

# Chapter 10

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## Forestry

Until relatively recent times, Thailand was dominated by impenetrable forests accessible only through water courses in the Central Plain, rain forests in the South, dry *Dipterocarp* forests in the Northeast, and mixed forest including extensive areas of teak in the North. Beginning with teak, poorly regulated extraction signalled the beginning of the demise of the forests, a trend which was accelerated with the introduction of plantation crops in the South, expansion of upland cropping in the Northeast, water control in the Central Plain, and general rising population in the forested mountainous areas of the North. One indicator that most of this decline has occurred during the twentieth century is the remnant attraction of the world's largest living teak tree (*Tectona grandis*) in Uttaradit Province; discovered in 1927 with a height of 47 metres, its girth at waist height currently exceeds ten metres and its age is estimated to be about 1,500 years.

Having largely lost these forests, the story of Thai forestry will increasingly include references to agriculture, social concern including community forests, and well-managed plantations of a range of species suited to industrial needs. However, the few remaining pockets of original Thai forest are of critical environmental importance.

### Frontier Forests

Forests traditionally represented the frontier; a barrier to most of the population, until population increase, new commercial opportunities, or the very value of products from the forest, ultimately led to the frontier being civilised. Notwithstanding reductions in forest area, remaining frontier forests are a critical

global and national resource<sup>1</sup> being large enough to provide a breeding haven for some indigenous species.<sup>2</sup> However, once fragmented, small areas of natural forest cannot sustain their full natural biodiversity,<sup>3</sup> and supplementation with plantations or man-made native refuge forests provide an incomplete replacement for old standing dead trees, for example, which once provided unique habitats for some species.<sup>4</sup>

Thailand has lost up to 95 percent of its original forest, and the remaining five percent is considered 100 percent threatened. This places Thailand with ten other countries which require immediate action to avoid losing remaining frontier forests.<sup>5</sup> With relatively open economic policies for foreign exploitation in the past, and exploitation by its own citizens through the twentieth century, Thailand now differs from its neighbours. By contrast, Cambodia, Lao-PDR, and Myanmar, through periods of instability, reaped the unexpected reward of maintaining much of their frontier forests intact. Today, satellite infra-red photographs indicate a sharp delineation of Thailand from these neighbouring countries on the basis of differing vegetative cover.

Overclearing natural forests impacts primarily on Thailand itself, while also combining with high levels of forest clearing across Asia to affect the regional and global environment. Forest resources and rates of change in selected Asian countries are presented in Table 10.1. These figures include plantation forestry, which is only significant in comparison to natural forest in China and India.<sup>6</sup> Within its 51 million hectare total land area, Thailand has designated some 112 nationally protected areas covering some 6.7 million hectare or 13 percent of total area, three biosphere reserves, and one internationally protected area.<sup>7</sup>

With the two most populous countries showing a lower rate of forest destruction, and a long period of rapid forest destruction in Thailand, continuing forest loss at more than two percent per year indicate poor management of this

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<sup>1</sup> Bryant, D. et al (1997)

<sup>2</sup> Schonewald-Cox, C. (1983)

<sup>3</sup> Harris, L. (1984)

<sup>4</sup> Norse, E. (1990)

<sup>5</sup> Bryant, D. et al (1997)

<sup>6</sup> Kaosaard, Mingsarn and Rerkasem, Benjawan (1999)

<sup>7</sup> WRI (1997)

**Table 10.1 Asian Forests by Area and per Capita, and Annual Rates of Change<sup>8</sup>**

Country	Land Forested (%)	Forest per Capita (ha)	Annual Change 1981 - 1990 (%)	Annual Change 1991 - 1995 (%)
China	14.30	0.1	-0.3	-0.1
Cambodia	55.7	1.0	-1.1	-1.5
Indonesia	60.6	0.6	-1.0	-0.9
Lao-PDR	55.9	2.5	-0.9	-1.1
Malaysia	47.1	0.8	-1.8	-2.3
Myanmar	41.3	0.6	-1.2	-1.3
Philippines	22.7	0.1	-2.8	-3.2
<i>Thailand</i>	<i>22.8</i>	<i>0.2</i>	<i>-2.8</i>	<i>-2.5</i>
Vietnam	28.0	0.1	-1.2	-1.4
India	21.9	0.1	-0.5	0.0

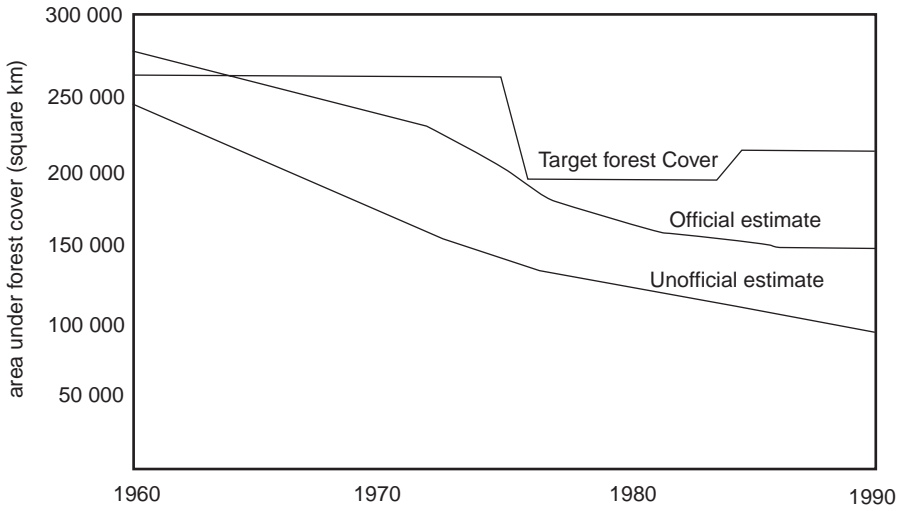
natural resource.

