing of MDF, hardboard and particleboard from eucalyptus has also started.

There is an on-going debate on the environmental impact of eucalyptus throughout the world and in Thailand, the public perception is also generally negative. However, among farmers the negative perception has apparently faded as it has been demonstrated that there is no adverse effect either on the productivity of agricultural crops if plantations are established and managed properly. With

relatively simple improvements in genetic material and silvicultural treatments, the productivity of eucalyptus plantations can be substantially improved.

The current emphasis on pulpwood production in eucalyptus plantations does not yield the optimum contribution of the resource to the country's wood supply. The potential of using eucalyptus for sawnwood and plywood, both presently being imported on a large-scale, still remains to be tapped. The associated technical problems can be solved. On the wood supply side, it is important to introduce thinnings (and pruning if needed) in plantations where owners can wait for higher economic yields than with short-rotation pulpwood. This could open up new areas for eucalyptus planting which are presently too distant from the existing industrial plants. In view of the critical wood supply situation in the country, this could be one of the strategic priorities of forestry development in the short and medium term.

Timber Supply and Demand

The total industrial roundwood supply was about 19.2 million m^3 in 2004. About 98% of the total industrial roundwood supply come from plantations. The largest consumer of roundwood (54% of the total) is the pulp and paper industry, followed by the sawmilling industry (30%) and wood-based panels. Imports are strategically important in the sawnwood supply (90% of the total). Thailand's main export items in wood products are sawnwood, particleboard and fiberboard. In the 1990s the sawnwood trade was small and rather stable in 2004 it reached 1.8 mill. m^3. This quite phenomenal development is a result of the growing interest of Chinese furniture producers to procure sawn rubberwood from Thailand.

There is some unrecorded trade with the neighboring countries and there are discrepancies between trading partners in the data. Unrecorded trade has two components, i.e. legal imports of small volumes for non-commercial purposes and illegal imports. There is a general perception that illegal imports have been declining drastically compared to what they used to be in the 1990s.

The sawmilling industry's biggest challenge is probably how to cope with the increasing labor costs and modernize the existing capacity. The improvement process could apply a value optimization approach. There is also a need to consider higher efficiency technological options for log handling, sawing, drying, further processing and waste handling.

Markets for Forest Products

In log trade, market transparency is limited and sellers do not have a clear understanding of the potential value of their wood crop. There is an urgent need to improve the market transparency, which could gradually start making the market more efficient. Wood measurement practices cannot be effectively controlled by the seller and therefore represent an opportunity for misuse. Buying of growing stock by area should be phased out and replaced first by weight measurement. In the long run, saw and veneer log measurement should preferably be carried out based on volume.

The crucial element for improving the negotiation power of roundwood producers is to establish effective common organizations (associations, cooperatives, etc.) which would be capable to protect farmers' interests in varying market conditions. Tree farmer-corporate partnership arrangements are useful instruments in promoting investment in plantations and mitigating against market risks. They can also mobilize such landowners in plantation investment who themselves do not have capacity to organize planting and management activities.

Furniture Industry

Without a concerted effort driven by the government, Thailand's thriving furniture industry, as a significant source of export earnings, is likely to become stagnant due to the heavy competitive pressure. The industry has developed largely on its own without (a) a systematic strategic approach in resource management, (b) R&D benefiting the whole sector, (c) marketing support, (d) standardization and quality control systems, and last but not least (e) specialist technical training. The Government's role is to address these bottlenecks. The key problem of the large-scale furniture industries is the shortage of competent supervisors and middle managers who would be able to improve operations at mill floor level on a continuous basis and implement effective quality control systems. In addition, there is only limited domestic capacity for furniture design.

Meeting Market Requirements for Certification
The Thai export industry has already taken some action to respond to the market demands for certified and legally produced products. These demands will increasingly influence the market access of Thai exports both in furniture and wood-based panels. A facilitated continued access to these markets should be ensured by implementing certification. There are no inherent obstacles which would not make smallholder tree growing certifiable in the Thai conditions. On the contrary, certification could boost the organization of farmers that would in any case be needed. The environmental issues related to eucalyptus planting need to be, however, duly addressed.

Fuelwood
The woodfuel sector offers a promising outlook for the Thai forestry. In addition to household fuelwood, the demand for charcoal making and associated alcatra production remains strong. Commercial combined heat and electricity production is expected to be feasible soon in Thailand. This would represent additional market opportunities for plantation wood, particularly in locations that are far from industrial mills using small-sized wood.

Bamboo
Thailand's bamboo resources cover 800,000 ha and the potential annual production of bamboo is 500,000 tons. In addition, 10,700 ha of plantations have been established. In spite of overexploitation, the production potential of bamboo is only partly tapped even though ready markets exist. Bamboo is particularly suited to social forestry/agroforestry practices as well as in watershed management. There is need to intensify cultivation of bamboo by providing incentives and guidance on improved technology which could have a significant impact on productivity and costs.

Rattan
Rattan resources have been subject to serious overexploitation and only timid efforts have been made to develop plantations. Present production systems are not sufficient to meet the demand for rattan. Government policies should be adjusted to support rattan plantation by providing secure tenure, credit and technical assistance. A network of gene banks is needed and adequate knowledge should be generated for the management and maintenance of rattan resources in the country,

Other Non-timber Forest Products
Besides bamboo and rattan, a large number of edible and medicinal plants, seeds, mushrooms, honey, wax, lac and resin etc. belong to Thailand's NTFPs. But their significance in the rural and national economies has been little appreciated. Yet NTFPs can play a key role in alleviating rural poverty. Information on the resource, markets and integration in forest management is typically needed. An adequate database regarding the availability of NTFPs by species, area and quantity would help policy design and planning as well as in developing proper market mechanism and trade opportunities for various value-added products.

Ecotourism
The national parks system in Thailand has a growing importance to ecotourism, one of the fastest growing sectors of the tourism industry. In the case of the Mekong River, the nature-based tourism potential particularly applies to the poor Northeast region. There appears to be no specific ecotourism development strategy that could guide local communities and the private sector to enhance the contribution of the natural heritages and local communities to sustainable tourism development. The Mekong subregional tourism strategy has identified three border areas as potential focal zones for future tourism development, i.e. west (Andaman), east (the Eastern Forest Complex) and the Northern area. Ecotourism should be adapted as one of the strategic elements of the development of national parks and other priority conservation areas.

Combating Deforestation and Poverty Alleviation
The available data on the deforestation in Thailand suggests that the rate is not declining and continues at unacceptable levels. Deforestation is concentrated in the forest margin or agricultural frontier. There is also deforestation inside the larger forest areas which is different in nature, permanence and degree of environmental impacts. Extension of the rural road network, expansion of cash crops, population pressure in the areas affected by immigration, and land allocation programs are key underlying reasons

which have resulted in policy failures in terms of forest conservation. Public policies on combating deforestation have been focused on measures to maintain forest cover through rehabilitation of degraded areas and reintroducing trees to deforested marginal lands. This costly approach (rather repair than prevent) has not ensured the halt of deforestation. Policies have not adequately addressed rural poverty as a root cause of deforestation. Impacts on forests of the policies of agriculture and other related sectors have not been duly recognized resulting in inconsistencies and policy conflicts which make the Government's effort to curb deforestation ineffective.

Illegal Logging and Logging Ban

The 1989 logging ban was a shock treatment has had mixed effects. The ban does not work alone but needs supporting and complementary measures which became late, were inadequate and could not have a desired impact. The market shock transmitted part of the problem of illegal logging to neighboring countries, as local supply could not respond to demand. On the other hand, had the logging ban not been implemented, conservation efforts may have proved to be less effective than at present. Social impacts have also been mixed: employment and income were lost in rural areas but improved environmental quality has also brought some social benefits.

The ban provoked a surge in illegal operations which has since then been contained by tightening control. The volume of confiscated timber is presently marginal but it is questionable whether the control is truly effective. According to stakeholders, illegal logging, which in the past was carried out on a large scale, has become a small-scale activity by small groups, often linked with timber buyers. On the other hand, traders have become more and more sophisticated when the control has improved. Underpricing, downgrading the product in official documents, and incorrect volume measurement can still be applied, as these practices are difficult to control. Various forms of extracting wood from the forest legally for household consumption but ending to the market have also emerged.

The authorities admit that corruption can be a problem but its importance is difficult to quantify. As many authorities from central and local government agencies are involved in control, the cost of corruption becomes easily high for illegal operators. On the other hand, traders have become more and more sophisticated when the control has improved but at the same time volumes are generally thought to have reduced significantly.

The effectiveness of control system has greatly improved after involvement of people's participation that has proved to be particularly useful for the control of encroachment. Extensive media coverage, international concerns and export market requirements have been important in bringing illegal logging largely under better control. However, more resources are needed to strengthen mobile units for communication and remote sensing data on the forest cover to monitor encroachment.

Financing and Other Incentives

Plantation development is an inevitable strategy in Thailand. Financing plays a crucial role as the required heavy investment cannot be borne by small farmers. The Government has provided some subsidies and incentives through various programs but the targets have not been achieved. Short-rotation plantations for timber production offer attractive opportunities and they do not need to be generally subsidized. Provision of adequate credit facilities is critical but currently insufficient. Credit would need to be accompanied by training of both farmers and the financial institutions involved. There is a particular need to strengthen the perception among BAAC and other support agencies concerning the planting as an economic activity. Modalities for lending to community forestry should also be established.

Development of Forest Policy

The 1985 Forest Policy was not successful in addressing the root causes of deforestation. The attempt to revise it in 1992 through the Thai Forest Sector Master Plan was not formally completed. There is an urgent need to revise the Forest Policy due to major changes in the political and legal framework. The use of forest cover as the key sectoral goal has serious limitations even though it is easy to monitor and communicate. The concepts of protection forest and economic forest represent a simplified view on SFM. There is also a false perception that only planted forests can be economic forests. The top-down government policy to protect and conserve natural forests has failed to obtain the cooperation from the rural poor which is partly due to the fact that the policy-makers do not know

enough about the lives of forest-dwelling people. The references to forest sector in the national social and economic plan (9th NESDBP) are general and do not provide sufficient guidance for the Government and stakeholders for the development of the forest sector. There is a need to launch a national forest program process involving broad-based participation.

Public Administration

RFD and DNP were separated with the apparent intention of division of work based on the territorial duties, i.e. DNP being responsible for protected areas and RFD outside these areas. This is, however, not reflected in the designated functions and reflects a misunderstanding on what is forestry as a functional activity. In addition, there is an element of duplication of activities, unclear delineation of duties in many functions and distorted allocation of human resources. Forest reserves cannot be effectively managed by RFD. In addition, there are problems in coordination and cooperation between the two departments at the field level.

RFD has been marginalized having been stripped down of some of its key functions. A clear vision is lacking on the Department's mission, functions and resources, and there is no proper line of command. This is a serious bottleneck for making progress towards SFM in the country. Duplication of extension work by several agencies is not proving efficient, instead it is confusing the farmers who are finding the messages from different agencies conflicting with each other. For proper forestry development, RFD extension efforts need to be augmented and better coordinated with other field offices and NGOs. There is overstaffing at higher and middle levels, i.e. at officers' level in the (RFD) headquarters. More field staff could be recruited (or assigned from the headquarters) as they are very limited at present. There is also a need to reduce the number of offices at the center and at the province level.

Decentralization

The legal provisions for local government at tambon (subdistrict) and village level provide a suitable administrative structure to transfer the responsibility of forest resource management to villages and villagers' groups. The on-going change in the revamping of the role of the public administration represents a paradigm change and its operationalization will be a long learning process. Provincial and District Natural Resource/Forest Officers should assume a strong role and develop solid strategic plans for the forestry development for their territories. Guidance for how such plans should be prepared does not exist and this, together with associated training, should be addressed by RFD as a top priority. In view of the large number of provinces the task is extensive.

Forest Industry Organization

FIO has evolved into a very diversified organization operating in resource management, industrial wood processing and marketing, tourism, conservation and social development. The Government constantly loads it with new tasks without adequate consideration of financial, managerial and practical implications. The result is an operation which has extensive assets and broad mandates but inadequate revenue generating capacity to carry out its tasks. There is no clear long-term vision and strategy about the organization's future role. FIO is in need of overhauling of its operations, which would probably involve divestment or transfer some of the duties and assets to organizations which are in better position to carry out the tasks.

Forestry Research

Research in forestry is presently scattered. The RFD Research Division was divided into two when DNP was established and there is no central body for forestry research, which has resulted in some overlap and lack of coordination. Many actors including universities and private sector are conducting forestry-related research on specific issues of immediate interest to them. The results are not often effectively disseminated and remain as gray literature in project files. The research agendas of various actors would benefit from a clear strategic vision of the forest sector which is unfortunately lacking. Extension requires development of technological packages suited to diverse agro-ecological, silvopastoral and socio-economic conditions. There are clear gaps in the research agenda (e.g. policy research, social impacts, NTFPs, etc.).

Forestry Education, Training and Extension

Forestry education has the tendency to confine itself within a very narrow base of target group institutions and it must find ways for addressing the needs of all the operators who have multiple

interests in forests. Conservation rather than forest management has become the main focus of training. Lack of adequate training on forest economics is a major shortcoming. Among all forestry professionals, there is a need for graduates to have adequate skills in problem analysis and relating them to broader issues. Skills in furniture design for export markets is another example of an area where no or limited educational capacity exist.

There appears to be no capacity for technical and vocational level training on forestry related subjects in the country. Consequently, concerned organizations and companies have taken the responsibility to develop their own human resources. However, there is a particular need to arrange common training for supervisors and other middle managers of wood and specifically furniture industries. This is one of the key constraints in industrial development. There is a need to carry out a survey of the industry's training needs and prepare an action plan, assigning an appropriate existing technical-level training institute for implementation. In addition, further training is particularly needed for forestry extension staff.

Extension

MONRE appears to have no planning and development of the overall extension policy and program in forestry. This is unfortunate when the responsibility for management of forest resources and production is rapidly shifting to the private sector and communities. The field centers have limited outreach capacity, due to shortage of financial resources. Most of the budgeted funds go for maintaining infrastructure and paying staff salaries with little left for covering the cost of training events. At present, extension activities at the field level are *ad hoc,* confined to specific project sites. There is no training on maintenance and harvesting of the planted trees, and marketing of forest products. A separate extension division, with its own field offices and personnel and its own line of communication and command, is unlikely to be a viable solution. On the other hand, the extension unit or division at the department level would be necessary for the overall development of forestry extension.

Information System

The present statistical reporting in the forestry sector in Thailand is far from satisfactory. Information is a powerful tool in managing the sector but this area has been almost neglected in the past. There is a need to have a programme to improve the collection of forestry data and its publication and the economic and social aspects of forest utilization. An overall strategy for information management does not exist. For middle-level staff the purpose of data collection is not clear and it is perceived as an administrative burden rather than a management tool due to little feedback. The entire forest statistical system needs to be carefully reviewed, including identification of data needs and gaps.

Forestry Cooperatives

Forestry cooperatives are still nascent but offer a viable solution for organizing individual tree farmers. International experience on setting cooperatives for a group of community forests is mixed due to differences in objectives and resources. This option could, however, be considered for Thailand, particularly in situations where community forests are small and cannot develop downstream activities on their own.

Organization of the Private Sector

There are about 10 organizations/associations of forest-related industries in Thailand which are weak as enterprises see more value in promoting their interests individually. This will have to be reviewed when the national policy processes have become participatory and all stakeholder groups are expected to propose clear priorities and policy proposals. In tree farmers' associations the membership is still limited. In view of the size of the country and the large number of smallholders involved, a bottom-up approach could be attempted to organize tree farmers. It is also important that farmer/landowner associations develop over time their own extension capacity as it is unlikely that the public sector could carry out this task. Associations could also facilitate the development of partnerships between forest industries and smallholders. Organizational development of smallholders will not happen without the catalytic support from RFD or other public agencies. One single model may not work everywhere in the country and alternative approaches for organization of tree farmers and extension services could be tried.

Civil Society
The civil society active in the forest sector is heterogeneous with different agendas being promoted. The past suspicion among the NGOs concerning authorities and among the public agencies concerning NGOs has been gradually diminishing, partly as a result of the opening-up of the policy processes to broad participation. There is a sense of mutual need to cooperate among most parties on both sides. However, government policies tend to be opaque and access to information – albeit greatly improved– still need to be enhanced. From the Government's perspective, the fragmentation of the NGO community makes dealing with them somewhat cumbersome. It would be beneficial if the dialogue on the rural people's role in conservation strategies could be enhanced among the NGO community as the Government is getting mixed messages on how policies on forest-dependent people should be designed and implemented.

MAIN CONCLUSIONS

The diagnosis of the Mission has shown many gaps and weaknesses in the current situation but it does not show a gloomy picture for SFM in the country if corrective action is taken. Thailand has accumulated a wealth of knowledge and well-trained professional human resources based on which further progress towards the SFM goal can be made.

Future Vision
The following elements could constitute possible elements for the future strategic vision of SFM in Thailand: (a) net deforestation arrested; (b) most degraded areas rehabilitated; (c) the role of forests in poverty reduction enhanced through income and employment generation and improvement of livelihoods of rural people; (d) community forests established with a secured usufruct/tenure rights; (e) most industrial wood obtained from plantations with less dependence on rubberwood; (f) the wood-based industry having an active role in the development of its raw material supply; (g) all the timber harvesting operations verifiably legal and certifiable for SFM; (h) tree resources outside forests substantially expanded; (i) efficient forest product market with adequate transparency; (j) the international competitiveness of the Thai forest-based industry; (k) bamboo and rattan resources brought under systematic management and sustainably utilized; (l) the protected areas would be managed also for improved livelihoods for the people living in and around them; (m) forest environmental services for mitigation of climate change, biodiversity, soil and water conservation enhanced and, as appropriate, remunerated; (n) a firmly grounded forest policy process in place based on NFP principles; (o) decision-making based on adequate information; (p) FIO privatized; (q) forest communities and forest owners effectively organized; (r) civil society well organized and educated on forestry; and (s) private sector promoting common interests through strengthened associations.

Main Constraints
The most critical constraints impeding progress towards SFM in Thailand are: (i) the bottlenecks of the regulatory framework; (ii) lack of coherence between public policies; (iii) people's widely varying perceptions about how Thailand's forests should be conserved and managed; (iv) lack of coherent support to communities and the private sector to manage forest resources; (v) institutional uncertainty related to public forest administration; (vi) deficient information systems; and (vii) lack of systematic strategies for human resource development and extension (including processing industries).

Opportunities
In spite of the constraints highlighted above, sustainable management of Thailand's forests offer a number of significant opportunities: (1) the potential of community forestry to contribute to poverty alleviation; (2) major expansion of commercial tree planting on marginal lands thanks to Thailand's competitive advantage; (3) enhancing forest-based environmental services through payment mechanisms to forest managers and owners; and (4) expansion of the production of non-timber forest products in high demand both in the domestic and export markets.

RECOMMENDATIONS

The Mission's key recommendations by target group are summarized below and those in italics are considered priorities:

Government

Natural forests

1. *Guidelines for the preparation of management plans for PAs and forest reserves should be revised to better address participation of local people and potential for management of NTFP resources.*
2. Effective communication mechanisms should be established to inform local people and the stakeholders on the gazettement processes.

Community Forestry

3. *The Community Forestry Bill should be approved without delay. Community forestry should be allowed in national forest reserves through legal provisions.*
4. The Bill would also need to be supported by a field implementation guideline.
5. Utilization of community forests should be open for both the subsistence and commercial purposes and harvesting of all types of forest products as specified in the agreed management plans.
6. *Regarding the issue of community forestry in protected areas, a policy statement/instruction could be issued to develop specific forest management and utilization activities to meet the needs of communities residing in and around PAs. Such activities should be defined in the management plan of each PA.*

Plantations

7. RFD should take a more active role to promote strengthened coordination between the agencies involved in rubber planting and utilization of latex and rubberwood.
8. The obligation of transit permit should be removed from teak logs from thinnings in areas outside forest reserves. At a later date, regulation of harvesting mature planted trees could be reconsidered in the light of then prevailing enforcement situation.
9. Wood measurement practices should be further developed and promoted to protect sellers' interests.
10. *The Government's role in mitigating market risks related to private sector plantation investment should be focused to the following measures: (i) arranging adequate credit facilities, (ii) improved market transparency, (iii) promotion of diversification of outputs, (iv) developing measurement and grading systems for timber, (v) support to organization of producers, and (vi) promotion of landowner-industry partnerships. A government-backed minimum price scheme should not be put in place.*

Fuelwood

11. A study on the production and utilization of fuelwood should be carried out in view of meeting demand through fuelwood and other bio-energy plantations.

Non-Timber Forest Products

12. The knowledge generated on the state-of-art in management and utilization of bamboo resources should be effectively disseminated down to the farmer and SME levels.
13. Bamboo should be promoted in the social forestry/agro-forestry practices as well as in watershed management through guidance on intensified technology and provision of incentives.
14. Market transparency on the demand and trade of NTFPs should be improved.

Ecotourism

15. A national ecotourism development strategy should be elaborated. The three border areas as potential focal zones for future tourism development (Andaman, the Eastern Forest Complex and the Northern area) should be duly considered in the strategy.

Financing

16. Feasibility of establishing a special forest fund for community forestry and smallholder plantation development through using the existing banking institutions as the delivery channel should be studied.

Public Policies

17. The Forest Policy should be updated through an inclusive structured NFP process. The conflicting policy goals related to land use, which impact forests and the forestry sector, should be removed.

18. National Criteria & Indicators for SFM should be developed to serve as a tool for clarifying forest policy goals and designing a monitoring system at national and forest management unit levels.

19. Forest impact safeguards should be developed to guide the design of future infrastructure and urban/tourism development projects.

20. A special survey with field data collection should be carried out on the illegal logging and associated trade. Monitoring and control systems should be further developed.

Institutional Capacity

21. A detailed assessment should be carried out on options for the institutional structure related to RFD and DNP. RFD needs to establish a proper line of command should be established.

22. The extension unit or division at the department level should have a clear role in the overall development of forestry extension with the tasks of developing suitable extension strategies and packages, and providing support and training to field staff.

23. Provincial and District Natural Resource/Forest Officers should assume a strong role and develop solid strategic plans for the forestry development in their territories. Guidance for preparation of such plans should be prepared together with provision of associated training.

24. FIO should revise its mandate and overhaul its operations within a strategy where all options for the organization's future role are duly considered.

Research

25. The research priorities should be identified based on problem analysis. Practical and field-oriented research and dissemination of research results should be improved.

26. The research agendas of various actors should be linked to a clear strategic vision of the forestry sector and an integrated Forestry Research Network should be established in the country.

27. Further research would be required on (a) economic and social aspects of forestry, (b) suitable tree species for shelterbelt establishment, (c) increasing of productivity of wood and other forest produce, (d) reclamation of wastelands and degraded lands, (e) social forestry, farm forestry, agroforestry, and urban forestry, and (f) commercial bioenergy generation.

Education, Training and Extension

28. A human resource development plan and extension strategy should be prepared for the forestry sector covering education and training (for the next 5-7 years).

29. Government support to organizational development of community forests and smallholders should be strengthened.

30. One of the technical colleges/institutes should be assigned to set up a specialized training programme to meet the technical level training of the about 1,700 Thai furniture enterprises.

Information System

31. RFD should prepare a road map with the time frame for the collection, dissemination and development of National Forestry Database Management System (NFDMS).

Other Stakeholders

Forest Industry

1. Sawmilling and plywood industries should improve the current purchasing system of logs with due attention to the use value of logs based on established grading criteria.
2. The private sector should implement an integrated approach to develop eucalyptus utilization for sawmilling and plywood production.
3. Both sawmilling and pulpwood industry should be engaged in R&D work to develop utilization of large-diameter logs.
4. *A broader range of species should be introduced in plantation investments, particularly Eucalyptus grandis, E. urophylla and their hybrids.*
5. *The industry should have a stronger role in the development of its raw material supply and wood procurement.*
6. The industry should move more aggressively towards adoption of higher efficiency technological options for log handling, sawing, drying, further processing and waste handling.
7. The industrial associations should be strengthened in view of policy analysis, participation in policy dialogue and promotion of sectoral interests.
8. A joint consultative body among industry associations should be considered to address common interests like promotion of wood production, certification, trade regulation, promotion of training and research, etc.

Forest communities, Farmers and Landowners

9. Forest communities, farmers and landowners should establish at local level effective common organizations to protect their interests in varying market conditions.
10. *Associations should probably develop a clear two (or three)-level structure with provincial or district level associations and a national federation.*
11. Tree farmer-corporate partnership arrangements should be promoted as a means for greater investment in plantations and mitigating against market risks.

Civil Society

12. The dialogue on the rural people's role in conservation strategies should be enhanced among the NGO community to avoid different and mixed messages on policy adjustment.
13. An NGO Forest Network should be established.

All Stakeholders

14. *All the stakeholders, probably with the facilitation of the RFD, should identify and assess options for the development of forest certification in Thailand. A national-level stakeholder workshop would be a useful instrument to reactivate the process.*

ITTO

Support to Thailand

1. The development of national Criteria & Indicators through a broad-based participatory process has a potential to serve as a critical element in developing a shared vision among stakeholders about how the country's national forests should be managed. ITTO has a comparative advantage in supporting Thailand in this important exercise which could clarify the national policy goals.
2. Cross-border forest complexes represent a particular priority in the maintenance of protected areas over broader landscapes which need to be conserved through integrated approaches including buffer zones, biological corridors, etc. and which should address the specific issues of border areas ITTO support would be required to develop the Management Plan for the Western Forest Complex.
3. The elaboration of the human development plan and extension strategy would be the first step to remove a key constraint to making progress towards SFM in Thailand. In view of ITTO's earlier

work in this field in the region, the Organization would have a competitive advantage to provide support the country by starting with a pre-project study.

4. A major support program should be launched to strengthen the national forest information system. This is required for improved control of illegal logging and associated trade but also public decision-making on the sector in general. The work could be launched with a feasibility study that would map out options and outline a comprehensive plan for implementation.
5. ITTO should build partnerships with Thai education and training institutes and some regional organizations, such as RECOFTC, to design and deliver a range of capacity building products and services targeted at implementation of the recommendations of the Mission.
6. In view of the urgent needs of the Thai furniture industry, a program of crash courses for supervisors on quality management could be arranged by ITTO assistance.

General Recommendation

7. ITTO has a comparative advantage in promoting the transfer of knowledge on eucalyptus processing for solidwood products. An international-level project to take stock of the state-of-art and disseminate the existing knowledge would benefit producing Member Countries, including Thailand, which need to diversify the production of their eucalyptus plantations. Dissemination should focus on technical solutions on problems of species utilization, sawing and drying of eucalyptus, further processing, markets and economic aspects.

1. INTRODUCTION

1.1 Background

The International Tropical Timber Council (ITTC), at its 29th session, adopted Decision 2(XXIX) entitled "ITTO Objective 2000" which set up a possibility for producer countries to seek specific assistance in their efforts to achieve the Objective 2000 and sustainable forest management (SFM) through the following provision:

> *"Authorize the Executive Director to render assistance to producer countries, on request, to identify, in each country, those factors which most severely limit progress towards achieving Objective 2000 and sustainable forest management and to formulate an action plan to overcome these constraints."*

In 2001, the Royal Government of Thailand requested such assistance from the International Tropical Timber Organization (ITTO) and action was respectively taken to mount a diagnostic mission within the specified terms of reference. The Thai mission was the sixteenth in the series of largely similar exercises already carried out in other tropical timber producing countries.

Thailand has been an important recipient of ITTO's support during the last sixteen years. Eleven projects, with a total ITTO funding of US$ 3.8 mill., have been completed and three more are under implementation. The total ITTO support to Thailand amounts to US$ 5.2 mill. (Annex 4). Most of the projects have been either support to R&D or related to management of buffer zones, and protected areas.

1.2 Objectives

The Mission had three main objectives:

(i) Identify the factors that represent the most determining obstacles to the realization of sustainable forest management in the country
(ii) Regroup these constraints in order of importance
(iii) Recommend a series of measures aimed at lifting these constraints, and estimate their cost where possible

The detailed terms of reference are reproduced in Annex 1 outlining the tasks which were to be carried out by the Mission.

1.3 Methodology and Conduct of the Mission

Three local consultants had prepared a background document, which served as the basis of the work of the Mission (Ungphakorn et al. 2005). The Royal Forest Department (RDF) was requested to inform the key stakeholder groups on the objectives and the conduct of the Mission and written comments on the main constraints to SFM were invited.

The Mission was thereafter fielded from March 22 to April 8, 2006. It consisted of Dr. Markku Simula (Finland) as Team Leader, Dr. Takeshi Akaha (Japan), Dr. Bipin Behari (India), and Dr. Yam Malla (Nepal). The mission was assisted by a team of specialists assigned by RFD to the task coordinated by Mr. Suchat Kalyawongsa.

The Mission started its work with a review of the available information and scrutiny of existing statistics. After a briefing with the RFD management, the Mission identified six main topics for detailed investigation as these were considered to be critical elements for the achievement of sustainable forest management (SFM) in Thailand. These were (a) conservation and management of natural forests, (b) community forestry (c) plantations, (d) industry and markets, (e) non-timber forest products, (f) public policies, and (g) institutional capacity.

After the field visit to five provinces the Mission gave a presentation of its preliminary findings in a stakeholder workshop organized by RFD. Observations of the workshop were considered during the elaboration of the report.

The itinerary of the Mission is presented in Annex 2. A total of about 125 people were consulted representing different stakeholder groups (Annex 3).

The report contains first a brief review of the national context of the forestry sector which is then followed by the thematic chapters presenting the analyses and the Mission's assessment. The overall assessment on the progress and constraints related to achieving the ITTO Objective 2000 are summarized in Chapter 10 and Chapter 11 contains a summary of the Mission's recommendations to the Government, stakeholders and ITTO.

PART I. OVERVIEW OF THE CURRENT SITUATION

2. FOREST IN THE NATIONAL CONTEXT

2.1 National Context

The Kingdom of Thailand is located in the southeastern part of Asia between the 5^{o} 35' and 20^{o} 15' North latitudes and 97^{o} 30' and 105^{o} 45' East longitudes. It encompasses an area of 513 115 km^2. The country has common boundary with four countries (Myanmar, the People's Democratic Republic of Laos, Cambodia and Malaysia).

The upper part of the country is hilly where the four main tributaries of the Chao Phraya River, flow through the alluvial plain of the central part downward to the Gulf of Thailand and forms a great central alluvial plain known as the Chao Praya Delta. A long stretch of the peninsula stretches far in the south where population is predominantly Muslim. One third of the upper part of the landmass forms a large plateau stretching eastwards and known as the Northeast highland or Korat plateau sloping eastwards to the bordering Mekong River.

Administratively, Thailand is divided into five regions: Northern, Northeastern, Central, Eastern and Southern Regions, with a total of 76 provinces (Chang Wad) and 716 districts (Amphoe). Each district is further divided in sub-districts (Tambon).

The country's climate is influenced by the southwest monsoon during the wet season and northeast monsoon during the dry season. The distribution of rainy months ranges from 2 to 8 a year with an annual rainfall of 1 000 – 4 000 mm. There are broadly two definite dry and rainy seasons in the whole country. The temperature may rise up to 40^{o}C during the dry season and drop to 0^{o}C in some places in the cool-dry season. The average temperature of 25 C is common all over the year.

At present, the population totals 63 million inhabitants with an annual growth rate of 0.4%. The population density is 123 persons per km^2. Eighty percent of the population lives in the rural areas. Thai society comprises many groups with ethnic Thais as majority, Chinese, Khmers, Laotian and hilltribe people as minorities. Buddhism is the national religion.

2.2 Policy and institutional framework

2.2.1 Macro-level Policies

Over the last four decades of national development, all parties in the Thai society have had to continuously adjust to changing socio-economic situations. The First and Second National Economic and Social Development Plan (NESDP) (1961-1970) emphasized economic growth through the diversification of investment in infrastructure, including road, electricity, and water supply networks. Despite achieving an impressive record of economic growth, both income distribution and the quality of life of the people in the rural areas deteriorated. Hence, the Third Plan (1971-75) gave more

attention to social development, the reduction of the population growth rate, and income distribution. During the Fourth Plan period (1976-1980), political uncertainty and an energy crisis ensued, bringing about severe deficits in balance of trade and current account. As a response, the Fifth and Sixth Plans (1981-1990) emphasized economic stability, structural adjustment and poverty eradication. A subsequent worldwide economic recovery brought about rapid expansion of the economy, causing it to overheat. The Seventh Plan (1991-1995) subsequently began the shift to a sustainable development paradigm which emphasizes maintaining a sustainable level of economic growth, stability, improving income distribution, developing human resources, and enhancing the quality of life and the environment.

The Eighth NESDP (1996-2000) continued change in the development concept, shifting from a growth orientation to people-centered development. The well-being of the people was considered the final measure of success; economic improvement was viewed only as a means toward this goal. The planning process has also been shifted from a compartmentalized to a more holistic approach, which enables all stakeholders in the society to participate in the national development planning process. However, due to the Asian economic crisis (1996-1998) there was a need to revise the plan, with more attention given to economic stabilization, provision of social protection and economic structural adjustment.

The economic crisis generated many negative impacts on the quality of life which have not yet been duly addressed. Poverty and income disparities have worsened. In addition, unemployment has also increased. The rapid deterioration of natural resources and the environment has also given rise to more social conflict. Despite all of these shortcomings, the Eighth Plan's emphasis on participation was a major step toward the mobilization of Thai people to play a more active role in the process of national development. This is evident in the increased levels of political activism, networking among people's organizations and public–private partnerships, which all serve as a strong foundation for the future development of the country. The collaborative efforts have not only led to the identification of shared vision and development strategies for Thailand's future, but also to a significant degree of consensus to adopt the "philosophy of sufficiency economy" introduced by the King. It stresses the middle path, moderation and due consideration in all manner of conduct, as the guiding framework for national development.

2.2.2 Legal Framework

The Government of Thailand has established stringent laws towards the protection and conservation of forest areas including water and biodiversity. Presently, there are following five main Forestry Acts:

(1) Forest Control Act, 1941 concerns logging operations and non-wood forest products collection, transportation of timber, and non-timber products and, sawnwood production as well as forest cleaning.
(2) National Park Act, 1961 covers the determination of the National Park land, National Park Committee, as well as protection and maintenance of the National Park.
(3) National Reserved Forest Act, 1964 includes the determination of National Reserved Forest, control and maintenance of the National Reserved Forest.
(4) Wildlife for Preservation and Protection Act, 1992 establishes provisions for the National Wildlife preservation, establishment of Protection Committee and identification of 15 species of reserved wildlife.
(5) Reforestation Act, 1992 covers the determination of reforestation and land registration of private reforestation right, ownership and exemption from royalty on forest products from reforested areas.

Besides the provisions for heavy penalties under these Acts, other provisions have been made to ensure that any crime or illegality in the field of forestry and wildlife is effectively controlled and convicted. As a whole, there are more than 20 laws and a number Cabinet decisions for forest and resource management. Under Section 39.23 of Forestry Act, 1941, whoever moves the timber or forest products shall have a moval pass issued by the competent officer in accordance with the terms specified in the ministerial regulations.

The most significant recent political development in Thailand has been the 1997 Constitution that recognizes the rights and roles of Thai people to participate in national policy formulation regarding resources and environmental development and conservation. The Constitution clearly notes the rights of civil societies in managing natural resources and the roles of actors[1].

2.2.3 Institutions

The Royal Forest Department (RFD) was founded in 1896 in Thailand to consolidate the exploitation of forests. As a result, the ownership and control of all forests were transferred from the feudal chiefs to the Government. RFD was divided into three Departments in 2002: Royal Forest Department (RFD), National Park, Wildlife and Plant Conservation Department (DNP) and Department of Marine and Coastal Resources (DMC). All the departments are under the supervision of the Ministry of Natural Resources and Environment (MONRE).

RFD is responsible for forests outside protected areas which are DNP's responsibility. DMC performs resource management of marine of coastal flora and fauna, including mangrove forests, through conservation and rehabilitation. The following agencies are also dealing with forests.

MONRE

(i) *Office of Natural Resources and Environment Policy and Planning* develops and proposes the natural resources and environmental enhancement and conservation management plan and policy.

(ii) *Pollution Control Department* regulates supervises, directs, co-ordinates, monitors and evaluates rehabilitation, protection and conservation of environmental quality.

(iii) *Department of Environmental Quality Promotion* carries out research, development training, public awareness, development of environment technology, natural resources and environment.

Ministry of Agriculture and Cooperatives (MOAC)

(a) *Land Development Department* – A division of this Department is responsible for land use planning. Several categories of forestry land uses are included in its land use related work.

(b) *Agricultural Land Reform Office* – Large numbers of the state forest land are being declassified and turned over to this office for distribution to the farmers.

(c) *Office of Agricultural Economic* collects statistics and conducts economic studies concerning agricultural crops, including forestry information.

(d) *Office of the Rubber Replanting Aid Fund* is responsible for development of rubber plantations.

(e) *Office of Marketing Organization for Farmers* is a possible alternative to developing markets for forest products.

Other Ministries and Agencies

(i) *Ministry of Interior:* The day-to-day operations of the province and district forest officers of RFD are supervised by the office of the Governor of the different provinces, which are under the Ministry of Interior's Local Administration Department. The Forest Police Unit of the Police Department assists in forest protection and control of illegal activities.

(ii) *Ministry of Industry and Ministry of Commerce* are responsible for promoting forest-based industries and their internal and overseas trade.

(iii) *National Economic and Social Development Board (NESDB)* prepares and promotes the National Economic and Social Development Plans on a five-year cycle, formulates the

[1] Article 46, 56, 59, 69, 79 and 290.

policies to implement the plans and assesses the progress of forest development programs to ensure their consistency with the plan.

(iv) The are two state enterprises in the forestry sector: *Forest Industry Organization (FIO)* involved in reforestation, teak plantation, sawmilling, and development of forest villages. FIO´s subsidiary *Thai Plywood Company Ltd*. produces plywood and other wood products.

2.3 Land Use and Deforestation

In 2001, the land use of the country was divided between agriculture or farmholding land (41%), forest (31%) and unclassified areas (28%). This pattern is the result of rapid expansion of agriculture on what was previously forest land. There are significant differences in the land-use pattern by region; the North still having more than 50% under forest cover, while the other regions are predominantly agricultural. It is noteworthy that about a third of the total land in the other three regions remains "unclassified". This includes urban and peri-urban areas, infrastructure, etc, but obviously also degraded areas which were in the past under the forest cover (Table 2.1).

Table 2.1 Land-use Pattern by Region, 2001

Region	Forest	Farmholding land	Unclassified
	- per cent -		
North	54.0	26.4	19.6
Northeast	15.0	55.0	30.0
Central	27.1	30.9	33.0
Southern	22.5	43.4	34.1
Total	**31.4**	**40.9**	**27.7**

Source: Based on Agricultural Statistics of Thailand, 2004

In 1961, the total forest area of Thailand was about 27 mill. ha. covering over 53.3% of the country. Subsequently, forest areas were encroached for the purpose of slash-and-burn, shifting cultivation, land resettlement, dam and road construction, land reform for agriculture, etc. As a result, the share of forest area declined to 25.3% in 1998. From 2000 onwards the forest area has been assessed from LANDSAT-5 interpretation imageries at the scale of 1:50,000, while the earlier assessments were made using imageries of 1:200,000. Due to the change of scale and method of calculation[2] a new benchmark was established for forest area (Table 2.2). The annual rate of deforestation has been about 63,000 ha per year since 2000, or higher than in the 1990s. The current forest area is estimated at 16.8 million ha.

2.4 Forest Resources

There are two main types of forests in Thailand: (1) evergreen forest and (2) deciduous forest .

(1) The ***evergreen forest*** is subdivided into the tropical evergreen forest, the pine forest, the mangrove forest and the beach forest.

(1.1) ***Tropical evergreen forest*** is found all over the moist part of the country. This type of forest is also subdivided into the tropical rain forest, the semi-evergreen forest and the hill evergreen forest.

(1.1.1) ***Tropical rain forest*** is characterized by a very rich flora and very dense undergrowth. This type of forest is commonly found in the Southern and the Eastern regions where rainfall is above 2 000 millimetres. It is also found along rivers and/or in valleys in other parts of the country. The predominant species (the top storey species) are, for example, *Dipterocarpus spp, Hopea spp, Lagerstroemia spp*, and *Shorea spp*, whereas the lower storey species are bamboos, palms and rattans.

[2] Any pixel containing an element of tree cover was included as a whole in forest/area (Charuppat, pers.comm.).

Table 2.2 Forest Cover, 1961-2004

Year	Forest Cover	
	1,000 ha	% of the country area
1961	27,369	53.33
1973	22,172	43.21
1976	19,841	38.67
1978	17,522	34.15
1982	15,680	30.56
1985	15,087	29.40
1988	14,380	28.02
1989	14,343	27.95
1991	13,670	26.64
1993	13,355	26.03
1995	13,148	25.62
1998	12,972	25.28
2000	17,011	33.15
2004	16,759	32.66

Source: RFD (1998) and RFD (2004b)

(1.1.2) ***Semi- evergreen forest*** is scattered all over the country where the rainfall is between 1,000-2,000 millimetres. The predominant species are *Dipterocarpus spp, Hopea spp, Diospyros spp, Afzelia spp, Terminalia spp,* and *Artocarpus spp*. The main undergrowth species consist of bamboos and rattan.

(1.1.3) ***Hill evergreen forest*** is found on the highlands (above 1 000 metres from the sea level) where the climatic condition is the humid subtropical type. The presence of mosses and lichens on trees and rocks is the indicator of this forest type. The predominant species are oaks *(Quercus spp)* and chestnuts, (*Castanopsis spp,* and *Lithocarpus spp).*

(1.2) ***Pine forest*** has two species of tropical pines, *Pinus merkusii* locally called Son Song Bi (the two-needle pine) and *P. kesiya* locally called Son Sam Bi (the three-needle pine). *P.* m*erkusii* is found in the northern and the western part of the Central region, where the soil is poor (grave) lateritic and podzolic. *P. kesiya* is found only on the highlands of the Northern and Northeastern regions.

(1.3) ***Mangrove forests*** occur along the coastal areas of the Eastern, Central and Southern regions. The mangrove forest is scattered along the estuaries of rivers and seashores where the soil is muddy and influenced by the tide. The predominant species are *Rhizophora spp, Xylocarpus spp*, *Avecennia spp, Bruguiers spp, and Nypa spp.*

(1.4) ***Beach forests*** occur along the sandy coastal plains especially in the eastern coast of the Southern regions. The main species in this type of forest are *Diospyros spp, Croton spp, Lagerstroemia spp* and *Casuarina spp*.

(2) ***Deciduous forest*** is characterized by the presence of deciduous tree species and is commonly found throughout the country. It is broadly subdivided according to the species composition into the mixed deciduous forest (with and without teak) and the dry dipterocarp forest.

(2.1) ***Mixed deciduous forest*** is commercially among the most valuable forest of Thailand. In the Northern Region, this type of forest is called the teak forest with *Tectona grandis*, *Xylia kerrii, Pterocarpus macrocarpus, Afzelia xylocarpus* and *Dalbergia spp* (rose wood) as dominant/common species.

(2.2) ***Dry dipterocarp forest*** is commonly found in the dry area (rainfall below 1 000 millimetres) with sandy or gravely lateritic infertile soils. The predominant species are mainly *Dipterocarpaceae* such as *Dipterocarpus tuberculatus, D. obtusifolius*, *Shorea obtusa, S. siamensis* with the presence of *Dalbergia spp, Lagerstroemia spp, Terminalia spp* and other species

The forest area by type of forest is given in Annexes 5 and 6.

2.5 Permanent Forest Estate

The area of permanent forest estate (PFE)[3] reported in 1991 was 23.5 mill. ha, much of it already without forest cover. PFE had shrunk by almost 50% to 12.0 mill. ha in 2001. About 1.15 mill. ha of the original PFE had been converted to agriculture, 8.3 mill. ha to settlements and infrastructure, and 1.1 mill. ha to other uses. The balance now available comprises about 10 mill. ha of protected forest area (Table 2.3) and 1.9 mill. ha of plantations. The production PFE now is found only in planted forests on government land. Theoretically, forest reserves (Annex 7) should be classified as PFE but while they do not have effective protection in spite of their legal status, many of them have lost their forest cover, and there are no management plans, they have not been classified as part of PFE.

2.6 Land Tenure

Practically all the natural forests are owned by the state and managed by RFD, DNP or DMC. Privately owned forests are mostly plantations but not accounted as part of PFE. The Government has issued various types of tenure rights for people living in forest reserves.

Table 2.3 Permanent Forest Estate

Estimated total forest area	Total closed natural forests	PFE (1,000 ha)		
(mill. ha)	(1,000 ha)	Production	Protection	Total
13.0-16.8	10,127	Natural 0 Planted 1,870	10,118.8	11,988.8

Source: ITTO (2006a), total closed forests FAO (2001), RFD (2004b)

2.7 Management of Natural Forests

In the historical perspective four stages can be identified in Thai forestry:

1. ***Early exploitation stage*** (from the mid-1890s to the early 1930s). Logging for commercial purposes started to meet domestic and export demand for teak. RFD was established to regulate forest exploitation, particularly in the teak forests of the North.
2. ***Expanding exploitation and management stage*** (from the 1930s to the early 1960s). Logging became an important economic sector generating foreign exchange, capital for national development, and government revenue, as well as making land available for agriculture. RFD attempted to bring forest exploitation under management by enacting forest laws, staff training, and enforcement efforts.
3. ***Forest exploitation decline stage*** (from the 1960s to the mid-1980s). Logging peaked, export-oriented agriculture expanded, and national economic development gained momentum. Coupled with inefficient control and excessive logging, often illegal, the forests continued to dwindle, at an alarming rate. As a result, a growing awareness of the link between the forest and national well-being emerged. Desperate measures were introduced to rationalize forest management but were not successful.
4. **Struggle towards sustainable management** led to a logging ban (from 1989 onwards) as a result of widespread awareness of the adverse effects of forest exploitation. The forest had declined to a point where the nation had to decide that what remains of it must be kept for conservation rather than for further exploitation.

[3] ITTO (2005) defines Permanent Forest Estate as "land, whether public or private, secured by law and kept under permanent forest cover. This includes land for the production of timber and other forest products, for the protection of soil and water, and for the conservation of biological diversity, as well as land intended to fulfill a combination of these functions.

The new forest management approach has had three main interventions: (i) expansion of designated protected areas, (ii) expansion of the forest resource base by plantations to substitute wood supplies from natural forests, and (iii) development of community forestry.

There are no management plans for the Reserved Forest areas. The annual operational plan of the reserved forests covers the activities such as protection, reforestation, nursery activity and land allocation. There are no provisions for silvicultural treatments and aided natural regeneration. Emphasis in forest management is on patrolling, recreation and other services, and only limited research has been carried out.

2.8 Plantations

Reforestation in Thailand started already in 1906. Teak was planted in the form of taungya agroforestry system[4]. Small areas were planted annually until 1960. A national reforestation campaign was implemented during 1994-1996 with a target area of about 800,000 ha. The campaign embraced planting of forest trees (i) along roadsides, (ii) around the school premises, governmental offices and religious places, (iii) areas such as parks, recreation areas, dams and reservoirs, riverside, etc. and (iv) existing degraded forests.

The government's farm forestry program (1994 to 2001) was a response to the deteriorated wood supply situation with the target area of 1.28 mill. ha. The program subsidized the private sector and farmers to c tree planting costs. 80,000 farmers joined the program but the planted area only covers 169,400 ha (Annexes 9 and 10). The program is still going on.

The total extent of planted forests in 2000 (Table 2.4) was estimated at 2.81 mill. hectares and there are another 2.0 mill. hectares of rubber plantations (FAO, 2001).

Table 2.4 Plantation Area by Species in 2000

Species	1000 ha
Rubber	2,019
Teak	836
Eucalyptus spp	443
Acacia mangium and other *A. spp*	148
Other broadleaved species	541
Pinus merkusii and other *P. spp*	689
Other conifers	148
Total	**4,824**

Source: FAO (2001)

2.9 Forest Protection

Forest fire is defined by RFD (1996) as "a fire that occurs [on forestland] for any reason and in the absence of any control". Thus, controlled burning, for instance, in shifting cultivation system is not a forest fire according to this definition. Forest fires are regarded as a "serious threat" because, although many tree species of deciduous forests can survive fire, seedlings and saplings are easily destroyed, and wildlife is also affected. Furthermore, loosing soil fertility due to large-scale fires is regarded as a threat. (Nalampoon 2003). Each year in Thailand large areas burn during the dry season: in 2000, the total burned area was 197,000 ha (FAO 2001). RFD has established forest fire control centres in critical areas. These are, however, inadequate in controlling fire in remote areas, and the military assists in high-risk sites. In addition, extension campaigns to combat forest fires have been launched (Nalampoon 2003). Community-based approach has also been introduced to fire management.