The naturally forested areas of Thailand by province and region have been monitored by the Royal Forestry Department across several decades. Over the period 1961 - 1985, the proportion of native forest in the North has declined from 69 percent to 50 percent, in the East from 58 percent to 22 percent, in the Northeast from 43 percent to 14 percent, in the Central Plain from 53 to 26 percent, and in the South from 42 to 22 percent; over the whole country forested areas declined from 53 percent to 29 percent.<sup>9</sup> However, official estimates are constrained by the need to demonstrate policy successes, and inherent data inconsistencies. Unofficial area estimates, vary markedly from official or targeted figures (Figure 10.1) over the three decades of most rapid forest demise, and are also substantially less than those of United Nations figures.<sup>10</sup> One of the confounding factors in past statistics has been the combination of forest and grazing land, which easily leads to optimistic estimates of the remaining forest cover.

<sup>8</sup> FAO (1997a)

<sup>9</sup> RFD (1985a)

<sup>10</sup> FAO (1997a)



**Figure 10.1** Official, Targeted, and Unofficial Forest Estimates, 1961 - 1991<sup>11</sup>

## Forest Types

Thailand's forests include both evergreen and deciduous; evergreen is divided into four types. The first comprises; valuable *Dipterocarpus* timber species, rattans (*Calamus caesius* and others), dammars used in varnish manufacture, gamboge from *Gardinia hamburyi* used as a yellow colouring agent, gutta-parcha from *Palaquium ovatum* used as a heat and electricity insulator, wood oil from various *Dipterocarpus* species used in local torches, for caulking boats and varnishing, and waterproofing basketware as well as for fuelling engines during times of oil shortages, cardamoms from various *Amomum* species used for medicine and flavouring food, jelutong from *Dyera costu-lata* used in chewing gum manufacture, incense wood from *Mansonia aqilaria* species for joss stick and perfume manufacture, bamboos for multiple purposes, chaulmoogra oil from the seeds of *Hydnocarpus kurzii* used in treatment of leprosy, *Corypha* species leaves used for religious texts and hat manufacture, and phungtalai fruits from the *Scaphium lychophorum* used in confectionaries.

<sup>11</sup> Sadoff, C.W. (1992)

The second type of evergreen forest, hill evergreen, occurs in limited areas above 1,000 metres and produces tan barks from *Quercus* species used in tanning and for mixing in betel-nut chewing, and gum benjamin derived from *Styrax* species. Mangrove forests constitute the third type which supplies fuel-wood, charcoal, dye and tan barks, the latter especially from *Ceriops roxburghiana*. Conifer forests, the fourth evergreen forest type, occur at elevations of 700 to 1,000 metres or more and are dominated by *Pinus* species used for resin which can be distilled into turpentine and rosin for local industries.

Deciduous forests were once the most prevalent, covering 70 percent of the Kingdom. Mixed deciduous forests contained teak and other valuable species as well as providing fibres, traditional medicines, and food. Tannin, derived from *Terminalia*, *Anogeissus*, *Diospyros* and *Acacia* species are used in various industries as well as in local crafts and foods. Dyes from mixed *Dipterocarp* forests are derived from satin wood (*Caesalpinia sappan*) for red dye, *Cudrania javanensis* for yellow dye, and *Diospyros mollis* for dyeing of re-exported silk to China. Deciduous *Dipterocarp* forests have possibly been the most valuable to Thailand yet the least recognised. Railway sleepers and construction work once extracted more than 800,000 cubic metres per year from such areas although forests are more known for their minor products which include dimmarz, wood oils, seeds of *Strychnos nux-momica* for local strychnine uses, oil from the seeds of *Parinari anamense* used for waterproofing umbrellas and laquerwork, and olio resin from *Melanorrhoea* species to provide the black varnish associated with Thai laquerware.<sup>12</sup> All types of forest provide timber useful for a range of purposes, with those timbers in particular demand for export markets being teak and some *Dipterocarpus* species.

## Forest Destruction

Major causes of forest destruction in Thailand have included:<sup>13</sup>

- population increase
- expansion of low productivity agriculture
- legal and illegal logging, also involving agribusiness
- shifting cultivation in the highlands.

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<sup>12</sup> Ministry of Agriculture (1961)

<sup>13</sup> Ramitanondh, Shaoardchai (1989)

The rise in population from less than 18 million in the early 1960s to more than 65 million today has reduced forests, even when agricultural activities are excluded. The pattern of forest destruction in heavily populated areas has long been observed in demand for fuel-wood and charcoal,<sup>14</sup> and a correlation<sup>15</sup> with population growth is evident, with variations explained through changes in agricultural production systems and market prices.