[4] Agricultural crops were grown in young teak plantations

2.10 Forest Production

No reliable statistics exist in the country on wood production. There are two main sources of industrial wood: eucalyptus plantations and rubber plantations. Due to the logging plan, there is practically no timber production in natural forests. The total volume of industrial roundwood production is estimated at 19 mill.m^3/year (see ch. 6). There is no information available on the volume of fuelwood produced.

At least five million people[5], the approximate number of actual forest dwellers in Thailand, are critically dependent on non-timber forest products (NTFP). Non-timber forest products include a large number plant and animal products. The most important NTFPs are bamboo, rattan, lac, bee products and medicinal plants.

2.11 Conservation of Biodiversity

Thailand is bestowed with rich floral, faunal and cultural diversity. It contains approximately 7 % of the world flora and fauna. It is considered a collective centre of botanical diversity from major regional elements: Indo-Burmese, Indo-Chinese and Malaysia.

There are approximately 15,000 plant species in the country of which approximately 12,000 are vascular plant species, including over 1,140 species of orchids. There are more than 2,154 non-vascular plant species in Thailand, including algae and bryophytes, i.e. moss, hornwort, and liverwort.

Thailand has approximately 4,600 species of vertebrates and about 83,000 invertebrate species, of which 14,000 species can be identified. Most of the identified species are insects (MONRE 2006). There is a large number of plant and animal species which are endangered, rare or threatened (Table 2.5). Many species have also been domesticated. More detailed data on species is given in (Annex 8).

Table 2.5 Species with Status in Thailand

Status	Plants	Animals						
		Mammals	Bird	Reptile	Amphib.	Fresh water fish	Sea fish	Total
Extinct	-	2	8	1	-	1	-	12
Endangered	100	39	39	10	2	12	7	109
Rare	1,000	48	68	26	21	12	6	181
Threatened	300	12	21	4	3	3	12	55
Domesticated	1,000	7	2	33	11	37	-	90
Exotic	800	3	95	8	3	125	-	234
Ornamental (plant)	700							
Native (animals)		19	5	6	2	64	1	97
Total plants	**3,900**							
Total animals		**130**	**238**	**88**	**42**	**254**	**26**	**778**

Source: MONRE 2006

2.12 Socio-economic Aspects

Due to the logging ban the sectoral contribution to GDP of forestry, logging and related activities has been declining since 1989. In 2003 it amounted only to US$ 120.5 million representing 0.1% of the total GDP and 1% of the GDP of Agriculture, Hunting and Forestry (Office of... 2005). This does not take into account fuelwood and NTFPs, which are important activities in the forestry sector. It is unclear whether rubberwood harvesting is included in the sector's statistics. The declining trend is probably changing with increasing volumes of plantation

[5] Various sources give estimates for forest dependent people ranging from 2 to 5 million people

wood maturing for harvesting. Forestry's accounted GDP contribution can be expected to significantly increase in the future.
Out of the total population of 64 million, 70% is reported to live in rural and mountains areas. The poverty level is low and most people living in protected areas are experiencing high or medium level poverty (46% and 28%, respectively). For the rural poor, fuelwood and NTFPs are important sources of livelihood. Poverty is the most significant underlying cause for deforestation in the country.

PART II. DIAGNOSIS

3. CONSERVATION OF NATURAL FORESTS

3.1 Forest Conservation

3.1.1 Protected Area System

Since the enactment of the National Park Act in 1961 the areas under legal protection have expanded rapidly and they presently cover about 17% of the total national territory. The protected area (PA) system consists of national parks, wildlife sanctuaries, provincial or local government controlled forest parks, wildlife sanctuaries, no hunting areas (mostly I private lands), botanical gardens and arboretums. The existing 227 protected areas[6] amount to 11.3 mill. ha and they are under the control of the Department of National Park, Wildlife and Plant Conservation (DNP). The national forest reserves managed by RFD form also part of the system, as logging is not allowed in them. The forest reserves have obviously less strict rules than the sites with protected area status (Lakanavichian) 2001, 10–11) (Box 3.1). In addition, the system of conservation includes watershed areas which largely overlap with forest areas (cf. section 3.3).

Box 3.1 Key Legal Provisions of Protected Areas

The National Park Act of 1961 states that a national park is to be preserved in its natural state for the public education and enjoyment'. National marine parks have similar functions: most are former national parks that have reclassified.

The Wildlife Protection and Preservation Act of 1960 states that wildlife sanctuaries are areas for the conservation of wildlife habitat so that wildlife can freely breed and increase their populations in the natural environment'. Wildlife sanctuaries are not generally open to the public but researchers are allowed. They are primarily areas for biodiversity conservation. Some are grouped in clusters and adjoin national parks.

Forest parks are forested areas that have at least one significant feature such as waterfall, large trees or geomorphologic formations. They are provided for under the National Reserve Forest Act of 1964, and their chief purpose is to provide sites for local tourism and recreation.

Non-hunting areas protect land that is open to consumptive uses such as fishing and gathering of non-timber forest products but from which hunting is excluded.

The PA system is relatively fragmented and individual areas vary in size, habitat and conservation condition. In many areas degradation of the conservation values is ongoing from local agricultural encroachment, infrastructure and tourism development, illegal logging, and substantial illegal wildlife trade (Lessons Learned ….n.d.)

Although extensive, the PA system contains disproportionate amounts of upland forest but very little lowland evergreen forest. Apart from this, MacKinnon (1997) rated habitat coverage as 'quite satisfactory' and reported 'no obvious gaps'. All biounits and subunits were represented. Already prior to the logging ban it was widely believed that the PA network in Thailand was one of the best in Southeast Asia (Parr 1996).

[6] Excluding botanical gardens and arboretums.

In 1989, the King made an amendment to the National Park Act, which prohibited basically all activities in national parks and allowed the conversion of the national reserve forests into national parks (Sutthisrisilapa & Noochdumrong 1998). National parks fall under group II of the IUCN PA classification, wildlife sanctuaries under group IV, and no hunting areas and forest parks under group V.

3.1.2 Protected Area Management

By 1979, Thailand had only 16 national parks covering an area of 935,700 ha. But, by 2004, 114 national parks covering an area of 6,35 mill. ha were established. According to DNP, there are still several national parks which have not yet been are gazetted (i.e. legal status) (Table 3.1). All the 55 wildlife sanctuaries (conservation areas) are gazetted. In addition, 67 forest parks have been created covering an area of 87,000 ha. There are 55 "No-hunting areas" covering 441,000 ha, out of which about 17,00 ha are on private lands, and the rest on public lands, probably with more effective control for hunting risks in the latter case.

Thailand has set up a target to have 25% of the country's total land area as protected areas. At present, protected areas declared by Royal Decrees (under DNP's responsibility) account for about 20% of the country's total land area. Table 3.1 lists the types of protected areas by category.

Besides taking the stringent efforts in covering a total of 9.3 mill. ha under the protected area system, Thailand has also created 1,221 National Forest Reserves spread over an area of 23.4 mill. ha. Out of the five regions in Thailand the North has the largest area under National Forest Reserves with 11,2 mill. ha. It is highly significant for policy design that National Forest Reserves together with protected areas cover about 63.2% of the total area of the country. About 20% of the country's 56,000 villages are also located within forest reserves.

DNP has well-developed procedures for producing management plans[7]. In 1999, a little over 30 national parks and about 20 wildlife sanctuaries had management plans. By 2005, the Government had prepared master plans for 55 national parks, out of the total 103 gazetted national parks. These master plans are more general strategic plans than operational management plans. Out of these 55, 15 are approved/validated whereas 40 master plans have expired. DNP reported that 5 master plans are under preparation. This clearly exhibits that master plans of 88 national parks are yet to be processed which includes 43 gazetted parks. Moreover, there is no master plan for 55 wildlife sanctuaries. It is understood that master plans for 25 sanctuaries are under preparation. There is also a plan to have wildlife corridors in two national parks.

Management plans may be produced in-house by DNP officers, by universities or by private consultancy companies, subject to terms of reference defined by DNP. Each management plan takes about one year to complete. During this period, a steering subcommittee supervises the work especially when an external agency is being employed. All stakeholders are consulted during the planning process, including local communities, although this is said to be a relatively recent innovation. (Clarke n.d.)

Completed management plans are vetted by a management committee, comprising representatives of RFD, the Tourism Authority of Thailand (TAT), universities and relevant NGOs. Those that are approved go to the Director-General for final signature are then passed to Superintendents to implement.

Implementation is subject to monitoring, and past experience has been of a 50 to 60 per cent rate of achievement with regard to the planned targets. The reasons for this are unclear but may include prescriptions being too elaborate or demanding; insufficient manpower; insufficient time; or inadequate equipment. Whatever the reasons, the low rate of implementation suggests that prescriptions may be unrealistic given the resources available to management (Clarke n.d.). The life

[7] Called master plans in Thailand

span of a management plan is currently five years but consideration was given to increasing this to 10 years already about ten years ago. The validity period has not, however, been changed as yet.

Table 3.1 Types and Areas of Protected Areas, 2004[8]

Categories	IUCN protected area category	Number	Total area 1000 ha	Percentage of total country area
By Royal Decrees				
National park	II	114	6,346.4	12.37
Wildlife sanctuary	Ia & IIb	59	3,675.9	7.16
Marine national park	II	27	862,8	1.68
Non-hunting area	IV	55	441.0	0.86
Total		**227**	**11,326.1**	**22.07**
By Ministerial Declarations				
Forest park	III	67	87.0	0.17
Botanical garden	VI	15	5.9	0.01
Arboretum	VI	54	3.9	0.01
Total		**136**	**96.5**	**0.19**
By Cabinet Resolutions				
Watershed class 1 & 2	I, II, IV & VI		9,309.0	18.14
Conservation mangrove*	VI		42.8	0.08
Environmentally protected area			..	..
Total			**9,351.8**	**18.22**
International Recognitions				
World Heritage (nature)*	II	2**		
Ramsar Site*	VI	10***	373.2	..
Biosphere reserve	VI	4	26.1+	0.05+
ASEAN Heritage*	II	2**		
Total			**399.3**	**0.05+**

* Total land area is not shown because some overlap with other categories, e.g. national park, wildlife sanctuary and non-hunting area.
** As legal status, the World Heritage and ASEAN Heritage sites are either wildlife sanctuaries or national parks.
*** 8 out of 10 Ramsar sites are protected areas.

Source: MONRE 2006

3.1.3 People and Protected Areas

The Thai conservation policy initially revolved around a "wilderness approach," which recommended the total exclusion of people from protected areas. This approach was introduced to Thailand by US experts already in the 1950s. It has become increasingly evident that such an approach is no longer possible in a country where a large population dependent on forest resources lives inside PAs (cf Chapter 4). There is a need to balance people's rights to land and traditional resource use within the formal conservation context. The history of conflicts over access to natural resources is rooted in the process of villagers' "encroachment" of forestland. Changes in land allocation and uses over the years have also resulted in pronounced imbalances in power relations between state, private sector (largely through commercial farmers and land developers) and forest dwelling ethnic minorities. (Bugna & Rambaldi 2003).

[8] The data differs somewhat from what is reported from DNP (2004). There is some overlap between categories.

Most protected areas have people living in them and all have people living nearby who harvest timber and NTFP from within. Harvesting is not only for subsistence use. There are considerable commercial interests stimulated by middlemen. The forests are plundered for wild animals (dead and alive), timber, basket-weaving materials, medicinal plants and other commercially valuable products.

Resource harvesting in protected areas is not allowed under current legislation except by permission of the Director General, although it is occurring in the surrounding buffer zones. However, it is reported that, although there is legal justification, some park or sanctuary Superintendents may, on their own initiative, relax the rules at local level in the interests of fostering local support.

The measures to enlarge protected areas and stop the rotational farming systems have raised concerns at the local level over people's livelihood. In particular, the intentions to relocate villages have caused resistance already for years. The solution suggested in the Thai Forestry Sector Master Plan was to limit relocation plans to only a few necessary cases and instead to encourage people to find alternative livelihood outside the protected forest (TFSMP 1993). The Government has never formally endorsed this.

Several NGOs are active in protected areas, including TEI, the Dhammanaat Foundation, the Foundation of Education for Life and Society, Seub Nakhasathien Foundation, Promotion of Human Resources for Community Development Foundation, Village Foundation, Serving for the People Association and WWF Thailand. Some NGOs expressed the view that DNP does not encourage participation by communities in the management of forests or protected areas but RFD is cooperating to find local-level solutions to the problem of population pressure. The reason is said to be that professionals are jealously guarding their territory against those they perceive as amateurs. Nevertheless, local people continue to manage forests according to traditional skills and knowledge, albeit to some extent often illegally. Radical conservation NGOs still argue for expulsion of people who are living in PAs.

3.1.4 Cross-boundary Issues

At least 18 protected areas lie adjacent to international borders with neighboring countries. Thailand has recently made an agreement with Lao PDR on the common approach to the Eastern Forest Complex and it is reported that Cambodia will join this effort. ITTO's role has been instrumental in this exercise in providing support to the management plan of the zone on the Thai side and facilitating the discussions with the neighboring countries. Informal contacts have been made with Myanmar concerning the Western Forest Complex (WEFCOM) (Box 3.2)

Common approaches are necessary to bring the cross-border areas under effective protection and control which has also national security implications. There is an illegal flow of non-timber products from neighboring countries to Thailand. This includes supplies to feed a major illegal market in agarwood oil (*Aqualaria spp*) in the Middle East and Japan, where it is said to catch so high prices that illegal harvesting has all but eliminated the plant from Laos[9]. Illegally obtained timber also crosses the borders from Cambodia and Myanmar. Another market in wildlife by-products involves the wild cattle-gaur[10], kouprey and banteng which occur on the border between Cambodia and Lao PDR. They are hunted for trophies that are exported to Thailand. Thai middlemen encourage this trade. Wildlife trade routes also enter Thailand from Myanmar by way of Tachilek and Maesod (Clarke n.d.).

[9] The current export price from Indonesia is US$ 118/kg (www.bulkoil.com).
[10] Wild ox.

Box 3.2 The Western Forest Complex

The Western Forest Complex (WEFCOM) is a large, hilly tract of forested land on the border with Myanmar between about 14º10' and 16º30' N. It comprises a cluster of 11 protected areas that have an important watershed protection function. WEFCOM is a biogeographic crossroad, where the Indochinese, Himalayan and Sundaic realms meet. There is therefore unusually high biodiversity. Tiger (*Panthera tigris*), elephant (*Elephas maximus*), guar (*Bos guarus*) and tapir (*Tapirus indicus*) are among 153 mammal species found in the area. As many as 490 bird species are encountered. WEFCOM encompasses many waterways which supply three of Thailand's six major rivers.

WEFCOM is the largest surviving contiguous forest tract in Thailand, covering 1,873 mill. ha. It is composed of 9 national parks, 6 wildlife sanctuaries and 2 proposed national parks. Two of the largest wildlife sanctuaries, Huai Kha Khaeng and Thung Yai Naresuan, have been designated as World Heritage Sites by UNESCO.

A number of communities are living inside the protected area and a large number of villages are surrounded by WEFCOM. The protected area is under pressure from agricultural encroachment, wild fires, infrastructure development, mining, illegal logging and poaching of wildlife.

All these villages need special attention in terms of outreach strategies, particularly on controlling human impacts. In addition 25 villages need specific outreach strategies in order to manage resources sustainably for the well-being of local people. Continuous monitoring of human use in WEFCOM is considered essential.

Source: Emphandhu & Kalyawongsa (2003)

Assessment

1. The key issue for the future of the PA network is how to deal with the 1.2 to 2 million people who are living within the protected areas. This issue is discussed in detail in chapter 4.
2. Research on northern Thailand suggests that actually protected areas have no significant effect on reducing the likelihood of forest clearance unless they are supported by the local communities and the livelihood of their residents is adequate without encroaching on park territory (Cropper et al. 2001). It is also problematic that the national parks lack buffer zones and, in practice, the boundary areas tend to function as a buffer zone.
3. A large number of pilot projects have been implemented in the various ways to involve local communities which provide convincing case for the benefits of involving people in planning and implementing management plans of PAs. As there still persist perceptions among policy makers, government technical staff, NGOs, academics, etc. about the viability of this approach, there is probably a need to carry out a comprehensive stock-taking exercise of this experience to clarify the lessons learned in terms necessary preconditions and practical arrangements to achieve conservation and development goals in specific situations.
4. Valid management plans exist only for 15 of the country's 103 gazetted national parks[11]. 45 parks have been proclaimed but are not yet gazetted. During the last six years only four new parks have been gazetted. As regards the 55 wildlife sanctuaries, only 25 have management plans under preparation. This shows that the pace of extending the PA network has well exceeded the capacity of the administration to bring these areas under effective management.
5. In addition, management plans are not necessarily leading to improved protection as they often lack implementation. Expropriation of the PAs from the community use has led to a degree of alienation of communities in the protection efforts, as there are no clear incentives to take corrective action.
6. Guidelines for preparation of PA management plans need updating. The contents of the plans is largely defined by experts and therefore the plans treat social and economic aspects as secondary at most. Plans tend to be theoretical documents rather than well grounded on what is possible to implement in practice.
7. There is a need to improve the involvement of the communities in the preparation of the PA management plans to make them more realistic and to reduce conflicts between PA manage-

[11] 40 have expired, 5 are under preparation, and 55 are scheduled to be prepared. Source DNP

ment and people living in and around the area. This is also called for by the 1997 Constitution (Sections 46, 56 and 79).

8. Delineation of the gazetted area boundaries has been criticized and the scientific basis of decisions has not been made public. The decisions would be better accepted if the underlying reasons (e.g. habitat of wildlife populations, breeding grounds, migration routes, important floristic communities, etc.) would be communicated in an easily understandable form to local stakeholders.

9. Degraded areas have been typically rehabilitated by high-cost planting which limits the areas that can be covered by interventions. Planted sites would also need to be managed to keep them healthy (including thinnings) which is not possible under the present regulations. This issue could be addressed by a two-pronged approach: (i) adjusting regulations to allow necessary silvicultural treatments in protected areas, and (ii) applying less intensive techniques to restore the ecosystem functions.

10. Cross-border forest complexes represent a particular priority in the maintenance of protected areas over broader landscapes which need to be conserved through integrated approaches including buffer zones, biological corridors, etc. and which should address the specific issues of border areas (immigration, trade in endangered species, illegal logging, etc.).

3.2 Forest Reserves

Thailand has never had a long-term silvicultural management system despite the successful experiences developed in the neighboring countries with similar forest types, particularly Myanmar. There are no records of national level forest inventories and during the logging period inventories were regional or local in scale and they contained data only on teak. However, any sustainable silvicultural management requires data on the potential of stands in terms of their future growth and yield. This information is grossly inadequate in Thailand.

Native teak, *Tectona grandis*, has been the most favored species for commercial plantations. Other broadleaved species such as *Pterocarpus macrocarpus*, *Dipterocarpus spp*, *Swietenia macrophylla* and *Hopea odorata* are planted on a smaller scale. Teak trees grown in plantations on good soils may reach an average of 60 cm in diameter at breast height and 30 m in height in about 50 years. Typically, 1,200 to 1,600 stems per hectare are planted and canopy closure takes place between the third and fourth year and suppresses the development of weeds. Pruning is carried out near the time of canopy closure. This has the added purpose of reducing the chance of ground fires reaching the crowns and facilitating access to the stand. The first thinning generally takes place when the dominant height reaches about 9 or 10 m, and the second when the dominant height reaches 17 to 18 m.

Teak is also the dominant tree in the mixed deciduous forests of northern Thailand. These forests are open, with teak trees isolated or in small groups. Although logging in natural forests in Thailand was banned in 1989, the current National Forestry Policy states that efficiency in timber production should be increased through appropriate forest management techniques using both selection and clear-felling systems. With the logging ban in force, this provision has become irrelevant.

In theory, the clear-felling system would require cleared areas to be replanted immediately. Teak forests should be managed under a 30-year felling cycle; trees to be felled are marked and girdled for felling. The tropical evergreen forest should be managed under a similar system and the same felling cycle. The dry dipterocarp forest should be managed under “modified coppice” and “coppice with standards” systems, based on a 20-year rotation. These provisions are technically sound but cannot be applied in practice.

Recent research has revealed that the growth potential of dry dipterocarp forest is about 5 m^3/ha/yr of which 1 m/ha/yr is crop trees. These forests have potential for silvicultural management, particularly through liberation and refinement. However, due to long history of disturbance, a large part of these forests’ growing stock levels are so low that advanced management is not justified and therefore silvicultural treatments should be targeted in areas with high growth potential. The specific uniformity of stands and the high degree of regeneration render such sites suitable for shelterwood system which

is widely practiced in the Indian sub-continent. Clearcuts would be unsuitable opening soil for erosion. The transitional areas would need to be managed taking into account their heterogeneity targeting at resembling mixed or dry dipterocarp forests. Selective treatments, harvesting and regeneration would be appropriate in these areas. Both intensive and extensive management methods could be applied depending on the characteristics of the forest and the site. This would in any case require clear delineation of management compartments based on the inventories to be carried out (Weyerhäuser 2001).

Since the logging ban the overall management objectives of the forest policy have been geared towards conservation. For PAs this is logical but in the existing 1,221 forest reserves there has been lack of clarity what the management objectives should in practice be. PAs were established in some areas which used to be forest reserves. As large areas do not have forest cover they have become *de facto* common public lands that are encroached by expanding agricultural activity. Lacking inventories little is known about the growing stock, including the relatively large areas planted over the last 20 years in forest reserves. These areas would need to be managed to guarantee their health and vitality.

Silvicultural treatments such as thinnings are not allowed because of the logging ban and therefore hardly any revenue can be generated from this huge state-owned asset. What is allowed is the production of NTFPs which is mainly being carried out by local people. In addition, RFD employs them to carry out forest rehabilitation and reforestation work where available funds allow it.

Assessment

1. The most extensive forest types in Thailand, dry dipterocarp and mixed deciduous forests, can be technically managed in a way which would mimic natural processes resulting in a healthy natural forest representing higher environmental and social values than as these forests presently stand, often degraded. Sustainable management of these forests could generate benefits for local people to serve as incentives for their conservation.
2. In mixed dipterocarp forests, traditional silvicultural systems (minimum DBH and fixed rotation) may not be applicable. A more attractive option could be species-specific and site-adjusted selection systems or conversion methods which attempt to convert the existing stock into a natural-like forest. The whole regeneration process should be better understood which is only possible when based on long-term permanent plot data. Such a silvicultural approach would lead to complex forest structures.
3. In order to develop appropriate silvicultural systems in Thailand, it would be necessary to establish permanent sample plots for monitoring growth and yield of different forest types. Knowledge on the phenology and physiology of key indigenous species should be improved on aspects like seed production, shade tolerance/light requirements and responses to competition, liberation and other treatments. There is also need for further research on taxonomy.
4. The logging ban has probably reduced deforestation but not eliminated it. The ban currently impedes any silvicultural improvement of the forest reserves, as the necessary treatments would involve liberation harvesting. In Thailand, there is an erroneous perception that setting aside is the only way to effectively protect forests, and the large degraded areas suggest that this is not even effective. There are other countries which have been able to manage similar forests for the national benefit and, with the revenue generated, silvicultural management has also become economically possible which is not the case in Thailand.
5. Without a change in the current conservation paradigm, Thailand is implementing a non-optimal conservation strategy, which ignores the economic value of timber as one of the outputs of sustainable forest management. The economic value of lost opportunities could be assessed based on the available yield estimates to guide future policy decisions.
6. The Mission is fully aware that this is politically a most sensitive issue in Thailand. Any policy changes should be part of a broader process involving all the stakeholder groups at different levels. Necessary background information on the options, their impacts and consequences should be generated to allow a meaningful consultation process. .

3.3 Watershed Management

The land area can be grouped into three types according to topography and the soil:

1) flat lowland areas in river valleys and flood plains, where paddy rice can be cultivated,
2) uplands suitable for upland crops and where slash-and-burn cultivation used to be the primary farming system,
3) uplands with steep slopes unsuitable for cultivation

Classification of watersheds into five categories, for which a special Watershed Classification Committee was established in 1992, is an integral component of the Protected Area system. The classification is made according to five criteria: slope, elevation, landform, soil and geology (Box 3.3). Watershed Classes 1A and 1B are the areas with a slope more than 60% and they are totally protected from utilization including also a prohibition of settlement. Watershed Class 1B has somewhat less strict rules because it is defined as a degraded area. The aim is to reforest as much of this area as possible or maintain it under permanent agroforestry. Other categories of watersheds (2–5) allow use and logging to a certain extent. (Lakanavichian 2001). Of northern Thailand, about 30% of the land area belongs to the Watershed Class 1A and 3% to Class 1B. About 15% belongs to the Class 2 and the rest falls under categories 3–5.

The protected area system is closely linked with watershed management. In Watershed Class 1A areas, national parks, wildlife sanctuaries and other conservation areas have been gazetted according to the respective laws. According to the regulations, no human should be allowed to inhabit, cultivate or utilize any tangible product in these areas.

Box 3.3 Watershed Classes

The watershed classes are described as follows:

1. Protected forest in headwater source:
   - 1.A Strictly protected forest usually at high elevations with very steep slopes
   - 2.B Physically similar to 1A but partially cleared for agriculture and soil protection requires special attention. Planting of trees in this area is encouraged.
2. Commercial forests, where logging and mining is allowed, in high elevations with steep slopes but less susceptible to erosion than the areas under Class 1.
3. Fruit tree plantations in uplands with steep slopes that can be used for commercial forests, fruit trees, grazing, or certain agricultural crops provided that soil conservation is taken care of.
4. Upland farming in gentle slopes with a moderate requirement for erosion control.
5. Lowland farming in gentle slope or flat area with only a few restrictions.

Only less than ten percent of the total land area is classified as suitable for agriculture. Nevertheless, even steep slopes are cultivated. Merely slightly over one percent of the land area is suitable for irrigated farming and even the land suitable for hill crops is only about seven percent of the total land area.

The strategy in watershed management has been to maintain or create a protective forest cover for the protection of soil and water but the implementation concept has changed over time (Table 3.2). Many activities in the past tended to be top-down in planning and implementation. As large-scale reforestation was attempted, there was also resistance from local people as planted areas were no longer available for their use. More diversified strategies are presently being used including strategic plantings of natural species carefully matching the choice of species to the site conditions. Low density planting minimizes costs and maximizes impacts, which is particularly useful in degraded watersheds where biodiversity and other environmental services are important considerations (Elliott et al. 1998). Alternative land use and agricultural practices have been introduced to discourage shifting cultivation and landscape-level approaches have also been introduced (Thomas 2005).

Table 3.2 Evolution of Watershed Management Policy

Period	Policy focus	Major activities
1976-1980	Watershed rehabilitation	Reforestation of abandoned swidden areas; relocation of hill tribe villages and improvement of their quality of life
1980-1990	Integrated watershed management	Land-use planning, soil and water conservation measures, forest fire control and promotion of agricultural extension
1990-1999	Participatory watershed management	Local people's participation, village committee, watershed network, internal rules and regulations
2000-	Watershed for the people	Landscape-level approaches to watershed management, integrated land-use, participatory planning and implementation, integrated approaches, policy linkages and adjustment

Source: Elaborated based on Jantakad & Gilmour (1999)

In the past, rotational slash-and-burn cultivation was the main form of land-use and the main crop was upland rice, which was intercropped with various other crops; paddy rice was cultivated only in a small area. Aerial photographs show that in the 1950s no modern roads or national parks existed, the landscape was dominated by forests under different stages of succession during fallow period, and only relatively small areas were cleared for cultivation annually. Since then significant changes in landscape have taken place. The forest area is now permanent instead of being a fallow in a swidden cycle. On the other hand, the area under cultivation has increased substantially during the past decades, mainly because cash crops are grown instead of subsistence crops (Thomas 2005). While slash-and-burn cultivation area has considerably diminished, intensive cash-crop cultivation has been increasing in area. It is often practiced in the sites of former opium poppy fields and typically in the villages with good road communications. Irrigated fields are found on flat lands, but now, in addition to rice, cash crops are grown in them (Care 2001).

The Watershed Management Division of DNP largely focuses on the protection and rehabilitation of denuded watersheds, most of which are located in national park forest reserves and wildlife sanctuaries. Alternative land use and agricultural practices have been introduced to discourage shifting cultivation. ICRAF has done extensive pathbreaking research on the conservation of watershed improving the understanding of the dependency between upland conservation and lowland land use. The focus has been recently moving towards landscape level management of watersheds instead of developing techniques for plot-level integrated technologies (Thomas 2005).

Assessment

1. The past government efforts have often been costly focusing on work to be carried out rather than people's capacity to conserve watershed. The government delivery system of support has suffered from inefficiencies (e.g. timely delivery of seedlings), lack of adequate technical knowledge, allocation of poorest sites for rehabilitation work, and involvement of local people mainly as hired labor.
2. Partnership arrangements between authorities and local communities are still poorly developed. Such arrangements would allow decentralization of authority for resource management and conservation. Greater attention to traditional rules, regulations and practices would enhance the feasibility of interventions.
3. The main constraints in achieving more success on the ground have been limited and unclear rights of local people to use natural resources and the legitimacy of local institutions and organizations to make decisions about the land use (see chapter 4).
4. Best results are achieved when villagers have instituted a clear set of rules and regulations to control access and use rights aimed at regenerating the natural forest while allowing controlled use of the resources.

3.4 Mangroves

3.4.1 Resource Management

Mangrove forests constitute a unique tropical ecosystem, occurring most extensively along the protected coastal shores with muddy to sandy bottoms, which is alternately covered and uncovered by tidal fluxes. The development, structure and dynamics of mangrove ecosystems are regulated by the interplay of marine coastal waters with fresh or brackish waters from land drainage (ITTO Mangrove work plan, 2002-2006). Thailand has 2,600 km of coast line and 70% of this is under mangroves covering a total area of 276,000 ha with 55 species, showing an increase of about 7,600 ha per year[12] (Table 3.3**)**.

The concessions in mangrove forests have been stopped for the last 2-3 years. To avoid any confusion and possibility of illegality, demarcation has been done on the ground through canals. Aquaculture can be practiced by farmers and local inhabitants in the existing canals within the mangrove areas. The fisheries sector (marine and inland) offers great potential for employment and income generation as well as for food security. Rice cultivation is the main agricultural activity in these areas. The houses are exclusively made of mangrove poles. One-third of harvested mangrove trees are used for making charcoal, lactic acid, etc.

The Department of Marine and Coastal Resources (DMC) is carrying out a project for the enrichment of mangroves (2004 – 2009). About 16,000 ha have been planted in the last two years and the planting target for 2006 is 8,000 ha. In total, 60,000 hectares are to be planted in the five-year period under the project. The Government is also funding the 'People's Participation Program' which includes (i) training and awareness raising, (ii) participation in planting activities, and (iii) protection and improvement of facilities.

Table 3.3 Mangrove Forests

Region	2000	2004	Annual change [13]
	- ha -		
Central	12,550	9,650	-725
East	23,390	22,750	-160
South	209,310	243,400	+8,522
Total	**245,250**	**275,800**	**+7,637**

Sources: RFD 2004b, Geo Informatics, DNP

Thailand Environmental Institute (TEI), a reputed NGO, is developing mangrove information network which will be completed in three years. TEI is operating in 80 buffer zones to improve their management to enhance protection of mangrove forests.

3.4.2 Tsunami Disaster

On December 26, 2004, a large 'tsunami' hit the coast of Southern Asian and African countries. The tsunami caused heavy destruction of human life, property, economic infrastructure and environmental assets in six southern provinces in Thailand along the Andaman coast line (Ranong, Phang Nga, Phuket, Krabi, Trang and Satun). The severely affected areas included 407 villages in 95 sub-districts. Casualties stood at 5,395 dead, the injured at 8,457 and the missing at 3,001. A total of 12,068 households with a population of 54,672 were directly affected by the loss or injury of family members. About 3,300 houses were totally destroyed and 1,500 houses were partly damaged. This natural calamity cost more than US$ 75 million[14].

[12] Expansion has only occurred in the South Region.
[13] The increase is assumed to be due to change in the assessment method (see ch. 2.3).
[14] Department of Disaster Prevention and Mitigation, Ministry of Interior

About 320 ha of mangrove area was severely affected by the tsunami in Thailand. Damage was serious with *Avicennia spp* whereas *Rhizophora spp* withstood the tsunami because of their deep roots. Damage was severe in areas where there was no protective bioshields. The Government has already rehabilitated the severely affected mangrove area.

The tsunami disaster has, dramatically shown the high vulnerability of the coastal areas to natural hazards that can have immense impact on human lives and economic infrastructure. It has also illustrated the role that coastal forests can play as bioshields and speed-breakers to enhance coastal security. However, the damage caused to coastal forests is threatening the ecological security of the zone as well as the livelihoods and economy of the communities which mainly depend on fishing activities. The coastal vegetation is diverse; it includes beach forest which plays a crucial role in the protection of communities and economic infrastructures against tidal waves, coastal erosion, crop destruction, etc. It comprises also the mangroves which are the nurseries of many coastal and oceanic fish species, and are therefore vital for the livelihoods of coastal communities and for commercial fisheries of the country.

The Government of Thailand is implementing an ITTO project titled 'Contribution to Forest Rehabilitation in Thailand's Areas Affected by the Tsunami Disaster' (PD 372/05 Rev.1 (F)) to the amount of US$ 790,020. Among the project's most important outputs will be the rehabilitation of 1,250 ha damaged by the tsunami and the elaboration of plans for long-term community-based coastal forest rehabilitation in pilot areas of the Provinces of Krabi and Pang Nga. The project will promote the use of bamboo in house construction and furniture to replace mangrove wood. The Danish Government is supporting rehabilitation of biodiversity and ecosystem functions of protected areas affected by the tsunami catastrophe with responsibilities and outcomes of sustainable management shared among all stakeholders.

Assessment

1. Coastal zone management requires cohesive, multi-disciplinary approaches as well as a multi-dimensional vision. Sustainable human security in all its dimensions – ecological, economic, ethical, cultural and social well-being, in terms of the health and happiness both man and nature – should be the goals of an enlightened coastal zone management policy. The implementation of such a policy will require appropriate regulations supported by effective monitoring systems as well as education, public and political understanding of risks and benefits of development activities and, above all, social mobilization through grassroot institutions.
2. Devastating as they were, the tsunami of December 2004 and recent tropical storms have sent a clear message that investing in environmentally sound development and sustainable management of the coastal environment will, in the long run, be more cost-effective than restoring human lives and ecosystems after a catastrophe.
3. Rehabilitated mangrove ecosystems can bring back all the benefits of the ecosystem to the local people who depend on it for livelihood. ITTO's Mangrove Work-plan (2002-2006) has suggested the following measures for the protection and development of mangrove ecosystem which are relevant in the Thai context: (a) conservation and sustainable management, (b) mangrove information and awareness, (c) social-economic aspects, (d) mangrove ecosystem functions and health, (e) cooperation and capacity building, and (f) pragmatic policies and legislation.
4. Promotion of integrated watershed management programs and redesign of farming systems based on the principles of ecology, economics and employment generation are needed in mangrove area. Community participation through local organizations, fishermen and the youth should be encouraged.
5. Capacity building programs are needed for local communities on the state-of-the art of post-tsunami agronomic, ecological and livelihood rehabilitation measures drawing on the accumulating experience.
6. There is a need for a close integration of the efforts between the concerned government departments and their interaction with the reputed NGOs working in the field of disaster management. The grassroot community institutions should also be strengthened in this context.

7. At least 70 metre buffer zone along the sea coast is required in Thailand depending upon low and high tide[15]. This would reduce losses of life and property in natural calamities. Bioshielding requires a combination of mangrove and terrestrial systems such as beach forests. Thus, the bioshield programs should be strengthened to regenerate mangroves and other suitable terrestrial forest programs within the context of the dynamics in the geomorphology and coastal hydrology. These initiatives would act as bioshield and reduce the impact of any future disaster due to storms or tsunamis.

8. If bioshield plantations are raised starting from the high tide line, then the supply of sand/sediment to the littoral current would be greatly reduced or stopped (due to sand/sediment binding property of the plantation) and to compensate this, current and waves would remove large chunk of sand in other areas, leading to sea erosion in those areas. To address this risk, the shelterbelt plantation should be started at least from 50 to 75 m away from the high tide line. Moreover, the natural landscape of the coastal area has high aesthetic value, which should be conserved not least because of tourism attraction.

3.5 Trees Outside Forests (TOF)

In the Thai context, "tree cover" means the area covered by crown of trees that is too small to be delineated by digital interpretation of remote sensing data at 1:50,000 scale used for forest resource assessment[16]. "Tree cover" differs from the concept of "Trees Outside Forests" (TOF) which means all tree crops outside recorded forest area (forest and other woodland). About 18.9 mill. ha or 36.8% of the land area of Thailand comes under the category of "others", i.e. outside recorded forest area, which may be interpreted as potential TOF area.

TOF is an important element of landscape in the whole country but particularly in Central Region where the relative forest cover is lowest. Trees are grown as part of land use for a variety of products such as fuelwood, construction poles, NTFPs, shelter, fencing, etc. Trees are also part of land-use systems such as agro-forestry or silvo-pastoral techniques. The open areas with TOF resources are also important for biodiversity conservation. Data is, however, badly lacking on the biological and socio-economic importance of TOF as a strategic natural resource. Knowledge on the contribution to meeting farmers' various needs could lead for adjustment of reforestation programs and extension services.

Assessment

1. TOF inventories should be carried out using remote sensing and ground truthing be carried out based on sample plots in each strata (block plantation, linear plantation and scattered trees) and the data obtained should be processed to generate a computed tree cover at 70% canopy density. Such an assessment of TOF will help in developing proper monitoring mechanism/ information system to support the sustainable development of tree resources outside forests at the sub-district level. This monitoring could be combined with regular assessment of the progress and survival rate/status of various afforestation programs in the country, to make their future planning realistic[17].

2. TOF management should be considered in the extension packages for farmers.

[15] The control buffer zone in Indonesia is 400 m.

[16] See also definitions of forest and TOF in FAO (2005b)

[17] ITTO has recently decided to fund a TOF project PD 376/05 Rev.1 (F, M) in Thailand to address information needs related to this resource.

4. COMMUNITY FORESTRY

4.1 Evolution of the Government Community Forestry Program

Forest resources have been an integral part of Thailand's rural life, involving all aspects of local people's activities, thereby contributing to their social, economic, cultural, environmental and political objectives. At present, some 1.2 to 2.0 million people are reported to be living in and around the protected areas (national parks and wildlife sanctuaries) and rely on forests for livelihoods. In addition, another 20 to 25 million people are reported to live near national forest reserves and use them for forest products both for household consumption and to sell them in markets for cash income ((Wichawutipong 2005; Pragtong, pers. comm.)

As early as 1970s, RFD recognized community (or village) forestry as a strategy for sustainable management of the nation's forest resources (FAO 1978; Pragtong, 1991.). In 1991 a Community Forestry Division, now renamed as the Office of Community Forest Management, was created with a mandate to plan and promote community forestry, and to involve local communities, local organizations, NGOs and other civil society organizations and various other institutions in community forest management. The Forest Sector Master Plan of 1992 recognized community forestry as one of the main strategies (TFSMP 1993).

In 1993, drafting of a legislative framework what is known as the Community Forestry Bill, was initiated to provide a legal framework to promote community forestry in the country. Since then several versions, have been drafted, but the approval has been on hold due to difficulty in reaching a consensus among politicians and stakeholders (Box 4.1). In particular, views differ on a clause that would allow community forests in protected areas.

According to Wichawutipong (2005), the establishment of government-supported community forests is at present allowed in two types of legally categorized forests: (i) national forest reserves, under formal management by RFD, and (ii) other forests (i.e. any forests not yet occupied or developed for any use by Thai citizens, as per the Forest Act of 1941).

According to the draft of Community Forestry Bill (1993 version, cited in Wichawutipong, 2005), community forest would not be allowed in the following categories of land: areas (i) where use permits have been given to individuals and/or any government agencies for residential purposes, afforestation and other types of use, (ii) government afforestation areas, state parks and botanical gardens, and (iii) protected areas declared by the Cabinet.

4.2 Present Status of the Community Forestry Program

4.2.1 Extent of Community Forests

Some 11,400 villages (or 15.5% of all the villages) (Wichawutipong, 2005) are involved in managing community forests in the country, of which about a half (5,331 villages) are reported to have formally registered their community forests with RFD (Table 4.1). These community forests are reported to cover an area of 196,667 ha in both national forest reserves (112,869 ha) and other forest areas (83,798 ha), accounting for about 1.2 % of the total forest area (Wichawutipong, 2005). It can be extrapolated that were all the villages involved in community forestry, the total area covered could be in the range of 1.1 million ha.

The majority (72%) of existing community forests is concentrated in the North and Northeast regions where most natural forests are located. Moreover, these two regions are also the areas where the majority of the poor people are reported to live (IUCN, 2004). Interestingly, the Northeast, which is the poorest region, is also reported to be the least indebted region, with US$ 1,128 per household, compared to the figures for the whole country, Central, North and South, which are US$ 1,630; 1,467; 1,284 and 1,324, respectively (IUCN 2004). On the other hand, in the Northeast the average size of the community forest is smallest.

Box 4.1 Key Events in the Development of Community Forestry Legislation in Thailand

Date	Event
1991	The RFD began a process to develop a Community Forestry Act to involve local communities in managing community forests, and developed a draft Community Forestry Bill.
1992	The concept for a draft Bill was approved by the cabinet.
1992-1995	The draft bill was revised and reconsidered through committee and public hearings.
1993	A draft Bill was developed by RFD and another version by NGOs
1994	NGOs and grassroots groups campaigned for the government to accept the people's version of Bill.
1996	As a response to the grassroots and NGO pressure, the government assigned the National Economic and Social Development Board to organize and draft a new version of the Bill, with participation of representatives from government, NGOs, academics and grassroots communities. A compromise version of the draft was produced.
1997	Urban conservationists lobbied against the redrafted Bill and the concerned Ministry was ordered to further modify the Bill. The Cabinet approved the Ministry version of the Bill. Local community members from across the country rallied against the Ministry version. A joint committee revised the Ministry version.
2000	Nationwide community forestry networks announced their intention to collect 50,000 signatures to submit a people's version to the Parliament according to Article 170 of the 1990 constitution. The Bill was approved by the Lower House.
2001	A new government confirmed its intention to consider the Bill.
2002	The Senate's revision deleted the most crucial clause of the Bill which would have allowed community forests in protected areas. The Bill was sent to Joint Committee of Senators and Representatives. The Bill was sent back to the Lower House to consider the Senate's revision.
2005-06	The consideration of the Bill in the Joint Committee continued.

Sources: Kalyawongsa 1997; Witchawutipong 2005

Table 4.1 Number of Community Forests by Region and Selected Socio-economic Variables

Region	North	Northeast	Central	East	South	Total
Population (1,000 inhabitants)	10,479	22,315	18,172	2,449	9,004	62,418
Total forest area (1,000 ha)	9,206.8	2,809,6	2,124.3	824.0	1794.3	16,759.1
Villages with CFs (No)	3,359	4,809	1,621	563e	1,059	11,411e
Size of community forest (ha)	28.7	5.5	13.2	15.0e	26.7	14.9
CFs registered with RFD (No)						5,331
Areas under formal CFs (1,000 ha)						196.7
Population living in poverty (%)	12.2	28.1	5.4	NA	11	NA

Sources: Ministry of Interior, 2005; RFD 2004a; Wichawutipong, 2005; IUCN, 2004: Mission estimates

In the North and Northeast regions, the landless forest dependent population is dominated by so call hill tribe people. Furthermore, a significant proportion of the hill tribes live in and around the protected areas, especially those bordering neighboring countries. Many are reported to be illegal immigrants. They have no formal land rights and their land-use practices have been criticized by authorities and NGOs as being one of the main causes of deforestation. (cf. chapter 8.1).

4.2.2 Benefits from Community Forests

At present, due to the logging ban of 1989, villagers are not allowed to fell or harvest any kind of living trees ("green wood") from natural forests for household or commercial purposes. They may, however, use the plantation forests to harvest timber and fuelwood but for teak and other reserved species a permit is required from RFD.

Villagers are allowed to use community forests to collect dry and dead wood free of charge for subsistence needs (e.g. fuelwood and construction timber). With no other source of energy, the amount of fuelwood used each year by these millions of people for cooking and heating is significant (see ch. 6.6).

In addition to fuelwood and construction wood, villagers are allowed to use free of charge NTFPs, such as mushrooms, rattan, bamboo and bamboo shoots, wild vegetables, flowers, fruit and nuts, and medicinal plants. These are used mostly for household consumption to supplement diets, especially during the time of food shortages but also for supply to local markets for cash income. The types of NTFPs collected from CFs vary from place to place, and their volumes can be locally highly significant. For example, in 2004, villagers reported collecting about 13 tons of NTFPs from Nong Song Hong, Khon Kaen and Dong Keng community forests (a dry dipterocarp forest covering 287 ha) (Witchawutipong 2005).

Relatively few households are reported to be engaged in marketing of NTFPs, but the cash generated through forest products trade in local markets can be quite substantial. For example, in Dong Keng in 2004, NTFPs sold in the local market accounted for 5.25% of the average annual household income (Witchapwopitong 2005). According to the Thailand Environment Monitor Series, in 2004, a village generates, on average, over US$ 25,000 per year by selling non-timber forest products. Thus, with 73,467 villages in the country, this would amount to up to about US$ 2 billion per annum from the NTFP trade in the local market alone[18].

In addition, community forests have an important cultural and religious significance for rural people. Tens of thousands of monks are reported to reside inside the forests often cooperating with forest authorities to encourage villagers to protect the forest. Many NGOs and authorities see forests to be important for watershed protection and are therefore actively engaged in the promotion of planting trees and protecting forests for watershed areas through community involvement.

4.2.3 Public Support to Villages

According to the Office of Community Forest Management, RFD provincial and district staff help demarcate community forest areas and prepare operational plans. They provide villagers with basic forestry skills, such as nursery establishment, planting and maintenance and fire protection. RFD also provides planting materials, such as seeds and seedlings (mainly eucalyptus). Almost all the villages with registered community forests have a nursery and tree-planting program. RFD also organizes study tours for community forest group members to visit successful community forest sites, both within and outside Thailand. They also provide training on networking among community forest groups.

Some community groups are reported to receive financial assistance through the tambon (sub-district) administrations (TAO) under the decentralization program while RFD at present has no provision for direct financial support to villages for community forestry activities.

RFD has identified and promoted a variety of means to support local communities to manage their forests, albeit at pilot scales, so that these could be scaled up once the Community Forestry Act is passed. These support projects and programs include:

[18] This is probably an overestimate as there are wide regional differences in NTFP collection and trade (see ch. 7).

- *Community forestry in buffer zones,* which is being tested with pilot projects in national forest reserves that surround national parks and wildlife sanctuaries. The aim is to develop understanding of local processes and tools for developing collaborative management arrangements between local organizations and RFD to manage buffer zones.
- *Small-scale forest plantations to support TAOs* in their role as a primary local institute to promote small-scale enterprises and employment. Areas of 10 to 20 ha are allocated to a TAO for reforestation and planting of trees such as eucalyptus and teak.
- *Involving TAOs in forest management* in all 75 provinces, with the aim to develop procedures for local forest officers to work with the TAO administration to manage forestlands in their territories. TAOs are encouraged and assisted to develop forest management plans and activities (for TAO forests or community forests/village groups), while forest officers play a crucial role in providing extension services to plan and implement activities that will ensure wise use of forests by villagers for their own benefit.
- *One Tambon One Product (OTOP)* is a government program that supports local communities to develop value-added products that have potential for commercialization; for example products from forest trees and plants, such as wine, juice, honey, medicines are produced by many villages in the Northeast region.
- *Forest and forest fire protection initiative* involves local people in controlling forest fire. RFD has supported TAOs in developing forest fire control plans to reduce the impact of forest fires on local economies and forests, especially in national parks and wildlife sanctuaries[19].

These interventions need to be integrated in the overall planning of community forestry in a village in order to be relevant and effective. Involving TAO is highly relevant as the Government's decentralization program recognizes TAO as the focal organization for local development to mobilize people and resources. TAO authorities usually have a good understanding of the issues facing forest management in their areas as well as the local people and their forestry needs. This also fits well to the government's present decentralization policy which aims to vest the responsibility and authority of managing local resources in TAO authority (cf. ch. 9.3).