Expansion of traditional agriculture has required greater areas of land than would otherwise have been required from more intensive techniques. Thailand continues to show yields well below its potential and regional averages, with higher ratios of land to population than its often less naturally fertile neighbours.<sup>16</sup> New agricultural land created from forests in Thailand was associated with cash crops more than national food production, also unlike its neighbours; although in the Northeast, much of the expansion in recent decades has also been associated with maintaining larger families than the national average. Between 1960 and 1975, the total cultivated land rose from 20 percent to 35 percent of the total land area while forest land declined from 59 percent to 41 percent, the balance including grazing and other lands.<sup>17</sup> Such expansion met with little real government concern as farmers encroached on forests adjacent to farmlands, often already logged by influential groups, and converted these breached forests into cash cropping fields when prices were favourable, thus inadvertently attracting further migrant farmers to follow suit.<sup>18</sup>

Logging complemented agricultural expansion. Illegal logging left low value timber in accessible forest areas making such lands both easier to convert to cropping and less contentious for farmers to clear. Rising world timber prices encouraged illegal logging as the only means of maintaining an industry when prohibitions on logging were introduced. Powerful forces thus continually subverted the intent of the State, leading to profits accumulating in the hands of a few persons.<sup>19</sup> Issues surrounding illegal logging include poverty, landlessness, and small farm size particularly in the Northeast, the transacting of land through illegal means

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<sup>14</sup> Buri, Rachit (1989)

<sup>15</sup> Sermisri, Santhat (1989)

<sup>16</sup> Phantumvanit, Dhira (1989)

<sup>17</sup> Office of Agricultural Economics (1975)

<sup>18</sup> Amyot, J. (1987)

<sup>19</sup> Tingsabadh, Charit (1989)

including private appropriation of forest lands, the involvement of some officials in logging and land transactions, and poorly funded government programs.<sup>20</sup>

Forest destruction in the catchment areas of the North has been associated with the rising population of hill tribe groups,<sup>21</sup> now exceeding half a million. Estimates that more than 300,000 rai of prime watershed forest is lost each year to shifting cultivation were made at a time of peak population rise including immigration. Failure to acknowledge these persons as bona fide residents of Thailand, and official harassment associated with opium and other agricultural production, exacerbated a perception that these persons were responsible for massive forest destruction. In fact, the major forest destruction in Thailand has been associated with the expansion of rice in the Central Plain, upland crops in the Northeast, and plantation crops of rubber and oil palm in the South. Nevertheless, the potential danger of highland agriculture accelerating siltation of dams, served to alarm the lowland majority. More equitable recent policies concerning hilltribe persons have facilitated social reforestation programs in the highlands.

However, logging more than shifting or other types of agriculture, has caused the disappearance of forests.

## Logging

Logging first began on a large scale more than 200 years ago<sup>22</sup> when teak prized in China caused whole ships to be made from the timber for export. Involving Burmese, Ngeo, Chinese, and local merchants,<sup>23</sup> the industry became attractive to colonial groups who eventually negotiated means to harvest the teak forests of Thailand. From an historical perspective of assumed abundance of forest products, a new tradition of harvesting derived from forests being the property of feudal chiefs who allocated their exploitation to concessionaires.<sup>24</sup> Legislation during the reign of King Chulalongkorn created the Royal Forestry Department in 1896 with forests reverting to the King from 1899,<sup>25</sup> although the initial Directors-

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<sup>20</sup> Vichit-Vadakan, Juree (1989)

<sup>21</sup> TDRI (1986)

<sup>22</sup> Sukwong, Somsak (1989)

<sup>23</sup> Bhumibhamon, Suree (1987)

<sup>24</sup> Chunkao, Kasem (1987)

<sup>25</sup> Brockelman, W.Y. (1989)

General of the department being British foresters has caused some commentators to highlight potential conflicts of interest between commercial colonial objectives and long-term resource management.

Foreign expansion of teak extraction in the nineteenth century initially utilised Chinese merchants for saw-milling and teak export, shifting after 1880 to British financing of Burmese to obtain northern Thai forests concessions.<sup>26</sup> Exports grew rapidly, notwithstanding the royal ownership of forests and creation of the department, until in 1909 many leases expired and more conservative terms were introduced. The peak official export volume of 122,000 cubic metres of the period 1905 - 1909 was thus never again officially reached, with the average exported volume over the period 1925 - 1940 being some 76,000 cubic metres,<sup>27</sup> although teak consumption within Thailand continued to rise.

Initially, teak and other valuable species were logged from areas in the vicinity of rivers, with expansion upstream from major rivers which allowed logs to be floated to collection points. Already by the 1890s, one observer had noted that all forests in the western section served by streams had been exhausted.<sup>28</sup> Extraction continued utilising elephants and flotation until recent decades. In the early part of the twentieth century, teak was even floated down the Mekong river from Thailand to Saigon.<sup>29</sup> Logs took as little as a few weeks to reach their destination, or as much as twelve years from more remote areas with large distances of travel. Notwithstanding the rapid rate of efficient exploitation through the colonial-influence period, the highest rates of extraction of teak probably have occurred through the 1950s and 1960s when it is estimated that around 400,000 cubic metres was harvested in some years.<sup>30</sup>

By 1927, 32 forests were under concession, 17 to British, six to French, and one to a Danish company. Of the estimated 1.3 billion teak trees at that time, only 95,000 trees were in the eight concessioned forests run by Thai.<sup>31</sup> Organized

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<sup>26</sup> Samapuddhi, Krit (1957)

<sup>27</sup> Mahapol, S. (1954)

<sup>28</sup> Warington Smyth, H. (1889)

<sup>29</sup> Credner, W. (1966)

<sup>30</sup> Donner, W. (1978)

<sup>31</sup> Soonthornsawat, Chamaichom (1977)

deforestation may thus be considered to have begun with colonial expansion in the region, rather than as an economic objective of the Crown<sup>32</sup>.