4.3 Issues and Constraints

In two decades, only about 1.01% (Wichawutipong, 2005) of the total forests has been brought under community management. Therefore, with the current approach and slow speed, the Government's community forestry program will have limited positive impact on the livelihoods of forest dependent people and the country's forest resources. Key issues and constraints facing community forestry development are discussed in the following sections.

4.3.1 Trust and Confidence in Local Communities

The authorities and many vocal NGOs have little trust and confidence in local communities as custodians of forests. They see people living in and around the forests as the main cause of forest degradation, and fear that community forestry might contribute to further degradation of the remaining forests. Both DNP and some influential NGOs like Dhammanaat Foundation strongly believe that community forestry should not be allowed in protected areas, Even in the national forest reserves, where community forestry activities are allowed, RFD has retained control over almost all of the well stocked forests, leaving only degraded sites for community forests to be established. Communities are expected to rehabilitate these marginal lands.

As Kalyawongsa (1977) has pointed out there are conflicting interests among stakeholders on which lands should or could be allocated for community forestry. It is not only a matter of having differences between the groups but also within the groups which has made it complex to develop common views through a broad-based dialogue both at local and national levels.

[19] The responsibility for fire control is currently vested in DNP (see ch. 9).

4.3.2 Illegal Immigrants

The number of illegal immigrants, especially in the protected areas bordering Myanmar, Laos and Cambodia, is reported to be increasing continuously driven by better living conditions in Thailand (including possibilities for off-farm income) and the fact that the same ethnic groups are found on both sides of the border. According to Dhammanaat[20], the number of people living in and around the protected areas in 1994 was less than 1.0 million but the population has now more than doubled, mainly due to the illegal immigrants[21]. Some existing local communities are reported to encourage people from across the border (who are usually their own relatives) to come, clear forests and settle down. This is one of the main reasons for objection by DNP and NGOs to allow community forestry in protected areas. It is feared that not only would community forestry give illegal immigrants use rights to forests, but would also serve as a means for the immigrants to obtain Thai citizenship.

4.3.3 Privatization of Land Ownership

Individual land grant programs are well justified to provide people a more stable social situation as the delineation of granted holdings is a basis for effective controls against misuse. The downside is that titling may be expanded to areas that would be otherwise assigned to community forest. There are presently on-going programs to transfer some land to individual households both in protected areas and national forest reserves. In 1997, the Thai King declared the need to recognize forest use rights of people living in and around the forests, regardless of protected areas or national forest reserves. Consequently, this particular year became a basis for determining which households would be eligible for land grants (i.e. families living in a site prior to 1997).

According to RFD, in the national forest reserves, a household is entitled for minimum one ha, whereas, in the protected areas this has now been reduced to a maximum of a little over one hectare per household.

There seems to be no proper guideline laid out for what can or cannot be done on such land, especially in the protected areas. In principle, families can use the land to grow crops, vegetables and fruits, etc., but they are not allowed to sell the land. However, in practice some villagers/farmers are reported to have informally sold their land to people from cities without having a formal land title. Payment of land tax is used as a proxy to demonstrate that the land is occupied by its claimed holder.

4.3.4 Tenure and Use Rights of Forest and Forest Products

All the natural forests - regardless of their status as protected area or national forest reserves – are owned by the state and controlled by two government agencies, DNP and RFD. In protected areas, local communities have no formal use rights (although they are allowed to collect free of charge some basic forest products, such as dry fuelwood and some NTFPs for household consumption). All decisions related to the use and management of protected areas are made by the DNP authorities.

In the national forest reserves, local communities are reported to have usufruct rights to forest resources (but not to the forest land). RFD attempts to control the forests and local communities are engaged in protecting and patrolling the resource. Villagers are allowed to collect free of charge dry and dead wood for use as fuelwood and construction timber, but felling of any living tree species in natural forests is prohibited. In plantation forests, felling of reserved tree species, such as teak, for household use or for village development activities may be allowed but requires a permit from RFD. Villagers are also allowed to collect free of charge various NTFPs for both household consumption and sales. Thus, from villagers' perspective, apart from some use rights of selected forest products (which are allowed in non-community forest areas anyway), a formally registered community forest seems to bring no additional direct benefits to them. Instead, it would bring more responsibilities for forest protection, management and other activities.

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[20] Interview information

[21] There are various estimates on the number of illegal immigrants and people living in protected areas in general.

4.3.5 Financial Support

There is no financial support to community forestry. RFD provides some assistance to villages (e.g. forest demarcation, operational plan preparation, planting materials, etc.). The current approach to community forestry typically focuses on planting trees and protecting forests, and sees the utilization of forests mainly from the perspective of subsistence needs. On the other hand, local people are involved in collecting NTFPs from forests, within and outside community forests and are trading them in local markets. At present, there seems to be little support and assistance for local people in marketing of forest products or setting up community-based processing enterprises for commercial purposes. Such enterprises are, however, in the interests of TAO Councils.

According to RFD staff, TAOs are supposed to allocate funds for forest management, but local budget allocation procedure has yet to formally include community forests. Some TAOs have started to do this and e.g. in Don Keng, Nong Song Heng and Khon Kaen a TAO can allocate up to US$ 1,500 a year as wages to forest protection groups. Forest guards receive up to US$ 12.50[22] per month for patrolling forests 2 to 3 times a week (Witchawutipong 2005). However, rather than directly hiring and making payments to individuals for forest protection, it would probably be more appropriate for TAOs to provide such support through community forest groups.

4.3.6 Legal Framework

As explained above the Community Forestry Bill is still waiting to be approved by the Parliament. Regardless of the Bill, local communities in many villages are already actively engaged in managing forest resources, even though the delay in approval has slowed down the progress. The lack of an appropriate regulatory framework has also resulted in the misunderstanding of what can and cannot be done in a community forest, often contributing to frustration among, and even frictions between, the concerned parties. Field forestry staff often have to take personal risks in promoting community forestry as later on it may be found out that such activities were against the letter of the law in force.

Concerns over illegal immigrants have been cited as a major reason for holding up the Community Forestry Bill[23]. However, the number of illegal immigrants in the protected areas has increased over the years independently from the legal control. Thus, the issue appears to have more to do with the immigration policy than the Community Forestry Bill. Another risk involved is, as pointed out by some conservation NGOs, that community forestry may be used as a means to giving land out to individuals which could possibly be later on privatized or would be converted to other uses (cf. section 4.3.4).

Without a Community Forestry Bill in place, it has proved difficult to develop proper, formal administrative procedures and guidelines for field implementation of community forestry. The proposed process of the establishment of a community forest is outlined in Box 4.2. Formally it would be up to local people to decide whether they want a community forest and then to form a group and fill in an application. However, the planned system is rather complex, bureaucratic and time consuming. For example, each community forest has to be approved by the Director General of RFD before a village is formally given a use right of forest. This responsibility could be delegated to the concerned provincial authority. In addition, some conditions, such as the need to form a group with at least fifty households, may not always be applicable for every village. Management plans in the past have considered mostly technical details (forestry and environment) and very little of social, economic and cultural aspects and this should be rectified.

[22] Equivalent to about 3-day minimum wage in Thailand.
[23] Interview information

Box 4.2 Proposed Procedure to a Establish Community Forests

A number of steps will have to be completed before a community forest is officially registered in the name of a group.

1 Local people organize themselves into a group of at least 50 people (18 years or older), discuss and agree on a set of community forestry programs and activities, fill-in and sign a community forestry application form **(**CF Document 1**)**, and submit it to community leaders (e.g. Tambon leader – Kamnan and/or village headman– Poo Yai Ban), who in turn submits the form to the concerned District Administration Authority.

2 District Mayor, District General Secretary and District Forestry Officer review the application form (CF Document 1), check if all the supporting documents are included, and forward the application to the concerned Provincial Authority.

3 The Governor, with authorized Forestry Officers from the Provincial Office of Natural Resources and Environment (i) appoints a responsible Forestry Officer for field investigations; (ii) the Officer carries out the field investigation, together with Kamnan and/or Poo Yai Ban and authorized community members, and writes a field site investigation report **(**CF Document 2); (iii) the applicant local group/institution develops a proposal for community forest **(**CF Document 3) with technical assistance from forestry officers; (iv) together with a recommendation from TAO, the group submits the proposal to the Provincial Administration; and (v) the concerned provincial officers review the proposal and submits to the RFD for final approval.

4 The Director General of the RFD approves or disapproves the proposal, informs the provincial officers of the decision and issues instructions to implement the decision.

Upon the approval of the CF proposal, the authorities start the process for registration of the community forest, as follows:

5 The Provincial Governor declares an area of the approved community forest as per the National Forest Reserve Act 1964 (Decree 15) and informs the District Mayor, Kamnan and/or Poo Yai Ban, Forestry Officers, and Provincial Agricultural and Cooperative Officers. These officer are responsible for monitoring and evaluation of the program. Forestry and Agricultural/Cooperative Officers develop a CF monitoring and evaluation report (CF Document 4) and submits it to the RFD at least once a year.

6 The local group, with the help of forestry officers, demarcates boundaries of the forest, place community forest signs with information on rules and regulations, sanctions and restricted forest products. The community forest group (a) develops a CF operational plan for plantation, enrichment planting, community forest development, etc., (b) establishes forest patrolling groups, (c) monitors CF activities, (d) informs community members of the plan, and (d) provides progress reports to forestry officers.

7 Forestry officers work closely with the local CF group as technical assistants to ensure program effectiveness and forest sustainability

Source: Witchawutipong 2005

4.3.7 Goals and Strategy of Community Forestry Program

The final constraint relates to the lack of definition of the overall goal and long-term strategy of community forestry. The Forestry Sector Master Plan of 1992 clearly describes objectives and roles of community forestry, but they were never formally endorsed

The situation with the Community Forestry Bill shows that the Government's community forestry program has been trapped in a political stalemate. The lack of overall policy goals corresponding to today's realities in the environmental degradation, inappropriate resource use, imbalance between demand and supply of forest products, a long-standing ban on logging, uncertainties in the utilization of plantations, etc. does not provide an adequate strategic framework for community forestry. It is unclear whether community forests should become commercially viable economic undertakings or just a means to meet subsistence needs and generate some additional revenue for the most disadvantageous groups in the community who do not have other resources. It is also important to clarify the role of agriculture as a source of livelihood in forest communities be they located in or outside protected areas (cf. e.g. Walker 2005).

This situation undermines the government investment already made in promoting community forestry. Important lessons have been learned to avoid top-down and bureaucratic approaches and to generate awareness and willingness to manage and conserve forest resources sustainably. These lessons however, cannot be put in practice due to the lack of clarity in policy and strategies.

If community forestry is not allowed in protected areas in the future, the Government should also make it clear what kind of livelihood strategies are offered to the 1-2 million people living in these areas (relocation, long-term subsidization, engagement in PA management activities, etc.).

4.4 Towards Effective Community Forestry

From the experience and insights of planning and implementing community forestry in and outside Thailand, the Mission identified a set of key building blocks for effective community forestry development which are described in the following sections.

4.4.1 Community Forestry Policy and Strategy

There is a need to recognize the key role of community forestry in the overall strategy to achieve sustainable forest management in Thailand. Local communities should be seen as assets or human capital for improving the country's forest condition (rather than as the cause of forest resource degradation) (Box 4.3). There are numerous examples from different parts of the world (including Thailand) that demonstrate local communities' understanding and knowledge of forests and forest products as well as their successful efforts in managing and regenerating forests and trees in their villages.

The rationale and good practice is relevant to Thailand's forestry situation. The knowledge and understanding of forest-dwelling people on forest conservation have been well demonstrated and documented (e.g. Hares 2006). Community forestry fits well into the government's current development objective of poverty reduction and the philosophy of development through decentralization. Not only would community forestry mobilize millions of people to participate in the management of the country's forest resources, but the Government's financial and administrative burden for forest management would also be reduced.

Box 4.3 Rationale and Good Practice of Community Forestry

Community involvement in forest management has been justified on following grounds:

1. *Proximity to the resource*: those in close contact with the forest are best placed to ensure its effective husbandry.
2. *Impact:* those whose livelihoods depend on the forest should be involved in its management.
3. *Equity:* forests should be managed so as to ensure adequate resource flows to rural population.
4. *Multiple needs:* single-purpose management for timber may be incompatible with the livelihood needs of rural population.
5. *Capacity:* forest-dwelling communities may be better forest managers than the government agencies.
6. *Biodiversity:* multiple purpose management of forests by communities can lead to better conservation of biodiversity than management for timber alone.
7. *Cost-effectiveness:* local involvement in management may be an important way of cutting cost to the state.
8. *Governance:* community involvement introduces important checks and balances in relation to state services, which tend to be mismanaged.
9. *Sustainability:* local participation, decentralization and subsidiarity can ensure sustainability

Source:Adapted based on Brown (1999)

It is important to have clear targets as to how much forest area would be under community management and within what time period should that be achieved. Such targets would give the planners clear goals and strategic direction to strive and plan for, and for seeking and mobilizing the necessary resources. Targets would also serve as a useful basis to measure progress and assess the overall impact of community forestry over time as experience in other countries demonstrates (Box 4.4).

Box 4.4 Areas under Community Forests in India and Nepal

In **India**, the Government introduced Joint Forest Management (JFM) in 1990 and since then the programme has been implemented in 29 States covering 21.44 million ha under JFM system. These forests are being managed by 99,868 JFM committees involving 16.3 million rural people (men – 68% and women – 32%). (Proceedings of … 2005)

JFM is essentially creating equity in participation. Rights have also been given to the community to collect, store, barter and sell non-nationalized NTFPs free of royalty. NTFPs such as wild fruits, gum, honey, barks, flowers, medicinal plants etc. are sold by the villages either to local traders who visit the villages or at the local markets/haats. Some produces, such as Sal leaves are usually sold after value addition. For the nationalized NTFPs such as Tendu/Kendu leaves, Sal seeds, cashew etc. communities mostly get collection charges on delivery of NTFPs at the designated collection centers. There are benefit-sharing arrangements between the State and community in respect of timber.

In addition to the direct benefits, villages under JFM have been getting several indirect benefits from the program such as village resource development and wage employment. In a nutshell, maximum benefit under JFM has come in the form of easy access to and increased supply of fodder, fuelwood and NTFPs. The side benefits like wage employment and village development have also been quite significant.

The JFM programme has led to regeneration of degraded forests, reduction in frequency of conflicts, reduction of encroached forest land and improved livelihoods. Experience so far gained with JFM shows that it is a successful approach for protecting and regenerating India's forests and biodiversity. While forest destruction and degradation is continuing at an alarming rate in many parts of the world, India has managed to arrest this trend. The JFM programme has made an important contribution in reversing the degradation of forests and also fostering a sense of commitment among the people for the cause of conservation. The involvement of people in the management of forests is leading to regeneration of forests and creation of an efficient institutional framework for the protection of forests, apart from meeting the livelihood needs of the people. JFM Committee has been recognized as a vehicle of ensuring Sustainable Forest Management and conservation with local community participation.

In **Nepal**, a community forestry program was initiated in 1978, but the program to hand over forests to user groups was actually started only after the restoration of multi-party system in 1990. After 15 years of implementation of forest user group concept, there are now 13,749 forest user groups, involving some 1.14 million ha (21% of the total forest area) and over 9 million people (38% of the total population) (Bhattarai, 2005).

4.4.2 Benefits and Costs of Community Forestry

Actual or perceived benefits are a key to attract local people for active participation in community forestry activities. Most government programs, including in Thailand, tend to place emphasis on meeting local people's subsistence needs. However, many villagers, especially the poorer members, do not have access to other means of livelihoods and therefore find such programs irrelevant. These poor villagers are interested in forestry activities that would help them get out of the subsistence economy. Therefore, community forestry must consider production of goods and services beyond the subsistence needs, i.e. development of commercial operations including collection and sales of NTFPs and supplying wood to processing industries (Box 4.5). This would help raise the income of poor households while adding value to forests for society at large.

Unfortunately, community forestry has yet to find its way to benefit the poorer villagers in Thailand. Specific pro-poor activities are needed to reach this social group (e.g. providing scholarships to children, interest free loans for income generating activities, and providing necessary skills by training) (Kanel and Niraula, 2004).

Community forestry's contribution to conservation objectives is equally important. A large number of case studies from different parts of the world have highlighted regeneration of forest resources, improved watersheds and return of wild animals and birds, following the implementation of community forestry programs. Community forestry has a huge potential for contributions towards the objective of sustainable forest management, thereby enhancing the role of forests for society through

improved ecosystem services (i.e. biodiversity conservation, watershed management and carbon sequestration, etc.).

Box 4.5 Income Generation from Community Forests in Nepal

A survey of 1,788 forest user groups from 12 hill and lowland districts in Nepal, carried out in 2002 and extrapolated to all forest user groups in the country, showed that the total annual cash income from the sale of forest products from community forests was more than US$ 10 million. This amounted to about 42% of the annual budget of the Ministry of Forest and Soil Conservation. The benefits go to the forest user groups. The value of subsistence forest products and other income generated by the user groups, was estimated at about US$ 24 million. About 36% of the income from community forests was spent by the forest user groups on community development activities such as building of schools, roads and drinking water facilities.

Source: Kanel and Niraula (2004; cited in Gilmour et al., 2005)

As well as benefits, it is equally important to consider costs caused by community forestry activities. According to Malla (2006), local communities, once they are in control of community forests, can start making substantial investment of their resources (money, time, energy, knowledge and skills) in regenerating, protecting and sustainable use of the resources. Long gestation period of forestry investments makes it impossible for the poor to engage in tree planting without external support. Appropriate incentive structures have to be tailored to the operational environment and they have to address power sharing, information sharing and equity issues (Castrén 2004).

Apart from direct costs of management and production there are also transaction costs which are often disregarded (Adhikary 2005; Malla 2006). Through community forestry programs, the authorities impose a lot of demands on local people's time and other resources. They are required to organize meetings among themselves and with forest authorities. They need to fill in forms and submit periodic reports. When forest officers pay visits to a village, they expect to be entertained with organized visits to community forest sites, all free of charge. Indeed, in some places, some community members are reported to have started to use the village fund to cover such costs. There is a need to consider all benefits and costs (direct and indirect) when planning community forestry and carrying out financial analysis.

4.4.3 Tenure and Use Rights of Forest and Forest Products

Another important factor for community forestry lies in the "ownership" and "secured use rights" of forest and forest products. For this, two actions are critical. First, it is important to clearly define boundaries of the resource that will be allocated as community forests and identify which households are users of the forests (Gilmour & Fisher 1991). The draft Community Forestry Bill would require a group of minimum 50 people to commit to the activity before a community forest can be established. Second, the local communities should be vested with both "authorities" and "responsibilities" (not just responsibilities) for the protection and management of community forests, including authority to protect the resource from outsiders and action against the community members who breach the forest management rules (Moore, 2005). This would involve establishment of clear internal rules for use rights, protection of the resource, sharing of benefits and penalties. Most community forests, where these elements are present, are found to be very effective. Table 4.2 provides a tentative outline for how local communities' use rights of forests could be defined in the Thai conditions.

In Thailand in general, it appears that most community forests have loosely defined resource boundaries and users and villagers have unclear responsibilities for protecting and regenerating forests, but with no effective control over the resource. It is important to provide a clear set of conditions for what is and isn't possible for community members, i.e. resource boundaries and users, use rights (both authority and responsibility) as well as sanctions (Table 4.2).

Table 4.2 Tentative Definition of Use Rights of Forests in Thai Conditions

	National forest reserve	Communal land	Protected area
Resource boundaries of forests (area, restricted area, etc.)	Yes	Yes	Yes
Users (h/holds numbers & names)	Yes	Yes	Yes
Ownership of land Ownership of forests/trees	State Community	Community Community	State State
Responsibility for: ● Protection ● Regeneration ● Monitoring	 ● Yes ● Yes ● Yes	 ● Yes ● Yes ● Yes	 ● In designated areas ● In designated areas ● In designated areas
Authority to community for: ● Controlling/protecting resource ● Imposing fines and sanctions	 Yes Yes	 Yes Yes	 Within FMP provisions Possible through internal rules
Forest resource use: ● Subsistence purposes ● Commercial purposes ● Set aside core conservation areas	 Yes Yes If necessary	 Yes Yes If necessary	 Yes **No** **Yes**
Forest land grants/leases: ● To a defined community or group for tree planting ● Use of products for subsistence need by a defined group or community ● For planting trees by individual households (disincentive to CF) ● For cultivation/building house by individuals ● To clear forests for other uses by a community or group ● To a company / corporation	 Yes Yes No No No Yes	 Yes Yes No No No No	 Within FMP provisions Within FMP provisions Within FMP provisions No No No
Benefit sharing arrangements: ● 100% to community (group ● 100% to Tambon/provincial govt. ● Share b/w community & govt.	 No No Yes	 Yes No No	 Within FMP provisions No Yes
Utilization of income ● For forest management ● For village development ● Sharing among group/community members (loans, etc.)	 Yes Yes Yes	 Yes Yes Yes	 Yes Yes Yes
Operational or working plan	Yes	Yes	In designated areas
Agreement with gov. authority	Yes	Yes	Yes

The present Thai policy to grant/lease reserve forest land to private individuals and private companies for commercial tree plantations may represent a limitation to community forestry development. Therefore, other options should be considered in situations where communal management can better achieve the sustainable management objectives.

An appropriate regulatory framework is critical to enable community forestry activities in the field (Moore 2005) and for their mainstreaming beyond the pilot sites. Indeed, in countries such as India, Nepal and the Philippines, community forestry expanded rapidly once a regulatory framework was put in place. On the other hand, in Thailand, the delay in approving the Community Forestry Bill has been one of the limiting factors for the expansion of community forestry.

4.4.4 Organizing Communities and Forest-based Community Enterprises

Community forestry is about both forests and people (communities), and it can only move ahead if the people concerned are interested in acting together. A community is made up of individuals and groups with different interests and means of livelihoods. Different interest groups see forest resources from

the viewpoint of their own specific needs. Many Thai forest communities are ethnically and socio-economically diverse. Community members need to organize themselves to be able to manage the forest and to ensure that different forest goods and services are available in a sustainable and equitable manner.

Community-based forest management and related enterprises have been expanding dramatically in the world with the recognition of historical tenure rights and the transfer of responsibilities to local levels (Molnar et al. 2005). Yet, a major weakness of most government community forestry programs, including in Thailand, is that they concentrate resources and effort mostly to forest protection and regeneration activities. The reason is that these programs have been initiated largely in response to the environmental concerns. Forest industries and market promotion have been viewed negatively as expanded production is feared to accelerate the deforestation process.

It is time that policy makers and stakeholders realize that community forestry is not about just planting and protecting forests, or producing forest products for subsistence purposes only. Communities can generate revenue to reduce poverty while contributing to meeting broader societal needs of forest goods and services. It has been demonstrated that people are willing to pay for such goods and services. Both domestic and international markets for timber and NTFPs have expanded dramatically and as a new opportunity payment schemes for environmental services have been put in place in many countries. Financing is available through various financing institutions and private sector sources which are providing credits and other services to support small and medium-scale enterprises.

On the other hand, local people are already extensively involved in collecting NTFPs, within and outside community forests, trading them in local markets. In Thailand, the Bank of Agriculture and Agricultural Cooperatives (BAAC) provides loans to groups of farmers for various types of processing, including NTFPs, and even for export market development. Various initiatives, such as the Royal Foundation Projects and the King's Projects and have been designed to help the poor people, especially hill tribes, living in and around the forests to improve their livelihood base. These Royal projects provide training and financial support to the villagers. Similarly, the government program One Tambon, One Product (OTOP) is specifically designed to encourage villagers to become more business oriented. Support and infrastructure for forest-based community enterprises already exist in the country but they do not reach the target groups in the communities. It is necessary to link community forest groups with these various initiatives through training, communication and eventual adjustment of financing instruments.

4.4.5 Networking and Association of Community Forest Groups

Community networks

As the number of community forests increases and more experience is gained, local communities need to develop networks among themselves, share experiences and learn from each other. In particular, communities, which have yet to establish community forests, could benefit from visiting the existing ones. As community forest groups expand both in number and area, the RFD staff will find it increasingly difficult to meet the information demands of the community groups.

In some parts of the country, especially in the North and Northeast regions, some groups have already started networking often assisted by donor projects and NGOs[24]. RFD can build on these community networks as channels of information and assist in expanding them in an organized and systematic manner.

Associations of community forest groups

As well as networking among community members, another major task of community forestry practitioners should be to assist in establishment of associations of community forest groups. This concept has been applied in some other countries (e.g. in Nepal, see Bhattarai (2005) for details). Such associations could operate at different levels – from Tambon through to the national level. Just as

[24] E.g. Thailand Wildlife Fund, WWF, TEI

government authorities need to inform community groups on new programs or changes in policy instruments and regulations, local communities need to provide feedback on the extent to which public programs are relevant. Community forestry associations could play a range of roles in facilitating this communication by:

- *Acting as an interest* group in dialogue with the government and market actors including on policy and market issues ensuring that the concerns of community forest group members are taken into account.
- *Acting as a link* between community group members and other stakeholders (government forest authorities, industries, etc.) for communication on new knowledge and information, including changes in forest regulations.
- *Acting as an agent of change* by educating and motivating different groups of community members (children, men and women), using a variety of media communication tools and techniques, for awareness raising and sustainable use of forest resources.
- *Acting as a service provider* to community members on the management of community forests, including hiring necessary technical expertise.

Community forest groups should be charged a membership fee to make the operating of such associations financially sustainable[25]. For technical services community groups should pay fees which can be initially nominal and subsidized. Over time they may take responsibilities for extension and campaigning activities, and associations may raise funds from various sources.

Assessment

1. Despite recognizing its strategic importance in achieving sustainable forest management (FSMP 1992) and the provision of the 1997 Constitution (Article 46 on Decentralization Policy) on the rights of local people to natural resources, community forestry has made only limited progress in Thailand. The reasons include unclear legal basis, conflicts, and politics of various interested groups. While the Community Forestry Bill is waiting to be approved by the Parliament, RFD has already for years supported local community groups. However, without an enabling regulation, the future of these community forests is insecure, as RFD is not in a position to provide in writing any guarantee that these forests will definitely continue to be community forests. Besides, the area under community forests is so small and the speed at which they are established so slow that no significant positive impact has been achieved on poverty reduction and the management of the country's forest resources.

2. The deep mistrust concerning local communities capacity to manage forests among the government and some NGOs, who see villagers as the main cause of forest degradation, is one of the main reasons for holding community forestry back. Authorities and the conservation movement seem to have a strong opinion not to allow community forestry in the protected areas. There also seem to be strong views among the RFD staff whether to allow community forestry beyond the degraded sites within the national forest. Consequently, most of the existing community forests in the forest reserves have been established on the degraded sites.

3. The view that the main purpose of community forestry is to help local people meet their subsistence needs for forest products is yet another major constraint. Local people in and around forests are poor, living with less than US$ 2/day. Subsistence economy cannot help them exit from poverty and therefore off-farm income is the only route to improved welfare.

4. In spite of potential risks, the Mission thinks that the Community Forestry Bill should be approved without delay. Passing the Bill would open way for millions of forest dependent people to take part in, and benefit from, forestry activities legally within a regulatory framework. Regarding the issue of community forestry in protected areas, a policy statement/instruction could be issued to develop specific forest management and utilization activities to meet the needs of communities residing in and around protected areas. Such activities would be defined in the management plan of each PA. This would keep the forest under state property ensuring its authority under changing conditions to protect the resource

[25] This is practiced in many countries including e.g. Nepal.

while allowing local communities to develop their livelihood strategies based on sustainable use of the forest resources without endangering the environmental values of the PA.

5. The Mission is of the opinion that community forestry should be allowed in national forest reserves through legal provisions. There will also be a need to start preparation of additional provisions for issues like transfer of group member rights in different situations, etc. The Bill would need to be followed by the development of a field implementation guideline, which describes in simple language (a) the rationale for community forestry, (b) process and approach to establish community forests, (c) definition of roles (responsibilities & authorities) of government forest departments and local communities, (d) institutional structure, (e) formulation of management/operational plans, (f) supporting services available from the Government, as well as (g) procedures for monitoring progress and assessing impacts. The Government could set up a special commission or task force to look into the specific issues and come up with solutions.

6. If community forestry is to make any meaningful contribution to the country's forest resource management and the overall national economy, there has to be a fundamental shift in the overall thinking on the rationale and purpose for community forestry policy and program. Therefore, the Mission makes the following observations:

   (a) Community forestry represents a great opportunity and should be seen as a key, viable strategy for the management of the country's forests. There is a need to broaden the present vision of community forestry and see it in the light of challenges and opportunities within the changing social, economic and environmental contexts of Thailand. Local communities should be seen as assets of human capital for improving the country's forest resource condition.

   (b) Community forestry should be allowed and practiced in all forest types, adjusting local management activities to the ecosystem maintenance and landscape-level management objectives, on the basis of defined "users" and "use/access rights of forests". The government should accelerate the process of extending community forests throughout the country.

   (c) The current policy for land allocation to individual families – although benefiting the livelihoods of the poor if implemented properly – could pose a serious constraint and disincentive for community forestry development in Thailand. Once the land grants to presently landless people have been completed in forest areas, no new programs may be justified.

   (d) Utilization of community forests should be open for both the subsistence and commercial purposes (rather than limiting it to the subsistence purpose only). Further, the concerned community members should be allowed to harvest all types of forest products, including living trees, provided harvesting is carried out as specified and agreed in the management plan for sustainable forestry and effective enforcement and control are in place.

   (e) The role of TAOs and individual villages is critical in the planning and implementation of community forestry activities, and they must be involved in the process with clearly defined responsibilities. In the planning of new community forests village members should preferably be engaged in an appropriate way to avoid internal conflicts.

7. Regarding the issue of community forestry in protected areas, a policy statement/instruction could be issued to develop specific forest management and utilization activities to meet the needs of communities residing in and around PAs. Such activities should be defined in the management plan of each PA. This would keep the forest under state property ensuring its authority in changing conditions to protect the resource while allowing local communities to develop their livelihood strategies based on sustainable use of the forest resources without endangering the environmental values of the PA.

5. PLANTATIONS

5.1 Rubber Plantations

5.1.1 Rubber Planting

The rubber tree (*Hevea brasiliensis*) is native to the equatorial tropical zone in the Amazon Basin in South America. It was first introduced in 1900 in south Thailand and in 1908 in eastern Thailand. Rubber planting has been actively promoted by the Government since the 1960s and the total area reached 1,959 million hectares in 1996. The international rubber markets experienced a period of excess supply in the mid-1990s and the expansion of the area was discontinued. Since 1999 the international prices of rubber have more than doubled (Table 5.1**)** and a new promotion program was launched in 2004. The current rubber area is 2.019 mill. ha of which 84% is found in the Southern region and 11% in the Central region. Thailand, together with Malaysia and Indonesia, is one of the biggest rubber producers in the world.

Rubberwood, also called parawood in Thailand, is a medium density hardwood with relatively low shrinkage, compressive and bending strengths for its hardness. It is highly susceptible to fungal attack and dries well. It machines easily, but latex tends to clog the saw's teeth. Gluing and finishing pose no problems. It has become a very popular timber for use in furniture, parquet flooring, wooden household articles and toys. It is also used as a raw material for the production of particle board, MDF and plywood. Rubberwood has thus become the lifeline of the Thai wood industries and the country has been a forerunner in the development of rubberwood utilization.

Growing of the rubber tree and the production of latex fall under the Ministry of Agriculture and Cooperatives, productivity improvement is the responsibility of the Rubber Research Institute (RRI) under the Department of Agricultural Extension, and the promotion, financing and control of the replanting are the responsibility of the Office of the Rubber Replanting Aid Fund (ORRAF), reporting to the Department of Agriculture. The conversion of the logs into manufactured products is promoted by RFD.

5.1.2 Rubber as a Crop

The rubber tree is generally planted for its latex, which can be harvested from the age of seven years onwards[26]. Good drainage and suitable soil are required. The most commonly used technique for rubber planting is stump budding improved varieties or clones. RRI has promoted a special approach for production of high quality rubber. Earlier they used to provide free seedlings but now, the high quality seedlings are being provided at the rate of US$ 0.38/seedling. The planted area, harvested area, yield of latex, farm price and farm value for the period 1995 to 2004 are given in Table 5.1**.**

Table 5.1 Rubber Plantation Area, Latex Production and Farm Value 1995-2004

Year	Planted area 1,000 ha	Tapping area 1,000 ha	Latex production 1,000 tons	Yield Per ha Kg	Farm gate price of latex US$ per kg	Farm value US$ million
1995	1,870	1,572	2,062	33.6	0.78	1,605
2000	1,988	1,524	2,378	40.0	0.54	1,279
2004	2,083	1,657	3,005	46.4	1.10	3,315
2005	2,019	1,602				

Source: Agriculture Statistics of Thailand, 2004, Centre for Agricultural Information, Office of Agricultural Economics, Ministry of Agricultural & Co-operatives, Bangkok, Thailand, data for 2005 from the Office of Agricultural Economic

[26] When trees reach 50 cm girth 150 cm above ground.

93% of rubber plantations belong to smallholders, the average size of the plantation being only 2.08 ha. The medium-sized plantations are larger averaging 9.6 ha but they represent only 6.7% of the total area. The rubber holdings represent a major source of income (about US$ 3.3 bill. per year) for over 800,000 rural households or 2.4 million people and their social importance is therefore strategic. The average family income from rubber is US$ 4,125 per household.

5.1.3 Rubberwood Supply

The rubber plantations are the main source of industrial timber in Thailand. The Mission has estimated the theoretical potential of wood supply to be about 21 mill. m3/year (Table 5.2). The sawlog share is estimated to be 7.9 mill. m^3 while the rest (13.1 mill. m^3) would be small-sized logs for wood-based panels, fuelwood and other purposes.

This theoretical supply potential is calculated based on regular replanting of mature rubber plantations as after 25 years of age their latex productivity starts to decline rapidly. In practice the annual replanting is only 48,000 ha (or 57% of the theoretical long-term potential)[27]. During the last few years when the latex prices have peaked as a result of oil price increase, farmers continue exploiting their mature plantations as the lower yield is well compensated by the current high sales price of latex. As a result, the rubberwood supply has dropped and it is estimated that only about 35,000 to 40,000 ha is being currently harvested and replanted releasing only 8.7 to 10.0 mill. m^3 of rubberwood for the market. This has seriously influenced the wood supply of the sawmilling and panel industries (see ch.7).

Table 5.2 Potential Rubberwood Supply 2005 – 2010

Region	Total planted area	Tapping area	Annual wood harvesting area[1)]	Annual wood supply [2)]	Rubber tapping productivity index
	- 1000 ha -			1000 m^3	
North	1.9	1.6	0.1	25	64
Northeast	94.4	53.4	2.8	700	83
Central	222.2	160.5	8.4	2,100	87
Southern	1,699.4	1,386.2	73.0	1,820	102
Total	**2,019.0**	**1,601.7**	**84.3**	**21,075**	**100**

1) Assumption: 25 year rotation, even age structure
2) Based on standing volume of 250 m^3/ha

Sources: Planted area based on remote sensing data from Office of Agricultural Economic, June 2006. Harvesting area and supply: Mission estimates

Revenue from wood sales is additional to that from latex and helps farmers finance replanting cost. While the average annual revenue from latex is US$ 2,000/ha, the wood sales at the end of the rotation period can only generate US$ 1,000–1,500/ha (stumpage). At the national level, the total stumpage revenue of the smallholders from rubberwood is estimated at US$ 35 to 60 mill. but it could be much higher were the plantations managed based on regular output. Wood production can be a particularly attractive option for the North and Northeast regions where latex productivity is well below the national average (cf. Table 5.2).

5.1.4 Improvement of Genetic Material

It is apparent that in the current situation farmers prefer those clones which are for latex only. RRI's research has also targeted developing clones that yield most latex. Strong rubberwood demand has, however, created an interest in developing clones which combine both latex and wood, or which are targeted at wood production only (as in Malaysia). RRI has three types of clones available for farmers:

(a) Only for latex – RRM 1 is the most popular clone in this category, but PB 225 is also used.

[27] Based on Laesak, pers. comm. and ORRAF

(b) Only for wood – BPM 1, Chatchensao 50, AVRS 2037 and PBM 1; these clones are not tapped.
(c) Combined latex and wood – PB 255, PB 235, PB 260, RRI 110.

Apart from the strong market for rubberwood, the other reason for interest in planting rubber trees for wood production is limited labor supply for tapping work. In the Southern and Central regions labor can be attracted by offering only with a basis of benefit sharing as the standard minimum wage (US$ 4/day) cannot mobilize sufficient labor force for tapping. In a typical arrangement, skilled workers get 40% of the output value which results in a daily wage of about US$ 12 to 14. It is common to employ immigrant labor in rubber tapping as the working season is only about 100 days per year and no permanent employment can be offered.

The Malaysian experience suggests that timber clones of the rubber tree can have a mean annual increment of about 26 m^3/ha which can represent an attractive investment opportunity for the landowner if regular annual revenue is not needed and skilled labor for tapping is not readily available. This contrasts with the best Malaysian latex clones where MAI is 20 m^3/ha and the 9th year latex yield is 2,675 kg/ha[28]. (Hassan 2000).

In planting rubber solely for its wood, no tapping would be involved, and the rotation period can be significantly shortened. For medium-sized farmers with other income or absent landowners this investment option is likely to become attractive.

5.1.5 Harvesting Methods and Organization

Rubberwood harvesting is a simple operation (chainsaws or bulldozers are used for felling, bucking is by chainsaws and loading is often manual onto trucks directly on the plantation site without skidding) where the focus is on the volume rather than optimizing the potential value of the tree as a raw material for industrial processing. This labor-intensive approach has worked well in the past when manpower was available and the industrial capacity was below wood supply. In the long run, semi-mechanized harvesting is likely to become attractive and loading, as an enduring and accident prone manual work, should be the first phase for mechanization. The industry's involvement in the harvesting of rubberwood is limited as it is usually contracted out or organized by middlemen. Transportation is mainly with small-sized trucks (10 to 14 tons) which can easily enter the plantation site and circulate in narrow rural roads but their use also results in high transportation costs.

Due to rubberwood susceptility to fungal attack, the harvesting-transportation process has to be fast as logs cannot be stocked for more than a few days. There is no information available on the wood quality loss due to to deficiencies in the wood supply system. There is a need to carry out analysis of this issue as well as other means to improve value added of the log output through improved bucking. The short log length makes manual loading practical but longer log lengths would be desirable for productivity improvement both for transportation and industrial processing. Silvicultural aspects (e.g. pruning techniques) could be integrated into the management prescriptions of rubber plantations to maximize timber value while not losing productivity of latex at the same time.

Most harvesting is carried out by contractors who usually work for intermediaries. Some large sawmilling-furniture companies and panel producers have a few harvesting crews to be fully informed about the production costs. Long-term planning of the wood harvesting operations has not been given a due attention in the past (Bassili 2000).

5.1.6 Other benefits

Rubber plantations are largely established at the spacing of 3mx7m as recommended by RRI. In the initial years, farmers plant other annual cash crops such as tea, coffee, pineapple or chile to gain some additional income during the first three years. There are also other options which have not yet been tried in Thailand. In Mexico, a shade-tolerant ornamental palm tree (*Chameodora elegans*) was introduced in the rubber plantations. Its leaves are regularly harvested to be used for providing green

[28] Both referred clones are of the RRIM 2000 series.

material in flower bouquets, mainly for export markets (notably the USA). This has become economically so attractive that palm leaves can generate more revenue than latex tapping. An optimum utilization of the rubber resource can therefore have several diversification opportunities, and various options could be considered in Thailand, which is a world leader in flower exports.

5.1.7 Role of Office of Rubber Replanting Aid Fund (ORRAF)

ORRAF was created in 1960 with the responsibility to provide rubber plantation technology to farmers and promote high-quality rubber production ORRAF subsidizes the cost of replanting rubber. The funding source is the cess of US$ 0.475/kg of latex which is collected from producers. The subsidy covers the initial period of replanting and it amounts to US$ 1,441/ha to cover the cost of seedlings and labor force. The subsidy is paid in seven installments after milestones of implementation.[29] The subsidy has proved to be necessary to keep farmers replanting and not switching to other crops. Recently other crops (including 28 tree species, mostly fruit trees but also e.g. teak and dipterocarps[30]) have, however, been included in the support program. The subsidy can also be used for replanting with oil palm.

Together with the Bank of Agriculture and Agricultural Cooperatives (BAAC) (see ch. 8.3), ORRAF is also providing small loans to farmers for establishment of new rubber plantations. The loan amount can be up to US$ 750 with an interest rate of 3%. ORRAF is also important in improving the efficiency of the market mechanism. They assist farmers in collecting production volumes in strategic locations for supplying the rubber industry. Information on available sales volumes is disseminated for bidding by interested buyers, and farmers are informed on market trends. ORRAF does not buy any rubber as their role is just to collect and disseminate information and facilitate trade.

ORRAF is fully aware of the importance of wood revenue for farmers but it is seen as a complementary element in the replanting phase. There is no coordination with Thailand's important rubberwood industry although information on plantation areas has been made available to the wood industry. The wood production depends practically entirely on the latex market and therefore represents a significant market risk factor for the wood processing industry.

Assessment

1. The current policies and institutional arrangements do not adequately take into account the potential offered by rubberwood production. Comprehensive economic analyses on the feasibility of rubber tree planting for wood, either alone or together with latex, do not guide policy design. Based on the experience of other countries, growing rubber trees for timber can be an economically attractive option and add net benefits to farmers compared to the current situation.
2. The current replanting rate of rubber plantations appears to be lagging in view of the economic rotation of rubber trees. Accelerating replanting would significantly increase latex yields as a result of better clones while releasing badly needed wood supply to meet the wood industry's demand for raw material.
3. The dependence of the rubberwood supply on the sales price of latex and the extensive cyclical variations of international rubber prices represent a major business risk for furniture, sawmilling and wood-based panel industries. In addition to increasing the replanting rate, the only short and medium-term solution is to diversify wood supply to reduce the current dependence on rubberwood.
4. There is little coordination between the promotion of production of latex and that of utilization of rubber trees as a source of wood raw material. The available information on the volume of standing rubber trees is still based on simple pilot measurements rather than comprehensive inventories in spite of the recent development of appropriate methodologies with ITTO support.

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[29] 1st year in two installments US$ 181.40 and US$ 346.72, 2nd year US$ 139.69, 3rd year US$ 127.50, 4th and 5th year US$144.69 each and 6th year US$ 55.94.

[30] Eucalyptus is not included

RFD is promoting planting of rubber trees exclusively for timber production with the same clones and with the same plantation densities that are used to yield maximum latex production lacking information on timber yields. There is a need for improved information and co-ordination between different government departments (besides sharing of information). The collaboration between RRI and RFD's Forest Products Research unit should be intensified for identification of suitable clones for wood.

5. There is only limited information available on the country's growing stock of rubber trees, their total volume, annual increment, age distribution, diameter at various ages, initial plantation density, etc. The recent survey by the Office of Agricultural Economic on the rubber areas should be complemented with quantification of potential wood supply. Such information would be needed by region and province, type of clones, type of soil etc. to enable reliable estimation of the industrial wood supply. Lack of this information makes not only promotion of rubber planting and the rubberwood processing sector at the macro level more difficult and more imprecise, but it also adversely affects firm-level decisions to invest in the rubberwood industry. Several pilot studies have been carried out as a follow-up of the ITTO-supported Rubberwood Action Plan (Bassili 2000) but their results should be consolidated and complemented.

6. Management of rubber areas for latex could better consider the terminal value of the standing timber stock through adjustment of treatment prescriptions. Farmers have now no incentive to do this as timber selling is based on area to be harvested or the weight of timber to be removed. No clear rules exist for compensating for the log quality. It would be in the interest of the sawmilling and plywood industries to improve the current purchasing system of logs where the only criterion of quality is presently log diameter, if any. Such a system should pay due attention to the use value of logs based on established grading criteria.

7. RRI is developing new clones but there is no economic analysis available on the combined wood and latex production options to guide farmers' decisions. The current planting program of rubber for wood is still timid and would merit expansion drawing on experience in Malaysia.

8. Direct cooperative linkages between producers, smallholders and wood industries should be promoted so as to ensure more equitable prices for producers to encourage sustainable production of both latex and rubberwood. There is a need to have a relevant programme for the integrated development of the rubber and rubberwood sectors.

9. In the medium term, a more systematic approach for the harvesting-transportation chain will be needed to control the landed cost of the rubber logs. This would be in the industry's interest in order to mitigate business risks related to their wood supply and keep the wood costs competitive.

5.2 Timber Plantations

5.2.1 Government Programs

All forests in Thailand are owned by the State whereas all trees established on private lands are private property. Since logging in natural forests is banned, timber production in Thailand has shifted from natural forests to planted forests, particularly teak and rubberwood and non-forest sources supplemented by imports. But planting of timber species has progressed slowly due to a series of constraints. Most farmers are poor and indebted and therefore, they have to obtain quick returns and even a five-year rotation with eucalyptus is often too long for them. This has led many farmers to apply only 3-4 -year rotations with resulting loss of timber yield. Thus, they prefer to raise agricultural crops for seasonal regular revenue and tree crops are usually complementary to these sources of income. Only rich and large-scale farmers can wait for the returns at the maturity of the timber species.

Farmers hesitate in investing in timber plantations because of the following additional reasons: (a) no proper credit facility is available, (b) forestry species are competing with other cash crops such as cassava, sugar cane etc. which are being actively promoted (see ch. 8.1), (c) the registration problem of reserved species at the time of harvesting represents a source of uncertainty, and (d) some species such as neem have no market.

In order to overcome the problem of diminishing forest resources and achieve the target to bring 40% of country area under tree cover, both the private and public sectors have initiated plantation promotion schemes (Annexes 9 and 10). Teak, eucalyptus and rubber are main plantation species though bamboo, *Acacia mangium, Albizzia lebbeck, Leucaena leucocephala, Gmelina arborea, Pinus spp, Acacia spp* and *Azadirachta indica* (neem) have also been planted.

After the initial trials by the Forest Industry Organization (FIO), the private sector also initiated teak plantations. The long rotation period (about 30 years) and lack of initial cash flow, however, curtails teak's attractiveness. Teak is mostly planted as part of agro-forestry systems and on some commercial block plantations. The initial experience indicates that the plantations are able to provide medium-quality raw materials for wood-working industries.

Data on private plantations is scarce. Available figures are biased upwards as they refer to the planting carried out, not the trees survived. No detailed inventory of the existing plantation area has been carried out. The estimates of the survival rates range from 33% to 57%. Thus, even at best, the net plantation area would be only half of the cumulative area reported as planted. On the other hand, there is estimated to be a significant area which has been planted without any government involvement but no reliable data is available.

The Government-supported plantations in Thailand have been established mainly through the following six agencies (Annex 10): (a) afforestation by Government budget, (b) concessionaire's reforestation i.e. the reforestation campaign in commemoration of the Royal Golden Jubilee, (c) Forest Industry Organization (FIO) and its current subsidiary Thai Plywood Co. Ltd., both parastatal companies, (d) reforestation according to the Ministry's Regulations, and reforestation by concessionaire budget. The average plantation area from the above six sources during 1999 to 2004 has been 21,380 ha /year.

In 1992-2004, the JICA Reforestation and Extension Project (REX) in the Northeast promoted planting by local people, through a social forestry approach in order to restore environmental conditions and to improve living standards in the region (JICA 2004). The project included four components: (i) forest management information, (ii) forest management techniques, (iii) training and extension, and (iv) monitoring. In 1998 the project concluded with remarkable outputs such as 89 million seedlings produced by four large-scale nurseries, seedling distribution to 2,444 villages in the region, 143 training courses, 6,093 hectares of demonstration plantations, research reports and various others activities contributing to the promotion of tree planting activities by local people in the region. The main species were selected based on the farmers' preferences, including eucalyptus, neem, *Pterocarpus macrocarpus*, *Acacia mangium* and teak. Trees are generally planted on marginal lands by small farmers often intercropping with other cash crops, particularly on the boundaries of agricultural field. The main objective is to get quick returns. Marginal lands have been usually used, except on saline soil. The bushland mostly belongs to the community, which means that plantation activity needs be decided by the community. Villagers have formed community forest centers which provide seedlings. The promotional activity is concentrated on marginal farmers who do not have other economic options. Most of the trained villagers are spreading the knowledge and therefore, work as informal extension agents. The main objective of the community forest may be NTFPs whereas private forest owners aim to produce timber which gives them quicker and better economic returns.

Eucalyptus and *Leucaena leucocephala* have been raised on private lands for making charcoal and wood vinegar (alcatra). Mushrooms and some NTFPs such as bamboo shoots, jungle spice and medicine herbs are also grown and they offer large potential for economic benefit to the farmers (see ch. 6).

In order to meet the increasing demands for wood, the Ministry of Agriculture and Co-operatives, upon the initiative of RFD, proposed the budget to the Government to implement a farm forestry program. The Private Tree Farm Incentive Plantation Promotion ran from 1994 to 2002 (except 2001), with the target area of 1.28 mill. ha. The program encouraged the private sector and farmers to plant the specified economic tree species on their lands at 1,250 seedlings/ha. The purpose was to make use of all unutilized marginal farmland and areas for environmental benefit, and to reduce rural poverty.

Planting was subsidized by the Government with US$ 469/ha[31]. The farmers are free to harvest or manage the standing stock on their own decision after the deal ends at the beginning of year six.

About 80,167 farmers joined the programme. The planted area covered 169,400 ha (Annex 9) which means that only 13% of the target was achieved. The reason is claimed to be more attractive subsidies offered for rubber but the inherent obstacles of investing in tree crops discussed above have obviously been important as well. The program is still going on for some years even though it was officially planned to end in 2002.

Assessment

1. There is a need to adjust the law so that farmers can be allowed to harvest, transport and sell plantation timber on their own private lands without any permission, including reserved species. This would remove uncertainty related to possibility to harvest at the end of the rotation.
2. The plantation development should be linked with proper marketing mechanisms which are lacking in many parts of the country (see ch. 6).
3. Charcoal making and associated alcatra production are economically viable options for small-scale utilization of plantation wood[32]. Private plantations for charcoal should be encouraged as their economic viability has been demonstrated e.g. by the REX project.
4. Studies should be carried out to diversify plantation sites and species for improved economic returns.
5. Forest Plantation Promotion Centres should continue the monitoring and establishment of experimental plots for periodic measurement, etc. This could be done in partnership with industry and linked to training of farmers as both parties have common interest in plantation development.
6. Courses should be preferably organized in villages instead of at the regional centres. It is important to create a critical mass of trained farmers at village level.
7. There is no study or estimation available regarding the production and utilization of fuelwood (cf chapter 6.7). Though the use of gas and electricity has reduced pressure on forests, uncontrolled collection and use of fuelwood is still continuing in rural areas. Introduction of solar equipment may be promoted in villages outside the reach of the national electricity grid to reduce their dependence on wood in areas with fuelwood shortages.
8. Fuelwood plantations could be expanded to meet the demands of fuelwood outside forests. Bio-energy plantations could be established by the private entrepreneurs for industrial use.

5.2.2 Teak

"*Among timbers, teak holds the place which diamond maintains among precious stones and gold among metals"***.** This is what Dietrich Brandis, the renowned German forester, observed about teak (*Tectona grandis*) some 150 years ago. Teak is one of the most favoured timbers all over the world, since it has been used for many centuries for a range of products and services. It is known for its strength, durability and appearance. The ever-increasing demand for teak timber has resulted in large-scale plantations, both within and outside its range of natural distribution. Teak is a species of significant ecological and socio-economic importance throughout the tropics.

Teak forests occur naturally in the Asia-Pacific region over an area of about 23 million hectares in India, Laos, Myanmar and Thailand. Asia constitutes 94% of global teak plantations. The natural distribution in these countries ranges from sea level to mountainous areas of 800 m and in exceptional cases, up to 1,300 m above the sea level. Teak can survive and grow under a wide range of climatic

[31] This corresponds to THB 3,000/rai which was disbursed as follow: 1st year THB 800, 2nd year THB 700, 3rd year THB 600, 4th year THB 500, 5th year THB 400

[32] Only eucalyptus produces alcatra (vinegar) as a by-product of charcoal burning. Its economic contribution is currently larger than that of charcoal for the producer.

and edaphic conditions. The rotation period is 60 -120 years. Shorter rotations of 20-30 years for both veneer and sawlog production for relatively quick returns are now being employed in many countries. Since teak is basically a long rotation tree species, its carbon sequestration potential is also significant (Bhat et al. 2005).

The area of natural teak forest in Thailand decreased from 2,324,300 ha in 1954 to about 150,000 ha in 2000, mostly due to the demand for agricultural land and construction wood by the increasing human population. Overexploitation, often illegal, was also an important factor. Up to 2000, both private and public sectors in Thailand had established only 836,000 ha of teak plantations (FAO 2001). Thailand, therefore, has to import teak wood, especially from Myanmar, Laos and Indonesia, with an average value of about US$ 50 million annually. However, small logs from domestic teak plantations can already be used for furniture, carving, building construction, household utensils, toys, poles and posts, etc. for domestic consumption as well as for export. Forest Industry Organization (FIO) has obtained two FSC certificates for its sustainable teak plantations and is still trying to get additional certificates for other areas (Kijkar 2005).

Teak planting in Thailand started in 1906, by applying the *taungya* system with modifications to suit the surrounding circumstances, both economically and socially. From 1994 to 2000, RFD has already assisted the private sector to establish teak plantations of about 100,000 ha. Spacings are typically 2mx4m or 4mx4m whereas Mean Annual Increment (MAI) is reported as 13.52 m^3/ha.

The long-term production potential of the existing teak plantations has been estimated at about 0.9–1.0 mill.m^3/yr[33]. This level of production would require timely implementation of thinnings which is to some extent lagging behind due to limited markets (see ch. 6). As teak planting has mostly taken place in forest reserves, it is unclear whether they can be effectively managed for timber production due to the logging ban.

Teak plantations have increased since 1993 after the Government of Thailand started to promote private sector investment in this business through the provision of subsidy. However, the enactment of the Forest Plantation Act, 1992 is presently considered an obstacle for private planting. Teak plantation establishment is likely to increase when the Act is amended which is foreseen by RFD. FIO[34] has played an important role in teak plantation establishment and utilization (see ch. 8.3).

Lack of domestic supply of teak is a major concern among the wood-based industries. Legal harvesting is only possible with a special license and the volume of confiscated illegal teak logs (about 10,000 m^3/yr) is only a fraction of what was produced in the 1980s (see ch. 6.1).

More and more farmers and other landholders are planting teak in rotations of 20–30 years[35]. Recent research findings indicate that short-rotation teakwood is not significantly inferior in density and strength compared to natural-grown teak, but its lower heartwood and extractive contents make it less durable and attractive. These studies[36] offer the following outlook to plantation-growers, including smallholders:

(a) Without altering timber strength, plantation managers can aim to produce logs with higher yields of naturally durable heartwood by accelerating tree growth in short rotations with judicious fertilizer application and genetic improvements on suitable sites. Irrigation during the early years of the rotation period can also be justified.

(b) The MAI for teak plantations is generally relatively high in short rotations of 20–25 years. However, yield tables indicate that MAI usually peaks within 20 years of plantation establishment.

(c) Teak can produce timber of optimum strength in relatively short (e.g. 21-year) rotations.

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[33] This is probably an underestimate.

[34] Including its subsidiary Thai Plywood.

[35] In addition to Thailand, this is going on in countries like Laos, Malaysia, India, Costa Rica, Panama, Brazil, etc.

[36] Summarized in Bhat et al. 2005.

(d) Fast-growing provenances/clones can be selected for teak management without reducing the wood's specific gravity. However, matching the provenances for specific site conditions and product requirements appears to be crucial in tree improvement programs and therefore on-site testing is useful.

Some research has been conducted in Thailand into teak breeding through pollination among selected trees. However, the seed orchards have not given satisfactory open-pollinated product. Controlled pollination trials have therefore been initiated and seed production area has been established to support field operations. The Teak Improvement Centre (TIC) has operated in Lampang since 1965, in collaboration with DANIDA, to improve plantations, especially using genetically improved materials. Techniques to propagate teak vegetatively have been developed and have been commercialized and are at present used for superior clonal multiplication. Other main results of TIC include:

(a) 480 elite trees selected (Gavinlertvatana, 1995) for further multiplication and propagation. Out of them, 357 plus trees have been vegetatively reproduced for clone banks and clonal seed orchards establishment (Sumantakul & Sangkul, 1995).

(b) Both local and international provenance trials have been established and studied for their appropriateness to suit different conditions and sites.

(c) About 1,120 ha of seed production areas and 1,831 ha of seed orchards have been established and maintained for immediate seed production. However, seed productivity of these areas is rather low, i.e. about 10 kg/ha (Meekaew, 1992).

(d) Controlled pollination in teak has been successfully developed for breeding programmes. The research outputs from this exercise are still under-way.

(e) Vegetative propagation techniques have been developed. Buds are commonly used for cloning; tissue-culture technique was developed in 1987, which became commercial in 1992. Annually, about 500,000 plantlets are produced (Gavinlertvatana, 1995).

(f) Utilization of small-sized teak logs from thinnings is under study.

The availability of relevant information on water use and carbon sequestration potential of teak trees and suitable teak provenances/seed sources for quality timber production can help preparation of sustainable plantation management plans. Standardized cost-effective vegetative propagation/clonal multiplication techniques are envisaged with the establishment of decentralized nurseries and clonal orchards to supply genetically superior planting material to teak growers.

In spite of the extensive research effort, wood production has not yet benefited much from such improvements. The main problems of teak plantations in private land are as follows: (a) planting on unsuitables sites where growth is poor, (ii) delays in thinnings, (iii) lack of market for thinning wood, and (iv) lack of definition of key silvicultural parameters, including the targeted rotation period, thinning densities, pruning schedules, etc. The relatively large areas planted in the Northeast region are now reaching the age of thinnings and their timely execution will be crucial for the economic returns to the investment made (JICA 2004).

Assessment

1. Apart from the TIC project, practically no research has been done regarding teak in Thailand in spite of the fact that the species was the mainstay of the forestry sector for more than 100 years. There should be registered sources of teak seeds and planting material for large-scale plantations and smaller landowners. There is a need to have adequate systematic research on quality planting material and increased productivity in plantation management to support the expansion of teak plantation.

2. No survey of existing teak plantations has been done in the country. There is a need to have a database regarding these plantations which need to be registered anyway before harvesting can be allowed. The information would also assist in policy design, planning and marketing of plantation teak, etc.

3. The initial analysis on the economic viability of young plantations indicate that growing of teak can be highly profitable (JICA 2004). There is, however, a need to carry out further research on

the economics of teak plantations and to disseminate up-to-date information for the private sector and forest communities with plantation programs.

4. There is no management plan for teak in protected areas and reserved forests. Silvicultural treatments of teak should be an important component of their management. Thinning materials, dead, diseased and dying trees could be made available at least from reserved forests to the local people to reduce illegal logging, but this should be under effective control (see ch. 8.2).

5. The movement of all timber is not free as a transit permit is required for teak and reserved species. Large plantations of teak could be established by farmers, especially the rich ones, were they allowed to harvest and transport the planted teak at the time of maturity without uncertainty. The obligation of transit permit could be removed from teak logs from thinnings as the first step to facilitate trade and to reduce transaction costs for owners. At a later date in the future, regulation of harvesting mature planted trees could be reconsidered in the light of then prevailing enforcement situation in the forestry sector. There is an urgent need to amend the law in this context to reduce uncertainty among investors and to reduce illegal logging in natural forests.

6. FIO and the REX Project have done pioneering work in developing thinning schedules and markets for thinning logs. This experience should be disseminated to private plantation owners through extension and training work.

7. The research results under the REX project are a valuable source of information for training of extension agents. Broad dissemination of these results in a suitable form in Thai language is needed.

5.2.3 *Dipterocarpus macrocarpus*

There are some plantations of *Dipterocarpus macrocarpus* in the Northeast of Thailand but only limited information is available on their characteristics. The species is suitable for the region as it can grow on sandy soil in lowlands. The available data suggests that *D. macrocarpus* grows first more slowly than teak but at about 15 years it becomes taller. There is little information on tree improvement but the REX project has identified plus trees. Seedlings can be propagated from cuttings and the first gene bank of this species is reported to exist. Basic knowledge on nursery techniques has also been developed. Once established with proper site preparation and fertilization, *Dipterocarpus* stands require effective tending to avoid growth losses and pruning is also recommended. (JICA 2004). Further research is required on the economic potential of this species as a strategic option for plantation programs.

5.2.4 Eucalyptus

Because of their astonishing growth characteristics, climatic adaptability and wide ranging usefulness, eucalyptus trees are increasingly being regarded as amongst the most important species available for economic utilization. Eucalyptus wood is versatile and can be used for multiple purposes including transmission poles, posts, fuelwood, pulpwood, particle board, plywood and sawnwood. Minor forest products obtained from eucalyptus include oil distilled from leaves, tannin from bark, alcatra from charcoal burning, etc. Many eucalyptus species have decorative flowers and are used as ornamentals, others are used for windbreaks and shelterbelt. It is also a common species in housing and furniture making.

In South-East Asian countries, eucalyptus acquires the maximum strength at about age of 13-14 years whereas the yield can be up to 50-60 m^3/hectare/year. In the existing private plantations in Thailand, the recorded MAI tends to average 25 m^3/ha in good sites but only 8 m^3/ha in poor sites. However, even with the current relatively low MAI rates on good and medium sites, planting is clearly profitable (JICA 2004) and spreading fast on farm lands, however with sub-optimal techniques.

The quality of seedlings is a key issue. This is demonstrated by the fact that pulp and paper companies are selling improved seedlings at the cost of US$ 0.06 to 0.11 each while ordinary seedlings cost only US$ 0.04. Selling improved seedlings by the pulp and paper company is a win-win option as it

increases wood supply reducing upward pressure on pulpwood prices while the nursery operations of companies are highly profitable. Strong demand for improved seedlings (sometimes in short supply) demonstrates that farmers are aware of their net benefits as well. As two to three coppice rotations are usually applied, the yield impact should be considered over a period of 15 to 20 years.

In Thailand, 70-80 per cent of eucalyptus produced goes to the paper and pulp industry, 10-15 per cent is used for charcoal and 5 per cent is used for construction poles, etc. Manufacturing of MDF, hard-board and particle board from eucalyptus has been taken up by some companies. Moreover, it is also used by the Electricity Department as a source of biomass energy.

Eucalyptus has some problems in sawing. Surface cracking and splitting, warping and collapse are common seasoning defects for both air and kiln seasoning. However, these defects can be reduced considerably through air drying before kiln seasoning and using appropriate drying schedules with low temperature (Vermaas 1998). SDR process (Saw-Dry-Resaw) also improves sawing quality of eucalyptus. *E. hybrid* seasons well when sawn radially compared to tangentially. Improved peeling after boiling or adequate soaking and gluing techniques have made it possible to use plantation grown eucalyptus in plywood and veneer in many countries. Eucalyptus could be a prime species for plywood manufacture also in Thailand. As the country is in short supply of sawn timber and saw logs, eucalyptus can improve the situation if its use is promoted in sawnwood and plywood manufacture.

There is an on-going debate on the environmental impact of eucalyptus throughout the world and in Thailand the public perception is also generally negative. Eucalyptus has been seen as incompatible with soil water retention and local people's livelihoods. This is partly due to past top-down programs to plant eucalyptus where people did not want it. Eucalyptus plantations were also seen as a means to transfer land which was used by local people to private investors (Carrere & Lohmann 1996).

However, among farmers the negative perception has apparently faded as it has been demonstrated that there is no adverse effect either on the productivity of the land or on the agricultural crops if plantations are established and managed properly. About 20 years of regular plantation in dry farming areas has proved that there is usually no adverse impact in this respect. Instead, with the plantations, increased production of rice has been reported when eucalyptus has been in paddy fields[37]. *E. camaldulensis* has been largely planted at the spacing of 3mx3m. It gives a MAI of up to 50 m^3/ha in short rotations. The selling price of eucalyptus pulpwood at mill gate is about US$ 17 to 35 (average US$ 30) per m^3 whereas the cost price for five years is about US$ 780/ha resulting in an attractive positive margin with even lower MAI rates.

One of the biggest consumers of planted eucalyptus wood is Advance Agro Group. The company consumes about 2 mill. m^3 of eucalyptus wood annually for the production of bleached chemical pulp[38]. The company encourages farmers to plant trees and seedlings are also provided under contract farming as the company wants to ensure sustained supply of raw material to the mill. Similar approaches are practiced by other pulp producers (see also ch. 8.3).

According to FAO (2001), eucalyptus plantations covered 443,000 ha in 2000 in Thailand. The current area is estimated at 480 000 ha of which 10% is in paddy fields. Wood production is estimated at 7 mill. m^3/yr (Table 5.3). Rotation period of eucalyptus is 3-5 years and spacing 1mx1m or 1mx3m. Productivity varies by province. Many small farmers prefer to sell standing trees through the contract farming to be sure about the income whereas others prefer to cut the trees on their own and sell the wood by weight to the company.

[37] Source: field interviews by the Mission

[38] In Thailand, wood is measured as green tons and the conversion factor is 1 ton = 1 m^3

Table 5.3 Eucalyptus Wood Supply from Existing Plantations

Indicator	Current situation	Potential
Area, 1000 ha	480	480
MAI, m^3 /ha/yr	4.6	
- medium-term		25
- long-term		40
Wood supply, mill. m^3	7.0	
- short-term		12.0
- long-term		19.2

Source: Mission estimates

A study of eucalyptus plantations with cassava has shown that the Benefit-Cost ratio is 1.85 whereas the Net Present Value (NPV) is US$ 1,086/ha (JICA 2004).

Assessment

1. With relatively simple improvements in genetic material and silvicultural treatments, the productivity of eucalyptus plantations can be significantly improved. For the pulp and wood-based panel industry, this is important as the current wood costs of the Thai producers are not particularly competitive in an international comparison. For farmers and other investors increased productivity would be crucial to improve economic returns.
2. Plantation activities require initial heavy expenditure, which is beyond the capacity of poor farmers. Though the Bank for Agriculture and Agricultural Co-operatives (BAAC) is providing some credit facilities (see ch. 8.3), there is need to make financing more readily available at the grassroot level.
3. Availability of labor is also becoming a problem in forestry operations because people prefer to work in urban centers and factories rather than in forests. Rubber plantations are facing this problem already with the extraction of latex. The problem is not acute in eucalyptus plantations, but there is a need to adopt more efficient harvesting methods than at present.
4. Harvesting training would be needed for those growers who have capacity to work in harvesting. Industry and contractors could encourage this by introducing remunerative prices for logged timber sold on roadside or on the plantation site.
5. Smallholders often sell their timber to middlemen who have a profit margin of 20 to 40%. There is a need to develop a more effective market mechanism and educate and inform farmers on wood prices and pricing. Farmers' associations could play a key role in this task (see ch. 9). The RFD extension activities are not sufficient and they need to be expanded. The development of a national plantation database could help in better management, monitoring and marketing.
6. The current emphasis on pulpwood production in eucalyptus plantations does not yield the optimum contribution to the country's wood supply. The potential of using eucalyptus for sawnwood and plywood, both imported on a large-scale (see ch. 6) still remains to be tapped. As explained above, the technical problems can be solved. On the wood supply side, it is important to introduce thinnings (and pruning if needed) in plantations where owners can wait for higher economic yields than with short-rotation pulpwood. This could open new areas for eucalyptus planting which are presently too distant from the existing pulp and panel plants. Inview of the critical wood supply situation in the country, this could be one of the strategic priorities of forestry development in the short and medium term.
7. There is initial research on thinning schedules with *E. camaldulensis* in Thailand which suggests that the impact on log yield may take several years to materialize. The sample plots are still young (JICA 2004). However, a more serious constraint is presently the lack of market for large-sized logs. Both sawmilling and pulpwood industry should be engaged in R&D work to develop utilization of large-diameter logs to gain experience in processing, particularly drying, drawing on knowledge in other countries. ITTO has a comparative advantage in promoting this transfer of knowledge and an international level project to take stock of the state-of-art in

eucalyptus processing for solidwood products would benefit Thailand and other countries in a similar situation.

8. In view of the potential to use eucalyptus for solidwood products there is a need to introduce a broader range of species as *E. camaldulensis* is not the optimum for all uses. This would also reduce risks related to plantations. The feasibility of growing *E. grandis*, *E. urophylla* and their hybrids should be studied.

6. INDUSTRY AND MARKETS

6.1 Supply and Demand

6.1.1 Roundwood

There is no reliable information on the production of roundwood in Thailand. What is known is (a) the small volume of illegally harvested confiscated logs that are sold to the domestic market by FIO and (b) the limited volumes of licensed harvesting dying or decaying trees in natural forests or areas cleared for road construction and other infrastructure. The total volume of these items used to be about 30,000 m^3 but it has now reduced to a few thousand cubic meters (Table 6.1).

Table 6.1 Recorded Industrial Roundwood Production, 2000-2004

	Licensed fellings of reserved species	Fellings of non-reserved species	Confiscated timber	Total
	- 1,000 m^3 -			
2000	5.5	20.6	20.2	46.4
2001	4.5	17.1	19.8	41.2
2002	5.8	10.2	17.6	33.6
2003	2.7	10.7	6.8	20.2
2004	1.2	0.5	0.5	2.1

Source: RFD 2004b

Lacking reliable data, the Mission has estimated the wood supply situation on the basis of industrial production by sector and typical conversion factors of processing by type of raw material. The timber from natural forests is only a small fraction of the total roundwood supply, which is estimated to be about 19.2 million m^3 in 2004 (Table 6.2). About 98% of the total industrial roundwood supply comes from plantations, 10.6 mill. m^3 being eucalyptus and 8.2 mill. m^3 rubberwood.

The largest consumer of roundwood is the pulp and paper industry accounting for 54% of the total, followed by the sawmilling industry (30%). Particleboard is estimated to absorb 11% as it mainly relies on sawmill residues (Table 6.3). MDF production is based on small sized logs that are debarked before processing while many particleboard mills also use unbarked raw material.

Table 6.2 Industrial Roundwood Supply and Consumption, 2003

End-use sector	Source of supply					
	Natural forest	Plantation wood			Imported roundwood	Total
		FIO	Private eucalyptus	Private rubberwood		
	- 1,000 m^3 (r) -					
Roundwood						
- Sawmilling	20.2	3.9	-	5,348.4	356.1	5,728.6
- Veneer & plywood	-	-	53.3	851.6	4.8	909.8
- Particle board & fibreboard	-	-	190.0	2,000.0	-	2,190.0
- Pulp & paper			10,332.9		19.1	10.351,1
Total	**20.2**	**3.9**	**10,576.2**	**8,200.0**	**380,0**	**19,179.5**

Source: Mission estimates, partly based on RFD & RFD/ KU 2005.[39]

Table 6.3 Wood Residue Balance, 2003

	Domestic logs	Imported logs	Total
	- 1,000 m^3 (r) -		
Wood residue availability			
• Sawmilling[40]			
- rubberwood (65%)	3,476.5	-	3,476.5
- other (55%)	10.2	178.0	188.2
Sub-total	**3,486.7**	**178.0**	**3,664.7**
• Plywood and veneer	452.5	2.4	454.9
Total availability	**3,939.2**	**180.4**	**4,119.6**
Wood residue utilization			
• Particle board and fibreboard production			3,120.0
• Energy generation [1)]			999.6
Total utilization	**3.393.2**	**180.4**	**4,119.6**
1) Assuming that all other residues not used for panel production are used for energy generation			

Source: Mission estimates

6.1.2 Wood Products

In spite of its limited economic forest resource base, Thailand has been able to develop an extensive forest industry, which can meet most of the country's domestic demand (Table 6.4). The largest segments of the industry in terms of production volume are pulp and paper, sawmilling and particleboard. With the exception of plywood and veneer, the Thai industry is a significant export supplier in all products in spite of rapidly increasing domestic demand. A particular element in the Thai domestic timber demand is the consumption of the export-oriented furniture industry, which is a major consumer of sawnwood, particleboard and MDF.

Imports play a key role in meeting the demand for sawnwood and plywood. About two thirds of sawnwood consumption is imported, mainly for building construction as this end-use market cannot be served by rubberwood, the mainstay of the Thai sawmilling industry. The limited supply of good

[39] It is noted that various sources give quite different figures for industrial roundwood supply and consumption in Thailand. E.g. FAO (2005) reports industrial roundwood production in 2002 as 7.8 million m^3, and respective consumption as 8,488 million m^3.

[40] 100-recovery rate %.

quality large-sized logs is a constraint for plywood industry and therefore imports account for 28% of the apparent consumption. Log imports (Table 6.2) have been necessary for keeping the country's present plywood production level as the domestic raw material, rubberwood, is only applicable in mills which have been designed for this purpose.[41]

Table 6.4 Production and Apparent Consumption of Wood Products, 2004

Product	Production	Imports	Exports	Consumption
	- 1000 m^3 (s) -			
Sawnwood 1)	2,700 - 3,000	1,835	1,789	2,746 - 3,046
Veneer & plywood	455	176	4	627
Fibreboard	914	25	638	301
Particle board	2,600	11	867	1,744
Woodpulp[1)]	900	457	167	1,190
Paper & board[2)]	3,600	560	819	3,341

1) FAO (2005c) reports sawnwood production as 288,000 m^3 which is likely to cover only part of the domestic supply (probably based on non-planted timber).
2) 1,000 tons

Sources: Sawnwood production: Mission estimates based on interview data; imports and exports Table 6.5

In particleboard and fiberboard the country is a large export supplier as 33% and 70% of the total production is exported, respectively. Thailand also exports 23% of its paper production and 19% of pulp output. About 1 million tons of virgin fiber is imported either in the form of wood pulp or paper and board to complement the local supply.

Thailand has no systematic data collection on the production and trade of sawnwood and processed products. The Mission could find no reliable estimates on sawnwood production that had to be estimated. This is a major lack in the current information system which should be addressed.

6.2 Foreign Trade

6.2.1 Imports

The total trade balance of wood-based products (including pulp and paper) is positive amounting to about 3.4 million m^3 in wood raw material equivalent (WRME) (Table 6.5). Apart from reconstituted panels, Thailand is also a significant exporter of wood chips (about 800,000 m^3/yr) which are mainly produced in eucalyptus plantations. In all other wood products the country is a net importer.

The sawnwood trade is strategically important as it accounts for 90% of the total wood product imports and 54% of total exports. It must be reviewed in the context of log imports (Annex 11). The combined imports were in the 1980s relatively stable (about 1 mill m^3 WRME per year). The imports expanded exponentially as a result of the logging ban, first in logs but later on in sawnwood. Sawnwood production based on imported logs proved gradually less and less competitive compared to imported sawnwood. The peak level of combined imports was reached in 1994 (7.1 mill. m^3 WRME). In the second half of the 1990s the imports declined, partly due to the economic crisis and associated decline in demand. However, in 1999 the import started showing an upward trend which has been continuing since then, driven by the strong demand in the building construction sector. At the same time log imports have gradually declined and they represented no more than about 10% of the total combined imports in 2004.

[41] Automatic peeler for small-sized short logs

Table 6.5 Recorded Trade in Wood and Wood Products in Thailand 2004

Products	Imports	Exports	Balance
	- 1000 m^3 ---		
Logs (wood in the rough)	381	1	-380
- coniferous	0	0	0
- non-coniferous	381	1	-380
- wood chips	-	800	+800
Sawnwood	1,835	1,789	-46
- coniferous	50	-	-50
- non-coniferous	1,785	1,789	+4
Veneer sheets	35	2	-33
Plywood	141	2	-139
Fibreboard	25	638	+613
Particle board	11	867	+858
Sub-total	**2,047**	**3,298**	**+1,254**
Wood pulp[1)]	457	167	-290
Paper & board[1)]	560	819	+259
Total wood raw material equivalent (WRME)[2)]			**+3,371**

1) 1,000 tons
2) Different conversion factors have been used for imported coniferous and non-coniferous sawnwood and exported rubberwood sawnwood.

Sources: UN/FAO/EUROSTAT/ITTO Thailand's Forest Sector Questionnaire; WRME based on Mission estimates

The recorded imports do not cover all the trade in sawnwood. There is unrecorded trade with the neighboring countries, particularly Myanmar and Laos. It has two components: legal imports of small amounts for non-commercial purposes and illegal imports (see ch. 8.2). The volume of these flows is not known. There is a general perception that illegal imports have been declining drastically compared to what it used to be. However, unrecorded and unlicensed importation by private individuals has become in some border towns a lucrative semi-organized activity. It takes place not only in the form of sawnwood but also in pre-cut furniture components or rough pieces of squared wood to be processed into value added products in Thailand.

The main sources of recorded log imports are Malaysia and Myanmar (130,000-140,000 m^3 each) (Table 6.6). Two thirds of sawnwood imports come also from Malaysia, mainly various dipterocarp species. The next largest source is Laos (mainly planted teak) while the balance is mostly temperate hardwoods from North America and Europe. Malaysia is also the main source of supply for veneer sheets and plywood, which are also imported from China and Indonesia. The Chinese imports are representing a tough competition for traditional suppliers and their market share has been increasing rapidly.

The imports from the neighboring countries represent distinctive patterns (Table 6.7). Thailand imports mainly logs from Myanmar, as the share of sawnwood is still only a quarter of the combined volume (on WRME basis). With Laos the situation is reversed: most imports are sawnwood and log trade is limited. The imports of sawnwood from Cambodia are marginal (2004) but there is some furniture trade with Laos and Myanmar. Differences in labor costs make furniture trade profitable and it is likely to expand in the future.[42]

Imports of wood products are influenced by tariff escalation (Annex 12). While logs have only a nominal import duty of 1%, in further processed products the duty can be up to 30%. Also wood-based panel imports face a duty of 2 or 12.5%.

[42] There are discrepancies in the trade data between partner countries. Myanmar reported log exports to Thailand in 2004 as 163,865 m^3 (29% more than the recorded Thai imports), and sawnwood exports as 21,270 m^3 (17% more than Thai imports). In addition, Myanmar exported 3,799 m^3 of plywood to Thailand which does not appear in the Thai import statistics at all.

Table 6.6 Sources of Recorded Imports of Wood and Wood Products in Thailand, 2004

Source	Logs	Sawnwood	Veneer sheets	Plywood	Particle-board	Fibreboard
	- 1000 m^3 -					
China	1	9	4	29	3	1
Indonesia		41	1	24	1	
Laos	27	290	5			
Malaysia	142	1,187	16	83	1	8
Myanmar	127	18	1	3		
Asia total [1)]	**298**	**1,556**	**28**	**141**	**6**	**11**
Oceania	63	93	-	-	5	10
Africa	13	2	-	-	-	-
Europe	4	25	5	-	-	3
North America	3	106	1	-	-	-
Total	**381**	**1,835**	**35**	**141**	**11**	**25**

1) Including all Asian countries

Source: UN/FAO/EUROSTAT//ITTO Thailand's Forest Sector Questionnaire

Table 6.7 Recorded Imports from Neighboring Countries in 2004

Products	Myanmar	Laos	Cambodia
	- 1000 m^3 ---		
Logs	127,419	27,400	-
Sawnwood	18,208	290,158	5,260
Parquet panels	-	670	-
Furniture (pieces)	62,416	33,906	27,777

Source: RFD 2004b

6.2.2 Exports

Thailand's main export items in wood products are sawnwood, particleboard and fiberboard. In the 1990s the sawnwood trade was rather stable varying within a relatively small range of 45,000 to 96,000 m^3 per year. In 1999 the situation started to change and volumes increase rapidly reaching the level 1.6 mill. m^3 in 2002. There was a dip in 2003 when the exports dropped to 1.1 mill. m^3 but picked up again in 2004 reaching 1.8 mill. m^3. This quite phenomenal development is a result of the growing interest of Chinese furniture producers to procure sawn rubberwood from Thailand. About 97% of the total sawnwood exports in 2004 were rubberwood and China represented 80% of this[43]. Most of the balance (15% of the total) was rubberwood exports to Peninsular Malaysia which has been suffering from shortage of sawn rubberwood.

The Mission noted discrepancies between trading partners also in the export data. Sawnwood imports from Thailand to China (incl. Hong Kong) were 510,000 m^3 less than the reported Thai exports; in the case of Malaysia the same difference was 130,000 m^3. A possible explanation is that these volumes could have been re-exported directly from the importing countries. However, there is clearly a need to investigate why such significant differences exist; i.e. a third of the reported Thai sawnwood exports does not get recorded in the importing countries.

Particleboard exports have been increasing since 2002 as the volume more than doubled in 2002-2004. The entire exports go the regional market in Asia where the principal outlets have been the Republic of Korea, China, Malaysia and Taiwan Province (Table 6.8).

[43] Including Hong Kong

Table 6.8 Exports of Particleboard and Fibreboard, 2004

Market	Particle board	Fibreboard
	- % -	
Korea Rep.	29.8	8.2
China, incl. Hong Kong	26.4	31.6
Malaysia	17.0	9.7
Taiwan Province	12.3	12.8
Vietnam	5.9	7.5
Indonesia	3.9	1.3
Korea Dem.Rep.	2.7	..
Philippines	0.6	1.4
Other Asia	0.7	14.3
Other	0.7	27.5
Total	**100.0**	**100.0**
Total 1,000 m^3	**869.6**	**705.5**

Source: RFD 2004b

In fiberboard the export growth has been limited, i.e. during the last few years only 3-4% per year. The market distribution is different from particleboard as the subregional market has less importance. China is the biggest outlet absorbing almost a third of the total followed by the Taiwan Province, Malaysia, the Republic of Korea and Vietnam. The main export item is MDF which many countries have shortage of capacity and sometimes no capacity at all. Fiberboard is exported in significant quantities also to the Gulf States.

In further processed products, a significant item is parquet panels, the exports of which reached about 7,800 m^3 in 2004. This was 41% less than in 2000 indicating difficulties in competing internationally with laminated MDF flooring. The main markets for this niche product were Japan, Germany, USA, Denmark and Italy.

Thailand is one of the world leaders in rubberwood furniture exports and the trade expanded rapidly in the 1990s. The value of exports in 2004 was about US$ 562.8 mill. In addition, the furniture or furniture parts made of rattan and bamboo added another US$ 4.2 mill. making the total forest-derived furniture exports valued at about US$ 567 mill. The growth in wooden furniture exports has, however, slowed down even though it picked up again in 2004 (growth was 13%) after a stagnant period in 2003. The small bamboo and rattan furniture market has expanded vigorously, 30-40% per year during the last two years.

The main export market for Thai rubberwood furniture is the USA (50% of the total), where most of the volume is sold on the basis of price and the quality is at the low end, but still strictly controlled (Annex 13). The second largest outlet is Japan (26%) which represents the high end of the furniture market. The quality requirements, particularly for finishing are significantly higher in Japan than in the USA. Europe takes another 12% of the Thai exports and the quality requirements are between Japan and the USA. All the markets are highly competitive, being supplied by traditional rubberwood furniture exporters (Malaysia and Indonesia) as well as new suppliers (particularly China and Vietnam, often based on imported Thai rubberwood). The sawn rubberwood exports are partly in the same hands as furniture exports as the larger companies are all integrated. There have been calls for restricting sawnwood exports to ensure competitiveness of the Thai furniture makers who buy their raw material in the open market.

6.3 Wood Industries

6.3.1 Overview

According to the industrial statistics, there are about 2,500 establishments in the wood-based industries of which two thirds are furniture producers (Table 6.9). They employ about 260,000 people representing 11.2% of the total manufacturing industries. The sector paid US$ 560 mill. in wages and

salaries, or US$ 2,150 per employee on an average. The wood-based sector generated a value added of US$ 1.5 bill. in 2000 or about 8% of the total manufacturing. The figure could presently be at least about US$ 1.8 – 2.0 billion taking into account the output growth during the last five years. In 2000 the value added by employee was US$ 5,724 or 70% of the average in all manufacturing. However, the wood-based sector's wages and salaries were less than 80% of the average in all industries. These indicators illustrate the significant direct economic contribution of the wood-based sector even though they do not take account of the indirect upstream and downstream effects.

Table 6.9 Economic Indicators of Forest Based Industries, 2000

Indicator	Wood and wood processing	Furniture [1)]	Pulp and paper and converted products	Total
Number of establishments	797	1,671	487	2,555
- Employment	52,482	163,182	44,260	259,924
- Employee remuneration US$ mill.	99.8	321.0	138.4	558.8
- Remuneration/ employee US$.	1,902	1,967	3,126.9	2,149.8
Value added US$ mill.	222.8	703.1	561.9	1,487.8
Value added % of gross output	24.9	29.2	22.8	..
Value added/employee US$	4,246	4,309	12,695	5,724
Relative indicators (total manufacturing = 100)				
- Employee remuneration	69	72	114	78
- Value added/ employee	51	52	154	69
Share of total manufacturing				
- Employment	2.3	7.0	1.9	11.2
- Value added	1.2	3.7	2.9	7.8
1) Furniture and manufacturing n.e.c.				

Source: Mission calculations based on data of National Statistical Office (www.nso.go.th)

The industrial statistics do not include the smallest scale operators. According to another source in 2004, there were reported to be 242 sawmills and 5,318 woodworking plants, half of which in the Bangkok area (Annex 14). The wood-based panel sector has 22 particleboard mills, 4 hardboard units and 7 MDF plants.

In addition there were about 3,000 timber traders, lumberyards and similar operations and another 3,800 wood products retailers selling timber and timber products. The formal timber trade can be estimated to generate an additional employment of 30,000. The informal operations are likely to be even more important as a source of employment.

Of total employment of the wood and wood-processing sector (260,000), 45% are women (Annex 15). The industry relies heavily on unskilled labor (50%) while the share of skilled labor is only 39%. This is a cause of concern and is reflected in low labor productivity and problems of quality control, and, in general, inefficiency in the organization of work. This was observed during the mill visits of the Mission and also highlighted in the top management interviews. Particularly, maintenance teams are often overstaffed while production operations are better organized.

6.3.2 Sawmilling and Panel Industries

The sawmilling industry has been under a major restructuring as most of the teak and mixed hardwood mills have been closed down due to lack of raw material[44]. Most of the rubberwood sawmills are medium sized but there are also large units with up to 25 band saws. These mills are typically owned by furniture companies and produce mainly for the corporate needs. Mills are labor intensive and the layout is simple tailored to the rapid throughput of rubber logs which cannot be stocked for longer periods. Most of the equipment is locally made and tends to be old. The recovery rates vary depending on the level of technology and production management, varying in the range of 20 to 35%. Operators appear to be skilled and have only had on-the-job training. The processing system is targeted at maximizing the throughput rather than at high conversion rates, or even less at optimization of the potential log yield.

The common length of rubberwood logs in the South is 1 m, while in the East it is 1.3 to 1.5 m. Logs with diameter below 15 cm (in length of 1.8 m) are used by MDF mills while particle board mills buy branches and thinner logs with minimum diameter of 5 cm and minimum length of 0.9 m, using them with bark. Largest logs (diameter of over 30 cm) are destined for plywood production if there is a mill within an economic distance, while the balance goes to sawmilling. As the logs are short (from 1 to 1.3 m), the number of pieces to be handled is huge even in medium-sized mills which lowers labor productivity. Furthermore, possibilities to produce longer lengths for applications where finger-jointing is not desirable are limited.

In the action plan for the rubberwood industry developed with ITTO support (Bassili 2000), it was highlighted that the value of sawn rubberwood could be increased through a higher quality of sawing, operating at lower speeds to select the best open face, sawing for grade and not only for volume. Other possible measures included grading of logs and applying smaller number of diameters in the headsaw to increase recovery rate. The quality of saw-doctoring is still weak in many mills. These conclusions are still valid.

As much of the sawnwood market is integrated with furniture production, there has been little incentive to introduce grading systems. Some mills selling to third parties are applying their own classification system but no national standard like in the case of e.g. Malaysia exists.

The Thai plywood industry has been declining due to the changing raw material situation, especially after 1989 when the logging ban was introduced and practically no local logs were available. It is estimated that there are still about 10 veneer and plywood mills in the country. Many rely on the use of rubberwood as a raw material for core veneer. The largest unit is state-owned Thai Plywood (see ch. 9.4). The future development of the industry will depend on the availability of large-sized logs from plantations, including eucalyptus.

The reconstituted wood-based panel industry has many modern world-class production units which are relatively well organized as regards the processing and handling of products. Woodyard operations could however often benefit from improvements. Of the four hardboard mills, three utilize eucalyptus as raw material but in the case of MDF only one mill has been relying on eucalyptus and another one on bagasse. All the others use rubberwood. Most particle board mills use rubberwood and only some smaller mills use either eucalyptus or bagasse. There are several investment projects either decided or in the planning stage and at least two new MDF lines are going to be installed by 2008. They represent a challenge to already tight wood supply situation.

Assessment

1. The wood supply situation is a critical factor for the expansion of both sawmilling and panel industries in Thailand. With rubberwood availability recently curtailed by the upswing of the international latex market, the companies are now looking for any options including fruit trees (durian, mango, etc.) which could be used as raw material. These somewhat improvised efforts are unlikely to be the long-term solution for the Thai wood industry and therefore a more

[44] In 1996 there were 756 sawmills of which 409 worked with teak and mixed hardwoods (Bassili 2000).

systematic approach should be developed. The industry should have a better control of its raw material supply and it should also play a more active role in its development.

2. Rubberwood is the most important raw material but the use of eucalyptus is expanding rapidly in the production of MDF, fiberboard and particleboard. Eucalyptus has also potential as a raw material for plywood and sawnwood but the users will have to overcome the technical problems. There is accumulated experience on solutions for sawing and drying of eucalyptus sawnwood and peeling of eucalyptus logs in other countries. This technology could be transferred to Thailand without major problems. The Thai industry has not yet mobilized itself for tapping this opportunity which could reduce dependency on the rubberwood availability which is periodically constrained by the international rubber markets. Eucalyptus sawnwood has broader application areas than rubberwood due to better log form and longer logs but its use in high quality furniture making is not well developed even internationally. An integrated approach would be needed to develop eucalyptus utilization for sawmilling and plywood production including (i) establishment of thinning trials and development of silvicultural systems, (ii) stock-taking of the international experience on the use of eucalyptus for solidwood products, (iii) industrial-scale trials, (iv) development of quality requirements for large-sized logs and pricing scales, (v) promotion of thinnings among eucalyptus farmers.

3. The sawmilling industry's biggest challenge is probably how to cope with the increasing labor costs and modernize the existing capacity. The improvement process could apply a value optimization approach where the sawnwood yield would have to be analyzed in the light of what could be obtained from the available log material. This could have major changes in the production philosophy of independent rubberwood sawmills that are better placed to maximize economic value of sawmilling than mills which are practically exclusively serving integrated furniture plants. The vision of the industry appears to be inward looking which is illustrated by the fact that improved foreign technology is only seen in forklifts (Bassili 2000). There is a need to consider higher efficiency technological options for log handling, sawing, drying, further processing and waste handling.

4. The reconstituted panel industry has world-class production units. Its future competitiveness will greatly depend on the long-term wood supply which is already under pressure. The industry should assume an active role in developing its wood supply sources.

5. A major effort is needed to improve the almost useless production statistics and to investigate the reasons for discrepancies in trade statistics between Thailand and its trading partners.

6.4 Markets for Wood and Wood Products

6.4.1 Roundwood

The current market mechanism for plantation-based roundwood is characterized by the strong demand-pull in the southern and central parts of the country where most of the processing industry is located (Annex 5 Table 8). The sellers are small producers and they are poorly organized. In logs the number of buyers is large and competition between them is intensive while in small-sized logs there are fewer buyers and they are well organized. The pulpwood prices (Table 6.10) appear to be rather uniform over species. The sawlog market is limited to teak thinning logs which are sold at higher prices depending on the size.

Intermediaries play a significant role. Large buyers have small logging operations mainly to be fully informed about the real costs of harvesting. No systematic information is available on intermediaries and contractors but field data suggested that their margins can be significant, typically 10 to 30% of the sales price. Large buyers appear to have a policy to favor larger contractors capable of implementing medium-term commitments in their deliveries. Contractor management and wood supply/purchasing planning appear to be based on simple principles of quick, short-term deliveries rather than long-term win-win partnership.

Wood purchasing is either based on area (rai) or weight. Both are inaccurate measures for wood trade. In area-based deals the buyer makes a lump sum offer for the standing stock and the seller does not

necessarily have a sufficient idea of the potential value of his crop. Weight-based deals are not measured in purchasing and they are estimated by truckloads. In weight-based deals the log size and log quality are not considered and the sole criterion is minimum diameter. The intermediary, often the contractor, carries out log sorting and makes the profit when selling to the industry different assortments, this time by actual weight. In rubberwood, weight-based measures work better than in eucalyptus as logs cannot be left in the site for more than a couple of days while in eucalyptus drying on the ground takes place quite fast and influences the owner's revenue if paid by weight. Storing is not however practiced widely due to the tight supply situation.

Table 6.10 Examples of Roundwood Prices in April-May 2006

Type of wood	Location	Price US$/m^3	Comment
Stumpage			
- Rubberwood	Rayong	21.40-35.70	THB 10,000-100,000/rai depending on the quality of growing stock
	Prachinburi	25.00-41.70	
	Southern Region	20.00-50.00	
- Eucalyptus	Nakon Ratchasima	12.50-23.75	Low end for small logs, high end for large logs
	Northeast	40.00	
- Teak thinning logs	Northeast	50.00-112.50	Low end for first thinnings, high end for second thinning
Delivered mill price			
- Rubberwood	Rayong	33.25	
	Southern Province	40.00-47.50	Low end for less than 6" and high end for more than 8" in diameter
- Eucalyptus	Prachinburi	30.00-40.00	
- Teak planted, from Laos	Chiang Mai	125.00-150.00	

Source: Mission field data

The current market mechanism is far from being balanced and is strongly influenced by the small number of pulpwood buyers. They have also contract farming schemes where they provide seedlings, technical advice and other support in the establishment stage while committing themselves to buy the output at "market prices". Many farmers living in their properties have been reluctant to embark on this type of contract being unsure about their true benefits. Strong demand for wood is contributing to this cautiousness for long-term commitments from the owners' side. The formula fits better for absentee landowners that do not have the capacity to manage their plantations.

The delivered mill wood costs of pulpwood vary in the range of US$ 30 to 40 which is significantly higher than e.g. in Indonesia but lower than in Europe or North America. In addition, for foreign pulp mill investment, Thailand is not among the most attractive locations due to lack of reliable information on the raw material source and the weak organization of the timber market.

6.4.2 Wood Products

The distribution channels of sawnwood and panel products are relatively well established. All the bigger consumption centers have their own private lumberyards that compete which each other in selling to builders and professionals. In addition, small wood shops both in urban and rural areas sell to individual customers, often providing resawing, drying, and even cabinet or furniture making services to buyers.

Typical current prices in the Thai timber markets (Table 6.11) indicate that the market is highly competitive and relies on imported natural timbers in sawnwood trade. The imported sawnwood goes largely to the building and construction sector, which cannot be supplied by domestic timbers. There is a heavy emphasis on hardwoods for traditional reasons and the consumption of coniferous species is marginal. Only radiata pine is used in small quantities for utility purposes. In the construction sector

there is potential to substitute high-value hardwoods with lower-cost good quality softwoods which would result in economic gains for the users. Strong teak tradition has however kept such transition marginal.

Table 6.11 Wood Product Prices, April-May 2006

Product	Location	Price US$/m^3	Comment
Sawnwood			
- rubberwood	Bangkok	211	Furniture grade
- rubberwood	- " -	132	Utility grade
- Thai mixed hardwoods	- " -	268	
- Malaysian hardwoods	- " -	357	
- meranti	Chiang Mai	483	
- radiata pine	Bangkok	210	
- teak natural (from Myanmar)	Chiang Mai	7,500	25x300 mmm, KD
- teak planted (from Laos)	Chiang Mai	720	Green
Plywood			
- teak veneered	Chiang Mai	713	
- utility grade hardwood	Bangkok	365	
- construction grade (from China)	Chiang Mai	295	
Recycled wood			
	Bangkok	44	Sales price for residues
	Bangkok	90	Purchase price

Source: Mission field data

Of particular social importance as a timber use is the strong small-scale enterprise sector dominated by the carving industry which is suffering from the non-availability of Thai teak. An associated market segment is the traditional hand-made furniture industry which thrives e.g. in the North region serving both the domestic market and high-valued export market niches, especially in Europe. Imported teak is expensive and prices are high. Planted Thai teak comes still in small dimensions which limits its use for large-sized objects.

About 75% of plywood consumption is in the building construction (including doorskins), 20% in furniture and 5% for packing crates, advertising boards and other uses. Particleboard, MDF and hardboard are mainly used for furniture and cabinet making, laminated flooring, etc. The use in construction for ceilings, fittings, interior walling etc. is less important.

The Thai panel market is competitive due to the presence of many strong domestic suppliers and some imports. There is a large share of sales which go directly business-to-business and the balance is marketed through the same distribution channels as sawnwood. There are established practices for grading of the product unlike in sawnwood.