Informed concern about logging of teak, expressed from the 1950s,<sup>33</sup> caused government to establish a company to assume foreign teak concessions.<sup>34</sup> However, illegal cutting led to substantial additional losses from teak reserves to which some well-intentioned policies contributed, such as the allocation of a forest concession to Kasetsart University to provide an independent income in the mode of the USA land-grant colleges.<sup>35</sup> Overharvesting of teak, and rising government attention, led to logging expertise shifting to other valuable timber species, thereby widening the environmental impact of forestry. Government revenues from the industry included export duties, business taxes, business profits, and royalties, each of which was probably consistently under-collected.<sup>36</sup> Throughout this period, the primary agricultural activities of logging and rice monoculture provided the majority of export income.<sup>37</sup>

The 1950's construction of large hydro-electric dams legitimised widespread tree felling in areas to be flooded, thereby providing a cover for illegally logged timber in the hands of influential military leaders. Counter-insurgency campaigns of the mid-1960s provided the means of continuing such logging, sometimes by linking army and private business interests which extended at one point to an unsuccessful attempt for army monopoly control over the whole timber trade of Thailand.<sup>38</sup> With such forces of forest destruction, coupled with the expansion of population, annual rates of deforestation across Thailand rose to more than six percent during the late 1970s; although the average annual rate of deforestation from 1970 to 1990 appears to be of the order of 2.5 percent.<sup>39</sup> Policies to curb such unsustainable action were mainly ineffectual.

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<sup>32</sup> Ramitanondh, Shalardchai (1989)

<sup>33</sup> Ungphakorn, Puey and Yossundara, Suparb (1955)

<sup>34</sup> Ratanaprasidhi, Metah (1963)

<sup>35</sup> Silcock, T.H. (1970)

<sup>36</sup> Usher, D. (1967)

<sup>37</sup> Poapongsakorn, Nipon (1995)

<sup>38</sup> Phongpaichit, Pasuk and Baker, C. (1997)

<sup>39</sup> Sadoff, C.W. (1992)

## Forest Policy

National forest policy has drawn from the policies of other countries and comprises statements of good intent which have seldom been able to be fully implemented due to an inadequate regulatory environment, and economic expansion associated directly, or peripherally, with agriculture. Forest policy, in the 1950s for example, included the unenforceable policies of:<sup>40</sup>

- preservation of native forest to provide the public with forest products in perpetuity
- protection of areas to minimise soil erosion and preserve watersheds
- production forests to be cut on a sustained-yield basis including national parks
- detailed surveying to ensure monitoring and policing capability
- sound supportive educational structures at tertiary and sub-tertiary level in forestry
- afforestation to provide future forest product needs
- research into improved economic efficiency in the use of forest products
- engagement of the wider populace in understanding the value of forests
- encouragement of private tree planting.

Forest destruction by the 1980s was perceived as a failure to implement legislation and modern knowledge concerning sustainable forestry, rather than a failure of understanding the industry and its management.<sup>41</sup> Deforestation at a rate of three million rai per year for 30 years caused professional foresters to officially note an underlying change in assumed national values,<sup>42</sup> and incidentally their own impossible task of policing the forests. Rising political activity included local rallies against logging, particularly in the North. Revocation of a forest concession resulted from such civil concern in 1988, emboldening involvement in a campaign which successfully blocked a reforestation project of a politically-aligned family and converted the area to a community forest. A fatal mud slide in the South associated with logging, and rising civil pressure, caused government to revoke all logging concessions in 1989. Through this period, agribusiness separately lobbied government to have lands classified as degraded in order to then have land allocated to them for reforestation, usually with fast-growing introduced species such as *Eucalyptus*. That some of these lands had been communal grazing lands, or

<sup>40</sup> Ministry of Agriculture (1961)

<sup>41</sup> Ramitanondh, Shalardchai (1989)

<sup>42</sup> RFD (1993)

otherwise providing herbs and forest products for local communities, led to villager objections. The Royal Forestry Department, the Army, and agribusiness combined to plan the removal of perhaps six million persons who, according to the reallocation of ownership, were now designated as squatters on what they considered their own agricultural land.<sup>43</sup>

Various government attempts to regulate logging have been subverted by inherent conflicts in the legislative and administrative arms of the government. As early as 1895 it appears that teak extraction rates were some three-and-one half times sustainable levels,<sup>44</sup> heralding an approach to logging which was to continue to the 1990s, and only to decline in response to international environmental interests, and exploitation of all easily accessible timber. Government ownership of forests, and the limited native forest reserve, now provides an opportunity for forest reserves created in the 1930s to be managed appropriately. This has caused reassessment of simple use of standard GDP measures which overstate national income by failing to acknowledge depletion in resource stocks.

Since the 1970s, increased public awareness of the need for environmental conservation and management has brought a focus onto native forests causing government to enforce its own regulations.<sup>45</sup> During the early 1980s, Thailand's rate of forest loss exceeded that of the Southeast Asian average by nearly two-and-one half times<sup>46</sup> and was nearly five times the average rate for all tropical areas.<sup>47</sup> In this context, Thailand's world-leading 1989 prohibition on logging,<sup>48</sup> rather than being a far-sighted environmental management policy, can be seen as a need for extreme action in response to excessive exploitation. Such exploitation built on a century-old tradition of the elite viewing forests as unlimited and available for exploitation, itself anomalous with respect to both Tai<sup>49</sup> and Khmer<sup>50</sup> village traditions, which required maintenance of at least one forested area close to each village.