Assessment

1. In log trade, market transparency is limited to local information on prices offered by local buyers. Sellers do not have a clear understanding of the potential value of their wood crop but while their negotiation power and sales options are limited, more information would not necessarily change the situation. There is an urgent need to improve the market transparency which could gradually start changing the situation.
2. Wood measurement practices cannot be effectively controlled by the seller and therefore represent an opportunity for misuse. Buying of growing stock by area – albeit simple – does not protect sellers' interest as s/he is less prepared to make reliable estimates of the volume of sales. This should be phased out and replaced by weight measurement. In the long run, saw and veneer log measurement should preferably be carried out based on volume, which would make the value of the product more transparent for both parties.

3. In addition to market transparency and measurement, the crucial element for improving the negotiation power of the roundwood producers is to establish effective common organizations (associations, cooperatives, etc.) which would be capable to protect farmers interests in varying market conditions.

4. Tree farmer-corporate partnership arrangements would be useful instruments in promoting investment in plantations and mitigating against market risks. They can also mobilize such landowners in plantation investment who do not have own resources to organize planting and management activities. There is a need to improve transparency on the practical arrangements and, if needed, introduce facilitators to advice on appropriate formulae which are not abusive for small landowners. Farmer associations can assume the facilitator role.

5. Proposals have been tabled to introduce some kind of government intervention (e.g. through FIO) to ensure that producers can obtain a fair, stable minimum price which would remove the uncertainty concerns related to plantation investment. Based on the experience on other countries, the Mission thinks that such measures would not be appropriate and they risk distorting the wood markets in Thailand. A package of measures including (i) improved market transparency, (ii) diversification of outputs (introducing sawlogs as complementary product for eucalyptus plantations), (iii) developing measurement and grading systems for log trade, (iv) organization of producers, and (v) for risk averse farmers and landowners, encourage the industry to include a minimum price clause in partnership agreements. These measures would go a long way towards contributing to the objectives that a government-backed minimum price scheme would achieve without the risk of leading to a financial disaster. There are also other options which could be considered like introducing tradable timber futures when the market for plantation timber has developed further and the volumes have become large enough.

6.5 Furniture Industry

Thailand's wooden furniture industry can be divided into solid rubberwood furniture (60%), hardwood furniture (10%) and furniture made of wood panels such as particleboard, MDF and plywood, 90 per cent of which are also made of rubberwood. Thus, the industry is almost entirely dependent on rubberwood for its raw material. There are about 1,700 wooden furniture factories in the country (cf. Table 6.9) which produce for the domestic and export markets; 200 of which are considered larger factories employing over 200 people. However, the bulk of the exports is created by about 10 to 15 large-scale enterprises which have been able to develop reliable regular export trade with the US, Japanese and European customers.

The manufacturing of rubberwood furniture and parts has been the fastest-growing sub-sector within the furniture industry accounting for the bulk of production for exports. As indicated in section 6.2.2 the exports are still growing but at significantly slower pace than in the past. The Thai exporters are presently under a heavy competitive pressure from Chinese producers with ample supply of low-cost labor and who import a significant part of their raw material from Thailand. Addressing this issue through export regulation based on the protection of domestic industries does not, however, appear feasible.

In the larger companies equipment and process layout are, by and large, up to the international standard. Lines are not yet fully automated, as labor force has still been available at reasonable cost. Working conditions are generally good in large and medium-scale mills. Internal transportation of intermediate goods is sometimes haphazard. Surface finishing skills are good and can meet, if needed, the highest Japanese standards. Investment needs are mostly in improving the bottleneck equipment. Management system standards are also high allowing easy monitoring of production and costs. The situation in the small mills is different as plants suffer from problems if inadequate layout, weak maintenance standards, and only basic level of planning and quality control. (Bassili 2000).

Assessment

1. Without a concerted effort driven by the government (e.g. the Ministry of Trade and Industry) Thailand's thriving furniture industry is likely to become stagnant due to the heavy competitive pressure. Furniture industry has developed largely on its own without (a) a systematic strategic

approach in resource management (e.g. development of timber clones for rubber plantations, introduction of sawlog schemes in eucalyptus management), (b) R&D which would benefit the whole sector (technical process improvements), (c) marketing support (export promotion), (d) standardization and quality control systems, and last but not least (e) specialist technical training which is practically non-existent in Thailand. The Government's role is to address these bottlenecks and e.g. the Malaysian experience shows how this can be done successfully.

2. The key problem of the large-scale furniture industries is the shortage of competent supervisors and middle managers who would be able to improve operations at mill floor level on a continuous basis and implement effective quality control systems. This is the reason why probably the bulk of the Thai exports go still today to the least remunerative US market. This outlet is extremely prone to price competition from China and other new exporters and represents a significant market risk for the entire Thai furniture industry. At the operator level, on-the-job training with adequate basic education appears to function well and no major development action is needed. There is, therefore, an urgent need for the Government to assign one of the technical colleges/institutes to set up a specialized training programme to meet the technical level training of the about 1,700 Thai furniture enterprises. Crash course-based training could be arranged e.g. by international assistance to meet the most urgent needs of the industry.

3. There is only limited domestic capacity for furniture design and most of the product models are from the buyers or copied from others. This is another weakness as there is still limited movement towards developing entire living concepts for consumers (rather than individual pieces of furniture) to meet the specific taste of individual target markets. Such product concepts can significantly add to the value of the product. Development of new business opportunities is a lengthy process but it can draw on the exceptional design skills available in Thailand. What is missing is the link between the market demands and the local design skills to be able to generate marketable product concepts. This work could be started in close cooperation with selected distribution channels serving the upgrade segment of the market.

6.6 Certification as a Tool to meet Market Requirement

Certification has been one of the key market drivers in several major importing countries over the last five years. Large buyers of wood, wood products and furniture have been under pressure to issue their own responsible purchasing policies and many traditional customers of Thai exports in North America and Europe are now taking brisk action in this field. Furthermore, many governments have turned to using public procurement policies as a tool to give preference to products which are legally and sustainably produced. These policies are now in place in Japan, Denmark, Belgium, France, the UK and New Zealand while many others like Germany and Spain are in the process of finalizing similar provisions. The ultimate objective is to phase out illegally produced timber from the market and give a boost to implementation of forest certification as a tool to ensure that products come from sustainably managed legal sources.

The Thai export industry has already taken some action to respond to these market demands which are likely to be more pronounced, particularly when China as an in-transit further processing country will have to meet the same requirements. Household furniture markets have still been quite immune to these market pressures but in garden furniture certification is almost a basic requirement in many markets. Some Thai companies have obtained an FSC chain-of-custody (COC) certificate and a few company-owned plantations have also been certified. With the relatively well-developed management systems in place, larger companies have no problems to obtain a COC certificate but certifying the wood source has proved to be problematic.

Only a few rubberwood plantations in the whole world have been certified under FSC and practically all of them are large-scale plantations which are rare in Thai context (see ch. 5). Rubber is planted in 99% of cases for latex not for timber. The whole latex management concept has little to do with sustainable forest management. The other issue is plantation sustainability as rubber may be replaced by other crops when trees reach maturity. Similar issues are likely to arise also with eucalyptus when grown as in agroforestry systems in paddy fields which is typical in the Central and Northeast regions.

At least two companies have taken action to start certifying their small-scale rubberwood suppliers according to the generic FSC standard as special orders had been received for FSC certified products. Certifying smallholders proved to be complex for a number of reasons. They are scattered and they do not have common organizations. Individual commitments to FSC principles were difficult to explain when the main purpose of plantation is to produce latex and wood is only a by-product. One of the companies managed to form a group of 200 farmers with a major effort providing explanatory material in Thai language but the whole effort failed when the group could not meet the FSC specific requirements for group certification.

Assessment

1. The demands for certified and legally produced products will increasingly influence the market access of Thai exports both in furniture and wood-based panels, which are often used in importing countries in the region to produce further processed products to be exported to third countries where customers have such demands. The Thai wood industry sector should take measures to ensure a facilitated access to these markets by implementing certification. There are two non-exclusive options to be considered:

   (a) Consult with FSC on their plans for addressing specific issues related to certifying agricultural tree crops such as rubber or timber produced in agroforestry systems and, based on the results, assess whether appropriate relevant FSC provisions could be put in place which would be applicable in Thailand within a reasonable time-frame. This would enable development of a national certification standard according to the specific requirements of FSC.

   (b) Develop a national certification standard drawing on the relevant international C&I (ITTO) and certification (PEFC) frameworks as well as other relevant reference documents (e.g. the planned FAO Code on Plantations). The standard should be applicable for auditing/certifying smallholders in Thailand. The production volumes are probably sufficiently large to justify development of a national certification system which could eventually be enforced by the international mutual recognition framework PEFC (Programme for Endorsement of Forest Certification).

   If option (a) does not prove to be feasible, the only way to implement certification is to proceed with option (b).

2. The Mission did not observe any inherent obstacles which would not make smallholder tree growing certifiable in the Thai conditions[45]. Certification could boost the organization of farmers which would in any case be needed for improving their negotiation power in the timber markets. The environmental issues related to eucalyptus planting need to be, however, duly addressed. Scientific knowledge and practical experience has accumulated on the impacts of eucalyptus trees on intercrops and the water table, but appropriate choice of species and planting sites should be applied to address the key concerns.

3. A national-level stakeholder workshop would be a useful instrument to take stock of the market demands and grassroots experiences, and to assess which option(s) above would be feasible in Thailand. In the development of the national standard a broad-based participatory process should be applied.

6.7 Fuelwood and Charcoal

Since 1990 no reliable surveys have been carried out on the consumption of woodfuels in Thailand. It was then estimated that the household sector uses about 20 million tons of fuelwood and charcoal annually. According to the National Energy Agency (NEA 1991), the per capita annual consumption in rural households in 1990 was 0.410 m^3 (97.1 kg).

FSMP (1993) estimated that 92 per cent of the wood energy is used in the countryside and one per cent and 7 per cent in Bangkok and other urban centers, respectively. In rural areas, the per capita

[45] Apart from the difficulties to meet some specific FSC requirements.

demand of fuelwood has been estimated at 0.6-0.7 m^3 (or significantly higher than the NEA estimate). The rural population of Thailand (47 million) may be estimated to consume 28-33 million m^3 of woodfuel annually.

FSMP further estimated that only a fifth of fuelwood supply (6 to 7 mill. m^3) comes from forests and the balance from other sources, such as tree crops and agro-forestry (37 per cent) and non- forestry crops (18 per cent). It was also estimated that the supply potential could be in the range of 40 million m^3. [46]

Since the early 1990s the energy situation has radically changed. The average monthly expenditure of household on woodfuels was then 16.4% of the total expenditure on all fuels but in 2000 the figure had dropped to 3.9%. However, in absolute terms, the consumption levels have slightly increased (Table 6.12). Calculated based on energy equivalent, it has been estimated that fuelwood represents 60% of the total wood-based energy while the balance is charcoal. It is noteworthy that the consumption of other biomass energy sources has increased faster and bagasse is now more important source of energy than charcoal. There are also some imports of charcoal which amounted to 34,000 tons in 2004 or 62% more than in 2000[47].

Table 6.12 Biomass-based Energy Consumption, 1999-2003[48]

Type of energy	1999	2003	Change
	ktoe		%
Fuelwood	3,279	3,493	+4.6
Charcoal	2,218	2,357	+6.3
Paddy husky	733	996	+35.9
Bagasse	2,092	2,905	+38.9
Total Biomass	**8,322**	**9,751**	**+17.2**
Share of total national energy consumption %	17.7	17.3	..

Source: Thailand Energy Situation 2003

There are a large number of industries, which still depend on wood-based fuels as their main source of energy. These industries (agro-processing, food processing, brick making, pottery and ceramic production, etc.) have experienced shortages of energy, which has led to calls for government investment in fuelwood plantations. This is paradoxical when it is considered that the Thai forest resources could easily produce more than double the current demand.

Several measures to improve the situation have been taken including the development of fuel briquettes, promotion of agricultural residue stoves, improved cooking stoves, and improved charcoal kilns (Panunumpa 2004). The REX project demonstrated that charcoal production can be highly profitable, particularly as alcatra (wood vinegar) from eucalyptus can generate more revenue than charcoal. The problem to develop this activity is the availability of labor and limited number of investors who are interested in production which needs relatively low investment and can largely be based on non-saleable plantation output.

Assessment

1. The woodfuel sector offers a promising outlook for Thai forestry if the supply can be developed. In addition to traditional fuels for household and industrial use, it is foreseen that commercial combined heat and electricity production would become feasible soon in Thailand. This would represent additional market opportunities for plantation wood, particularly in locations which are far from industrial mills using small-sized wood. Further studies would be required in this area to

[46] It is noted that the production of fuelwood and charcoal have been reported as 'Nil' in 2003 and 2004 in Forestry Statistics of Thailand.

[47] RFD 2004.

[48] The reliability of these figures could not be validated by the Mission.

draft an action plan for similar promotional activities and make necessary policy adjustments accordingly.

7. NON-WOOD RESOURCES AND THEIR UTILIZATION

7.1 Bamboo

7.1.1 Bamboo Resources

Thailand has 12 genera and about 60 species of bamboo. The main species are *Thyrsostachy siamensis, Bambusa blumeana, B. polyumorpha, B. mana, B. tulda, B. arundinacea, Dendrocalamus hamiltonii, D. giganteus, and D. brandisi.* Bamboos constitute the natural undergrowth in deciduous forests. The latest survey (1998) showed that bamboo covers a total area of 800,000 ha. On the basis of an average annual yield of 0.1 ton/hectare green weight, Thailand's potential annual production of bamboo from natural sources is about 500,000 tons[49].

Bamboo is used extensively as a substitute of timber in construction, scaffolding, ladders, bridges, fences, and in pulp making. Numerous articles such as baskets, furniture, toys, musical instruments, sticks, beds, fans, fishing rods and traps, water containers, etc. are also made from bamboo. About 80 per cent of the bamboo production in Thailand goes to the non-industrial uses and about 20 percent has gone to the pulp industry but the latter use has been declining. The pulp industry's preference is to use eucalyptus if available in the market.

The importance of bamboo as a source of employment is largely unrecognized. Harvesting licenses are being issued without any resource assessment. The free removal of bamboo from forests by the people has created shortage of bamboo which for artisans and SMEs is a more serious constraint than shortage of money. Because of inaccessibility and lack of management, the overall productivity of bamboo in Thailand is annually about 8% that of Japan. Since stump cleaning costs about US$ 0.5/clump, farmers do no cleaning of stump site. They use edible salt to change the pH of the soil which they feel gives more bamboo shoots. No other treatment is generally done.

7.1.2 Bamboo Plantations

To meet the demand for bamboo, farmers are also planting it on a large scale. There is an extensive niche market available among artisans in Thailand. Bamboo plantation requires one-time investment and utilization possibilities are diverse. Since the bamboo shoot is edible, the farmers use them for their own consumption whereas bamboo poles are sold in the domestic market. They are easy to transport and maintain and no insecticide is required. Farmers harvest about 20-40 percent of the culms from clumps every year. They do not require any permission for cutting in their own plantations or any transport permit.

About 10,700 ha of plantations have been established under the extension programme of DAE. Because of attractive yield, commercial plantations for edible shoots with *D. asper* are extending rapidly. According to an estimate, average bamboo production from 1980 to 1990 was 49.2 million culms or about 147,600 tons.

With the plantation of bamboo, farmers start getting income from the third year and therefore, in many villages each family has a bamboo plantation. Such a plantation can yield an average annual net revenue of US$ 875/ha. In Nongcan village in Prachinburi, planted bamboos are the best in the country because of soil conditions in comparison to those grown in Kanchanburi in the West and Bolachatani in the Northeast.

Due to its fast growth, easy propagation, soil binding property and short maturity period, bamboo is being recognized as an ideal species for afforestation, soil conservation and social forestry programs in

[49] Allowing economic accessibility rate of 62% estimated by the Mission.

many parts of the world. The bamboo, as an agricultural intercrop, can increase ground flora and the allied silvicultural and agricultural operations can significantly improve the nutrient status of the soil.

Bamboo is widely used as food and for many medicinal uses. Compared to tree crops, bamboo can produce an economic return in a relatively short period of time. Furthermore, while trees grown for timber can only be harvested once, a bamboo clump can be harvested many times over. Bamboo is a multipurpose species and its processing is labour intensive providing opportunities for diverse employment. It may also be converted to value added products. It is thus more useful than most multipurpose woody species. Therefore, developing bamboo cultivation is of great significance not only to promote economic gains but also to improve rural livelihood and economy as well as to increase farmer's income.

Bamboo is facing competition with rubber and eucalyptus. The competitive selling price of 6 metre Eucalyptus and bamboo poles are US$ 2.50 and US$ 0.62/piece, respectively. Only four bamboo culms from one clump can give the same revenue as obtained by cutting an eucalyptus tree. One bamboo clump provides several culms annually while eucalyptus needs 3 to 4 years to produce a valuable pole. Farmers harvest bamboo clump twice a year producing on an average 20 culms per clump per year. Bamboo market is very attractive. It has a high potential for domestic trade and export. In the best producing areas, local intermediaries buy bamboo for export to Taiwan Province and other markets. Bamboo is virtually a standing bank account for farmers which requires limited management effort.

Assessment

1. Expansion of bamboo plantations to bridge the gap between fiber demand and supply has not received adequate attention. The present shortage of bamboo for local processing represents a lost development opportunity which could be tapped with limited promotional effort. The ITTO Project PD56/99 Rev.(I) Promotion of the Utilization of Bamboo from Sustainable Sources has well established the state-of-art in management and utilization of bamboo resources (RFD/ITTO 2004a). This useful information still remains to be effectively disseminated down to the farmer and SME levels in an appropriate form. Such a public investment would have a high economic and social return for the country.
2. In the context of development of rural economies, bamboo should be given adequate importance in the social forestry/agro-forestry practices as well as in watershed management. There is need to intensify cultivation of bamboo by providing incentives to small-scale and marginal farmers. There is also an urgent need for guidance on intensified technology to the people to grow bamboo on private lands.
3. In the management plan for natural forest areas (when prepared) there should be provisions for bamboo resources. The current over-exploitation should be brought under control.
4. There is no proper harvesting management system, cleaning of clump site or soil mounting system, etc. Simple technological improvements could have a significant impact on productivity and costs. Besides addressing these issues, there is an urgent need to continue research over the entire spectrum of bamboo propagation, management and utilization.
5. A nationwide survey of bamboo supply and demand would be a useful tool to determine necessary promotion or extension measures. Such a database can help in policy design, planning and management of bamboo for tapping market/trade opportunities and bringing additional economic returns to the farmers.
6. Raw bamboo is exported to China and Taiwan Province. This makes sense to some private operators but potential added value is lost when bamboo is exported in raw form. Moreover, it is a bulky product (about 4,200 culms in one container). The necessary credit and technological facilities should be provided to the rural artisans and SMEs (e.g. by BAAC) for development of manufacturing of value added products of bamboo to reduce the export share of bamboo in raw form.

7.2 Rattan

7.2.1 Regulatory Framework

In the past all rattan species were growing in the natural forest, except *Calamus caesius* in the 14 southern provinces. Rattan was originally a non-reserved forest product and no permission was required for harvesting which led to serious overexploitation. The situation was changed through a Royal Decree in 1987 which specified rattan as a reserved forest product. To gather rattan in the forest, the permission is required from RFD and royalty is also to be paid. Thailand has banned the harvesting of rattan in natural forest and its export in raw form.

7.2.2 Rattan Plantations

The rapid reduction of rattan in natural forests prompted Thailand and other cane producing countries to establish plantations, as an obvious strategy for sustainable development of rattan resources. Rattan gardens can also serve as a safety net for the farmers. When they need cash, they can harvest some stems for sale. Selection of suitable species of rattan for plantation depends upon the targeted use:

- Large cane: *Calamus manau, C. blumei, C. peregrinus, C. latifoluis*, *C. rudentum*.
- Small cane: *Calamus caesuis, C. pandanosmus, C. myrianthus,* Wai Ka Nun, Wai Sanim, *Daenomorops sabu,t C. palustris, C. rudentum*, Wai Sai Kai, *C. javensis* and Wai Kao.
- Edible shoot: *Calamus viminalis, C. siamensis* and *C. tenuis*.

Rattan has been planted under different programs in Thailand but on a small scale (Sutthisrisilapa & Phuriyakrn 2002). In 1998, the total area of rattan plantations was 210 ha mainly with five species (*Calamus longisetus*, *C. latifoluis*, *C. palustris*, *C. caesius* and *C. rudentum*). By 2003, 512 ha was planted under the Royal Initiatives Programme (1997-2003) and 6,216 ha were planted under the supervision of RFD's Reforestation Division. Rattan plantations are found in Northern, Northeastern, Central and Southern regions. Their objectives were to serve as food bank and to produce value added forest products as well as to protect the reforestation area from encroachment. In state lands a total of 4,914 ha has been planted. Private investment in rattan has not advanced because of lack of know-how, the long rotation period (about 10 years), and lack of systematic promotion.

At the age of 14 years rattan has maximum growth rate of 0.49 m/year followed by the ages of 11 years and 12 years with the growth rate at 0.46 m and 0.45 m, respectively. The appropriate age for the utilization of rattan is 12 years, depending upon the species, site conditions, etc. The rotation of the larger stem rattan is about 15 years while the small stem rattan is grown in 7-10 years.

Thailand is also producing rattan shoots for food. In fact, Thailand and Laos are competitors in the trade. The development of management for shoots of three rattan species *C. viminalis, C. siamensis* and *C. tenuis*, has been quite successful and rather sophisticated in Thailand. The shoot can be harvested as early as 1-1.5 years and full production is achieved at 6 years. The shoot production can last more than 20 years. It is estimated that an income of US$ 1,562/ha can be obtained, which is a high return compared with other crops.

7.2.3 Utilization

The role of rattan in the rural economy is important in many areas as local people largely depend on rattan for their living. Rattan is used by the local people to produce various utensils for their own use. Cash income can also be obtained from rattan handicrafts. In many areas, local people use rattan shoots for food and also for medicine. The decline of rattan resources significantly affected the rural economy in many areas.

More than 200 rattan furniture factories are found in Thailand but most of them are small household manufacturers. Only three factories are large and can export their products. Due to shortages of local supply, rattan is also imported from other countries such as Malaysia, Indonesia, Laos, Cambodia, Philippines, Myanmar and India and but the volume is decreasing each year. Rattan furniture is one of

the important export items of Thailand with the main markets in France, Germany, UK, U.S.A, Japan and New Zealand.

Rattan and rattan products have an export value US$ 0.8 to 2.2 million annually, while the value of imports has varied up to US$ 0.5 million (RFD 2004b). During recent years, due to decline of raw material supply, the export value from rattan has reduced considerably (Sombrun 2004).

Assessment

1. Present production systems are not sufficient to meet the demand for rattan. There has been little monitoring and no management of wild rattan resources and virtually nothing is known about the population biology and ecological effects associated with extraction. Rattan should be duly considered in management planning for natural forests.
2. The management of cane can be done simultaneously for short and long cane. Farmers can get early income from shoots and extra benefits from short cane, or in the long run from raw material sales to handicraft and furniture industry. This would create employment and income for the rural poor.
3. Government policies should be adjusted to support rattan plantations. This involves providing tenurial security to rattan gatherers and planters. Moreover, suitable sites may be identified to promote the establishment of rattan plantations. The planting of rattan species for furniture industry such as *C. manau, C. pandanosmus, C. latifolius* etc. should be particularly encouraged. Rattan seedlings can also be planted in agro-forestry systems with rubber and fruit trees. Successful rattan cultivation and management require local people's participation in all aspects of the enterprise.
4. Since about 30-40 percent of the rattan stem is wasted during harvesting, better portable mechanical devices should be developed to pull down the entire stem without damaging the rattan stem or the supporting trees.
5. There is a need to provide credit and technical assistance for rattan plantation development, harvesting and marketing. ORRAF could have a potential role in channeling funds and other support to farmers, for the establishment of rattan plantations as in the case of rubber.
6. Taxonomic knowledge about rattan species is good in Thailand but the data both on natural forests and plantations are scanty. Local scarcity caused by uncontrolled harvesting is now limiting the access of gatherers to their income. Therefore, value addition by means of improved processing and manufacturing techniques is needed. The value of rattan as raw material is influenced to a great extent by the structural composition of the stem with considerable variation along the stem length. This needs to be considered in management of rattan areas.
7. A network of gene banks is needed. Genetic diversity studies are required to determine the size of the population for ex-situ conservation. There should also be more research on the management and maintenance of rattan resources in the country, including trade and marketing of products.
8. Some efforts have been made in the field of rattan research in Thailand. Future research priorities are: (a) survey the existing resources in order to establish adequate data of all rattan species (commercial and non-commercial) stock in natural forests and plantation areas, (b) development of propagation of cultivation and techniques, (c) improved systems of harvesting, utilization and marketing, and (d) germplasm collection, storage, exchange and characterization

7.3 Other Non-timber Forest Products

Non-Timber Forest Products (NTFP) have high economic potential and therefore, they should often be raised as crops so that people do not have to depend on wild plants. At least five million people are assumed to be critically dependent on NTFPs as they provide material needs, cash income and employment at levels which are significant to the rural and national economies. In addition, their extraction usually represents a non-exhaustive sustainable form of tropical forest utilization.

Besides bamboo and rattan, a large number of edible and medicinal plants, seeds, mushrooms, honey, wax, lac and resin etc. belong to NTFPs. But their significance in the rural and national economies has been little appreciated. Yet they can play a key role in alleviating rural poverty, as they offer the poor the means to increase both their food production and their incomes.

Traditionally used medicinal plants in Thailand are *Rauwolfia serpentina, Gloriosa superba, Cassia augustifolis, Amomum hrevanh, Dioscorea spp, Derris elliptical, Hydrocarpus anthelmintica, Calophucllum inophyllum and stemona tuberosa.* More than, 500 species of edible plants are found in Thailand. About 85 per cent of major natural forest-based food products such as bamboo shoots, mushrooms and vegetable are consumed by households. There are no estimates available on the amount of food collected from natural forests. Mushrooms have been cultivated during the last 30 years and annual production is about 70,000 tons valued at US$ 27.5 million.

7.3.1 Bee products

Honey and other bee products were mostly collected from the wild until 1980 when beekeeping expanded to a large scale in Thailand. The six bee products have broad range of use (FSMP 1992):

- Honey as food or sweetener in many industrial food products.
- Wax for polishes, cosmetics and candles.
- Pollen as dietary supplement and in herbal medicine.
- Royal jelly as food component or supplement which is also considered as an aphrodisiac and rejuvenator.
- Propolis is used on a small scale medically because of its bactericidal properties.
- Bee venom is used medically for desensitizing people who are hyperallergic to bee stings, and as traditional medicine to prevent arthritis.

Beekeeping is a highly useful activity for farmers. It provides easily harvestable, transportable and marketable products. It generates employment to the keepers and the traders and export earnings to the nation. Above all, it enhances pollination of crops and trees.

7.3.2 Lac

Lac is the resinuos secretion of several species of tiny plants the most common species being of *Laccifer lacca*. In Thailand, it is collected from the branches of numerous tree species of mixed and deciduous natural forests. Thailand is the second largest lac producing country after India. Lac production is done only in the North and Northeast regions. The North accounts for about 80-90 per cent of total production. The average stick lac production in the last 10 years has been 7,365 tons. Production was the highest in the mid-1980s. The most productive species is *Samanea*, which under normal conditions can produce annually as much as 2,440 kg/ha. *Swietenia macrophylla*, yields only 250 kg/ha.

There have been more than 50,000 families involved in stick lac production, in the early 1990s when there used to be 20 licensed lac processing plants in operation. The production volume as gone down since then.

7.3.3 Resin

Resin has been tapped from pine trees for centuries in Thailand. Oleoresin and gums are obtained from the two native pine species, *Pinus kesiya and P. merkusii.* Only *P. merkusii* is being tapped economically, yielding of about 2-5 kg per year while kesiya pine yields only about 1 kg/tree/year. The total area of pine forests, allowing for mixed stands, is about 216,200 ha located mainly in the North and Northeast. The estimated potential annual production from these trees is about 12,700 tons. Tapping can be done all the year round. In the last ten years, on an average, 285 tons of resin were produced annually and from these, 205 tons of rosin and 52 tons of turpentine were obtained. At

present, the net value realized from rosin and turpentine is about US$ 0.5/kg. The pine resin industry has the potential to create 25,000 jobs in rural areas.

Tapping dipterocarp trees is also an important source of income for many forest dwellers but the extent of the activity is not known.

Assessment

1. In Thailand, about 45 items of non-timber forest products are imported. They are mainly bamboo, rattan, cinnamon, natural honey, gum damar, other natural gums and gum resins, tung oil and its fractions and furniture. Some wildlife articles permitted under CITES are also imported. The total import value of these items was US$ 47.9 million in 2004. About 40 NTFP items are exported. They are mainly furniture, natural honey, feathers, skins and other parts of birds with their feathers, seed lac, gum damar, bamboo, shellac, seats of cane and its furniture. Total export earnings from these items were US$ 70.4 million in 2004. The country is a net exporter of NTFPs but the supply potential is far from being fully utilized.
2. The extent, role and availability of NTFPs should be explicitly specified in the management plans of protected areas and reserved forest areas for their sustainable harvesting, production and utilization. NTFPs have a huge potential to ameliorate the economic conditions of the rural poor.
3. The germplasms of NTFPs should be conserved in *in-situ* conditions and their propagation should also be promoted.
4. Knowledge of the resource should be improved and technology for propagation and processing should be developed.
5. There is a need for comprehensive study of lac production, processing, marketing and its important role in the income and employment generation for the rural poor.
6. There is also a need to have an improved streamlined market mechanism for bamboo and other NTFPs from the cultivation by the farmers to the final consumer.
7. Market information should be regularly published to facilitate the collectors and other primary producers in getting reasonable prices for their products, which will also help them in safeguarding their interests in dealing with the middlemen.
8. There is a need to develop a database regarding the availability of NTFPs by species, area and quantity. This would not only help in policy and planning but also in developing proper market mechanism and trade opportunities for various value added products.

7.4 Ecotourism

Tourism in Thailand is well developed and diverse, having prospered since it was promoted in the Fourth National Economic and Social Development Plan of 1977-1981. The number of foreign tourists arriving in the country has leveled around 10 million as the growth in the recent years has been slow (NSO 2004). Together with domestic tourism, this represents a huge market potential for nature-based tourism in the country. Indeed tourism in Thailand today focuses on archaeological, historical and cultural sites, protected areas and resort areas. There are sometimes overlaps between these areas.

Tourism is spreading its influence increasingly also to rural areas, particularly on the coastal zone, around national parks and in the North region. Its activities in the interior rural areas are typical in upper watershed where also most of remaining forests are found.

The tourism market has been changing toward more differentiation among types of clients and services demanded. These different types have different impacts and trade-offs regarding the environment and natural resources. Coastal zones are examples where one type of tourism for masses can undermine the potential for other types (e.g. ecotourism). The demands of the tourism industry are not necessarily compatible with the values of local residents. In landscape management, maintenance

of esthetic values tends to have a low priority as there is no legal basis for compensation of damages incurred by activities or investments dependent on them (Thomas 2005).

The Government's policy on tourism for the past years has been gearing towards more and more sustainable tourism development with emphasis on community participation, safety of tourists and non-exploitation. One of the fastest growing sectors of the tourism industry is that of 'eco-tourism' whereby tourists visit undisturbed natural areas to experience spectacular scenery and view wildlife. The term eco-tourism has been widely used to describe a form of tourism in natural areas that is based on the knowledge about and responsibility towards the ecological system of the area. At present, the number of real eco-tourism visitors is, however, still minimal. Mostly, those tourists are included in other types of tourism such as nature-based tourism, agro-tourism, cultural and historical tourism and health tourism. Most of such tourism areas are in natural parks and specific historical-cultural areas.

The national parks system in Thailand has as growing importance to the eco-tourism industry. With most parks easily accessible by road, there exists excellent potential to expand the number of visitors who use them. In the case of the Mekong River, the nature-based tourism potential particularly applies to Northeast Thailand, an area that Thailand Tourism Authority (TAT) has identified as a priority for tourism development. The national parks in close proximity to the Mekong River include sites of prehistoric, archaeological and natural significance. As the Mekong region increases in its exposure and popularity, these parks are expected to experience an increased number of visitors.

The composition of tourism attractions is being diversified. About two-thirds of all domestic tourists are engaged in varying forms of ecotourism (nature study, exploring, camping, trekking, rafting, etc), compared with slightly more than a quarter of foreign tourists (TISTR 1997). In general, Thai visitors are reputed to be more interested in sightseeing and picnicking, while foreigners appear to focus attention on nature.

The potential of the protected areas in ecotourism has been recognized in Thailand. Ecotourism projects have been implemented since the late 1990s in several national parks and wildlife sanctuaries. These projects have also tried to involve local people (Pragtong 1999). However, both social and ecological problems tend to appear when increasing numbers of people visit protected areas; shortage of staff, for example, makes control difficult (National Park Office 2004, cited in Hares 2006). Nevertheless, tourism, together with the availability of economic assistance, has encouraged the enlargement of protected areas (Sato 2003). The presence of local people can add value to the ecotourism products through the cultural aspects of ethnic groups. In particular, the traditional cultures of ethnic groups are expected to play an increasingly important role in tourism development.

To develop such cultural or rural tourism as a complementary line of ecotourism requires that there are adequate services of accommodation and catering in place. One-day tours in villages tend to leave behind more impacts and less income for local people than visits which involve overnight stay, trekking in the surrounding area, etc.

Problems or obstacles to developing ecotourism include the following (cf. Clarke n.d.).

A danger that the policy outlined above will not be implemented in full resulting in erosion of cultural and natural resources in protected areas and elsewhere, to the extent that biodiversity, heritage, scenic values, and eventually their tourism potential, are lost. The challenge is how to resolve conflicts between conserving Thailand's natural and cultural resources while at the same time promoting tourism based upon those resources. Heritage conservation and social impact management are also recognized as one of the key action areas of the Greater Mekong tourism development strategy (ADB 2005).

A tendency to focus management strategies on satisfying tourist demands rather than safeguarding the resources upon which tourism potential is based.

- Although there are about 2000 authorized tour operators and over 10,000 authorized guides, they are mostly geared to cater for the needs of general tourism. In particular, there is a shortage of well-informed guides who have a sound basic appreciation of nature and wild lands.

- Ill-behaved tourists who deposit litter, pollute protected areas, show disrespect for local cultural values, act in an uncouth manner and resist attempts by tour operators or guides to moderate their behavior.
- Community participation in protected area management is virtually non-existent. At present local communities derive little benefit from nearby protected areas.
- Mistrust and unwillingness to co-operate still exists on the part of DNP personnel, local administrative bodies, local communities and local entrepreneurs.

Assessment

1. There appears to be no specific ecotourism development strategy which could guide local communities and the private sector to enhance the contribution of the natural heritages and local communities to sustainable tourism development in Thailand.
2. The Mekong subregional tourism strategy has identified three border areas as potential focal zones for future tourism development: west (Andaman), east (the Eastern Forest Complex) and the Northern area. In these zones cultural and natural heritage conservation needs to be considered among strategic goals.
3. Ecotourism should be adapted as one of the strategic elements of the development of national parks and other priority areas. It will be appropriate to integrate relevant provisions for ecotourism into management plans and to develop mechanisms to involve local people in ecotourism activities as a source of income.

8. EFFECTIVENESS OF PUBLIC POLICIES

8.1 Combating Deforestation and Poverty Alleviation

The land-use process in Thailand is closely associated with population density, biophysical conditions and socio-political factors. Population creates the pressure on the natural resources and commercialization of agriculture brings the economic incentive for land use change which takes place within the bio-physical constraints (terrain, soil, rainfall, etc.). The deforestation process varies between regions, watersheds and cultural backgrounds of the people. However, the following description referring to the Northeast region can serve as a typical example. The example is also important as the region houses one third of Thailand's population and land area, and it is a region where deforestation has already progressed relatively far as forest covers only 15% of the total land area whereas the share was originally 90%.

Land was first transformed from forest to cultivated fields by pioneering farmers. In the early subsistence stage (i.e. until the 1950s), land transformation did not lead to dramatic forest loss at any scale. Only after the integration with the market economy, cash crops were increasingly cultivated and forest loss started to accelerate. Transformation began in the lowlands and worked its way upward to the uplands. The lowland was changed into paddy fields. Upland cultivation was originally for subsistence but, as population increased, paddy fields were expanded to more marginal lands with lower productivity. Cash crop cultivation spread also to upland cultivation, which involved the use of fertilizers, insecticides and pesticides. When the land could no more support the ever-increasing population, the migration flow changed outwards. Groups with little or no land left to seek for new areas and sometimes had to travel up to 50 to 100 km before a suitable location could be found to settle down. These land "pioneers" started with subsistence production but as soon as they got connected to the road network cash crops were introduced. The emerging agro-industries provided a ready market for products together with domestic and export outlets for basic commodities (Dixon 1978, Fukui et al. 2000, Thomas 1998, Vityakon et al. 2004).

The available data on the deforestation in Thailand suggests that the rate is not declining and continues at the level which cannot be ignored (see ch. 2.3). Deforestation is concentrated in the forest margin or agricultural frontier. There is also deforestation inside the larger forest areas which is different in nature, permanence and degree of environmental impacts. The two types of deforestation are also

associated with different socio-economic dynamics; the first one is driven by economic gains and the second more associated with the livelihoods of the poor. In the latter case communities are remote, they often still have extensive forests around them, population density is low but poverty levels are high while subsistence economy prevails. This traditional situation among the hill tribes in the North has, however, been changing when immigration from neighboring countries has changed population dynamics.

Several reasons could have led to a reduction in the deforestation rate in Thailand:

- The logging ban has limited the opening up of new areas for encroachment through new forest roads; the experience in Thailand and other countries suggests that the road access has probably been one of the most significant drivers for deforestation (Geist & Lambin 2001; Kaimowitz & Angelsen 1998).
- Rising off-farm income increases the opportunity cost and availability of labor for land conversion and low productive agriculture; the off-farm employment is being generated in tourism and associated commercial and industrial activities which are driving urbanization in many strategic valley locations, particularly in the North region (Thomas 2005)
- Control of the land conversion and illegal logging has improved in all natural forests (see chapter 8.2). This improvement has been observed both in forest reserves and protected areas and the expansion of national parks may have brought more resources for field-level control.
- The expansion of the farmholding land appears to have slowed down as well as the area under cultivation of major crops (Annexes 16 and 17).

In spite of these trends, deforestation in Thailand continues for a number of reasons:

- Rural roads are one of the main instruments to help isolated communities reduce poverty through cutting the transportation cost of inputs and products to the markets, and facilitating access to off-farm income. However, when immigration is possible (be it legal or unregulated as is the case in many communities in the North region), improvement of the rural road network through public investment is likely to attract new settlers increasing pressure on forests.
- Successful program to reduce opium crop cultivation has brought new cash crops to areas which were earlier outside the reach of commercial agricultural production.
- Immigrant communities along the border areas represent an increasing pressure on the natural resources as alternative livelihood means are limited. Some groups are used to move around in accessible areas utilizing slash-and burn agriculture not necessarily having an intention of settling down due to lack of tenure resulting in a periodic process of moving to new areas. Villages in the North region have experienced groups spinning off when the pressure on land could no more be coped with. These shifting cultivators are difficult to reach by authorities, as there is rarely a road access to areas where they are residing.
- Public land allocation policies transfer land to private individuals for crop cultivation. These land allocation programs are targeted at expanding the area under cultivation for oil palm, rubber, sugar cane and other crops, particularly in the Northeast region. The only land available for such an expansion is forest which is often fragmented or otherwise degraded. These programs may be socially and economically justified but they lack consideration of the environmental values which are lost when the forest cover is removed. Part of the land conversion is assumed to be financed by wealthy interests. Agricultural subsidies reduce production costs and make land conversion artificially attractive. This may not be sustainable if there is a policy change and subsidies are discontinued and land is ”returned” to forestry requiring major rehabilitation investment.
- High prices of some crops have provided a strong incentive for expansion of cultivation areas; e.g. the rubber price has doubled during in 2000-2004 (see ch. 5.1.2). This effect was found even in Thailand’s mangrove forests where high shrimp prices have promoted deforestation (Barbier & Cox 2004).
- Labor shortage in central and southern Thailand is already influencing many economic activities in rural areas and, as a result, wages have increased. Off-farm income is also reported to be increasingly common in other parts of Thailand even though labor shortages are not yet experienced. It has been argued that higher wages can lead farmers to substitute labor for land which could accelerate deforestation (Barbier & Cox 2004). On the other hand, higher off-farm

wages increase opportunity cost of subsistence farming. While increasing off-farm income undoubtedly reduces poverty, its impact on deforestation in the Thai context can be mixed.

The factors influencing deforestation described above are a cause of concern because the removal of forest cover tends to take place in uplands and can thereby adversely influence the protection of water catchment areas. There have already been serious conflicts over water between the hill population and lowlanders. There is a general view that lowland paddy fields experience no or limited degradation of soil or nutrients (compared to forestland) but they depend on the receipt of deposits of nutrient and organic materials eroded from the uplands. Degradation of uplands contributes to aggradation of the lowlands. This general view prevails in spite of the fact that the scientific evidence on the interaction between water run-off and forest cover is mixed (Bruijnzeel 2004).

The biophysical factors also influence the deforestation process. High rainfall (more than 2,000 mm) makes it difficult to grow many crops. Hilliness is another factor as slopes are difficult, often impossible to cultivate. As a result, deforestation tends to take place on better soils where biodiversity values can be high. It is generally recognized that permanent land conversion has more significant impact on the forest cover than shifting cultivation where fallow periods allow restoration of land fertility and help maintenance of biodiversity. This is demonstrated in many upland areas where shifting cultivation has been replaced by permanent intensive cash crop cultivation.

The role of tenure in deforestation has been explored in many studies and in general it is assumed that lack of established tenure tends to promote deforestation. This may be not always the case in Thailand. It has been observed that forest dwelling communities, having been under pressure from the government policies already for years, have taken action to effectively conserve forests in their surroundings to demonstrate to the authorities that they are capable for sustainable land management. Such village-level collective decisions and internal control are assumed to be motivated by the fact that, through demonstration of good land stewardship, communities will in due course gain formal tenure for their forests (e.g. Hares 2006).

The assumed link between forest destruction due to illegal logging and landslides and flooding was the reason why the Thai Government took the radical move in 1989 to ban all logging in natural forests[50]. The scientific evidence of this link suggests, however, a more complex relationship where local factors are important. There is little doubt that trees affect run-off and infiltration.

In Thailand a substantial body of research has been accumulated by the work of ICRAF which clearly articulates for a watershed or landscape-based approach to develop a combination of sustainable land-use systems (Thomas et al. 2004). However, the popular belief among many environmentalists and foresters in Thailand appears to be that rainforests cause increased rainfall even though the scientific evidence rather suggests that these forests exist because of high rainfall (Bruijnzeel 2004). Nevertheless, there is a common view that headwater conservation is important for reducing damage caused by flash floods and landslides, and mitigating dry season water shortages both for urban and village communities and agriculture. The quality concerns related to water supply are linked with pesticides and insecticides used in cash crop cultivation and varying rate of sediment in the surface water.

The popular perception in Thai society appears to be that deforestation and forest degradation are currently mainly due to highlanders, most of whom are living in long-established communities which were originally reserved forests, presently often declared as protected areas. These areas have been also subject to migration pressure and it is precisely due to lack of established tenure that local communities have not been able to effectively control the inroads of external people in their traditional lands. This process was also in a way a by-product of opium substitution program and stronger control of national security which as by-products opened large areas for immigration pressure.

While in mountain areas a lot of attention has been given to measures to stop deforestation, less emphasis appears to have gone to improving the sustainable management of lowlands which suffer

[50] The most recent catastrophe causing 100 dead and large areas flooded took place in May 2006 in five provinces of the North region.

from inadequate urban planning, weak administration of fluvial systems, environmentally sensitive water engineering projects, inappropriate development of flood plain areas, etc. Unsustainable lowland management often exacerbates the impacts of upstream land-use changes, particularly due to natural hazards. The result is that, in the media, the extent of disasters is easy to link with deforestation even though the impact might often be marginal at best.

Assessment

1. The Government policy on combating deforestation has been focused on measures to maintain forest cover through rehabilitation of degraded areas and reintroducing trees to deforested marginal lands. This costly approach (repair rather than prevent) has not ensured the halt of deforestation. Policies have not adequately addressed rural poverty as a root cause of deforestation.

2. Lack of established tenure as a reason for deforestation is widely recognized and, in addition to the Government, many actors have taken action to improve the situation. This has resulted in a multitude of programs and projects with well- intentioned objectives to improve people's well-being but the fundamental issue of lack of formal recognition of land and use rights has not been addressed. This has probably marginalized the effectiveness of other efforts or limited their impact on project sites only.

3. Expansion of commercial monocultures of agricultural crops in uplands promoted by public policies is, together with associated land allocation programs, probably one of the most significant threats to the remaining forests in Thailand. As land is getting increasingly scarce (at least in the lowlands), agricultural intensification is inevitable. Reversion to polycultural agricultural systems, especially those with tree components that mimic the natural systems is one possibility. Such systems could represent greater self-reliance depending less on external inputs (Vityakorn et al. 2004). These integrated farming systems which are characterized by intercropping could offer an economically feasible option for small-scale Thai farmers (the average size of their holdings vary in the range of 2 to 4 ha). As long as on-farm labor is available and its opportunity cost is not too high, these systems represent a strategic option for sustainable natural resource management.

4. Impacts on forests of the policies of agriculture and other related sectors have not been duly recognized resulting in inconsistencies and policy conflicts which make the Government's effort to curb deforestation ineffective. There is a particular need to introduce forest impact safeguards in the design of future road, infrastructure and urban/tourism development projects in Thailand as they play a critical role in opening up access to encroachers facilitating commercialization of the agricultural production in frontier areas.

8.2 Illegal Logging and Logging Ban

8.2.1 Illegal Forest Operations

There is a wealth of anecdotal information on the volume of illegal logging in Thailand, mostly referring to the 1990s (e.g. Lakanavichian 2000). The only official data available refers to confiscated timber (see ch. 6.1). The evolution of illegal logging since the logging ban in 1989 has gone through several steps (Box 8.1). The ban has resulted in an ever-increasing creativity in finding new ways to bring teak to the market. The various forms of illegal operations since 1989 can be summarized as follows (FER 2005):

(a) Nationalization of the logs through "Burmese dressing" as explained in Box 8.1. This also involves imports of small amounts of processed timber from neighboring countries (including Laos and Cambodia) in small lots without customs clearance as allowed by law. Pick-up trucks and motorcycles are used and operations may engage large numbers of people ("ant armies").

(b) Log laundering. All confiscated illegally cut logs were sold exclusively to FIO, which auctioned the logs often in pre-arranged deals. This is no more possible with the present management of FIO.

Box 8.1 Evolution of the Illegal Logging in Thailand

After the logging ban, the Thai Government negotiated with the Myanmar government for 18 large Thai companies to operate on the Burmese side along the borderline between the two countries. This was a win-win project for Myanmar government as (i) the logging roads would open up the accessibility to the area which was occupied by the minority ethnic groups (the Karen, Tai Yai, Kachin and Mon) while the possibility to control the sensitive area was facilitated by large scale removal of protecting forest cover, and (ii) it generated revenue for the Myanmar government.

On the other hand, the minority group, in the new situation needed more powerful weapons than in the past and for them it was logical to get involved in the logging activity to earn necessary cash. This was against their cultural values but they had limited options, as their earlier less intensive logging operations in the zone were no more sufficient for ensuring the livelihood of the communities.

In the first phase logging started in an intensive way on the Myanmar side and both large and small-sized trees of commercial species were harvested and transported to the Thai side as fast a possible to fill the vacuum which was left by the abrupt disruption of the log supply to the sawmills and plywood and veneer plants. The width of the border zone subject to exploitation was reported to be 100 km during just four years from 1988 to 1992. The result was so devastating that the Myanmar government gradually cancelled by 1995 all the Thai logging licences. In the Mae Hong Son border alone a total of 743,000 m^3 of logs were imported in 1989-1994 according to the customs statistics but the real volume is likely to be larger.

In this new situation, logging moved to the Thai side and logs were first hauled and floated over the border river to Myanmar side. Certificates of origin were obtained by inappropriate means and thereafter the logs were imported to Thailand as “legal” timber.