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<sup>43</sup> Phongpaichit, Pasuk and Baker, C. (1997)

<sup>44</sup> Bhumibhamon, Suree (1986)

<sup>45</sup> Sukwong, Somsak (1989)

<sup>46</sup> ESCAP (1990)

<sup>47</sup> WRI (1988)

<sup>48</sup> Sadoff, C.W. (1992)

<sup>49</sup> Sheng-Ji, Pei (1985)

<sup>50</sup> van Liere, W. J. (1989)

If the State is deemed to have been negligent in its forest management in the past, its future role may well be ensuring a balance between competing interests. Enhanced commercial forestry under the regulatory umbrella of government seems possible in a market place where the price of teak has risen some 150 percent in the past decade while *yang* rubber wood has risen some 600 percent.<sup>51</sup> Thus Thailand's forestry has moved from the hunting and gathering era to that of the era of agriculture, a revolution spurred by the prohibition on logging.

### **Prohibition of Logging**

The logging prohibition has been effective in reducing total forest clearing although it has been less successful in selective extraction of high value trees. The ban itself is in fact an amendment to three acts concerning forestry, wildlife conservation, and national parks and continues to allow for felling of trees in privately operated forestry plantations, harvesting of designated species and trees which have been damaged through age or natural disasters, and clearing for national infrastructure projects. The Bill's passage through parliament included it being characterised as a temporary measure. It has caused the losses of legitimate logging employment and rising log prices, which in turn led to some increased illegal cutting in the short term.<sup>52</sup>

Perhaps the worst of unintended effects has been the additional pressure put on the forests of neighbouring countries. In Myanmar, logging concessions have been granted in areas resisting Central government control; concessions have brought together Thai businessmen, the Myanmar and Thai Military, and government officials, in a complex and largely undeclared arrangement, which will supposedly result in greater Myanmar government control of logging and trade, and construction of roads to facilitate ethnic integration in Myanmar. With increased control over sensitive areas, the Burmese military has sought to contain Thai concessionaires, for commercial rather than environmental reasons. However, the history of such arrangements suggests that logging in Myanmar may settle back to semi-official and illegal activities soon.

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<sup>51</sup> Tingsabadh, Charit (1989)

<sup>52</sup> MIDAS (1991)

Land importation of logs from Cambodia to Thailand no longer requires certification of origin, in common with those arriving by sea. Cambodian forests have reduced from 73 to 50 percent of the land area over the last twenty years, increasing siltation rates in the Mekong and Tonle Sap rivers, and possibly increasing the severity of monsoonal flooding. The government of Lao-PDR, treated in a similar manner as Cambodia by Thai timber traders, attempted to control domestic logging, although recent economic pressure, which have impacted on the tiny Lao-PDR economy to a greater extent than provincial Thailand, has heralded a need for rapid replenishment for foreign exchange through one of the few saleable assets of the country, timber. The economic and political influence of Thailand, its skills base related to both illegal and legal logging, and a rising world price for timber, suggest that Thailand may now be exporting its destructive forestry management systems. An analysis of the Thai logging prohibition indicates its local economic benefit,<sup>54</sup> although exporting exploitive techniques across borders has obvious costs, and in the long term most will accrue to Thailand. Meanwhile, some acknowledgment of the requirements of social and conservation forestry has been introduced through development programs.

### **Conservation and Social Forestry**

In addition to national parks and community involvement, conservation forestry trials indicate the viability of tourism, collection of forest products on a controlled basis, and even controlled cropping within highland watershed areas. Involvement of communities in forest management enhances management efficiencies through reduced regulatory and labour costs; experience suggests that this may be the only forest management technique which can work in areas of rising or high population. Effective involvement with community from the planning stage has been demonstrated to be successful for village wood lots, tree farms, and management of existing forests.<sup>55</sup>

Community, or social, forestry is a complex concept worthy of expansion to avert further unintended consequences of open-exploitation of forests. Compulsory resettlement from areas where commercial plantations are to be

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<sup>54</sup> Sadoff, C.W. (1992)

<sup>55</sup> Tingsabadh, Charit (1989)

established easily contravene moral, and possibly legal, rights of residency, and tend to be impractical as land available for resettlement is usually of marginal utility. They also undervalue socio-cultural ties and indigenous knowledge of native forests.<sup>56</sup>

Forest losses have contributed greatly to Thailand's economic and agricultural development. However, though some costs of development are inevitable with rising population, it is clear that Thailand has exploited its natural forest resources to an extent far beyond that which was necessary or desirable. Effects on stream flows, increased risk of natural disasters from flash flooding and mud slides, and loss of less tangible assets such as bio-diversity, have socially impoverished Thailand. Protection of remaining forests, and enhancement through reforestation, are essential requirements for Thailand's agricultural development today.