The following parties were involved in the operations: (i) local villagers who had little other option than to work as paid labor in the operations, often under pressure from influential operators, (ii) minority group immigrants from Myanmar who were economically and socially even more vulnerable than local villagers, (iii) local influential groups (retired police officers, sub-district chiefs, village headmen and local politicians), (iv) log trading companies and the wood processing industry, (v) dominant regional businessmen who had a direct economic interest, (vi) state officials from several ministries and agencies (including Forest Industry Organization) who were attracted by bribes and pressed if they did not accept bribes, and (vii) politicians who laid down the policies for log imports.

Some logs were necessarily confiscated by the authorities. These logs were then auctioned by FIO but auctioning was typically arranged between log traders and industry so that each party could recover their investment in hauling the illegal logs to the border. After the logging ban the volume of confiscated logs in Mae Hong Son started to increase and reached almost 9,000 m^3 in 2000. Since then there was a drop in teak logs suggesting reduced availability but the volume of other species started to increase.

The border trade became more complex as the easily accessible river zone had been depleted. It continued however, and instead of importing the Thai timber back as logs, it was processed on the Myanmar side. Processed products did not in the beginning require certificate of origin and therefore they were easily exported back to Thailand. Subsequently, the requirement on the Certificate of Origin for processed products was issued.

Source: FER 2005

(c) Inflicting premature death on the trees (by girdling and chemical treatment) so that, when dead, they could be harvested by FIO. This method may still be applied on a limited scale.

(d) Re-launching of logs from adjacent areas. Originally this was practiced in concession areas but more recently in areas which were cleared for dams or irrigation infrastructure. The actual log removals were often many times larger than the authorized volume of the timber in the project area.

(e) Recycling of permits, i.e. using legal documents several times

(f) Recycling of confiscated logs: An example is the Sahanawakit sawmill in Tak province which had used a long-standing confiscated log storage as an intermediate stock for their raw material. New illegal logs were replenished to the storage area while older logs were transported to the sawmill for processing avoiding any control.

(g) Transformation of logs for ”subsistence” consumption into instruments or rough houses which were thereafter dismantled and sold to the market. This practice was encouraged by timber buyers who also offered to buy existing old houses often built with large-dimension teakwood.

(h) Illegal logging by small chainsaw teams which break down the logs in the forest into rough planks of short lengths which are then transported to the market under cover avoiding control.

The volume of confiscated timber is presently very low, only about 10,000 m^3/year. About 20% of the confiscated timber was destined for domestic use and 80% for commercial use. Illegal activities are said to mostly occur in the North and Northeast regions. However, in 2004 timber was confiscated in only two provinces (in Kamphaeng Phet, Northern region and in Prachuap Khiri Khan, Central region) (RFD 2004b). This raises the question of whether the control is effective where the problem is serious.

According to the authorities and NGOs which were interviewed by the Mission, illegal logging which in the past was carried out on a large scale has become a small-scale activity by small groups, often linked with timber buyers. Logging is typically carried out by 5-6 -man teams. Logs are broken down into short planks in the forest with chainsaws and the products are manually or by animals carried to the roadside where transportation is under cover by pick-ups, small trucks or even motorbikes. Environmental damage of such operations is mainly related to over harvesting of teak as loggers go for individual good trees. A lot of waste is generated as sawing of planks is by chainsaws. Sawyers can earn US$ 12.50/day, i.e. three times more than minimum daily wage paid in rural areas (US$ 3.75 to 4.50/day). There is a strong economic incentive for engaging in such activities, which is due to the very high value of teakwood and its ready markets in Thailand.

There is unrecorded trade between Thailand and neighboring countries. A lot of wood is imported in small lots using pick-up trucks, agricultural tractors and even motorbikes. Individuals can import goods free with a value less than US$ 500 provided it is not intended for commercial purposes. There are a very large number of people who are involved in this kind of activity around the border posts with Myanmar and Laos. Thailand has only 27 border posts with its neighboring countries.

A certificate of origin (CO) is presently required from Myanmar for logs and sawnwood. According to the Thai Customs, a CO is difficult to forge This requirement was imposed on natural teak imports as a significant part of it was in the past in reality illegally harvested in Thailand. With the introduction of CO requirement, a better control was attempted. In the past, processing was done into rough sawnwood but because of labor cost differences between the two countries and problems of availability of manpower in Thailand, the trade has moved to further processed products such as precut furniture components. However, often such a processed product that may be declared as window frame component is in fact rough sawnwood. For sawnwood classified as processed wood, a 20% import duty has to be paid which importers consider an acceptable cost for legalizing timber (further processed products can be transported without permit in Thailand). This shows that the transaction cost of illegal operations and the risk of being caught have become so high that a 20% import duty is more economical for traders compared to the costs of organizing in-country illegal logging and transportation. In the case of imports from Laos and Cambodia no CO is required as the teak from Laos is reported to come entirely from plantations and Cambodia has no teak exports to Thailand.

Since the border control has improved and illegal logging and smuggling of logs to Myanmar have become more difficult, overharvesting is believed to spread now on the other side of the border to feed the Thai (and Chinese) markets. In March 2006, the Government of Myanmar requested the Chinese Government to stop all imports of timber products through the borderpost in Yunnan. On June 3, 2006, the Myanmar authorities imposed a ban on all exports of timber through the Three Pagodas Pass which is the main entry point of timber exports to Thailand. The ban is planned to be extended to all the other border posts with Thailand soon. There are at least 80 furniture factories in and around the Three Pagodas feeding mainly the Thai market and these operations will have to be closed down due to the export ban. These extreme measures have become necessary to bring all the land-based trade with Thailand and China and associated illegal harvesting in Myanmar under control (ITTO 2006b). It is possible that the closing up of the Myanmar border for timber imports will give a boost to expand illegal harvesting of teak in Thailand due to strong market pull.

8.2.2 Control

For transportation of round logs and sawn timber a licence (moval pass) has to be obtained from RFD. This regulation is also extended to imported products. In further processed products, a licence is not needed. The arrangement appears to be working effectively even though it may also serve as an incentive for corruptive practices. There are also some anomalies; timber imported through Bangkok port and processed in a mill in the Bangkok area also needs a transportation licence. The private sector claims that this is negatively influencing their competitiveness due to slow bureaucracy and associated costs of obtaining the transportation permit It is also claimed that some Thai mills have been relocated in China or other countries due to this regulation. The private sector sees free trade and illegal logging as different issues; as the Thai (non-rubberwood based) sawmilling industry will have to operate mainly based on imported logs for several years to come, trade should be facilitated due to the weak competitiveness of the local production. The (organized) private sector does not see illegal logging presently a problem in Thailand as domestic natural teak is no more available to the market.

Underpricing, downgrading the product in documents, and incorrect volume measurement can be applied, as these practices are difficult to control. Planed sawnwood is classified as rough sawnwood to pay lower import duties. “Rough houses” (structures made of rough sawn planks) are being built in villages with timber which was supposed to be used for domestic consumption. However, after three years the owner is entitled to sell the timber in the open market. All these different forms of working outside or on the margin of regulations are difficult to control and put a major burden on the forest administration, the customs authorities and other parties involved in the control of illegal forest-related activities.

Several authorities are involved in the control operations: RFD, border police, the customs, and the army. RFD has 195 control units (excluding protected areas, which have their own patrols) in 75 provinces involving 650 officers and 1500 rangers and other employees. There are regional control stations and check points are operated in critical locations. DNP has even larger staff numbers involved in patrolling protected areas.

The effectiveness of control has greatly improved when the system was changed to involve people’s participation. RFD has a hot line where information can be given and the informant may remain anonymous if s/he so desires. The fine is shared between the informant (50%), forest officer (25%) and the Treasury (25%). The economic incentive has been instrumental in increasing the effectiveness of control. About 3,000 calls are received per year through the hot line of which about 70% lead to investigation. Court cases take about one year but there is not reported to be a large backlog of cases.

People’s participation is particularly important for the control of encroachment. However, more resources are needed to strengthen mobile units for communication and remote sensing data on the forest cover to monitor encroachment.

The authorities admit that corruption can be a problem but its importance is difficult to quantify. As many authorities are involved in control from central and local government agencies, the cost of corruption becomes easily prohibitive if the volumes are small. The stakeholder groups interviewed by the Mission no longer perceived illegal logging as the significant large-scale problem it used to be during the early years after the establishment of the logging ban. On the other hand, traders have become more and more sophisticated when controls have improved but at the same time illegal volumes are generally thought to have been significantly reduced.

Assessment

1. The logging ban provoked a surge in illegal operations which has since then been contained by tightening control. The ban was a shock treatment; it was not preceded by any planning or preparation to allow the industry to adjust itself, and there has never been any post-ban implementation legislation. The only apparent adjustment in Thailand was to demarcate more protected areas and to strengthen law enforcement which did nothing for the market for wood. Many negative impacts could have been avoided, had the policy been applied by stages (see also Brown et al. 2001). The problem was in a way sent to Myanmar.

2. The logging ban has had mixed effects. If the primary cause of deforestation and forest degradation is agriculture, rather than industrial forestry, a logging ban can be only of limited use in controlling degradation. On the other hand, had the logging ban not been implemented, conservation efforts may have proved to be less effective than at present. Social impacts have also been mixed: employment and income were lost in rural areas but improved environmental quality has also brought some social benefits. In the short and medium run many rural households were put into a difficult situation. Also Thailand's elephant population fell into serious problems when it became effectively unemployed (see ch. 9.4).

3. Thailand has been unable to cope with the imbalance of timber and wood product imports and exports. In economic terms, forestry and the forest product industry have reduced production foregoing considerable income. Markets responded with higher prices, which led to increased imports and additional expenditure of foreign exchange. In the 1990s shortages and higher prices also caused the private sector and involved parties to increase illegal harvesting which has been difficult to bring under control (cf. Lakanavichian 2001).

4. A logging ban does not work alone but needs supporting and complementary measures (Brown et al. 2001). In the Thai case, these measures came late, were inadequate and did not have the desired impact. The purpose of the Reforestation Campaign of 1994-1996 was, *inter alia*, to offset the impacts of the ban but production from these plantations started only around 2000 and it was in pulpwood, not sawlogs which was the market affected by the ban.

5. Since the late 1990s, extensive media coverage, international concerns and export market requirements have been important in bringing illegal logging largely under control in Thailand.

6. There is still concern on cross-border impacts of forest destruction and degradation. Due to the high demand, particularly for teak, which cannot be legally supplied from domestic sources, the question is how these demands are being met by importing timber from neighboring countries. Since the transparency of the market is not adequate, there is great apprehension of some illegal logging in the neighboring countries, especially those have large forest areas near the Thai borders. There is a need to continue cooperative efforts with Myanmar, Cambodia and Laos in order to avoid negative impacts of the Thai imports in those countries. Improved market transparency is important in this cooperation.

7. People's participation can make enforcement effective. Even the fairly large enforcement staff of RFD and DNP only have a fairly limited effect on controlling illegalities.

8. As a whole, the main lessons to be learned from the Thai logging ban can be summarized as follows: (i) adequate analysis of options to achieve the attempted objectives and their impacts should be done beforehand; (ii) the preparatory process should be participatory where all the legitimate interests should be considered, (iii) lead time should be allowed for economic operators to adjust their activities, (iv) adverse impacts on disadvantaged groups should be mitigated as far as possible, and (v) adequate support and complementary measures should be taken.

9. The logging ban will greatly limit the economic opportunities offered by community forestry development. In due course, options should be considered how the logging ban could be adjusted to allow sustainable community-based timber production to enter the domestic market (e.g. by applying forest certification or other independent auditing as a validation instrument).

8.3 Financing and Other Incentives

Besides creating awareness and proper legal framework, financing plays a crucial role in forestry. To meet the domestic demand for industrial wood, fuelwood, fodder, fruits and fibre etc., plantation development is inevitable. The required heavy investment cannot be borne by small farmers. The Government has provided some incentives through the programs like Private Treefarm Promotion Plantation which also involved subsidies (see ch. 5.2).

The Bank for Agriculture and Agricultural Cooperatives (BAAC) was founded in 1966 as the funding source for farmers and farmers' institutions as investments in their agricultural or related activities. BAAC is now the largest macro credit provider in Thailand for all farming purposes. It also provides

first step and second step loans to agricultural co-operatives. The annual credit volume is US$ 8billion for farming activities and US$ 2 billion for non-farming activities.
BAAC is also involved in the protection of forests by encouraging people to plant trees on a large scale, making it a movement. There are 5.2 million farm families which BAAC has started to engage through training and other awareness programs to have at least 9 planted trees/family/year. The number 9 has been chosen as the present King is the 9th king of Thailand.

BAAC has a credit scheme for plantation of rubber, eucalyptus, bamboo and other trees. It does not lend to farmers who cut the trees. Credit covers only part of the costs as it is feared that if more money is given, it will create avarice in the minds of the people which will lead to cutting of more trees. The credit scheme is a 10-year plan for provision of long-term loans up to 20 years. It is difficult to identify the right farmers for lending but BAAC is taking necessary steps to ensure that the credit is not used for other purposes. BAAC is also making necessary advertisements in television and other media against cutting of trees and contributing significantly towards the social and environmental goals. BAAC's approach is not economic and does not take into account that planted trees will have to be harvested one day anyway.

Many other agencies like Electricity Generating Private Limited are also joining hands with BAAC in this context to communicate to farmers not to destroy forests. Farmers are encouraged to carry out afforestation and reforestation by provision of free seedlings from departments whereas the necessary initial expenditure can be borne with the help of the loan provided by BAAC.

The annual budget for forestry sector credits is US$ 100 million. The funds allocated for training and capacity building (direct and indirect) is US$ 2.5 million. The loan is provided to the farmers at an interest rate of 7 per cent for 10 to 25 years. The repayment capacity of the farmers is good as non-performing loans to tree planting represent only 4% of the portfolio. The grace period for the repayment is 3 to 5 years.

BAAC is also helping the farmers in the production of handicrafts made from bamboo, cane etc. It is playing a significant role in the capacity building of the farmers and the workers in the field of dyes made from silk, baskets, etc. from bamboo. BAAC recognizes that the handicrafts which are difficult to make are easy to sell and generate good profit, but if the products are easy to make, they become difficult to sell.

Assessment

1. There must be proper access to credit facilities. Lending to forestry activities is more costly than for agricultural activities. Small farmers cannot invest large sums of money in raising plantations unless they are financially supported. BAAC is no doubt doing a valuable work which must be promoted to reach increasing numbers of small farmers in the country.
2. There is a need to strengthen training and extension activities in the field of private forestry to motivate people for afforestation and other forestry activities. Moreover, incentives and supply activities must be encouraged.
3. Subsidy makes the farmer more dependent and less focused than credit. The farmers should become self-reliant but lending, training and facilities are necessary to achieve this goal.
4. There is a need to strengthen the perception among BAAC and other support agencies concerning the planting as an economic activity which should be financially viable and capable for repayment of the credit.
5. BAAC should also look into modalities for lending to community forestry.
6. Short-rotation plantations for timber production could be an attractive target for financing institutions and they do not need to be subsidized.

9. INSTITUTIONAL CAPACITY

9.1 Development of Forest Policy

9.1.1 Past Policy Decelopment

Before 1985 the forest policy was expressed primarily through subsequent pieces of legislation (Box 9.1, see also ch. 2.2.2). In the first phase forests were brought under state ownership and management. The legal status of the permanent forest estate was established either as protected areas or forest reserves. In the latter phase, concessions were given to private operators and the state-owned FIO which were subsequently cancelled when the logging ban was instituted.

As part of the policy implementation the institutional structure was built up and adjusted, and various government programs were implemented. The evolution of the related legislation on land and promotion of agriculture also had an impact on forest policy implementation. (Box 9.1)

A National Forest Policy was drawn up and adopted by cabinet in 1985 in an attempt to consolidate sectoral policy in the country and to place forestry within the context of overall national development (Box 9.2). The process of preparing the policy was thorough and detailed, with extensive public hearings and input. Reforestation and afforestation were seen as important strategies to supply future wood demand in the country. The private sector was to become involved in tree planting and, in addition to meeting domestic demand, export supply was also foreseen. The Policy identified the need for partnerships between the public and (commercial) private sectors. Short, medium and long-term plans were mandated for development of forest lands and the forest industry. Forest laws and regulations were to be thoroughly reviewed and revised and RFD was directed to encourage local community participation and to cooperate closely with the private sector. The Policy urged all components of government and society to collaborate with RFD in defining and maintaining a forest resource base which can support the needs of society (Pragtong & Thomas 1990). However, the Policy was silent about the root causes of deforestation and poverty reduction in forest areas and it did not explicitly involve rural people.

The Forest Policy was not successful in addressing the root causes of deforestation (which are largely outside the sector), the growing imbalance in the demand and supply of industrial wood and woodfuels, illegal operations in forest harvesting, and livelihoods of people who were living in and around forest areas, often without proper permit or tenure rights. As a result, the process of degradation has continued. In the late 1980s this led to so serious consequences that a logging ban in natural forests as a drastic measure was introduced. The focus of the forest policy shifted thereafter towards an emphasis on conservation which still continues as reflected in the forest area targets for production and conservation. The usefulness of such a target can, however, be questioned, particularly as it is has not been achieved after more than 40 years of application (Box 9.3).

With the shift of the emphasis in the forest policy towards conservation, the production aspects have been set aside. Pragtong & Thomas (1990) raised three key issues in this respect which still remain to be clarified: (1) to what extent should economic forests emphasize natural forest management or intensive tree plantations; (2) to what extent should public forest lands be privatized; and (3) what scale of management units should be emphasized in private-sector collaboration.

Box 9.1 Key Milestones of the Thai Forest Policy

Year	Policy measure
Mid-19th century	- Commercial forestry with exploitation of teak started and expanded with road network under the partnerships of princely states and British foresters in Burma.
1874	- Proclamation of the monarchy's legal ownership of all land. - Royal order was issued to collect tax on the export of timber;
Early 1890's	- Legislation enacted to require government approval of any contracts between foreigners and northern lords prohibiting overlapping concessions.
1896	- Establishment of the Royal Forestry Department and termination of northern lords' control over forest resources.
1897	- Royal Order was issued to regulate cutting in teak forests.
Late 1890s	- Enactment of the Forest Protection Act, the Teak Trees Protection Act, a law prohibiting the unauthorized marketing of timber, a law outlawing teak extraction unless duties and royalties were paid.
1901	- Land law of documented individual private ownership, which distinguished factual occupancy (without legal protection), and ownership (protected). This led to confusion and conflicts.
1913	- The Forest Conservation Act was passed during the time of King Rama VI.
1932	- Constitution.
1938	- Promulgation of the Act for the Protection and Reservation of Forests.
1941	- Enactment of the Forest Act. Forest land was defined as "land which has not been acquired by any person under the land law. Farming on such land (Pah Sa-nguan) was legal only under authorization by RFD. This created incentives for entrepreneurs and landless farmers to migrate into previously forested areas and establish claims. - RFD is placed in the Ministry of Agriculture and Cooperatives. - The Forest Act provided the most comprehensive coverage of forest law. It has been amended several times, but remains the basis of forest law. It regulates forestry-related activities on all lands that are not under private ownership and prohibits the felling of certain species of trees whether they are on private or public lands.
1945	- The end of colonial teak era with the termination of concessions to foreigners which were not renewed. Logging continued under the concession system for national entrepreneurs.
1954	- Enactment of Land Code: anyone occupying forest land was eligible to receive a claim certificate (Nor Sor 1) which could then be upgraded to temporary occupation (Nor Sor 2), a certificate of utilization (Nor Sor 3) or a title deed (Nor Sor 4 or Chanode).
1960	- Enactment of Wildlife Reservation and Protection Act.
1961	- Government Decree to establish that at least one half of land cover to be permanently retained as public forest land. - Enactment of National Lands Act
1962	- Promulgation of the National Parks Act and establishment of the first National Park (Khao Yai).
1964	- Enactment of the National Forest Reserve Act which established gazettement of forest reserves with the intention of slowing deforestation. A target was established to set aside 50% of the country's land area as forest (already defined in the 1961 Government Decree).
Late 1960s	- Promotion of export oriented cash crop agriculture which led to conversion of degraded concession areas into farm lands.
1974	- Declaration of amnesty for occupants of forest reserves. - Enactment of the Agricultural Land Consolidation Act.
1975	- Approval of Plan for the Forest Village Program managed by RFD. - Enactment of the Agricultural Reform Act. - Launching of the National Forest Land Allotment Project which allowed leasing of up to 2.4 ha for three years without tenurial provisions.
1983	- Enactment of the Land Development Act
1985	- Adoption of National Forest Policy which reduced the forested area target to 40% (15% protected forest, 25% economic forest). - RFD was authorized to classify about 20% of the public forest land (Pah Sa-nguan) as non-forest. - Resolution on Watershed and Land. - Five-year Resettlement Program (khor jor kor) allowed commercial reforesting of degraded forest.
1989	- Logging ban in natural forests.

Box 9.1 Key Milestones of the Thai Forest Policy (cont'd)

Year	Policy measure
1991	- Eviction of occupants in khor jor kor areas started but led to a moratorium. - 7th National Economic and Social Development Plan changed the forest area target of 40% (25% - protected forest, 15% economic forest).
1992	- Land reform. - Completion of the Forest Master Plan with a focus on rural development and community forestry. - Amendment of Wildlife Reservation and Protection Act. - National Enhancement and Conservation of Environmental Quality Act.
1993	- First draft of Community Forestry Bill.
1994	- Tambon Administration Organization Act.
1997	- New Constitution was adopted with provisions for communal rights in the conservation and use of natural resources. - First Policy and Perspective Plan for enhancement and Conservation of National Environmental Quality (1997-2016) included guidelines for institutional reforms for the management of community forests, water, biodiversity and protection of watershed; and participation people and community. The forest cover target was set as 50% (30% conservation and 20% economic forest).
2002	- Separation of DNP from RFD. - Establishment of the Ministry Natural Resources and Environment. - Adoption of the 9th NEDP with earlier forest cover targets for production forest (reforestation).
2005	- The draft Community Forestry Bill was still discussed in the Parliament in a Joint Committee.

Sources: Sittichai et al. 2006; Rasmussen et al. 2000; Lynch & Talbott. 1995

Box 9.2 Key Measures of the 1985 National Forest Policy

1. Promoting shared forest management between the Government and the private sector.
2. Improving the administration system to make it compatible with the changes in the forest situation.
3. Specifying the target forest areas at 40% of the country's area (15% conservation forests and 25% commercial forests).
4. The Government and the private sector should jointly develop and manage the forest area both for direct and indirect benefits.
5. Reducing forest destruction by improving agricultural technology.
6. Integration of the Forest Development Plan into the National Development Plan.
7. Accelerating the city planning process and designing forest utilization zones in each province.
8. Appointing a National Forest Policy Committee under the Forest Act.
9. Intensification of private forest plantations to meet the needs of forest industries.
10. Defining 35% slope areas as forest areas.
11. Creating incentives for private forest plantations.
12. Planning of human resources development and settlement based on nature conservation basis.

Box 9.3 Forest Cover Percentage as a Policy Goal

- The forest cover percentage as the key sectoral goal was introduced in Thailand by a foreign forestry specialist more than 50 years ago. The country's forest policy has been formulated within the framework of achieving a target percentage of land area to be covered by forests. The original target was 50% and it has since then been revised (mostly downwards) several times differentiating the areas reserved for production and protection forest.
- In this way, the forest policy goal was reduced to one single indicator and setting of the targeted values for economic and protection forest was a reflection of value judgement. It was not based on scientific knowledge on how much forest would be needed in Thailand for the maintenance of the environmental services of the country's forests, or on assessment of what should the forests' socio-economic contribution to the nation's development be.
- The forest cover percentage is a simple indicator which lends itself to straightforward monitoring if necessary information is available (as has been the case in Thailand). But, it has also shortcomings: (a) it makes implicit assumptions on the relationship of forest cover and the contribution of forests to environmental conservation and socio-economic development, and (b) the division between protection and economic forest is too simplified a vision on practical forest management.
- The implicit assumption of the past policy is that biodiversity conservation is being addressed by setting aside a network of different categories of protected areas. As a result, little attention is being paid to addressing biodiversity conservation in other land use categories, including other forests, TOF and other resources. However, as deforestation and forest degradation continue to erode the biodiversity base of the country, it is becoming increasingly clear that the protected area system alone will not be sufficient to ensure that biodiversity is adequately conserved. Analyses in many countries have indicated that, while a well-designed network of protected areas provides the essential backbone of conservation needs, attention should also be paid to a conservation agenda outside the protected areas (Kanowski et al. 1999). The introduction of biodiversity conservation as an element of rehabilitation activities in production forests is one way of doing this.

9.1.2 Sectoral Planning

In the new situation an attempt was made to revise the Forest Policy in a comprehensive manner. The Thai Forest Sector Master Plan (FSMP) was prepared in 1992 involving detailed analysis of all the relevant aspects. Due to weak local capacity in strategic planning, the planning process was largely driven by outside technical experts. The process and contents were severely criticized by NGOs (both inside and outside the country) on three basic counts (IUCN 1996): (a) the plan did not pay sufficient attention to broader sectoral issues, (b) the plan was not sufficiently attuned to changing societal interests in forest management, particularly the shift from an emphasis on exploitation to one on conservation, and (c) the process used to develop policy positions was too technically driven and lacked effective participation of key stakeholders.

A particularly conflictive issue was plantation development as it was felt that it would lead to large-scale transfer of land from smallholders to private companies and investors (Carrere & Lohmann 1996). In spite of these shortcomings, many of the Plan's actions were gradually implemented (including the enactment of new legislation).

In April 1997, an improved version of the FSMP was presented for consideration to the National Forest Policy Committee (NFPC), which agreed in principle and asked RFD to update the Plan according to the changing situation of the country, including the preparation of an action plan, for approval by the Cabinet.

The mid-term review of FSMP, supported by FAO, was completed in 2002, stressing the urgent necessity of a reformulation of the country's forestry sector policy. Major changes had occurred both in the political and legal framework at the national level and in international initiatives which should now be taken into account. This recommendation has not yet been implemented but in 2005 a workshop was organized with FAO's assistance to encourage the country to launch a national forest program (NFP) process in Thailand (NFP Facility, 2005).

9.1.3 Cross-sectoral Linkages

Macro-economic and other sectoral policies have major direct and indirect impacts on the country´s forests. A comprehensive review was not possible but the Mission has noted the following[51]:

Land allocation programs. There are still many new and old forest encroachers living on forestlands (including protected areas, national parks and wildlife sanctuaries) who do not want to be relocated to the new areas. The Government has implemented several land allocation programs and there are also on-going initiatives. These programs transfer what is presently classified as forest land to other uses. Most of this land is assumed to be without forest cover.

Agricultural policies. Several programs are underway to expand cultivation of rubber, sugarcane and other cash crops, particularly in the Northeast. New cultivation areas will have to be found in zones which are presently gazetted as forest reserves. The Ministry of Agriculture and Cooperatives has developed nine policies for action which include a policy on resources of forest, soil, water, coastal area and biodiversity containing for land reform, land management, survey and use of forest resources, eco-tourism, improvement of agricultural production in irrigated areas, and prevention of pollution.

Rural development policy. Natural forest conservation and protection are included in the constitution and the rural development policy to maintain and improve the rural environment. At the local level, a forest officer is a member of the drafting committee for the rural development policy to ensure that forest resource management is incorporated appropriately into rural development programs.

Industrial development policy. The RFD does not permit the establishment of new sawmills. Gradually, wood-processing enterprises have installed high-efficiency machinery to increase recovery rates and wood residues are used for reconstituted panels, bioenergy and other purposes (e.g. rubberwood sawdust as a growing media for mushrooms). Many lesser-known species are being used as raw material. Even the old stumps of trees in the over logged forests are being used by the furniture and wood-carving industries.

Infrastructure policy. The Government has strict regulations for controlling construction of dams, roads, reservoirs, highways, etc. Project plans have to be passed by the national environmental committee, in which forestry experts are members. Every infrastructure project should minimize damage to natural forest resources.

Indigenous people. RFD and the Hilltribe Welfare Office of the Public Welfare Department have implemented a program to settle shifting cultivators in the North region. Permanent villages have been provided with access roads, schools, health centers and agricultural extension offices. Only part of the needs can, however, be attended. Permanent agricultural practices with soil conservation techniques and promising crops have been introduced to support a better living for the settlers, even if some settlements have failed to meet the targets.

By Ministerial Resolution on 4 April 1985, the Government granted amnesty to all forest encroachers who had been arrested and prosecuted and allowed them to use the land that they had occupied formerly; this resulted in extensive forest destruction as there was no evidence to establish the exact land boundaries. Thousands of new forest encroachers discovered this loophole and joined forces in clearing more forests. There is no reliable data but it is estimated that the forest areas occupied by these people amount to two million hectares.

Assessment

1. The development of the Thai forest policy has involved rapid changes which have not been properly prepared. The targets have focused on the forest cover and they have not been achieved indicating lack of realism. Downward adjustments have contributed to the lack of credibility of the national goals and the forestry sector as a whole.

[51] The list is largely based on the FAO NFP database (www.fao.org)

2. The 1985 National Forest Policy has been in force for two decades now, but some key issues still exist. Forest encroachment and poaching continue as root causes have not been properly addressed. The rural household and industrial wood demands are not being met on a sustainable basis. More importantly, the long-established conflict over land use of state forest land by local people remains unresolved.

3. The use of forest cover as the key sectoral goal has serious limitations even though it is easy to monitor and communicate. The concepts of protection forest and economic forest represent a simplified view on sustainable forest management which in practice should involve a continuum of various combinations of protection and economic objectives at the level of stand, forest management unit and landscape. There is now also a false perception that only planted forests are economic forests.

4. It is evident that the top-down government policy to protect and conserve natural forests has failed to obtain the cooperation from the rural poor who live close to or within the forests. The policy-makers do not know enough about the lives of forest encroachers who are destitute and have no rights to the natural resources (cf. Brown et al. 2001).

5. If the forest policies are not duly incorporated into the national social and economic plan, they do not endure and their impact is limited. The references to the forest sector in the 9th NESDBP are general and do not provide sufficient guidance for the Government and stakeholders for the development of the forest sector.

6. There is a need to launch a national forest program process involving broad-based participation. It would offer a major opportunity to advance consensus on key forestry issues which are still impeding efforts towards SFM. Cross-sectoral linkages should be duly addressed in the NFP. The launching of the NFP process should be considered a top priority by the Government as a major tool to clarify the goals of the national forest policy in the present situation and to adjust the policy instruments for their achievement.

9.2 Public Administration

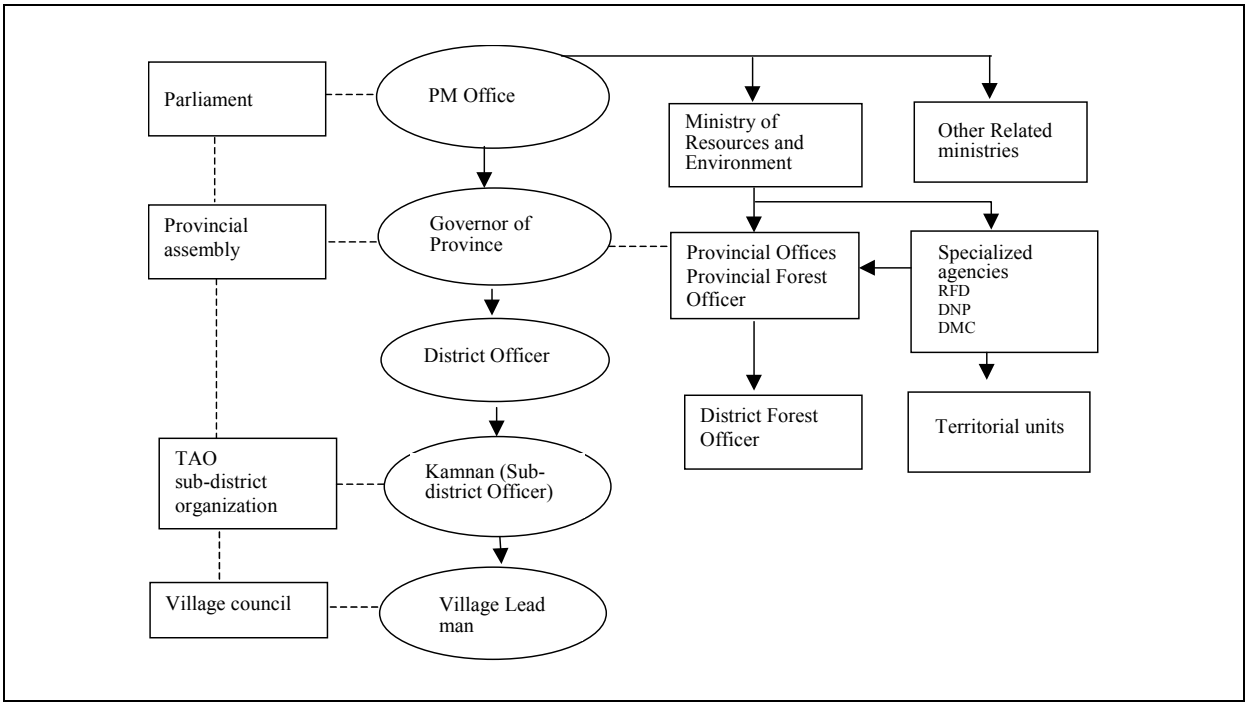
9.2.1 Organizational Structure

In the Thai public administration forestry, has been the responsibility of the Royal Forestry Department (RFD) since 1896. The Department was originally an independent unit but since several decades it has been under the control of various ministries. In 1941 RFD was placed under the Ministry of Agriculture and Cooperatives (MOAC) as the productive role of forests was emphasized. In 2002 RFD was transferred to the newly established Ministry of National Resources and Environment (MONRE) and it was broken down into two independent departments: RFD and DNP, while the management of mangrove forests was transferred to the Department of Marine and Coastal Resources (DMC).

The Government's policy is to promote decentralization strengthening the line of command from the level of provincial governors down to districts and sub-districts (TAOs) (see ch. 9.3). These are elected bodies at four levels (parliament, provincial assembly, TAO and village) which work together with the line officers of the public administration (Figure 9.1). Specialized agencies have had their own territorial units but since the establishment of MONRE, RDF staff have been assigned/seconded to the Ministry's provincial offices. MONRE had no other field staff in the beginning and forest officers were also assigned duties related to environmental regulation and natural resource management. As a result, there are now less human resources for forestry than in the past. The decentralization process is far from complete and it appears that RFD will have less and less human resources in the future[52]. This is a major cause of concern.

[52] During the mission, it was learned that about 1,000 RFD staff will be transferred to other administrative units.

Figure 9.1 Institutional Framework of the Forestry Sector



When DNP was separated from RFD, it was given the following main responsibilities: (i) conserve, protect as ell as maintain forest resources and wildlife in balance for sustainable use of natural resources to the highest economical and social benefits; (ii) rehabilitate and restore the deteriorated natural resources and ecosystems in the forest areas; (iii) monitor and prevent forest encroachment and offences to the forest law, forest reserve law, national park law, wildlife resources and biodiversity; (iv) study, research and develop conservation, management and rehabilitation methodologies of forest, wildlife resources and biodiversity; (v) establish ways and means as well as standards of conservation, management and utilization of forest wildlife resources; and (vi) providing information and technology transfer service.

RFD was left with regulatory functions outside protected forest areas, promotion of community forestry and private sector plantations as well as some aspects of forest research including on forest products (Table 9.1).

The apparent intention of the current arrangement was division of work based on the territorial duties of the two departments, i.e. DNP being responsible for protected areas and RFD outside these areas. This is, however, not reflected in the designated functions and can be interpreted as a misunder-standing of forestry as a functional activity. More specially, the following observations can be made:

- there is an element of duplication of activities (planning, administrative and support services)
- parallel units for the same functions (control) require coordination which appears to be difficult to organize in practice[53],

[53] Views expressed during field interviews.

Table 9.1 Oganizational Structure of RFD and DNP in 2005

Main function	RFD	DNP
Administrative and support offices and divisions	Office secretary Central administration Internal auditing System administrative development	Central administration Internal auditing Public service development
Functional offices and divisions	Planning division Permission division Forest management and control office Community forestry management office Forest plantation promotion office Forest management and products research office	CITES division Planning and coordination office National parks office Watershed conservation and management office Forest protection, suppression and wild fire control office Forest and plant conservation research office
Regional, provincial and local level	Territorial mission group at provincial and district levels	Regional conservation management offices (16) Protected area units

Sources: RFD and DNP

- many of DNP's functions extend beyond protected areas (watershed conservation, protection, fire suppression, rehabilitation of degraded areas) which should functionally be RFD's responsibility,
- RFD has no human resources to carry out these tasks in forest reserves even though it has responsibility for their management,
- there appears to be overlap also in research activities,
- coordination and cooperation between the two departments at the field level appear to depend on good personal relationships between responsible staff rather than based on a clear identification of duties and responsibilities.

As a conclusion, RFD has been marginalized having been stripped of some of its key functions and there is currently a lack of clear vision among public sector administrators of what the Department's mission is and what its functions and resources should be. The Mission considers this a serious bottleneck for making progress towards SFM in the country.

9.2.2 Human Resources

The institutional structure described above is also reflected in staff levels: in 2004 DNP had 2.4 more times staff than RFD (Table 9.2). The staff structures are also a cause of concern for the following reasons:

- 62% of RFD's staff are based in, or subordinated to, the headquarters,
- some field staff report directly to the DG instead of being subordinated to provincial forest officers,
- the double roles of the provincial forest staff working for MONRE and RFD tasks are not clearly defined,
- in RFD the ratio between officers and employees is 2:1 (in DNP 1:1.2); this is far from optimal as the ratio should rather be 1:2 (or more)[54].

[54] When outsourcing is not widely practiced as is the case in Thailand

Table 9.2 RFD and DNP Staff, 2004

Department	Officers	Employees	Deputy employees[1)]	Total	%[2)]
RFD					
- Headquarters[3)]	1,425	1,093	...	2,518	62
- Field level [4)]	1,130	384	4,500	7,014	38
Total	**2,555**	**1,477**	**4,500**	**9,532[5)]**	**100**
%	**63**	**37**		**100**	
DNP					
- Headquarters	913	764	...	1,617	18
- Protected area administration[6)]	3,344	4,515	12,000	7,859	82
Total	**4,257**	**5,279**	**12,000**	**9,476[7)]**	**100**
%[2)]	**45**	**55**		**100**	

1) Casual labour
2) Excluding "Deputy employees"
3) Includes staff seconded to field level but reporting to the headquarters
4) Provincial, district and project staff
5) Excludes about 4,500 temporary staff
6) Regional and PA offices
7) Excludes temporary staff, the total staff of officers and permanent employees was 11,921 in February 2005

Sources: RFD and DNP

In conclusion, there is lack of a clear line of command among a significant share of RFD's field staff and the structure of personnel does not reflect the operational duties of the organization.

9.2.3 Financial Resources

The financial resources assigned to RFD represent 12% of those of DNP (Table 9.3) while its staff levels are 42% of those of DNP. Even though direct comparisons are easily misleading. This is a cause of concern. Revenue generation is a marginal element in the finances of RFD (5% of the expenditure) mainly coming from various fees[55]. Also DNP can generate only 5% of its expenditure through its own revenue resulting mainly from entrance and other fees in national parks. It is also recalled the RFD has a management responsibility for 9.4 mill. ha of forest reserves while DNP's protected areas amount to 23 mill. ha.

As a conclusion, RFD's financial resource allocation does not appear to correspond to its mandate and it is obvious that most of the available funds go for staff salaries and other fixed costs instead of developmental field implementation.

Assessment

1. In RFD, there is no proper line of command, which needs to be looked into. Duplication of extension work by several agencies is not proving efficient, instead confusing the farmers who are finding the messages from different agencies conflicting with each other. Therefore, for proper forestry development, RFD extension efforts need to be augmented and better coordinated with other field offices and NGOs to avoid duplication of activities.

[55] The Permission Division has a staff of only 171 which suggests that the fiscal cost-benefit ratio of fee collection is possibly negative.

Table 9.3 Government Budget and Revenue of Royal Forest Department and Department of National Parks, Wildlife and Plant Conservation, 2003

	RFD	DNP	Total
Expenditure		- US$ million -	
Personnel	13.0	106.2	119.2
Operational costs	4.5	27.9	32.4
Investment	4.2	58.2	62.4
Other	0.9	2.5	3.4
Total	**22.6**	**194.9**	**217.5**
Revenue			
Royalties and sales of timber	0.0	0.0	0.0
Sales of confiscated goods	0.0	0.2	0.2
Fees	1.0	8.5	9.5
Others	0.1	1.6	1.7
Total	**1.2**	**10.3**	**11.5**
Revenue share of budget expenditure	**5.2**	**5.3**	**5.3**

Source: RFD 2004b and National Park… 2004.

2. There is confusion and overlapping between the functions and tasks of RFD and DNP. Moreover, there is lack of formal coordination mechanism, which is detrimental for the forestry and wildlife sectors. Both departments could be re-merged with more precise and clear mandate under a single line of command, for better coordination and understanding. It would have more meaningful impact on the people, senior bureaucrats and the politicians for the overall development of the sector. Both departments would then have a stronger role. However, it also possible to keep the two departments separate, but the above issues should be duly addressed.[56]
3. There is overstaffing at higher and middle levels, i.e. at officer level in the (RFD) headquarters. There is an urgent need to reduce this burden of large number of officers; instead more field staff could be recruited (or assigned from the headquarters) as they are very limited at present.
4. There is a need to reduce the number of offices at the center and at the province level dealing with minor subjects which have inter-related impact. These functions could be combined at some place, probably in the headquarters. This would lead to a single line of command with clear directions and obviously the implementation would be more focused than at present.

9.3 Decentralization

9.3.1 TAOs and Villages

Decentralization has been the government policy since the 1992 Tambon Administration (TAO) Act which provided a greater role for local government units in forest and other natural resource management. Under this act, TAOs (sub-district governments units) have responsibility for managing all natural resources within their boundaries. TAOs should also ensure that sustainable use and conservation of local natural resources and the environment is achieved. The decentralization process was further strengthened by the 1997 Constitution which states that local people and organizations should be involved in managing their natural resources (Box 9.4). These two laws enshrine people's participation in forest management and pave the way for clarifying land-use issues and people's role in forest management (Poffenberger 1999). However, it is not yet clear how the implementation should be carried out.

[56] In other countries there are both positive and negative experiences related to keeping production and protection functions separate, or combining them into one single department.

Box 9.4 Constitutional Framework of the Rights of Rural People to Participate in the Management and Use of Natural Resources

Section 3: Rights and freedom of the Thai people
Clause No. 46: Communities shall have the right to preserve and restore the traditional culture, knowledge and local fine arts of their local community and of the nation, and participate in the management, maintenance, preservation and utilization of natural resources and the environment in a balanced way as provided by law.
Clause No. 56: The human right to participate with the state and community for maintenance and utilization of natural resources and biodiversity and protect and promote the quality of environment for better living and better quality of life. This right must be covered by law.
Section 5: Basic policy guideline for the state
Clause No. 79: The state shall promote and encourage public participation in the preservation, maintenance and balanced exploitation of natural resources and biological diversity and in the promotion, maintenance and protection of the quality of the environment in accordance with development principles.

Source: The 1997 Constitution

The TAO is the lowest level of the local government administrative structure. It is made up of the tambon chief, the village headmen from each village in the tambon and the tambon health officer, and two elected members from each village in the tambon.

The level beneath the TAO is the village, which is the smallest community unit in Thailand. The designation of a village is legislated [57] as follows:

- Existing villages must have more than 400 resident villagers before they can be divided into the existing village and a new village.
- If the existing village has more than 400 people but the village headman can comfortably care for the enlarged population, there is no requirement for designation of a new village.

The village is managed by the village headman, two assistant village headmen and the village committee. This committee is the basic operating structure at the village level. The village committee acts as the advisory board to assist the village headman in his routine work. The village committee is subdivided into sections related to work areas for i.a. developing village plans and related projects. In addition, villagers form groups which usually include savings fund group, agriculturists group, women's group, youth group, etc. Other groups can be established to facilitate collaboration in specific areas. This approach is thought to be more practical than working with individual villagers. In almost every village in Thailand there is at least one such group. Some groups are functioning well while other may exist on paper only. Village forestry groups are usually initiated by Provincial, District or Tambon Officers who can participate in the preparation of respective development plans.

In spite of legal provision, it appears that for the time being decentralization of power and authority to TAO level has had a limited impact on local control and management of surrounding natural resources. Obstacles include unclear mandates, lack of budget, limited personnel and no clear procedures. The proposed Community Forestry Bill would improve the situation as it would clarify at least the role of TAO in the establishment of community forests (see Ch 4).

There are some lessons from the TAO process which are relevant to forestry development. A key requirement for promoting natural resource activities is adequate knowledge of what is possible and understanding of what people's rights and responsibilities are. One method that can speed up this learning process is by facilitating study tours where people learn by seeing. Interested villagers should be given the opportunity to visit successful managed villages to observe how success has been achieved. This method is also the most suitable medium for exchange of ideas for relatively poorly educated rural villagers. The support of the public sector as represented by local government must adapt its role from "caretaker" who does everything for the communities to that of a "helper". The objective of support organizations should be to promote true participation of the people in their

[57] By The Executive Service Regulation of the Kingdom of Thailand Act 1914

development. These simple lessons have been hard to interiorize by civil servants but there is now growing awareness of their fundamental importance.

While at the TAO level state's power is still dominating in the control of natural resources, at village level the political reform of decentralization appears to open more space for different fractions of people to hold and withhold their stands and the power relationships can become quite complex. The dominant politico-economic elites and their fractions of villagers are expected to be challenged in resource mobilization and accumulation by the poorer factions which by definition should lead to losing some of their earlier power (Prabudhanitisaarn 2004). This positive development induced by the decentralization policy reform will give more power to the powerless groups in the village and the Community Forestry Bill would ensure that they would as groups have formal access to resources which was not possible before.

9.3.2 Role of Provincial Government

The Thai Government has recently adopted a new approach for provincial government[58]. Governor is considered Chief Executive Officer (CEO) of the province and the local staff of all the agencies should be working to support him. The five-year strategic plan of the province is the key instrument of management as it provides the targets, the framework of the budget and other resources. Monitoring is based on Key Performance Indicators (KPI) which are agreed upon for individual units. Provincial level targets and KPIs are partly amalgamated based on tambon and village plans. The overall approach of this reshaping of public administration is targeted at putting people as customer of public administration in the center and the local level action at the focus of all government efforts. KPIs are expected to include such indicators as the forest cover for which the Governor would personally be responsible to the Prime Minister.

This will have major implications for the field level forestry administration as the provincial and field level work would be targeted at achieving village/TAO/province targets. Strategic plans should have clear strategies for sustainable forestry development in the province but these are not yet defined. The central administration's role (apart from PA management) would be emphasizing the normative and facilitator functions rather than being in charge of the execution. The central agencies would be expected to provide necessary tools and information and make sure that the adequate human resources are available for local efforts.

Assessment

1. The legal provisions for local government at tambon and village level provide a suitable administrative structure to transfer the responsibility of forest resource management to villages and villagers' groups. In community forestry it will be necessary to have clear internal rules of the village for how forests will be managed and utilized and what the rights and responsibilities of the community forestry groups are in order to avoid internal conflicts later on if the activities become economically important.
2. The on-going change in the revamping of the role of the public administration represents a paradigm change and its operationalization will be a long learning process. Provincial and District Natural Resource/Forest Officers should assume a strong role and develop solid strategic plans for the forestry development. Guidance for how such plans should be prepared does not exist and this, together with associated training, should be addressed by RFD as a top priority. In view of the large number of provinces the task is extensive.
3. The role of the protected area administration within the new structure is not yet clarified as many PAs extend to more than one province. There is, however, a need to link DNP's activities to the elaboration and implementation of provincial strategic plans.

[58] Information based on the Public Sector Development Commission

9.4 Forest Industry Organization

Forest Industry Organization (FIO) founded in 1947, is an autonomous State Corporation. FIO was originally set up for teak harvesting and industrial processing of teakwood. Subsequently, FIO got widely involved in reforestation and plantation development in accordance with the policy to reforest logged-over areas. Its role was further extended to research commercial growing of teak and fast growing species, nursery, and agro-forestry. FIO still has industrial operations and its elephant conservation activities are nationally important. It is still (at least in theory) the responsibility of FIO to balance wood production and consumption for the whole country even though its role in productive activities has become marginal and therefore this mandate cannot be effectively implemented.

9.4.1 FIO's Role in Plantations

FIO has played an important role in teak plantation establishment and utilization in Thailand. The total area of FIO plantations is currently 177,580 ha of which 49% is teak and 36% is eucalyptus[59]. The share of eucalyptus has increased rapidly. FIO has also 5,170 ha of rubber plantations which are important for its annual revenue. A fairly large area (12% of the total FIO planted area) is various other hardwoods (*Acacia mangium, Leucaena leucocephala, Dipterocarpus alatus, Acacia auricaliformis, Pterocarpus macrocarpus, Afzelia xylocarpa, Dalbergia cochinchinnensis*).