The most obvious, and probably the most successful, aspect of forest protection in Thailand has been the creation of national parks. While encroachment, exploitation, and corruption have featured in most parks, their designation has resulted in an overall protection benefit, while at the same time raising public consciousness of the benefits of environmental management linked to eco-tourism. The first national park was established in 1962 at Khao Yai, with a further three added over the subsequent decade. Over the period 1972 - 1979, a further twelve parks were created, and between 1979 - 1982 a further 29. By 1989, a total of 52 national parks covering 5.2 percent of the country's land area had been created. Wildlife sanctuaries and hunting areas were also established from the 1960s and by 1989, some 28 sanctuaries covering 4.2 percent of the total land area were under management.<sup>57</sup> With around 10 percent of the country designated as national parks and sanctuaries, these areas form a basis for future public education and management of natural resources.<sup>58</sup>

Expanding the areas designated as national parks and sanctuaries has not led to a concomitant increase in government budgets to protect these areas. Increased eco-tourism traffic has led to a rise in maintenance costs by 30 percent

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<sup>56</sup> Bello, W., Cunningham, S. and Kheng Poh, L. (1998)

<sup>57</sup> Faculty of Forestry (1987)

<sup>58</sup> Sukwong, Somsak (1989)

during a period when cost recovery has fallen from 51 to 30 percent even though users appear willing to pay 150 percent more than current entry related charges.<sup>59</sup> In concluding that Khao Yai National Park is under-utilised, under-priced, and dependent on government subsidy, it has also been noted that encroachment and poaching is necessitated by the welfare loss of adjacent villagers, whose traditional resource has been reallocated to local resort owners, tour operators, and middle-class tourists.<sup>60</sup>

Protection of forests and reforestation relies on the support of rural dwellers. Past failures, for both commercial and social forestry developments, have been traced to an ignorance of the root causes of rural poverty, part of which is the absence or withdrawal of secure resource entitlements. Land ownership, infrastructure development, enhanced incomes preferably through agricultural productivity, enhanced farm investment through responsible credit, improved education, policy revision, policing of agribusiness activities, and reforestation of watersheds have been determined as means of reducing both reforestation failures and poverty.<sup>61</sup> One practical approach acknowledges the needs of rural dwellers for fuel-wood in the design of projects.

A UNDP/World Bank study<sup>62</sup> has identified the need for reforestation to offset lost forest cover, and to provide sustainable forest products and cash income for rural dwellers, through sustainable supplies of fuel-wood and charcoal from tree planting combined with the planting of fruit and other productive trees. Multi-purpose village and army or school wood lots, associated with legume-based grazing areas, are termed alternative agriculture by some, yet represent a simple acknowledgment of past socio-environmental management systems. Products of fuel-wood, charcoal, poles, pulp, ply-wood, and timber can contribute financial rates of return to planters of more than 20 percent. Associated with such farm forestry is rehabilitation of fringe forest areas, enhanced research and development, education and training, and monitoring of the investment. Such approaches, which can represent applied outcomes from broad investigations of current problems and global solutions, provide an indication of likely future directions for forest protection

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<sup>59</sup> Dixon, J.A. and Sherman, P.B. (1990)

<sup>60</sup> Kaosaard, Mingsarn et al (1995)

<sup>61</sup> Tongpan, Sopin et al (1990)

<sup>62</sup> UNDP (1988)

and reforestation in Thailand.

### **Agriculture – Forestry Interactions**

The rate of forest destruction has been related to agricultural prices<sup>63</sup> even though arable land is at times left uncultivated under circumstances of:<sup>64</sup>

- low crop prices
- low soil quality
- agricultural population growth
- higher returns from the non-agricultural sector
- larger average farm holdings.

Rural residents rely on remaining forest resources for energy supplies. In the Northeast, for example, only 15 percent of rural households utilise commercial fuels such as kerosene, liquid petroleum gas, or electricity, and cooking for virtually the whole population relies on fuel-wood and charcoal, which constitutes about 98 percent of total household energy used<sup>65</sup>. Consumption levels of 207 kg of fuel-wood and 68 kg of charcoal per person per year equate to some 13 million cubic metres of timber which, from degraded forests and young trees, indicates the impossibility of re-establishing forests without first meeting the ongoing needs of poor rural dwellers. In the Northeast, the main causes of deforestation are poverty, population growth, and low cassava prices. Poverty is thus both a cause and a consequence of deforestation, as crop yields decline with soil exhaustion, and each new area of land opened is of lower agricultural value.<sup>66</sup> Equitable involvement of small-holders in future forestry development will apply especially to private forestry investments.

### **Private Forestry**

Notwithstanding eloquence in national economic and social development plans, the national forest policy has accepted the inevitability of forest degradation. For example, the 1985 policy acknowledges the continuing reduction of native

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<sup>63</sup> Cropper, M. et al (1997)

<sup>64</sup> Panayotou, T. and Parasuk, Chartchai (1990)

<sup>65</sup> UNDP (1988)

<sup>66</sup> Phantumvanit, Dhira and Panyotou, T. (1990)

forest as a matter of fact, thereby indicating powerlessness to implement policies which purport to protect natural forests. Acknowledgment of the need for private sector investment is balanced against perceived difficulties in attracting the necessary long term investment, which is associated with natural hazards such as fire, and price hazards associated with global markets and government policy.<sup>67</sup> However, a shift in public attitudes between 1985 and 1989<sup>68</sup> led to forest protection policies categorized as conservation, economic, and agricultural zones, with conservation areas representing 28 percent of the country. Conservation areas cannot be logged or farmed, and mining concessions cannot be renewed. However, conservation areas so declared exceeded forest conservation targets of the Seventh Plan by 25 percent, nearly doubled the targets of the Sixth Plan, and exceed the probable areas of remaining forest in the country. Such ambitious policies can only be realistic with successful development of the economic forest area which aims to cover 16 percent of the total land area,<sup>69</sup> in concert with strong regulatory action.

With the Reforestation Act of 1992, plantations may contain exotic species, except in conservation areas. Agribusiness interests, initially dampened by the perceived risks of natural or anthropogenic fire,<sup>70</sup> have extensive plantings of *Eucalyptus calmandulensis* and other fast growing species for paper pulp.<sup>71</sup> Controversies which focused on such species<sup>72</sup> often used it as a proxy for underlying resentment of the social inequity of reallocating lands, once accessible to agriculturists, to agribusiness firms for mono-cultural plantations. Cutting of virgin forests in order to create land for *Eucalyptus* plantations<sup>73</sup> which require as little 20 persons per square kilometre as labour,<sup>74</sup> increases the social inequity with respect to poor rural dwellers forced to assist their own demise. Nevertheless, the extent of the environmental and agricultural problem associated with forest degradation possibly required the involvement of agribusiness. Reforestation by government agencies and their concessionaires over the period 1961 - 1985

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<sup>67</sup> Phantumvanit, Dhira et al (1989)

<sup>68</sup> Phongpaichit, Pasuk and Baker, C. (1997)

<sup>69</sup> Sadoff, C.W. (1992)

<sup>70</sup> MIDAS (1991)

<sup>71</sup> Siamwalla, Ammar (1986)

<sup>72</sup> Sadoff, C.W. (1992)

<sup>73</sup> Bello, W., Cunningham, S. and Kheng Poh, L. (1998)

<sup>74</sup> Lohmann, L. (1991)

indicates variable success across some 3.4 million rai,<sup>75</sup> an over-estimate as many reforested areas have been re-degraded.

Research and incentives from government have encouraged planting of trees with rotation lengths of less than seven years, including the species: *Eucalyptus calmandulensis*, *Leucaena leucocephala*, *Azadirachta indica*, *Casuarina equisetifolia*, *Rhizophora mucronata*, *Casuarina junghniana*, *Acacia auriculiformis*, *Acacia mangium*, *Melia azedarach*, *Pinus kesiya*, and bamboo.<sup>76</sup> The potential for further forest plantation development in Thailand is indicated by:<sup>77</sup>

- the low base of plantation development, estimated at 529,000 hectares in 1990
- the extensive use of plantations in regional countries, such as some 32 million hectare in China, 13 million hectare in India, and six million hectare in Indonesia.

Thailand's development of plantations may be expected to link with other agricultural changes with an overlap between horticultural tree crops and timber trees in a manner exemplified by the rubber industry, and to thus support further growth in integrated forest industries.

### Forest Production and Industries

The shift in exports of forest products has been, across the centuries:

- Ayutthaya and before - forest products for medicine, food, household items, and domestic use of timber
- Beginning of the Ratanakosin period - exports of teak to China, as well as rising local use.
- Late nineteenth century - sales and concessions of teak and other timbers to colonial companies
- 1930s - nationalising concessions and exporting teak and other valuable timbers
- 1960s - declining availability of non log-based forest products including firewood, charcoal, barks, cardamom, dammar, gamboge, rattan, and lac
- 1980s - conversion of timber into value-added products such as furniture for domestic use, and in particular export

<sup>75</sup> RFD (1985b)

<sup>76</sup> Phantumvanit, Dhira et al (1989)

<sup>77</sup> FAO (1997a)

- 1990s - utilisation of fast growing timber species and previously rejected timber from plantations, such as rubber.

Yields of forest products in recent decades are difficult to reconcile from official statements. Plans and projections for, and assessments of, the state of Thai forests which are based on areas planted, degraded, or encroached do not provide specific enough information to understand the potential for future forest production. The density of forests is also critical in determining forest stock, as is forest type, climatic conditions, and the rates of extraction for each separate area.<sup>78</sup> An estimate of the volume of Thailand's forests over the period 1970 - 1990 indicates a reduction from nearly 700 million cubic metre to about 150 million with the largest effects in the North. The difficulty of presenting such information is indicated in attempts to estimate wood consumption, the measurement of which is based solely on legally harvested timber. Wood consuming industries have been sustained by illegal harvesting and wood imports; Thailand has been a net importer of logs and sawn wood since 1997.

Imports of commodities related to forestry include paper, paper board, boxes, pulp, household utensils made of wood, ply-wood, and other veneer sheets. Through the 1980s, imports of these products represented a little over 40 percent of the total value of wood related commodities consumed in Thailand, the bulk of which related to paper, paper board, boxes, and pulp.<sup>80</sup> These follow a long history of importing wood related products, which even in the 1950s, approached 200 million baht per year for products of newsprint, other papers, ply-wood, artificial timber and boards, and rattan.<sup>81</sup> A comparison of exported and imported wood products against the comparative advantages of production in Thailand reveals opportunities to increase production of; wood charcoal, parquet, hard board or particle board, wood pulp, wood chip, cement-based board, and fibre board.<sup>82</sup>

Export of wood products has been largely unaffected by logging prohibitions. In particular, furniture export has continued a rising trend established in the late 1980s.

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<sup>78</sup> Sadoff, C.W. (1992)

<sup>80</sup> Department of Customs (1986)

<sup>81</sup> Ministry of Agriculture (1961)

<sup>82</sup> Phantumvanit, Dhira (1989)

Income in the wood related industries has continued to grow relatively unaffected by the 1989 logging ban. Income growth derives primarily from value-adding; wood related industries exceeded forestry income in 1977, rising to about five times its value by 1990. The primary wood based industries are furniture, processed wood products, paper, and paper products. Incomes in the latter group are further insulated by their dependence on waste paper and non-wood pulp, such as kenaf, for fibre inputs.<sup>84</sup> Government revenue derived from forestry products is attracted through royalties on teak, other woods, firewood, charcoal, and other forest products, through fees, fines, sale of forest products, and forest improvement fees. Over the period 1987 - 1996, total revenues have declined from 272 million baht to 104 million baht with the major declines occurring in revenues from teak and other woods (115 million baht in 1987 and only one million in 1996).<sup>85</sup> This decline in government revenues is indicative of changes from traditional government revenue raising through concessions and licenses used since the Ayutthaya period, to a taxation system based on business profits, transactions, and incomes.