About 20 percent of the FIO lands are occupied by local farmers who are using them partly for agriculture. As a result, there is a strong conflict between the local people and the Company. The policy is to persuade these farmers to limit encroachment in forests. In the South region where rubber is grown on FIO lands, the benefit from latex is shared 50/50 between farmers and FIO but wood revenue goes entirely to FIO. Latex revenue represents almost 20% of FIO operating income from sales of products and services (Annex 5, Table 13).

FIO supports the local administration as 5-10 per cent of the gross revenue from eucalyptus plantations goes to TAO and in some areas also the revenue of teak plantations**.**

FIO (and its subsidiary Thai Plywood) involve smallholders in contract farming. The plots are usually no more than 1.6 ha. FIO provides free seedlings to the farmers[60] and buys the timber after 4-5 years. It offers a guaranteed market and price (presently US$ 25/m^3) for the farmer.

The Prime Minister of Thailand has recently set up a project in Asama District, Loyet Province in the Northeast region, to create sustainable economic tree resources for the eradication of poverty. The pilot project implemented by FIO is for 320 ha with interested farmers (mainly with rubber and eucalyptus). The program is planned to cover 160,000 ha over the next three-year period. Marginal private and public lands, paddy fields, etc. can be utilized for the program which is aimed at teaching people to earn more profits through tree growing.

9.4.2 FIO's Wood-Based Industry

FIO has three sawmills (one in the North and two in Bangkok) and one furniture factory (in Bangkok). It has one kiln-drying mill in Bangkok and one elsewhere. The sawmills are have a small capacity and they were designed for sawing large-sized teak logs[61] from natural forests. The equipment is not appropriate for the present raw material which is mainly small-sized plantation teak[62]. The financial result is therefore negative but the mills are kept in operation for social reasons. About 180 permanent employees are engaged in the industrial sector.

Thai Plywood is a wholly owned subsidiary of FIO. It has one plywood mill where the production is not continuous as runs are made to the order which reflects difficulties in competitiveness and

[59] FIO fact sheet, March 25, 2006 and management information.
[60] The cost of the seedling for Eucalyptus ranges from US$ 0.025 to 0.075/seedling.
[61] Typically 5-10m3/log.
[62] Typically 10 to 20 logs/m^3.

marketing. The Company has one MDF mill having capacity of 70-100 metric tons/day which is only 10% of the size of the modern production lines in Thailand. Most of its raw material in log form comes from Malaysia and Indonesia. Thai Plywood also imports veneer, particularly teak face that is bought from Myanmar. The core veneer is made from logs imported from PNG (about 2,000 m^3/month). There are 800 staff in Thai Plywood and the turnover is US$ 32.5 million per year. The debt burden is heavy amounting to US$ 57.5 mill. or 177% of the turnover. Such an operation cannot be considered viable.

The teak obtained from thinning is used by FIO in furniture making. This operation has expanded as it used to represent only 5% of the total operating income while, according to the management, it is presently about 20% (US$ 3.75 mill). FIO has been pioneering the use of teak thinnings for furniture making and its major achievement has been the acceptance of FIO garden furniture in the European outlets which refuse to buy furniture made from natural teak due to illegality and unsustainability concerns. FIO is also supplying plantation teak to the SME furniture industries which are concentrated in the Phrae Province. This cooperation has led to export trade also for the SME sector.

9.4.3 Sale of Teak and Confiscated Wood

FIO is the main supplier of teak in the country and its market share is about a third of the total national consumption estimated at 200,000 m^3 [63]. The balance is met by imports. In addition to logs and poles from plantations, FIO has also the duty and right to market confiscated timber, the volume of which is presently about 10,000 m^3/year on an average (see ch. 6.1).

Selling of logs is done by auction which is not optimal as buyers tend to form informal cartels to press prices down. With the confiscated timber, there is also the quality deterioration problem as the legal process can take up to five years from the confiscation to the sales of logs[64].

Due to its difficult liquidity situation (see ch. 9.4.5), FIO is forced to adjust its sales volumes according to the prices obtained. If price is high, FIO tends to harvest 50,000 m^3 but if prices are low more volume has to be sold. Within this income- based management framework, FIO aims to produce on average 60,000-70,000 m^3 per year as most of the plantations are still young.

In order to strengthen its market position FIO has attempted to achieve forest certification. The experience is however mixed as the first FSC certificate issued was subsequently cancelled. In addition to misunderstandings on the part of auditors, the main reasons were as follows:

- There was no input/effort for village welfare such as usufruct and taungya system rights etc. People's participation was not adequate in forest management decisions.
- Teak plantations were not managed on a systematic compartment basis (rotational blocks).
- Regional minimum wages were not applied and workers were forced to accept lower wages.
- There was no proper understanding among the staff about plantations (including the choice of species).

According to the FIO management, these deficiencies have now been addressed and the re-issuance of FSC certificate is foreseen in the near future.

[63] FIO estimate
[64] According to RFD, there is no major backlog of legal cases outstanding.

9.4.4 Elephant Conservation

There were 2,257 domesticated elephants in the whole country in 1998[65]. There are still 36 elephant camps in Thailand with about 1,000 elephants which can be classified into unemployed (53% of the total), tourism elephants (44%) and wandering animals (3%) (Tipprasert 2002). FIO plays an important part in elephant conservation for historical reasons as in the past the animals were mainly employed in forest operations. The conservation activities include the operation of a rehabilitation center to take care of elephants. FIO is presently running its elephant operations with its own funds[66] and considers them a social obligation.

Elephants are presently used mostly working for tourism. FIO's National Elephant Center attracts a large number of tourists. The Center provides training to the young elephants for tourism work free of charge. After training the elephant works for one or two years with FIO. FIO also organizes one-month training programs to the mahouts. For tourists, one-day training is provided for which a daily fee of US$ 25 is charged.

9.4.5 Financial Status

For its size of land assets and personnel, FIO generates only a limited turnover which varies from US$ 20 to 32.5 million per year. FIO and its subsidiary Thai Plywood are running at a loss which in the case of the parent company have represented about 2% of the gross revenue[67] (Annex 18). According to the management, there would be a gross operating profit of 35% this year. The financial result is burdened by heavy indebtedness as the interest payments are about US$ 0.7 mill. a year. Industrial operations are being run at a loss but they generate about 25% of the operating income (2001-2002). Ecotourism runs at 100% loss whereas the financial result of furniture making is reported to be positive. The available information does not allow reliable estimation of the profitability of individual operations.

Many reasons explain the weak financial situation. Lacking full information the Mission concluded that the following factors have probably contributed to the current unfortunate situation: (i) inadequate past financial management although the present management has made major improvements in this respect, (ii) inappropriate equipment and low productivity and efficiency in industrial operations, (iii) execution of tasks mandated by the Government which have no or partial cost recovery, (iv) various social obligations which go beyond the responsibilities of private companies.

Assessment

1. As a result of long historical development, FIO has evolved into a very diversified organization operating in resource management, industrial wood processing and marketing, tourism, conservation and social development. FIO appears to be an organization which is constantly loaded by the Government with new tasks without adequate consideration of financial, managerial and practical implications. The result is an operation which has extensive assets and broad mandates but inadequate revenue generating capacity to carry out its tasks.
2. There is no clear long-term vision and strategy about the organization's future role. FIO is in need of overhauling its operations, which would probably involve divestment or transfer of some of the duties and assets to organizations which are in better position to carry out the tasks.
3. Possible future roles for FIO could be (i) management of state-owned plantation assets (likely involving outsourcing), (ii) development of partnerships with farmers and other private landowners for production of timber and NTFPs, and (iii) acting as a catalyst for new technologies (utilization of teak thinnings, eucalyptus sawlog production and marketing, bioenergy, etc.). These roles (which are not exclusive) may include R&D activities as appropriate. If found justified, FIO may expand its sphere of activities by including supplying of

[65] There were 100,000 domesticated elephants a hundred years ago, almost all employed in the logging industry (Tipprasert 2002).
[66] In 2002 there was Elephant Aid Fund of about US$ 1 mill. accounted as equity in the balance sheet.
[67] Based on the balance sheets of the Company in 2001 and 2002.

quality planting materials, piloting new processes for raising source plants for NTFPs, channeling funds for tree planting and developing markets and providing market guarantees for forest products. Its promotional role should be seen in the context of the overall extension strategy of the forestry sector to avoid overlapping activities and staff structures. FIO could possibly best find its role in some priority zones where the RFD extension services cannot alone lead to the desired targets.

4. The Mission thinks that industrial operations are better carried out by the private sector than state-owned companies. Only few countries still have public enterprises running major forest industries. Earlier privatization efforts of Thai Plywood were not successful due to the weak industrial competitiveness of the facilities. There is a need for a re-valuation exercise of the existing assets, including technical evaluation of the equipment. Based on the results, possible divestment options could be developed.

5. The Mission recognizes the valuable work that FIO has carried out in the area of introducing new raw materials for furniture industries. State-owned production facilities are however not necessary for this, unless they primarily serve for training purposes for the entire sector. The future of the FIO furniture manufacturing should be viewed with this perspective.

6. With the decreasing work in timber processing, FIO needs to downsize its staff strength. The Mission also notes that the Board of Directors mainly consists of public sector administrators. There is a need to strengthen business management knowledge both in the Board and the managerial staff of the organization.

7. Together with its owner and the involved stakeholders, FIO should develop a clear vision and strategy on what its future role should be. This process should involve identification of options in view of the government policies and the strengths and weaknesses of the organization. The planning process should cover a detailed implementation plan for restructuring which is inevitably needed. The potential catalytic role of FIO in certification, extension to private farmers and R&D on diversified wood utilization could be considered in this context.

8. FIO's work on elephants is highly valuable but the duties, staff and facilities could be transferred to a separate body with a mandate on elephant conservation. The past link of this activity with FIO's operations has disappeared.

9.5 Forestry Research

9.5.1 MONRE Forest Research Units

Forestry research in Thailand started ten years before RFD was founded (1896) in order to develop knowledge on the extent of teak resources. For the early decades research emphasized the management of natural forests. Four regional silvicultural research stations were established in 1952 and others were added subsequently. The Teak Improvement Centre in Lampang and the Pine Improvement Centre in Chiang Mai were established with Danish support, together with three silviculture stations. Four lac research and extension stations were also established. Some collaborative research projects were carried out with the support of the Republic of Korea and Japan (REX project). All this has represented a major public sector investment in forest development.

Research in forestry is presently scattered in Thailand. RFD Research Division was divided into two when DNP was established. There is no central body for forestry research[68] which has resulted in some overlap and lack of coordination. Among the 19 current DNP research projects about five would probably better fall under RFD which, on the other hand, has eight on-going projects related to forest biodiversity.

[68] At times, the need for a Forestry Research Institute (FRI) was identified but not considered by the Government.

9.5.2 Universities and Other Bodies

The Faculty of Forestry at the Kasetsart University (KUFF) conducts research in important areas covering forest management, silviculture, forest biology, wood products, watershed, and forest engineering. The Faculty is actively engaged in inter-disciplinary research and educational activities of critical issues of sustainable forest management and utilization. The research programme is carried out by individual faculty members through the Forest Research Centre (FRC), which is basically a National Centre for Research and Development in all the fields of forestry. FRC has 67 staff members with 58 percent holding Ph.D. degree.

Areas of current and future research in FRC include (a) community based eco-tourism, (b) forest fire policy analysis, (c) remote sensing and GIS applications in resource planning, (d) protected area system analysis and planning, (e) mechanical properties of rubberwood, (f) agroforestry, (g) highland reforestation, (h) biodiversity of forest insects, (i) watershed modeling, and (j) mangrove ecology and coastal zone management. KUFF has 2 research stations one in Chiang Mai and the other one in the South.

Research funding is mainly through the Kasetsart University Research and Development Institute (KURDI). Funds for forestry research have been quite limited, at present forestry represents only 2% of the KU research budget

Besides KUFF and RFD, research on different aspects of forestry is also conducted by other state and private sector institutions. Chiang Mai University and the Farming Systems Research Institute of the Department of Agriculture conduct research on upland and highland farming systems. Khon Kaen University and the Chulalongkorn University Social Research Institute conduct research on community forestry. Research on environmental conservation and medicinal plants has been carried out by Mahidol University. FIO has carried out research on commercial teak growing, fast-growing trees, nursery techniques, utilization of teak thinnings and agro-forestry. Studies are also being done by the private sector, particularly on forest plantation development which the Thai Cement Company Limited, Phoenix Pulp and Paper Company Limited and the Kitty Plantation Company Limited are undertaking.

Various NGOs are also carrying out valuable research on site specific issues. Some have also done policy analysis to define their agenda. These have served as valuable inputs for the policy process as there is limited other research on policy issues.

Assessment

1. Forestry research and extension have a key role in improving forest conservation and increasing the productivity of forests. The extension of forestry research requires development of technological packages suited to a wide diversity of agro-ecological, silvopastoral and socio-economic conditions. Moreover, the technology transfer cannot be successful without improving the technology uptake capacity among the targeted users. The process of technology development and transfer involves (a) identification of needs of beneficiaries, (b) development of appropriate solutions involving testing, (c) assessment and validation, and (d) dissemination involving demonstration. To make this to work in practice, the following ingredients are needed: (i) awareness building and people's participation throughout the process to duly accommodate new technology in traditional land use patterns, (ii) clarification of benefits and economic feasibility, and (iii) identification of drivers and motivators of change.
2. There is an urgent need to establish an integrated Forestry Research Network in the country with sufficient budget allocations.
3. The research agendas of various actors would benefit from a clear strategic vision of the forestry sector which is unfortunately lacking. The criteria of the Ministry of Science and Technology are too general to properly guide forestry research. The research priorities should be identified based on problem analysis. Practical and field-oriented research would ensure its wider utility.

4. Many actors including universities and private sector are conducting forestry-related research on specific issues of immediate interest to them. The results are not often effectively disseminated and remain as gray literature in project files[69].

5. There are clear gaps in the research agenda (e.g. policy research, social impacts, NTFPs, etc.). A large number of pilot projects on community forestry and other key topics have been implemented but comprehensive stock-taking appears to be lacking. Such analyses would be useful to feed the policy design process.

6. The review of the on-going research programs of RFD and DNP leads to the following conclusions:

   - The link of the programs to the actual forestry problems and development priorities is not clear. This is understandable as there is no strategic sectoral development plan.
   - There is a strong focus on species-related research which represents a traditional discipline-based approach to forest research. With few exceptions like research on teak thinnings, it is often not easy to see how the generated information can be utilized in the practical forestry work.
   - The social aspects are almost absent in the research agenda. There also appears to be limited element of multidisciplinary research.
   - There are many related research topics but it is unclear whether these are planned to represent an integrated research program.
   - There are research projects which may not be necessary as similar research has been carried out elsewhere in the region (e.g. *Acacia mangium*, oil palm utilization, etc.).
   - Logical sequence could possibly be improved instead of launching a major effort on a species (e.g. utilization aspects of new plantation species to be studied after silvicultural questions have been clarified first).
   - Economic evaluation appears to be missing or weak in many cases.

7. The mission has identified a number of topics where further research would be urgently required:

   (a) Economic and social aspects of forestry
   (b) .Suitable tree species for shelterbelt establishment along the coastal areas.
   (c) Increasing of productivity of wood and other forest produce.
   (d) Reclamation of wastelands and degraded lands.
   (e) Research related to social forestry, farm-forestry, agroforestry, and urban forestry.
   (f) Commercial bioenergy generation from waste and residues

8. There is a need to expand on-farm research which has more demonstrative effect on the farmers. It is a challenging area as only successful results will lead to adoption of improved technologies based on convincing field demonstration which can launch a major people's movement. Something like this has already happened with eucalyptus planting by farmers. Demonstration has an immense role in agroforestry and farm forestry. The extension activities should go hand in hand with the on-farm research activities.

9.6 Forestry Education, Training and Extension

9.6.1 Education

There are several universities in the country that offer Bachelors' and Masters degree courses related to forestry and natural resources but wit different emphasis on technical subjects. These include, Kasetsart University which offers courses on forestry, agriculture and fisheries, Chiang Mai Agriculture University known for courses on farming systems and natural resource management, and Khon Kaen University for courses on rural development and regional planning. Similarly, Mae Jo

[69] The Japanese REX project is an exception as it has consolidated its research findings and disseminated them.

University offer courses on land use and eco-tourism, and Chulalongkorn University on community development (in which community forestry is a part of the course curriculum).

Kasetsart University has the only full-fledged forestry faculty in the entire country. It offers Bachelor's, Master's and Doctoral degree programs in forestry and related subjects. The four-year Bachelor's program presently include three specific subjects. These are forestry, wood sciences and technology, and pulp and paper technology. The forestry course covers: forest resource management, forest engineering, social forestry and forest biological sciences.

The Master's programs, which started in 1967, include four specialized subjects: forestry, parks and recreation, forest resource administration and tropical forestry. The forestry program has five major areas of specialization, including forest management, forest biology, forest products, watershed management and silviculture. The Master's program on forest resource administration also includes a special weekend program, designed to accommodate people who cannot attend regular weekday classes.

The Doctoral degree program in forestry, which started in 1992, focuses on five subjects: silviculture, forest management, watershed and environment management, forest ecology and tropical forestry (international program).

There are some 65 faculty staff (professors, associate and assistant professors and instructors) and some 90 administrative and support staff (including technicians). According to the enrolment record in 2002, there were 1013 bachelor students (478 female), 397 masters (116 female) and 34 doctoral students (8 female). So far, the Forestry Faculty has produced 833 diploma graduates, 3,814 undergraduates (Bachelors), 479 graduates (Masters) and 13 Ph.D. graduates. The number of female students in forestry has increased significantly in recent years.

There seems to be no problem for forestry graduates in finding jobs as they become easily employed by various departments of MONRE and NGOs and the private sector. The majority of the forestry professionals in MONRE are reported to have studied in the Kasetsart University.

Assessment

1. One of the main problems of forestry education in general is the tendency to confine itself within a very narrow target group, and Thailand is not exceptional. KU's forestry curricula seems to have remained focused towards producing graduates largely for employment in the government forest authorities, though in recent years some graduates are reported to be employed by NGOs and the private sector which also need forestry specialists. These new employers' needs are different from those of the public agencies. Therefore, forestry education must find ways for addressing the needs of the expanding target group, with multiple interests in forests.
2. Many of the forestry issues are cross-sectoral and their solutions often lie outside the forest sector. Thus, there is a need to learn from other disciplines and to influence the forest-related teaching of other relevant faculties and universities.
3. Knowledge on issues such as climate change, biodiversity conservation or management of national parks and promotion of eco-tourism, are now in demand, rather than the traditional skills related to timber production and utilization. New tools and techniques are required to manage forests for local communities' needs for timber, fuelwood and other non-timber forest products.
4. Many of the problems in SFM are policy related. There is, however, limited capacity among forestry professionals to carry out policy analysis, particularly on the economic aspects. This is also reflected in weak capacity to promote forestry as an economic activity among communities and smallholders. If extensionists cannot carry out field-level economic analyses, their messages tend to remain theoretical and unconvincing. Lack of adequate training on forest economics is a major shortcoming. Among all forestry professionals, there is a need for graduates to have adequate skills in problem analysis and relating to broader issues.

5. As regards forest industry, there is only limited capacity to train well-qualified specialized engineers. This is another major gap in the present supply of education. Skills in furniture design for export markets is another example of an area where no educational capacity exist.

6. The only way the Forestry Faculty could address future demand for forestry professionals is by partnering with other faculties in KU, other universities and institutions in Thailand, and even universities outside Thailand. Some other Thai universities, such as Chiang Mai, Khon Kaen, Mae Jo and Chulalongkorn, have already started to accommodate forestry related subjects in their curricula on natural resources or environmental management. Fortunately, there are also regional institutes located in Thailand, such as Asian Institute of Technology (AIT) and the Regional Community Forestry Training Centre (RECOFTC) which can be drawn on. Some universities, outside Thailand are interested in collaborating with Thailand in research and training on forestry issues. The International Course on Tropical Forestry of KUFF is an excellent initiative to this end (apparently largely self-financing).

7. There appears to be no capacity for technical and vocational level training on forestry related subjects in the country. Consequently, concerned organizations and companies seem to have taken the responsibility to develop their own human resources. However, there is a particular need to arrange common training for supervisors and other middle managers of wood and furniture industries. This is one of the key constraints in industrial development according to the industry top management representatives interviewed by the Mission. There is a need to carry out a survey of the industry's training needs and prepare an action plan, assigning an appropriate existing technical-level training institute in implementation.

9.6.2 Further Training

Prior to splitting into two departments, RFD had a training division, with several training centers in different parts of the country. The most important ones included the training centers located at the central office and those in Phrae Province, Khao Yai, Cha am, Chiang Rai and Tak Provinces. However, following MONRE's decision to restructure RFD, the training division was removed, placing all the respective human and financial resources and facilities under DNP. At the time of the Mission, RFD's annual program did not include any training activities.

According to DNP's training plan for 2005–06, the activities (meetings, workshops and seminars) cover such topics as orientation training for newly recruited staff, training of trainers, management and services, conflict management and negotiation, insect inventory/survey techniques, forest fire control, environmental impact assessment after forest destruction, forest law and enforcement, forest criminal case investigation, tools and techniques for financial analysis, youth camp trainers, GIS, database management, appropriate morale (King's birthday), research, development strategy for DNP, and refresher courses for senior government officials, etc. Overall, in total, some 150 activities are planned and carried out each year, involving over 3,000 trainees.

The main constraint facing further training is that all the resources have been assigned exclusively for the training of the DNP staff. This overlooks training needs of the staff working in RFD and other departments. The RFD staff (more than 4,000), responsible for the management of national forest reserves, promotion of community forestry and private reforestation, are completely deprived of further training possibilities.

Assessment

1. Conservation rather than management has become the main focus of training. Protected areas also need to be managed, including the application of silviculture, especially in areas that include plantations. Protected areas where local communities live and depend on forest resources for livelihood will need different management approaches and hence a different training strategy than for traditional park staff focusing on enforcement.

2. Forests outside the protected areas, both natural and plantations, need to be managed differently than those inside the protected areas, and may include harvesting and replanting as well as

involvement of local communities. Multiple-use techniques of forest management (particularly NTFPs and environmental services) would deserve a stronger emphasis than at present.

3. There is also a need for training activities to be linked with the Government's overall environmental and economic development objectives, such as poverty alleviation and decentralization. Further training is particularly needed for extension staff.

4. Most staff in the DNP training division and field centers have background in traditional forestry. While traditional forestry knowledge has an important role, the training staff should also have a good understanding and ability to relate forestry issues to wider socio-economic, political and environmental issues.

5. The staff of the training centers cannot be expected to plan and deliver all training activities by themselves. They need to pool together expertise from other departments within MONRE and other organizations by building partnerships with the training divisions of other ministries, universities and regional centers, such as RECOFTC. They should also engage NGOs and industries to identify on training needs and in designing and delivering relevant further training.

9.6.3 Extension

There is no specific extension division or unit in RFD or DNP. However, some RFD field projects have provisions for extension activities, although with focus on nurseries, seedling production and planting on private lands. Some RFD staff feel that the Office of Community Forest Management is also responsible for extension services. Some staff refer to the public relations unit within MONRE, and see this to be equivalent to an extension unit. There is no clear understanding in RFD what forest extension entails.

Assessment

1. MONRE appears to have no planning and development of the overall extension policy and program in the forestry sector. This is unfortunate when the responsibility for management of forest resources and production is rapidly shifting to the private sector and communities.
2. The field centers have limited outreach capacity, due to shortage of financial resources. Most of the budgeted funds go for maintaining infrastructure and paying staff salaries with little left for covering the cost of training events.
3. At present, extension activities at the field level are all *ad hoc* and confined to specific project sites. Once the projects are terminated, extension activities are either dropped or reduced to a minimum level.
4. The focus of extension activities seems to be mainly on nursery establishment and planting trees on private land. There is no training on maintenance and harvesting of the planted trees, and marketing of forest products.
5. Separation of DNP from RFD aggravated the problem of dissemination of conflicting messages to clients and general public. This has been earlier experienced with agriculture but it has now become an internal problem as well.
6. A separate extension division, with its own field offices and personnel and its own line of communication and command, is unlikely to be a viable solution. The extension unit or division at the department level would be necessary for the overall development of forestry extension with the tasks of developing suitable extension strategies and packages, and providing support and training to field staff.
7. The role of the extension unit or division would be to ensure that there are consistent messages going out to the clients and the public, in line with the Government's overall environmental and development policy objectives. The unit should provide leadership in developing a unified integrated extension program for the provincial, district, TAO and village level officers, including plans for activities related to extension of community forestry, private forestry, industrial forestry, watershed management and people's participation in management of national

parks and wildlife sanctuaries. The unit should also coordinate with the extension units or divisions of other sectors, especially agriculture, rubber, fisheries and ministries responsible for the implementation of decentralization as well as financing institutes (e.g. BAAC) that are involved in promoting community-based enterprises.

8. There is a need to develop a medium-term education, training and extension strategy (for the next 5-7 years). A task team could be established to undertake a scoping study for the current and future needs of education, training and extension programs and activities to serve as a basis for such a strategy.

9.7 Information System

Maintenance of proper statistics and records is inevitable for the management of forests on a sustainable basis. It is not only the long rotation of trees involved but also the nature of the forests as a renewable resource which requires comprehensive information for proper management with collection of necessary statistical data on the status and change of forest resources as well as activities carried out and their outcomes and impacts. Besides fulfilling the international commitments, the collection, compilation, validation and dissemination of forestry statistics are also urgently required for satisfying the national commitments for policy planning, and to assess trends and progress with respect to SFM.

Since there is no complete forestry statistics database in the country, the sectoral contribution to GDP and other key socio-economic variables is not known and grossly understated (see ch. 2.12). This is mainly due to the failure of the information system to capture reliable information on such key parameters of the sector as production of roundwood and sawnwood (as key outputs), production and consumption of fuelwood and charcoal, as well as collection and use and NTFPs. While Thailand is one of the few developing countries which has been monitoring its forest cover change based on satellite images for several years, no national forest inventory exists. On the other hand, the foreign trade data appears to be of relatively good quality although it is not comprehensive and discrepancies with some trading partners exist which need to be investigated (see ch. 6).

Two annual statistical yearbooks are being produced on the forestry sector which contain valuable information. “Forestry Statistics of Thailand” is being published annually by RFD to disseminate statistical data and information to contribute to policy formulation, planning for forestry development and to conduct academic research. The published data in this document was collected from secondary sources, special surveys, operational reports on field activities and research reports of RFD and other related departments. The document contains mainly foreign trade statistics and general statistics of the country, and only fairly limited information on forest resources and their utilization. In spite of its deficiencies, the document is, however, a valuable source of information.

The other basic forestry related statistical report is “Statistical Data-2004 by National Park, Wildlife and Plant Conservation Department” which contains data on protected areas and their management. The Mission notes that there is a considerable unnecessary overlap between the two publications as both include extensive reporting on foreign trade in forest products.

Data on private sector activities (planting, harvesting, roundwood production and sawmilling) is also lacking. There are now regular surveys targeted at this purpose in spite of the fact that productive activities are mostly carried out by the private sector.

Forest related data (mostly based on RFD’s information) is also published by National Statistical Office. Information on the extent of the rubber resources is collected by the Rubber Research Institute, and the Center for Agricultural Information of the Office of Agricultural Economic reports on land use under crop cultivation. All these various sources are used when Thailand reports to international bodies such as ITTO, FAO, UNFF, etc.

Besides the Government efforts, some organizations like ICRAF have taken serious steps in collecting necessary data at the local watershed level. Their parameters include rainfall, water quality, soil erosion etc. for data collection as from a natural resource management perspective watershed functions

and biodiversity conservation are clearly separate issues. In a nutshell, isolated good efforts have been made at various levels to generate data for specific purposes but there is no connectivity and linkage.

Assessment

1. The present standard of statistical reporting in the forestry sector in Thailand is far from satisfactory. There is no complete inventory of forest-based resources. Production, consumption, trade and movement of wood and non-wood forest produce outside the state-owned forest estate contributes substantially to the national economy but there is no proper mechanism for their recording. Some data in different projects and studies are available but there is a complete lack of information link. In fact, there is no data networking.

2. Information is a powerful tool in managing and analyzing the sector but this area has been almost neglected in the past. There is a need to have a programme to improve the collection of forestry data and its publication, research on growth and classification of forest resources and the economic and social aspects of forest utilization. The recording of forest statistics and availability of such information is weak in Thailand due to the following main reasons:

   (a) Inaccuracy and inadequacy of the official statistics.
   (b) Much of wood consumption is local, household utilization goes largely unrecorded.
   (c) Markets for roundwood and wood products are not monitored on a systematic basis.
   (d) Domestic subsistence use does not even pass through market mechanism viz. products are not valued in monetary terms. Informal markets are important for NTFPs and are not monitored.
   (e) Data on illegal supply (logging and imports) does not exist.
   (f) Lack of proper recording of rubberwood production.

3. Investment in RFD's hardware and software is not capitalized. An overall strategy for information management does not exist. For middle-level staff the purpose of data collection is not clear and it is perceived as an administrative burden rather than a management tool. This is due to little feedback of information from the data collected. There is a lack of analysis of the organization's information needs and a proper methodology is missing for data collection, compilation, dissemination and necessary networking. There is also need for the development of geo-biological and social models.

4. The top management and policy makers understand the importance of data but sometimes they appear to believe in *ad hoc* information produced by individuals rather than in the results that could be generated by an information system.

5. The entire forest statistical system needs to be carefully reviewed, including clear identification of data needs and gaps. Data collection and reporting capacity should be re-enforced. Only in this way the contribution of forests to social, economic and ecological well-being of the nation can be established. Both costs and associated benefits need to be known to inform policy design and resource allocation to the forestry sector. Dissemination of forest and wildlife statistics to stakeholders is vital to avoid misconceptions on the performance and contributions of the sector. There is a particular need to improve market transparency as part of the information system.

6. Within the forest administration the value of information as a management tool should be better recognized. In particular, middle management should be provided feedback information providing benchmarks and monitoring data to enable assessment of own performance.

7. Lack of sufficient information has proved crucial in forestry development in Thailand. The road map with the time frame for the collection, dissemination and development of National Forestry Database Management System (NFDMS) need thus be prepared covering data needs/formats for reporting of the forestry statistics. The individual components of the system should be linked and tools for networking should be put in place. The requisite parameters and variables must be properly identified through Information Need Analysis to have a uniform format for data reporting but giving due emphasis to regional and provincial priorities. The following additional aspects need consideration for developing NFDMS: (a) functional requirement study; (b) capacity building; and (c) regional/provincial and national workshops to discuss and decide the

parameters, variables for data reporting, and (d) development of necessary data networking mechanism.

8. There is a need to improve collection and dissemination of information and statistical data on forest resources, forestry operations, forest industry and product markets with unified definitions and measurement units. Use of commonly agreed international terms and definitions would reduce reporting burden to international bodies and facilitate cooperation.

9. Special studies should be carried out on key data gaps such as the production and consumption of timber and sawnwood, fuelwood, and NTFPs in the domestic market at the sub-district, district and provincial levels, including illegal harvesting and associated trade.

10. Advanced Information Technology (IT) should be used to facilitate timely and efficient data capturing and transfer for enforcement and environmental monitoring management as a key tool to prevent and suppress illegal use of natural resources. This should be adequately considered in the design of the NFDMS.

11. Development of the NFDMS database should involve participation of users and other stakeholders including the design of means for how they can access relevant information. A maximum level of transparency should be aimed at.

12. The Government should prepare a full-fledged project for the NFDMS development. A feasibility study would map out options and outline a comprehensive plan for implementation. Lessons gained in similar exercises in other countries should be drawn on. This activity could receive financial assistance from ITTO as a priority.

9.8 Forestry Cooperatives

Cooperatives are well established in Thailand and they are involved in a wide variety of activities. The total number of registered cooperatives is 8,424, of which 74% are active. Almost 60% are involved in the agricultural sector (including forestry). They provide loans to members for productive purposes at attractive interest rates; they provide savings facilities and credits, they can engage in purchasing inputs and daily necessities, and they are often involved in promoting appropriate farming practices and providing marketing channels for products.

Agricultural cooperatives are generally established for a specific purpose. There are water users' cooperatives to regulate water use and conservation from a common source, land reform cooperatives to assist farmer members in agricultural production to gain access to capital, agricultural inputs, marketing, saving facilities, etc. Special cooperatives have been organized for producers of some crops (e.g. rubber), livestock or even forestry.

Among the almost 5,000 agricultural cooperatives there are only 36 which are involved in tree planting, harvesting and sawmilling services. Only 30 are reported to be active. The first one was established only in 1996 and the experience is still accumulating. The average forest cooperative has about 300 members and the average investment is only US$ 3,250. More than half of the active cooperatives are involved in marketing of timber, one third in charcoal production and one third in wood processing. Three cooperatives are engaged in tree planting, another three in furniture making and two in wood handicrafts. Only one cooperative has invested in sawmilling. In general, most forest cooperatives have been set up for marketing purposes and the next important objective is development of production. Many are also involved in agriculture and therefore it is difficult to separate their forestry activities from the entire business of the cooperative.

Based on an RFD survey among the forestry cooperatives, the key constraint is lack of working capital (79% of replies). Shortage of raw materials is also a significant limitation (24%), as is difficulty in dealing with the authorities (24%) but this was not linked to the legality of operations. Marketing and human resources were a constraint for 21%, but also problems in relationships among members were also important (17%). A fairly common problem is insufficient forestry activity among members (17%).

Assessment

1. Forestry cooperatives have potential to help members to get involved in productive activities based on trees and forests. Their main role is in marketing and production promotion. The existing experience is still limited but a cooperative can be in many cases a useful way to organize farmers rather than trying to support them individually.
2. The key weakness is the lack of working capital. BAAC's credits do not appear to reach forestry cooperatives. With limited capital investment significant impacts could be anticipated. Most farmers as small-scale landowners do not have sufficient financial resources to invest in joint production facilities (e.g. small-scale sawmilling utilizing plantation wood).
3. There is a need to seek better cooperation between authorities and forestry cooperatives. The authorities would probably have to see themselves more as supporters and extension agents than enforcement bodies. It is a cause of major concern that one quarter of cooperatives see relationships with authorities as a constraint for their development.
4. Planning of cooperative businesses should be based on a realistic assessment of the available raw materials from the members' plantations to avoid failure in capital investment. Extension service should be able to provide business guidance and assistance in preparing and reviewing development plans which cannot be based on purely technical knowledge. Organizing effective forestry cooperatives need to be included in the forestry extension packages.
5. Good internal relationships are important for the success of forestry cooperatives. This can be achieved if there is a true willingness to work together and leadership is trustworthy. Many failures in cooperatives tend to be due to internal problems and conflicts and enough time is needed to develop a common vision of all the benefits from working together.
6. Forest cooperatives offer a viable solution for organizing individual tree farmers or artisans. International experience on setting cooperatives for a group of community forests is mixed due to differences in objectives and resources. This option could, however, be considered for Thailand, particularly in situations where community forests are small and cannot develop downstream activities on their own.

9.9 Organization of the Private Sector

There are about 10 organizations/associations of forest-related industries in Thailand, including the Wood Export-Import Association, the Thai Furniture Association, the Tree Farmers Association, the Thai Sawmilling Industry Association, the Sawmill Association (rubberwood producers), the Sawn Timber Trade Association, the Thai Pulp and Paper Industry Association, and the Thai Economic Reforestation and Wood Industry Association.

In wood producers' (planters') associations the membership is still limited. There is not a strong tradition among farmers to join common nationally recognized associations, which are sometimes perceived to mainly serve the interests of the leaders. This may be due to the fact that the leading figures have been earlier employed by the Government. At local level, there are, however, promising examples. E.g. in Nakon Ratchasima province farmers, with the assistance of RFD extension staff, have established a wood plantation and bioenergy producers' association. It has quarterly meetings, an annual exhibition to promote product sales and other activities. About 70 members participate from several districts. It will be possible to establish a database on the members which will be instrumental for monitoring, market promotion, and training and extension. Such initiatives would be needed throughout the country.

The Thai Economic Reforestation and Wood Industry Development Association was established in 1990 when the promotion of private tree planting was started by RFD. About 160 members include some 120 cooperatives (43 reforestation cooperatives) which have about 3,000 to 4,000 members all around the country[70]. The membership also includes all the industry associations. The thrust of the organization is to promote tree planting by farmers and to improve the market mechanism.

[70] It appears that these are not recorded in the MOAC data (see ch. 9.8).

Cooperation is focused on local level where farmers are informed about the industry's raw material needs and the industry can learn about the future supply potential of wood. Meetings of the Executive Committee of the Association take place at regular intervals. The basic objective is to provide acommon forum/platform so that farmers can know the demand of the species in the market and industry can know the requirement/quantity available with the farmers which can also guide them as to what species should be grown by them. These activities are managed at the local level by groups and co-operatives. The Association also attempts to provide some extension service and organizes high-profile national and local-level events to promote tree planting. The demand for extension advisory services far exceeds what the Association can provide. RFD has provided strong support to the Association.

The strongest industry groupings appear to be the Thai Pulp and Paper Association and the Thai Furniture Industry Association while the sawmillers' associations[71] are weaker. A major undertaking by the Furniture Association is organization of annual furniture fair which also attracts international participation. In general, the Thai forest industry is secretive by its tradition and the competition between enterprises is tight. This has greatly limited interest in jointly pursuing matters of common interest such as the development of the raw material supply, technical training or participation in policy processes. The situation is not facilitated by the fact that in some sectors there are competing associations.

Assessment

1. Tree farmers's organizations are still weak and need to be strengthened. In view of the size of the country and the large number of smallholders involved, a bottom-up approach could be attempted. Drawing on experience from other countries, a clear two (or three)-level structure could be aimed at where farmers (or their groups) join at provincial or district level into associations to assist members in the areas of technical advice, training, market information and market facilitation. These local associations could form a national federation which would serve as a common interest group in policy design and pursuing matters which need to be addressed at national level. These activities could include e.g development of wood measurement, and log grading rules, improvement of market transparency, market development for wood, design of model contracts, coordination of training and R&D to serve tree farmers' needs, etc.
2. It is important that farmer/landowner associations develop over time their own extension capacity as it is unlikely that the public sector could carry out this task. If the organization of smallholders remains only at the level of smaller groups, this may not be possible. Local associations would have a strong role in pursuing the interests of the members with provincial goverments and TAOs, and they could also facilitate the development of partnerships between forest industries and smallholders to achieve a more balanced negotiation power between the parties. For the forest industry, working with associations would reduce the transaction costs related to wood procurement and the role of intermediaries would not become too prominent.
3. In many villages there are already locally organized (more or less formal) groups of tree farmers. These groups could serve as nuclei for the provincial/district-level tree farmers' associations to make them more effective. Organizational development of smallholders will not happen without the catalytic support from RFD or other public agencies. This would involve identification of group leaders/lead producers at local level who could assume the responsibility for organization of the association work. Government support could include developing model rules of operation for local associations, and support to initial phase of organization. In due course, Government support to farmers in training, provision of seedlings, etc. could be channeled through the associations rather than targeting at individual smallholders directly.[72]
4. It is likely that one single model will work everywhere in the country. Therefore, pilot projects in representative situations could be launched to test alternative approaches for organization of tree farmers and how extension services could be arranged.

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[71] Rubberwood sawmills and other sawmills have their own associations but their memberships do not cover all the operators.

[72] E.g. Mexico is successfully piloting this approach.

5. Private tree farm development has been a major strategic area of intervention already for more than 10 years. The results are promising (see ch. 5) but still remain far from expectations. Without strong organization of tree farmers, they will not be able to become a major market player who can organize their own technical services, promote their markets and protect their interests.
6. The industrial associations are still generally fairly weak as enterprises see more value in promoting their interests individually. This will have to be reviewed when the national policy processes have become participatory and all stakeholder groups are expected to propose clear priorities and policy proposals. Associations will have to become more capable for their own policy analysis, more transparent and more effective to ensure that broader industry interests are duly considered in the public policy.
7. A common consultative body among industry associations could become useful in the future to address common interests like promotion of wood production, certification, trade regulation, promotion of training and research, etc.

9.10 Civil Society

The development of Thai NGOs has taken place in parallel with the socio-economic changes in the country during the last 25 years. Initially, their focus was on health, literacy and economic activities as a means to promote human development and the main target was rural areas. Later on popular environmental awareness gained momentum in the late 1980s partly as a result of the emergence of major environmental problems like the flash floods in 1988, blamed on deforestation. The introduction of the logging ban in natural forests was a major achievement of the civil society.

Among the civil society there appears to be two main currents of thinking as regards forests and their management. The extremist green movement focuses on strict protection of natural forests and the only way to achieve it is segregation of local communities from their forest lands. During the Mission, it was reported that in protected areas alone there are about 1.2 to 2 million people living. No clear solution has, however, been proposed by these NGOs for how these people could be removed from the forest (where these people should go and what they should do). The implicit apparent strategy is to restrict their living conditions to such an extent that people have no other option than to move out somewhere where they can survive.

The other part of the civil society movement takes a more social approach where community forestry is promoted in conjunction with recognition of land and use rights and use of traditional knowledge. This group would also allow community forestry activities in protected areas. The two groups have been actively doing advocacy work and implementing development projects among local communities.

The extremist activist movement tends to have its main constituency among urban elites while the other NGOs tend to have a more managerial approach grounded on rural environmentalism and it is more broadly represented in different local-level arenas. There is a tension between the two sides as their perceptions on the solutions for protection of biodiversity are different. The civil society has significantly increased environmental awareness and concern with nature, water pollution and increasing demands for water by agriculture, urban centers and industry, focusing attention to the use of upper watersheds (Hirsch 1997).

The past suspicion among the NGOs concerning the authorities and among the public agencies concerning NGOs has been gradually diminishing, partly as a result of the opening of the policy processes to the participation of all stakeholder groups which was grounded in Section 3 of the 1997 Constitution. Presently the Government sees NGOs as important partners in executing valuable activities that are beyond the reach of the public sector. There is a sense of mutual need to cooperate among most parties on both sides. On the other hand, NGOs have accepted that they alone cannot provide alternative to development and that their work is complementary to that of the Government.

However, there are still areas where improvements are needed. Government policies tend to be opaque and access to information – albeit greatly improved during the last ten years – still needs to be enhanced. This is probably more a matter of traditional way of dealing with information by bureaucrats rather than a deliberate government policy.

Assessment

1. From the Government's perspective, the fragmentation of the NGO community makes dealing with them somewhat cumbersome. There are several hundred NGOs in Thailand even though their exact number is not known. A particular problem is to ensure equal access to information and financing for local rural NGOs and community groups compared to international or Bangkok-based NGOs, which are often politically well connected. While the large, well established NGOs like TEI, TDRI Wildlife Fund Thailand, etc. are well positioned to influence political decision making, their local counterparts play only a marginal role in policy dialogue and there are no good mechanisms to involve them.
2. It would be beneficial if the dialogue on the rural people's role in conservation strategies could be enhanced among the NGO community as the Government is getting vastly different or mixed messages on how policies on forest-dependent people should be designed and implemented. In promoting sustainable forestry development, it is of utmost importance that the two sides of the NGO community can be engaged in achieving the common goals. For the NGOs their impact would also be more significant if they could develop common policy proposals and work strategies.
3. There is a need to promote an NGO Forest Network. Enhanced cooperation is needed both at national and local levels to ensure effective change of experience and information applying people oriented and participatory approach**.**. A new neutral body could be identified or established to run such a network.
4. The NFP process would be a useful testing ground for developing more common views among the NGO community on forestry issues and the planning process should include special events or other measures for this purpose.

PART III. CONCLUSIONS AND RECOMMENDATIONS

10. CONCLUSIONS

10.1 Future Vision

Self-sufficiency economy is one of the key principles of national development (cf. section 2.2.1). Forest resources offer a major opportunity in contributing to its achievement. The following elements could constitute possible elements for the future strategic vision of Sustainable Forest Management in Thailand:

(i) Net deforestation arrested and forest cover maintained over 35 to 40% of the total land area.

(ii) Most of degraded areas rehabilitated generating commercial and environmental goods/services for Thai society.

(iii) The role of forests in poverty reduction enhanced through income and employment generation and improvement of livelihoods of rural people. Traditional knowledge on the utilization and conservation of the Thai forests effectively employed in reducing poverty in forest areas.

(iv) Community forests established with secured usufruct/tenure rights in most villages providing goods and services to meet the household requirements, including for purposes beyond subsistence needs such as generating revenue from sales of various products to the expanding domestic and export markets for forest products.

(v) Most of industrial wood obtained from plantations established on private smallholder lands, community forests and industry owned lands; plantations would produce both pulpwood and

sawlogs from a variety of species to meet the industrial and household needs. The plantations would be sustainably managed with appropriate silvicultural regimes.

(vi) Rubberwood will continue to be an important raw material for wood industries but its relative importance would be less than at present. Part of the rubberwood supply will come from plantations established for timber or joint timber and latex production.

(vii) The wood-based industry would assume a more active role in the development of its raw material supply, including through partnerships with private tree farmers and community forests.

(viii) All the timber harvesting operations would be verifiably legal and certifiable for SFM.

(ix) The TOF resources will continue to be expanded and their products would become commercially valuable as sources of income for landowners from sales of timber, fuelwood and various NTFPs.

(x) The markets for forest products would become efficient based on full market transparency and as a result of organization of roundwood sellers. Bio-energy, including for commercial alternative energy supply, would be a significant outlet for forest production.

(xi) The international competitiveness of the Thai furniture industry, the wood-based panel industries and pulp and paper production will be maintained based on sustainable raw material supply and efficient operations aimed at maximizing the value added of wood and other production factors.

(xii) Bamboo and rattan resources would be brought under systematic management as part of the forest management plans and their planting would be spread in private and community forests.

(xiii) The protected areas would be managed in way which would ensure secured and improved livelihoods for the people living in and around them, including their engagement in park management and park-based ecotourism which will continue to grow.

(xiv) Forest environmental services for mitigation of climate change, biodiversity, soil and water conservation enhanced and, as appropriate, remunerated.

(xv) A firmly grounded forest policy process involving all the stakeholder groups would be established based on NFP principles; the national forest policy would be revised and its implementation spelled out in the national forest program (to be further elaborated at provincial level) which would be periodically updated.

(xvi) Decision-making at all levels would be based on adequate information, including periodic forest resource assessment, and regular reporting and monitoring systems. Indigenous knowledge and wisdom would be duly considered in making decisions on the use of forest resources.

(xvii) FIO and Thai Plywood would be privatized.

(xviii) Forest communities and forest owners would be effectively organized and they would be able to arrange the extension services for their own needs.

(xix) Civil society will become better organized and educated on forestry issues and its role in forest conservation and development will be increased.

(xx) Private sector would switch their focus from pursuing individual interests to identification and promotion of the common interests through effective associations.

These possible elements of the future vision of the Thai forestry should be discussed and further developed as part of the NFP process to create a common understanding among all the stakeholders about the direction of future actions.

10.2 Main Constraints

As a response to its terms-of-reference, the Mission has identified the following as the most critical constraints impeding progress towards SFM in Thailand:

1. The bottlenecks of the regulatory framework represent a critical obstacle for Thailand's progress towards SFM. These bottlenecks include the lack of legal framework for community forestry. In addition, the legal framework related to the utilization of plantations should be clarified to

eliminate uncertainties for private investment in plantation forestry. There are also a number of minor adjustments needed in the existing laws in this context.