Pulp production in Thailand has risen from some 31,000 tons in 1974 to 117,000 tons in 1986.<sup>86</sup> The first pulp mill, founded in 1945, utilised rice straw, although later more successful mills were based on the processing of imported pulp. The six pulp factories established through the 1970s suffered from world pulp and paper price rises, which led to increased interest in using non-wood raw materials, including bagasse, rice straw, grass weeds, and bamboo. However, bamboo resources were similarly declining in Thailand, bagasse had alternative uses, and rice straw declined in availability with the adoption of short-straw varieties and new agronomic techniques.<sup>87</sup> The utilisation of kenaf as a component of pulp appears to be technically successful although the one major venture associated with its use has produced mixed results. Further aspects of forest business are discussed in the chapter concerning agribusiness.

The production and value of teak, yang, and other timber cut under licence, and bamboo, yang oil, and gum damar over the period 1987 - 1996 (Table 10.2) indicates a 94 percent decline in total value from 6.7 billion baht to 0.4

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<sup>84</sup> Sadoff, C.W. (1992)

<sup>85</sup> Royal Forest Department (1997c)

<sup>86</sup> TPPIA (1987)

<sup>87</sup> Phantumvanit, Dhira (1989)

billion baht. Over this period, the number of power operated saw mills has increased from 480 to 683 while the number of hand operated saw mills has declined marginally from 84 to 73. Major investment has been in the South, a reflection of the availability of timber from rubber plantations and the reliably higher rainfall suited to plantation forestry.<sup>88</sup>

Forestry has become a social and environmental concern in Thailand, primarily as a result of having been viewed, and over-exploited as an economic resource. Plantation forestry is therefore assuming importance as industries which rely on forest products, especially timber, create rising demand. Having moved from a stage akin to hunting and gathering, forestry is now both a sector of agricultural production and agribusiness, while retaining an additional component of conservation and management. The relationship of small-holders to forestry will continue to change as community wood lots and fast growing private plantations are adopted. Agribusiness, in concert with the State, may be expected to assume the risks and rewards of larger scale plantation forestry and processing over the next decade. The role of institutions in the agricultural sector has influenced policy effectiveness, and will continue to be a force as the role of government is clarified in moderating competing interests, while meeting long term objectives; institutions are discussed in the following chapter.

## Summary

Key points pertinent to Thai agriculture from this discussion of forestry include:

- From a forested land until this century, Thailand's forests have been degraded to rank as the world's tenth most at risk, as a result of illegal and legal logging providing high private and government returns, and openings for agricultural expansion, with concomitant losses of forest products which once met a range of industrial, health, and handicraft demands.
- Beginning with Chinese demand for teak, colonial interest and State income demands expanded logging of valuable timbers, until attempts to slow extraction caused illegal and quasi-legal logging associated with national security and dam construction, thereby voiding policy intent, which while acknowledging

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<sup>88</sup> Royal Forest Department (1997b)

**Table 10.2** Production (cubic metre) and Value ('000 baht) of Teak, Yang, and Other Timber Cut Under Licences, Bamboo, Yang Oil and Gum Damara<sup>a</sup>, 1987 - 1996<sup>89</sup>

Year	Sawlogs												Total Value		
	Teak			Yang			Other			Bamboo				Others	
	Volume	Value		Volume	Value		Volume	Value		Production	Value	Production		Value	
1987	38100	4191000		543185	1412281		1567751	4685966		40733	183669		660961	11897	6712913
1988	46934	563208		531703	1541939		1469455	4808366		60798	633086		533797	10142	7556741
1989	26234	341042		148082	444246		744689	2787645		54333	583102		413628	10341	4166502
1990	17641	232861		35343	109563		438661	1358730		48295	436388		292605	7315	2144881
1991	2836	38286		3664	12824		225005	726043		51827	427207		254566	7128	1211488
1992	1167	15988		3844	14223		114426	368645		56509	893134		43.560	1307	1293296
1993	6147	89131		2804	12618		55917	186743		37039	569817		56449	2258	860567
1994	5781	86715		5103	22964		51443	181.837		14167	164324		14228	711	456551
1995	2154	34464		3093	15465		29637	118548		6674	106670		2807	140	275287
1996	10684	170944		2603	14317		30606	137727		7577	117961		2558	179	441128

<sup>a</sup> Gum damar production figures limited to 1989 and 1990 when they were 31,500m<sup>3</sup> and 126,000 baht, and 6,000m<sup>3</sup> and 24,000 baht respectively.

<sup>89</sup> Royal Forest Department (1997a)

the inevitability of further destruction, included attempts to introduce environmentally considered law, and industrial plantations.

- Traditional associations with and access to forests adjacent to villages for fuel, medicines, game, and other supplies changed, as perceived ownership shifted from communal to private hands through concessions, to eventually produce competition for residual forests and products, which now necessitates social and environmental planning in forest re-establishment.