2. There is lack of coherence between public policies, which makes implementation difficult and sometimes impossible. While the forest cover should be maintained for maintenance of environmental values according to the forest policy, the agricultural and development policies call for releasing forest land for crop cultivation and other uses. There is a need to clarify the policy goals based on adequate analytical work so that value judgements can be based on facts rather than perceptions.
3. People's widely varying perceptions about how Thailand's forests should be conserved and managed represents a major constraint for making progress towards SFM in the country. This has blocked the approval of the badly needed Community Forestry Bill, which continues to impede the development of community forestry, the cornerstone of the SFM strategy for natural forests. In addition, there is lack of clarity how natural forests outside protected areas should be managed. The prevailing conservation paradigm focuses on setting aside protected areas, which undermines the potential of these areas for meeting people's needs without compromising the biodiversity objectives. Analytical work to feed the public debate is relatively shallow and stakeholders are generally not well prepared to articulate their priorities and constraints. A broad-based participatory process (within the framework of developing Criteria & Indicators for SFM or an NFP process) could help generate a shared vision for the future forestry development in the country.
4. While the responsibility of forest management and timber production is being shifted in practice to the private sector and communities, there is lack of coherent policy measures to support this change. This has become a major constraint, as the change is fundamental requiring adjustment of the public policies to support farmers, communities and investors in achieving SFM. The Government's role should be more focused on support and facilitation rather than control and enforcement. The support programs and incentives in the past have been inadequate and should be reformulated to correspond to the present and future needs of the target groups.
5. Institutional uncertainty about how public forest administration will be organized is a major obstacle. Since 2002 RFD's resources to implement its mandate have become limited and lack of clarity in the policy framework has left the organization without clear direction on what its mandate in practice should be. The inherited organizational structure is not optimal in terms of deployment of human resources between the headquarters and the field activities, nor in the tasks and financial resources assigned to RFD at DNP.
6. Deficient information systems make decision making haphazard and policy design becomes sub-optimal by definition. Information should be understood as one of the main management tools at different levels of the involved organizations both in the public and private sectors. Inadequate information makes also monitoring and enforcement ineffective. There is a need to improve the transparency of the market, and information on illegal logging, control and enforcement, performance and impacts of forest operations.
7. In human resources the critical constraint appears to be lack of training for furniture and wood industry supervisors and technicians. This currently makes it difficult for the industry to expand and add value to its exported products. The other key constraint in the development of human resources is the narrow focus of educational institutions on traditional forest management and utilization concepts which can no more meet the current needs of the forest sector.

10.3 Opportunities

In spite of the constraints highlighted above, sustainable management of Thailand's forests offer a number of significant opportunities:

1. The potential of community forestry to contribute to poverty alleviation is significant and remains largely untapped. Several million people would benefit through improved livelihood and income generation based on community forests.

2. There is a significant potential to expand planting of trees in marginal and other unused lands for income generation. Thailand's biophysical conditions are suitable for growing a whole range of tree species and the country has a competitive advantage compared to many other countries even though it is not among the lowest-cost producers. The development of the resource base through plantations represents a major investment opportunity.
3. The forest-based environmental services have been declining due to deforestation. Mechanisms to generate payments to forest managers and owners for these services could change this. The services of carbon sequestration, soil and water conservation, biodiversity conservation, and amenity values (important both for local people and the tourism industry) remain largely as free public goods. Payment schemes for these services have a significant potential to change the situation but their development is a major undertaking involving also regulatory changes.
4. Certified plantation teak offers an opportunity to tap a high-value export niche market (garden furniture, decking, public construction projects, etc.).
5. Many non-timber forest products are in high demand both in the domestic and export markets which offers major expansion possibilities if the resources and production and marketing methods are duly developed.

11. RECOMMENDATIONS

The analytical chapters of this report (from 3 to 9) already contain a series of detailed recommendations for the Government and other stakeholders in Thailand. The Mission has singled out the following recommendations which are thought to be critical in making further progress towards sustainable forest management in the country. Those in italics are considered priorities:

11.1 Government

Natural forests

1. *Preparation of management plans for PAs and forest reserves should be accelerated. Guidelines for their preparation should be revised to better address participation of local people who are influenced by the PA and forest reserve management. Management plans should adequately address NTFP resources and their utilization by local people.*
2. Effective communication mechanisms should be established to inform local people and other stakeholders on the reasoning of the delineation of the gazetted protected areas to avoid conflicts and resistance among those who are affected by the gazettement decisions. Communications should be made in a simple, easily understandable manner.

Community Forestry

3. *In spite of potential risks, the Community Forestry Bill should be approved without delay, as it would open way for millions of forest dependent people to take part in, and benefit from, forestry activities legally within the regulatory framework.*
4. Community forestry should be allowed in national forest reserves. A task force should be established for preparation of additional provisions for issues like transfer of group member rights in different situations. The Bill would also need to be followed by the development of a field implementation guideline, which describes in simple language (a) the rationale for community forestry, (b) process and approach to establish community forests, (c) definition of roles (responsibilities & authorities) of government forest departments and local communities, (d) institutional structure, (e) formulation of management/operational plans, (f) supporting services available from the Government, as well as (g) procedures for monitoring progress and assessing impacts.
5. Utilization of community forests should be open for both subsistence and commercial purposes (rather than limiting it to subsistence production only). Further, community members should be

allowed to harvest all types of forest products, including living trees, provided harvesting is carried out as specified and agreed in the management plan for sustainable forestry and effective enforcement and control are in place.

6. *Regarding the issue of community forestry in protected areas, a policy statement/instruction could be issued to develop specific forest management and utilization activities to meet the needs of communities residing in and around PAs. Such activities should be defined in the management plan of each PA. This would keep the forest under state property ensuring its authority in changing conditions to protect the resource while allowing local communities to develop their livelihood strategies based on sustainable use of the forest resources without endangering the environmental values of the PA.*

Plantations

7. RFD should take a more active role to promote strengthened coordination between the agencies involved in rubber planting and utilization of latex and rubberwood. The promotion of planting rubber trees for timber production should be based on the evaluation of the clone performance and also the silvicultural aspects should be considered in the establishment and management of such rubber areas. This would require adequate information on the country's growing stock of rubber trees, their total volume, annual increment, age distribution, diameter at various ages, initial plantation density, etc. which should be generated through special studies and regular monitoring work.

8. The obligation of transit permit should be removed from teak logs from thinnings in areas outside forest reserves as the first step to facilitate trade and to reduce transaction costs for owners. At a later date in the future, regulation of harvesting mature planted trees could be reconsidered in the light of then prevailing enforcement situation in the forestry sector. There is an urgent need to amend the law in this context to reduce uncertainty among investors, reducing the pressure on illegal logging in natural forests.

9. Wood measurement practices should be further developed and promoted to protect sellers' interests. Selling growing stock without measurement should be phased out and replaced by weight measurement of harvested product. In the long run, saw and veneer log measurement should preferably be carried out based on volume, which would make the value of the product more transparent for both parties.

10. *The Government's role in mitigating market risks related to private sector plantation investment should be limited to the following measures: (i) improved market transparency, (ii) promotion of diversification of outputs (introducing sawlogs as complementary product for eucalyptus plantations), (iii) developing measurement and grading systems for log trade, (iv) support to organization of producers, and (v) for risk averse farmers and landowners, encourage the industry to include a minimum price clause in partnership agreements. A government-backed minimum price scheme should not be put in place.*

Fuelwood

11. A study on the production and utilization of fuelwood should be carried out as there is no data to plan programs in this field. Fuelwood plantations could be expanded to meet the demand of woodfuels outside forests. Bio-energy plantations could be established by private entrepreneurs for industrial use, were there sufficient information to enable such decisions.

Non-Timber Forest Products

12. The ITTO Project PD56/99 Rev.(I) Promotion of the Utilization of Bamboo from Sustainable Sources has well established the state-of-art in management and utilization of bamboo resources (RFD/ITTO 2004a). This useful information should be effectively disseminated down to the farmer and SME levels in an appropriate form. Further work will still be required on research on bamboo utilization for industrial applications. Such a public investment would have a high economic and social return for the country.

13. Bamboo should be given adequate importance in the social forestry/agroforestry practices as well as in watershed management. Providing incentives to small-scale and marginal farmers should encourage cultivation of bamboo. There is also an urgent need for guidance on intensified technology to promote growing bamboo on private lands.

14. Market transparency on the demand and trade of NTFPs should be improved with a continuous information service which would also reveal the mark-ups of middlemen to improve the efficiency of the market mechanism.

Ecotourism

15. An ecotourism development strategy should be elaborated which could guide local communities and the private sector to enhance the contribution of the natural heritage and local communities to sustainable tourism development in Thailand. The three border areas as potential focal zones for future tourism development (Andaman, the Eastern Forest Complex and the Northern area) should be duly considered in the strategy.

Financing

16. Feasibility of establishing a special forest fund for community forestry and smallholder plantation development through using the existing banking institutions as the delivery channel should be studied.

Public Policies

17. The Forest Policy should be updated through an inclusive structured NFP process. The conflicting policy goals related to land use, which impact forests and the forestry sector, should be removed.

18. National Criteria & Indicators for SFM should be developed to serve as a tool for clarifying forest policy goals and designing a monitoring system at national and forest management unit levels.

19. Forest impact safeguards should be developed to guide the design of future road, infrastructure and urban/tourism development projects in Thailand as they play a critical role in opening up access to encroachers facilitating commercialization of agricultural production in frontier areas with a risk of contributing to inappropriate land conversion.

20. A special survey with field data collection should be carried out on the illegal logging and associated trade, as there is no reliable information available on the current extent and nature of the problem. Monitoring and control systems should be further developed drawing on the integration of different sources of data and possibility for various modalities to improve the efficacy of control (e.g. independent auditing, chain-of-custody certification, etc.)

Institutional Capacity

21. A detailed assessment should be carried out on the options for the institutional structure related to RFD and DNP. Both departments could be re-merged with more precise and clear mandates for better coordination and understanding, but they could also be run as separate units. In the latter case reallocation of duties and resources would be needed and effective coordination mechanisms at the level of the headquarters and field staff should be established. In both cases, a proper line of command should be established.

22. The extension unit or division at the department level should have a clear role in the overall development of forestry extension with the tasks of developing suitable extension strategies and packages, and providing support and training to field staff. It should ensure that there are consistent messages going out to the clients and the public, in line with the Government's overall environmental and development policy objectives. The unit should provide leadership in developing a unified integrated extension program for the provincial, district, TAO and village level officers, including plans for activities related to extension of community forestry, private forestry, industrial forestry, watershed management and people's participation in management of

national parks and wildlife sanctuaries. The unit should also coordinate with the extension units or divisions of other sectors.

23. Provincial and District Natural Resource/Forest Officers should assume a strong role and develop solid strategic plans for the forestry development. Guidance for how such plans should be prepared does not exist and RFD should address this, together with associated training, as a top priority. In view of the large number of provinces the task is extensive.

24. FIO should revise it mandate and overhaul its operations within a strategy where all options for the organization's future role are duly considered. This would probably involve divestment or transfer some of the duties and assets to organizations which are in better position to carry out the tasks. Possible future roles for FIO could be (i) management of state-owned plantation assets (likely involving outsourcing), (ii) development of partnerships with farmers and other private landowners for production of timber and NTFPs, and (iii) acting as a catalyst for new technologies (utilization of teak thinnings, eucalyptus sawlog production and marketing, etc.). The future role is interlinked with RFD's future mandates. Options for the organizational arrangements in both organizations should be considered simultaneously.

Research

25. The general criteria of the Ministry of Science and Technology are too general to properly guide forestry research. The research priorities should be identified based on problem analysis. Practical and field-oriented research would ensure its wider utility. Effective dissemination of research results targeted at beneficiaries should be improved, as there is now emphasis on academic channels.

26. Many actors including universities and private sector are conducting forestry-related research on specific issues of immediate interest to them. The research agendas of various actors should be linked to a clear strategic vision of the forestry sector which is unfortunately lacking. There is an urgent need to establish an integrated Forestry Research Network in the country with sufficient budget allocations.

27. Further research would be urgently required on (a) economic and social aspects of forestry, (b) suitable tree species for shelterbelt establishment along the coastal areas, (c) increasing of productivity of wood and other forest produce, (d) reclamation of wastelands and degraded lands through low-cost measures, (e) research related to social forestry, farm-forestry, agroforestry, and urban forestry, and (f) commercial bioenergy utilization for electricity and heat generation from plantation wood and industrial residues. On-farm research should be expanded as it has more demonstrative effect on the farmers. The extension activities should go hand in hand with the on-farm research activities.

Education, Training and Extension

28. A human development plan should be prepared for the forestry sector covering education, training and extension (for the next 5-7 years) should be developed.. As a first step, a task team should be established to undertake a feasibility study for the current and future needs of education, training and extension programs and activities to serve as a basis for such a strategy.

29. Organizational development of smallholders and community forests will not happen without the catalytic support from RFD or other public agencies. Government support to organizational strengthening could include developing model rules of operation for local associations, and support to initial phase of organization. To start the process, pilot projects in representative situations could be launched to test alternative approaches for organization of tree farmers and communities, and how extension services could be arranged.

30. One of the technical colleges/institutes should be assigned to set up a specialized training programme to meet the technical level training of the roughly 1,700 Thai furniture enterprises.

Information System

31. RFD should prepare a road map with the time frame for the collection, dissemination and development of National Forestry Database Management System (NFDMS). The System would improve collection and dissemination of information and statistical data on forest resources, forestry operations, forest industry and product markets with unified definitions and measurement units. Special studies should be carried out on key data gaps such as the production and consumption of timber and sawnwood, fuelwood, and NTFPs in the domestic market at the sub-district, district and provincial levels, including illegal harvesting and associated trade. Development of the NFDMS database should involve participation of users and other stakeholders including the design of means for how they can access relevant information. A maximum level of transparency should be aimed at.

11.2 Other Stakeholders

11.2.1 Forest Industry

1. Sawmilling and plywood industries should improve the current purchasing system of logs where the only criterion of quality is presently log diameter, if any. Such a system should pay due attention to the use value of logs based on established grading criteria.
2. The private sector should implement an integrated approach to develop eucalyptus utilization for sawmilling and plywood production including (i) establishment of thinning trials and development of silvicultural systems, (ii) stock-taking of the international experience on the use of eucalyptus for solidwood products, (iii) industrial-scale trials, (iv) development of quality requirements for large-sized logs and pricing scales, (v) promotion of thinnings among eucalyptus farmers. This work could possibly be done through a joint project between RFD and the private sector.
3. Both sawmilling and pulpwood industry should be engaged in R&D work to develop utilization of large-diameter logs to gain experience on processing, particularly on drying, drawing on knowledge in other countries.
4. *In view of the potential to use eucalyptus for solidwood products, a broader range of species should be introduced in plantation investments as E. camaldulensis is not the optimum for all uses. The feasibility of growing E. grandis, E. urophylla and their hybrids should be studied with this objective. Based on the results, the woodworking industry could encourage private planting of these species which are also highly suitable for pulping.*
5. *The industry should have a better control of its raw material supply and it should also play a more active role in its development. Harvesting training should be provided to those growers who have capacity to work in harvesting. Industry and contractors could encourage this by introducing remunerative prices for logged timber sold on roadside or on the plantation site. This recommendation concerns particularly the pulp and paper and reconstituted wood-based panel industries.*
6. In order to improve its competitiveness, the industry should move more aggressively towards adoption of higher efficiency technological options for log handling, sawing, drying, further processing and waste handling.
7. The industrial associations should be developed to make them more capable for their own policy analysis, more transparent and more effective to ensure that broader industry interests are duly considered in the public policy.
8. A joint consultative body among industry associations could become useful in the future to address common interests like promotion of wood production, certification, trade regulation, promotion of training and research, etc.

11.2.2 Forest Communities, Farmers and Landowners

9. Forest communities, farmers and landowners should establish effective common organizations (associations, cooperatives, etc.) which would be capable to protect their interests in varying market conditions. These common organizations would be crucial for improving the negotiation power of the roundwood producers leading to remunerative wood prices.

10. Associations should probably develop a clear two (or three)-level structure with provincial or district level associations and a national federation which would serve as a common interest group. Farmer/landowner associations should develop over time their own extension capacity, as it is unlikely that the public sector could carry out this task.

11. Tree farmer-corporate partnership arrangements should be promoted as a means for greater investment in plantations and mitigating against market risks. Partnerships can also mobilize such landowners in plantation investment who do not have own resources to organize planting and management activities. There is a need to improve transparency on the practical arrangements and, if needed, introduce facilitators (e.g. RFD extension agents) to advise on appropriate formulae which are not abusive for small landowners. Also farmer associations can assume the facilitator role.

11.2.3 Civil Society

12. The dialogue on rural people's role in conservation strategies should be enhanced among the NGO community as the Government is getting vastly different and mixed messages on how policies on forest-dependent people should be designed. In promoting sustainable forestry development, it is of utmost importance that the two sides of the NGO community can be engaged in achieving the common goals. For the NGOs their impact would also be more significant if they could develop common policy proposals and work strategies.

13. An NGO Forest Network should be established. Enhanced cooperation is needed both at national and local levels to ensure effective change of experience and information. A new neutral body could be identified or established to run such a network if none of the existing NGOs can assume this task.

11.2.4 All Stakeholders

14. All the stakeholders, probably with the facilitation of the RFD, should identify and assess options for the development of forest certification in Thailand. A national-level stakeholder workshop would be a useful instrument to take stock of the market demands and grassroots experiences, and to assess which option(s) would be feasible in Thailand. In the development of the national standard a broad-based participatory process should be applied and the international requirements for national standards/systems should be duly considered from the outset.

11.3 ITTO

11.3.1 Support to Thailand

The following elements could constitute a framework for ITTO's future support program to Thailand

1. The development of national Criteria & Indicators for SFM through a broad-based participatory process has a potential to serve as a critical element in developing a shared vision among stakeholders about how the country's national forests should be managed. ITTO has a comparative advantage in supporting Thailand in this important exercise which could clarify the national policy goals.

2. Cross-border forest complexes represent a particular priority in the maintenance of protected areas over broader landscapes which need to be conserved through integrated approaches including buffer zones, biological corridors, etc. and which should address the specific issues of border areas (immigration, trade in endangered species, illegal logging, etc.). Drawing on the positive experience to develop a management plan for large forest areas in the Phatam Protected Forests Complex, ITTO support would be required to develop the Management Plan for the Western Forest Complex.
3. The elaboration of the human development plan and extension strategy would be the first step to remove a key constraint to making progress towards SFM in Thailand. In view of ITTO's earlier work in this field in the region, the Organization would have a competitive advantage to provide support the country by starting with a pre-project study.
4. A major support program should be launched to strengthen the national forest information system. This is required for improved control of illegal logging and associated trade but also public decision-making on the sector in general. The work could be launched with a feasibility study that would map out options and outline a comprehensive plan for implementation.
5. ITTO should build partnerships with Thai education and training institutes and some regional organizations, such as RECOFTC, to design and deliver a range of capacity building products and services targeted at implementation of the relevant recommendations of the Mission.
6. In view of the urgent needs of the Thai furniture industry, a program of crash courses for supervisors on quality management could be arranged with ITTO assistance.

11.3.2 General Recommendation

7. ITTO has a comparative advantage in promoting the transfer of knowledge on eucalyptus processing for solidwood products. An international-level project to take stock of the state-of-art and disseminate the existing knowledge would benefit producing Member Countries, including Thailand, which need to diversify utilization of their eucalyptus plantations. Dissemination should focus on technical solutions on problems of sawing and drying of eucalyptus, further processing, markets and economic aspects.

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Annex 1 Terms of Reference for Diagnostic Missions

The Terms of Reference of a Diagnostic Mission to any country will be to:

1. Identify the factors that are most critical in preventing the attainment of sustainable forest management in that country.
2. Assemble these constraints in order of importance.
3. Recommend a sequence of actions to remove the constraints, providing cost estimates whenever possible.

Notes of Guidance

The principles underlying the Diagnostic Missions are these:

1. In any situation, there is usually one factor that is most crucial in preventing progress. Until this constraint is removed, no progress is possible on any other front. But, once this first constraint is removed, there may be another that, in its turn, limits progress. Etc.
2. The objective of the Diagnostic Mission is to identify these constraints, to arrange them in a sequence and recommend appropriate action.
3. The exact procedures for the Mission will depend upon the circumstances in the country concerned. It should, however, include:
   - Discussion with government ministers and senior members of the department responsible for forests, land use and trade.
   - Discussion with forest managers and representatives of the timber trade.
   - Discussion with the principal NGOs concerned with forest questions.
   - Examination of the National Forestry Action Plan.
   - Visits to selected forest areas and forest industries that illustrate particular problems or opportunities.
4. The important constraints are likely to lie in Criterion 1 of the National Level Criteria and Indicators, and particularly in the subjects dealt with in Indicators 1.1 to 1.5.
5. The following questions may be found helpful in defining the subject areas in which constraints may be found. It is NOT intended that the Mission should provide answers to all these questions.

   Policy. Is there a national land use policy? Is there a national policy for the sustainable management of a permanent forest estate? If not, why?

   Extent What area of natural forest is managed for the sustainable production of timber?

   Allocation. Is there a satisfactory system for choosing, demarcating and protecting those areas that will be used as production forest? If not, why?
   Is there a satisfactory system for choosing, demarcating and protecting those areas that will be used as protection/conservation forest? If not, why?
   Are there pressures from other sectors or interests to remove productive forest from forest use? What measures are being taken to counter or divert these pressures?

Annex 1/2/ (Terms of Reference (Cont'd)

Sociological and economic conditions. In what ways do the various people who have an interest in or are affected by the management of the forest, benefit from this management or suffer from mismanagement (people dwelling in or near the forest, loggers, middlemen, wood processors, small industries, the Forest Authority, consumers generally, other government revenues)? Are the benefits adequate to provide an incentive to good management? Is there equitable distribution of these benefits? If not, why?

Management. Are there any management plans guiding timber production? Are the objectives of management conducive to sustainable production? Are the management prescriptions appropriate for the particular forest type? Are they rigorously applied and reviewed? If not, why?

Pre-exploitation survey. How comprehensive and adequate is the pre-exploitation survey: choice and marking of trees for felling; analysis of trees to remain unfelled; existing regeneration; environmental conditions; routing of extraction roads? If inadequate, why is this so?

Choice of exploiters. Does the choice take into account the best long-term interests of the forest? How?

Conditions of exploitation. Do these bring reasonable benefits to the various parties concerned: government revenues, any reforestation fund, the logging companies, local contractors, logging labour, those with customary rights in the land?
Are the conditions of exploitation such as to encourage long-term investment in the sustainable management of the forest? Are there reasonable incentives to encourage good management? What proportion of revenues are returned to forest management? If these conditions are not met, what prevents it?

Quality of exploitation. Are there guidelines for the siting, construction and maintenance of extraction roads, weather in which exploitation should not take place, equipment to be used, directional felling, cutting of lianes etc.? Are such guidelines followed? If not, why?
Are the above conditions monitored during and after exploitation? How? How well?

Post-exploitation survey and treatment. Are there guidelines? Are they sensitive to different forest types? Are they adhered to? Is later performance monitored? How? If not, why?

Control. Is there effective control of operations at all stages? If not, why?

Follow-up. Are there arrangements for monitoring and reviewing prescriptions? If not, why?

Research Is research designed to support sustainable timber production from natural forest? Is it adequate to provide the necessary information to answer the questions set out above? Are there permanent sample plots to provide the data upon which sustainable yield can be calculated? Are the data processed and made available to management within a reasonable time?

Education and training. Are sufficient trained staff at all levels being produced with qualifications in the skills needed in natural forest management?

Annex 2 Itinerary of the ITTO Mission

Date	Time	Activities
22 March		Arrival in Bangkok of Mr. M. Simula and Mr. C. Mayura
23 March	09.00	Finalization of the programme of the visits with RFD Discussion on the preliminary country report with local consultants
	10.00	Review of the statistical data on production and trade of forest products. Discussion with representatives of the Department of Customs and RFD Forest Control
24 March	09.00	Lecture on ITTO's programme in SFM in Kasetsart University
	11.00	Meeting with Tropical Forestry Program of the Faculty of Forestry on Silviculture
	14.00	Meeting at RECOFTC to review of background documentation
	15.30	Faculty of Forestry (Plantations)
25 March	10.00	Meeting with local consultants and the Geo-Information and Space Technology Development Agency
26 March		Review of background documentation
27 March	09.00	Meeting with the Director General, Royal Forest Department (Mr. Chatchai Ratanopat)
	10.30	Visit to Sophon Packing Company Limited in Samutprakarn Province
	14.00	Visit to Fancy Wood Industries Public Company Limited
28 March		Arrival of Mr. Behari
	09.30	Meeting with the Department of National Parks, Wildlife and Plant Conservation (DNP) and RDF
	14.00	Meeting with Thailand Environment Institute (Group 1)
	14.00	Meeting with the Fiscal Policy Office (Group 2)
29 March		Arrival of Mr. Akaha
	09.00	Meeting with the Forest Plantation Owners' Association
	10.30	Meeting with the Faculty of Forestry, Kasetsart University on forestry education and research
	14.00	Meeting with coordinators of ITTO-financed Projects (Group 1)
		Meeting with the Department of Marine and Coastal Resources (Group 2)
	19.00	Reception Dinner at Chaophraya Park Hotel
30 March	09.30	Meeting with Bank for Agriculture and Agricultural Cooperatives (Group 2) Meeting with the Public Sector Development Commission (Group 1)
	14.00	Meeting with the Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment (Group 1)
	14.00	Meeting with DANIDA (Group 2)
31 March	06.30	Departure for Chiang Mai by TG 100
	07.40	Arrival at Chiang Mai
	09.00	Meeting with Chiang Mai University (Group 1)
	10.30	Meeting with ICRAF (Group 1)
	09.30	Meeting with Mae Jo University (Group 2)
	14.00	Visit to Wildlife Fund of Thailand regional office at Chiangdao District (Group 1)
	14.00	Meeting with the Hill Tribe Development and Welfare Office, Chiang Mai (Group 2)
	19.00	Dinner meeting with wood and wood product traders, furniture companies and sawmillers, in Chiang Mai
1 April	08.00	Visit to Baan Talad Kilek, Doi Saket District: Case study on modern forest village (Group 2)
	08.00	Visit to Mallika Furniture Manufacturer (Group 1)
	10.00	Meeting with Prof. Dr. Mingsarn Kaosa-ard, Director, Social Research Institute, Chiang Mai University (Group 1)
	14.00	Visit to Baan Kampong, Sankampaeng district: Case study on community forest development plan and ecotourism

Annex 2/2 Itinerary of the ITTO Mission (Cont'd)

Date	Time	Activities
2 April	09.00 17.25	Meeting with Dr. Dhammanaat Foundation in Chiang Mai Departure for Bangkok by TG 115
3 April	 08.00 11.00 15.00 19.00	Departure of Mr.Mayura Departure for Nakorn Ratchasima Province by car Visit to Reforestation and Extension 4: case study on small scale forest plantation, sustainable forest management (small-scale), forest cooperatives, training and extension model in Nakora Ratchasima Departure for Prachinburi Province Dinner meeting with the representatives of the Forest Office Pachinburi Branch, RFD Provincial and National Park Division, Protected Area Regional Office 2 in Prachinburi
4 April	08.30 10.00 12.00 15.00	Visit to eucalyptus intercropping with paddy rice farms Visit two bamboo plantation farmers Visit to local bamboo market Departure for Rayong Province
5 April	09.00 11.00 12.00 15.30	Meeting with the Provincial Office of the Rubber Replanting Aid Fund, Rayong Visit to rubber plantation area, Rayong Visit to S.Kijchai Group (rubberwood processing factories) Visit to Vanachai Public Company Limited, Rayong Province
6 April	09.00 11.00	Meeting of the mission and counterparts for the preliminary conclusions Meeting with Forest Industry Organization Departure of Mr. Akaha
7 April	09.00 09.30 13.00	Meeting with national wood, paper and furniture industry associations (Group 1) Meeting with the National Economic and Social Development Board (Group 2) Debriefing with the Director General and management of Royal Forest Department, DNP and other stakeholders Departure of Mr. Behari
8 April	00.20	Departure of Mr. Simula

Annex 3 List of People Consulted

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- Dr Watanaa	Vice-President	
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Forest and Plant Conservation		
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Prachinburi (Regional Office)		
- Mr. Sumitr Sirichote	Director of National Parks	
- Ms. Wattana Wachirodom	Vice chairman	
FAO		
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Fancy Wood Ind. Plc		
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FIO - Forest Industry Organization		
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Annex 3/2 List of People Consulted (Cont'd)

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ROYAL FOREST DEPARTMENT		
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Annex 3/3 List of People Consulted (Cont'd)

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- Mr. Chonglang Sangonee	Forestry Officer	
- Ms. Tippawan Sirisakorn	Forestry Officer	
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- Mr. Pitak Chongsujja	Head of Forestry Operations	
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- Ms. Waraporn Trakoolsajjawat	Financial and Accounting Manager	
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Annex 3/4 List of People Consulted (Cont'd)

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- Mr. Than Jarasthanakis		info@thaisawmills.com
- Mr. Paisal Ratprasertkul		
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Thai Furniture Industries Association		
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- Mr. Mongkhon Amphapirom	Village Headman	
Village of Nong Chan, Prachinburi Province		
- Mr. Prasit Kamvichai	Assistant Village Headman	
- Ms. Bunga Trashoe	Bamboo plantation owner	
- Ms. Kanenng Chansir	Bamboo plantation owner	
Community forest, Doi Saket District Chiang Mai		
- Mr. Manoe Tatnum	Head of community	
Ecotourism , Community forest, Chiang Mai province		
- Mr. Phrommin Mala	Head of village	
Charcoal Producer Nakon Ratchasima Province		
- Ms. Sureporn Phadungyotsanan		
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Mr. Kaneung Chansiri	Assistant Professor	

Annex 4 ITTO Supported Projects in Thailand

Code	Year	Project title	Implementary agency	Budget / USD
11 Completed projects				
PP-F/08-18	1990	The National Biological Conference of Thailand	Ministry of Science, Technology and Energy	90,500
PPD005/96(F)	1996	Buffer Zone Development for Sustainable Forest Management	Thailand Environment Institute (TEI)	41,878
PPD001/98 Rev. 2(I)	1998	Rubberwood Utilization and Marketing in Thailand	Royal Forest Department (RFD) - Forest Research Office	82,290
PPD004/98 Rev. 1(I)	1998	Promotion of Tropical Non-wood Forest Production in Thailand	RFD - Forest Research Office	89,886
PPD005/99 Rev. 1(F)	1999	Development of a Model Forest for Sustainable Forest Management in Thailand	RFD - Forest Research Office	82,079
PD202/91 Rev.1(F)	1993	Sustainable Forest Management through Collaborative Efforts	Society for the Conservation of National Treasures and Environment	1,039,500
PD016/97 Rev.3(F)	1997	Integrated Buffer Zone Development for Sustainable Management of Tropical Forest Resources in Thailand	TEI	601,333
PD002/99 Rev.2(F)	1999	Preparatory Studies to Install a Continuous Monitoring System for the Sustainable Management of Thailand Forest Resources	RFD - Forest Research Office	681,034
PD028/99 Rev.2(F)	1999	A Scientific and Technical Workshop for S.E. Asia on Forest Restoration for Wildlife Conservation	Forest Restoration and Rehabilitation Unit (FORRU)	36,514
PD056/99 Rev.1(I)	1999	Promotion of the Utilization of Bamboo from Sustainable Sources in Thailand	RFD - Forest Research Office	452,996
PD015/00 Rev.2(F)	2000	Management of the Phatam Protected Forests Complex to Promote Cooperation for Trans-Boundary Biodiversity Conservation Between Thailand, Cambodia and Laos (Phase I)	RFD	629,624
Sub-total of 11 completed projects			**USD**	**3,827,634**
3 Operational projects				
PD024/00 Rev. (I)	2000	Promotion of Sustainable Utilization of Rattan from Plantation in Thailand	RFD – Forest Research Office	292,457
PD051/100 Rev.2(I,M)	2001	Improvement of Rubberwood Utilization and Marketing in Thailand	RFD – Forest Research Office	406,138
PD195/03 Rev.2(F)	2003	To Establish a National Monitoring Information System for the Effective Conservation and Sustainable Management of Thailand Forest Resources	Department of National Parks, Wildlife and Plant Conservation (DNP)	677,743
Sub-total of 3 operational projects			**USD**	**1,376,338**
Sub-total of 14 projects [1)]			**USD**	**5,203,972**

[1)] Excludes PP-F/09-21. Global Technical Workshop to Explore the Feasibility of Forest Options

Annex 5. Forest Area in 2000-2004

Region	2000				2004			
	Forest	Mangrove	Total	% of total land area	Forest	Mangrove	Total	% of total land area
	- 1,000 ha -				- 1,00 ha -			
North	9,627.0	-	9,627.0	56.8	9,206.8	-	9,206.8	54.3
Northeast	2,652.6	-	2,652.6	15.7	2,809.6	-	2,809.6	16.6
Central	2,133.6	12.5	2,146.2	31.8	2,114.7	9.7	2,124.3	31.5
East	820.4	23.4	843.8	23.1	801.3	22.7	824.0	22.6
South	1,532.0	209.3	1,741.3	24.6	1,550.9	243.4	1,794.3	25.4
Total	**16,756.8**	**245.3**	**17,011.1**	**33.2**	**16,483.3**	**275.8**	**16,759.1**	**32.7**

Source: RFD 2004

Annex 6 Forest Area by Type and Region 2004

Region	Evergreen forest	Mixed deciduous forest	Dry dipterocrap forest	Pine forest	Bamboo forest	Beach forest	Swamp forest	Mangrove forest	Total	Forest % of total area
					- 1,000 ha -					
Central	13.6	126.2	9.5	-	4.1	-	-	0.9	154.4	35.8
East	651.1	130.2	2.7	-	16.8	0.4	0.2	22.7	824.0	22.6
West	435.9	1,387.7	65.3	-	72.0	0.2	0.2	8.7	1,969.9	42.7
North	1,932.2	6,219.8	995.0	32.4	26.9	-	-	-	9,206.8	54.3
Northeast	821.7	889.1	968.8	13.0	117.0	-	-	-	2,809.6	16.6
South	1,500.7	0.3	-	-	.4	9.9	38.6	243.4	1,794.3	25.4
Total	5,355.1	8,753.4	2,041.3	45.4	238.2	10.5	38.9	275.8	16,759.1	32.7

Source: Forest Resource Assessment Division, RFD

Note: The data are not entirely consistent with other sources. The actual forest cover at national level is presently estimated at about 25% suggesting the figures in the table are likely be higher than actual. Therefore, the table is indicative for the distribution of forest resources by type and region rather than representing accurate current situation.

Annex 7 Forest Reserves, 2004

Region	National forest reserves[1)]	Total reported forest area	Balance
	- 1,000 ha -		
North	11,196.5	9,206.8	-1,989.7
Northeast	5,533.3	2,809.6	-2,723.7
Central	2,041.4	2,124.3	+82.9
East	1,447.5	824.0	-623.5
South	2,818.3	1,794.3	-1,024.0
Total	**23,037.1**	**16,759.1**	**-6,278.0**

1) Areas based on the declared area of the Government Gazette; some areas may overlap with each other and some areas have already revoked from the reserve category for other uses

Source: RFD 2004b

Annex 8 Endemic and Threatened Species in Thailand

Group	Species	Endemic species		Threatened species **	
Vertebrate Species	**No. of species**	**No. of species**	**%**	**No. of species**	**%**
Mammals	302	5	1.66	116	38.41
Birds	982	2	0.20	180	18.33
Reptiles	350 (366 forms)	47 (49 forms)	13.39	32 (33 forms)	9.02
Amphibians	137 (138 forms)	7	0.05	5	3.62
Fishes	2,820	72	2.55	215	7,62
Total	**4,591 (4,608 forms)**	**133 (135 forms)**	**2.93**	**548 (549 forms)**	**11.91**
Plant Species					
Pteridophyte	468	19	4.6	41	8.76
Gymnospermae	32	0	0	27	84.38
Angiospermae	8,560	738	8.62	1,356	15.84
- Monocotyledonae*	2,756	211	5.66	416	15.09
- Orchidaceae*	1,200	87	7.25	175	14.58
- Palmae*	150	16	10.67	85	56.67
- Zingiberaceae*	270	27	10.00	57	21.11
Dicotyledonae	5,804	527	9.08	940	16.20
- Euphobiaceae*	425	47	11.06	79	18.59
- Rubiaceae*	600	53	8.83	71	11.83
- Gesneriaceae*	144	46	31.94	63	43.75

* Only major families are included

Note: The figures are not fully consistent with Table 2.5 in spite of being based on the same source

Source: MONRE 2006 and Mission Calculations

Annex 9 Treefarm Plantation Promotion Program 1994-2002

Year	Planted area
1994	64.5
1995	148.6
1996	51.1
1997	35.5
1998	6.5
1999	4.9
2000	6.5
2001	-
2002	2.7
Total	**320.3**

By species	1,000 ha	%
Tectona grandis	147.9	46.2
Azadirachta excelsa	72.0	22.5
Pterocarpus macrocarpus	62.5	19.5
Others (53 species)	37.8	11.8
Total	**320.3**	**100.0**

Annex 10 Reforestation Area by Government Program

Unit 1 000 ha

Programs	From beginning to 1998	1999	2000	2001	2002	2003	2004	Total
Afforestation by Government Budget	658.0	9.3	5.5	4.2	5.6	3.9	5.6	692.1
Concessionaire's Reforestation (the Reforestation Campaign in Commemoration of the Royal Golden Jubilee)	340.4	15.3	13.0	16.0	16.8	2.4	5.0	408.9
Forest Industry Organisation (FIO)	27.0	5.9	0.7	0.0	0.0	0.0	0.0	33.7
Thai Plywood Co., Ltd.	2.5	0.7	0.4	0.3	0.6	0.1	0.3	4.9
Reforestation according to Ministry's Regulations	13.8	1.3	1.5	1.9	0.4	0.5	0.6	20.0
Reforestation by Concessionaire Budget	22.4	0.0	0.1	0.1	2.4	4.9	2.9	32.8
Total	**1,064.0**	**32.6**	**21.1**	**22.6**	**25.8**	**11.8**	**14.3**	**1,192,3**

Source: Forestry Statistics of Thailand (RFD 2004b)

Annex 11 Imports of Logs and Sawnwood, 1984-2004

Year	Logs	Sawnwood	Total WRME[1)]
	- 1000 m^3 -		
1984	199.5	382.0	1,048.4
1985	172.1	246.1	719.0
1986	152.7	195.9	588.0
1987	282.9	442.3	1,265.8
1988	447.0	676.6	1,950.6
1989	1,193.3	1,314.7	4,114.9
1990	1,847.4	1,493.6	5,166.5
1991	1,747.2	1,533.6	5,155.2
1992	2,036.1	1,778.3	5,987.9
1993	1,366.7	1,801.5	5.370.0
1994	1,548,9	2,516.8	7.141.8
1995	1,377.9	2,085.7	6.012.8
1996	936.3	2,215.5	5.859.6
1997	895.5	1,463.1	4.146.8
1998	278.1	961.6	2.415.0
1999	468.5	1,255.0	3.257.4
2000	487.4	1,027.1	2.769.8
2001	516.9	1,285.5	3.373.6
2002	641.4	1,924.6	4,918.3
2003[2)]	..	..	..
2004	381.3	1,835.3	4,459.7

(1) Calculated based on 45% recovery rate in sawmilling
(2) Data contains statistical errors and is not reproduced here

Source: RFD 2004b;

Note: Total wood raw material equivalent (WRME) calculated by the Mission

Annex 12 Import Duties of Wood Products 2006

Code	Product	Regulation	Effective
		% of CIF value	
44.01	Logs, chips, wood residues, fuelwood	10	1
44.02	Charcoal	10	1
44.03	Wood in the rough, all species	10	1
44.04	Hopwood, poles, piles, etc. (not sawn)	25	1
44.06	Railway sleepers	10	1
44.07	Sawnwood		
	- planed	40	5
	- other	20	1
44.08	Veneer sheets	40	12.5 or 5
44.09	Wood continuously shaped (tongued, grooved, rebated, etc.)	40	12.5 or 5
44.10	Particle board	70	12.5 or 5
44.11	Fibreboard	40	12.5 or 5
44.12	Plywood	60	12.5 or 5
44.14	Wooden frames	40	30
44.15	Crates, pallets	40	20 or 10
44.18	Builder's joinery (door, windows, etc.)	40	30

Source: Customs Department

Annex 13.a Foreign Trade in Furniture 1999-2004

Year	Exports	Imports	Balance
	- US$ mill. -		
1999	349.1	1.9	+347.2
2000	454.4	4.6	+449.8
2001	450.0	6.8	+443.2
2002	492.1	7.1	+485.0
2003	497.6	7.3	+490.3
2004	562.9	13.0	+549.9

Source: RFD & FRI, KU. 2005

Annex 13.b Export Markets of Wooden Furniture, 2004

Market	%
North America	
- USA	50.0
- Canada	4.3
Sub-total	**54.3**
Japan	26.0
Europe	
- UK	4.3
- Germany	2.0
France	1.4
Italy	1.6
Netherlands	0.5
Other Europe	2.2
Sub-total	**12.0**
Gulf States	1.3
Asia (excluding Japan)	2.3
Other markets	4.1
Total	**100.0**

Source: Customs Department

Annex 14 Wood-based Industries and Trade in Thailand

Type of establishment	Total	Bangkok	Central	North	Northeast	South	East
		- Number of establishments -					
Sawmills							
- mechanized	217	48	92	33	25	17	2
- manual	25	-	7	14	2	-	2
Total	**242**	**48**	**99**	**47**	**27**	**17**	**4**
Wood-working plants							
- mechanized	5,123	2,494	1,403	295	544	273	114
- manual	195	35	20	28	100	9	3
Total	**5,318**	**2,529**	**1,423**	**323**	**644**	**282**	**117**
Timber traders, timbers yards	3,049	1,110	855	226	613	157	88
Wood products shops	3,837	1,939	726	401	585	103	83
Total	**6,886**	**3,049**	**1,581**	**627**	**1,198**	**260**	**171**

Source: RFD 2004b

Annex 15 Structure of Labour Force in Forest-based Industries in 2000

Indicator	Wood and wood processing	Furniture [1)]	Pulp, paper and converted products	Total manufacturing (all industries)
Share of female employees in total employment %	44.6	53.3	39.4	53.7
Structure of labour force %				
skilled labour	39.2	54.4	46.0	50.4
unskilled labour	49.5	34.0	37.6	33.3
Sub-total	88.7	88.4	83.6	83.7
Other employees	10.3	10.4	16.0	15.7
Grand total [2)]	99.0	98.8	99.6	99.4
Furniture and manufacturing n.e.c.				
(2) The balance is ”unpaid workers”				

Source: Mission calculations based on data of National Statistical Office (www.nso.go.th)

Annex 16 Farmholding Land-use Change 1998-2004

Land use	Share of total land use in 2001	Change of area in 1998-2001	Regional differences
	- % -		
Residential area	2.8	+3.9	Increase in all regions
Paddy land	49.8	-1.1	Increase in Northeast, elsewhere decline
Upland field crops	21.5	-2.8	Decrease in all areas, non-existent in South
Land under fruit trees	20.3	+6.0	South has largest area but slower increase than elsewhere
Land under vegetable and ornamental plants	0.9	+19.9	Increase highest in Northeast, Central and South
Pasture land	0.7	+27.8	Largest area in Northeast where increase is smallest
Waste land	2.1	-7.0	..
Miscellaneous	2.0	+15.6	..
Total	100	+0.5	North decline, elsewhere stable or slight increase
Total 1,000 ha	**20,970**		

Source: Mission calculation based on Agricultural Statistics of Thailand 2004

Annex 17 Cultivated Area by Main Crop 1996-2004

Crops	Share of total cultivated area in 2004	Change of area in 1996-2004
	- % -	
Rice	70.6	+5.1
Maize	7.4	-19.9
Mungbeans	1.5	-28.4
Cassava	7.2	-14.3
Sugar cane	7.4	+11.6
Soybean	1.1	+85.5
Oil palm	2.1	-40.3
Others	2.7	..
Total	100	0.0
Total 1000 ha	**15,109**	

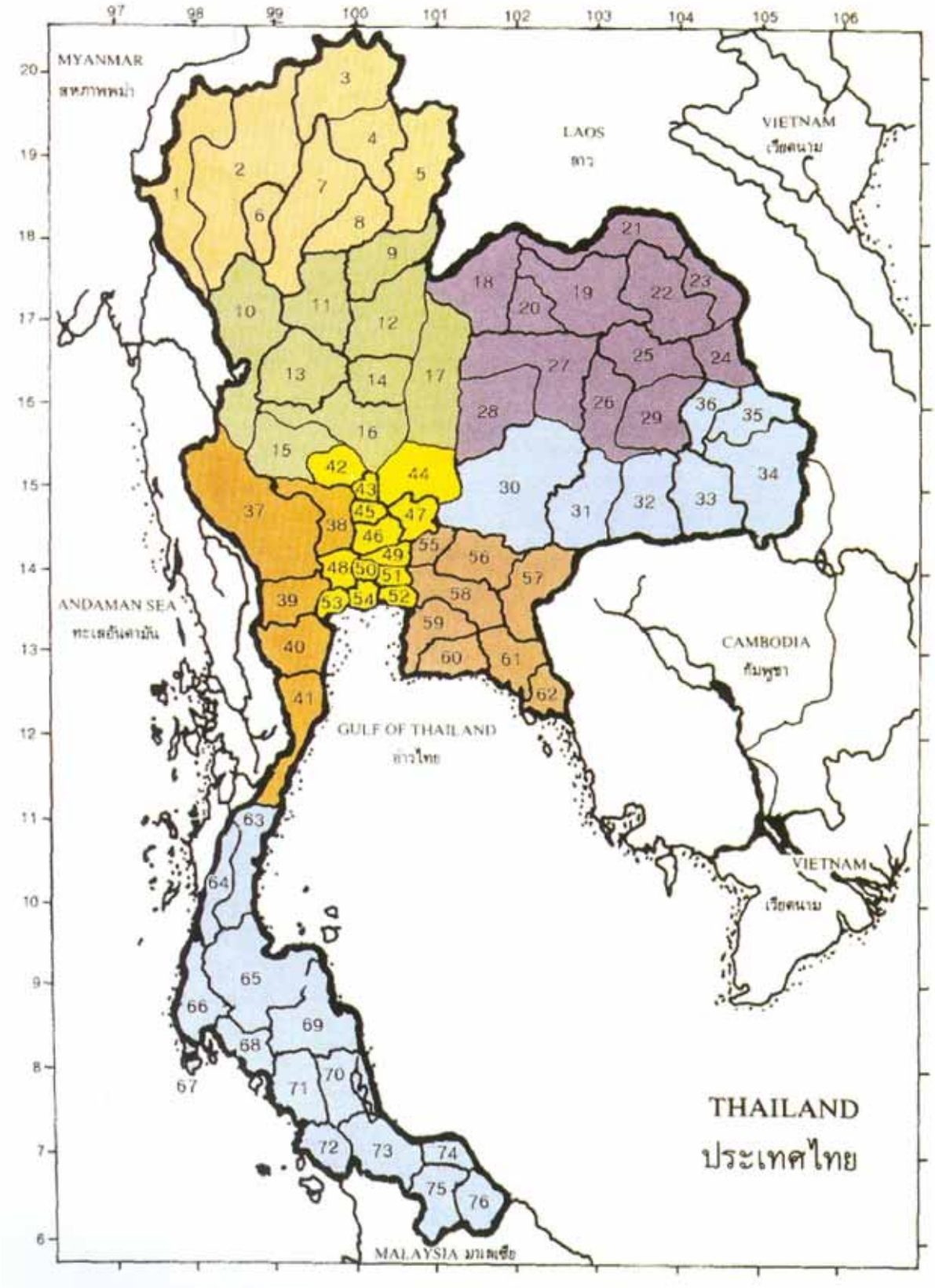
Source: Mission calculation based on Agricultural Statistics of Thailand 2004

Annex 18 FIO Production and Sales

Production	**1999**	**2000**	**2001**	**2002**
	- m^3 -			
Teak logs	3,150	5,200	4,620	5,260
Other logs	29,320	29,160	20,830	13,280
Total logs	**32,470**	**34,360**	**25,450**	**18,540**
Teak sawnwood	6,730	10,409	4,985	1,938
Other sawnwood	1,332	1,411	2,112	-
Total sawnwood	**8,062**	**11,820**	**7,097**	**1,938**
Sales from own production/ services				
	- US$ mill. -			
Logs	3.23	3.30	2.84	3.22
Sawnwood	3.55	4.08	2.82	--
Poles from plantations	6.62	7.33	8.36	9.09
Sawmilling and planing	0.19	0.22	0.20	0.19
Furniture	0.80	1.28	1.11	1.15
Latex	2.03	2.52	2.57	3.36
Tourism	0.17	0.18	0.21	0.22
By-products	0.12	0.20	0.18	--
Other	0.15	0.01	0.01	0.11
Total Sales	**16.86**	**19.12**	**18.30**	**17.34**
Gross revenue	..	23.25	22.41	25.93
Expenditure (operating)	..	..	-21.95	-25.88
Interest paid	..	..	-0.80	-0.67
Net profit	..	0.25	-0.34	-0.64[1)]
(1) The reported loss in the balance sheet in 2002 was US$ 0.59 mill.				

Source: FIO Annual Report 2002

Annex 19 Administrative Regions in Thailand



Annex 20 Forest Area Map of Thailand