

13 Paradigm Shifts in Asian Forestry

Coordinating convening lead author: Can Liu

*Convening lead authors: Maxim Lobovikov, Daniel Murdiyarso, Hiroyasu Oka
and Yeo-Chang Youn*

*Contributing authors: Keith Barney, Makoto Inoue, Mitsuro Ishihara,
Hariadi Kartodihardjo, Pia Katila, Tetsuya Saito, Bintang Simangunsong
and Yasuhiro Yokota*

Abstract: During the last two decades, Asian forests have experienced dramatic paradigm shifts, such as transition from planned to market economy, shift of timber supply from natural to planted forests, increased role of wood substitutes and NTFPs, decentralization and increase in local people's participation in forest management, and advancement of ecosystem management. These paradigm shifts, and the linkages between forests, society and environment, vary greatly among different countries in Asia. The use of market-based instruments, development of payments for environmental services and community participation should be encouraged to further support sustainable forest resource management in Asia.

Keywords: Forestry; ecosystem management; paradigm shift; decentralization; property rights; trade; livelihood; Asia.

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13.1 Introduction

Asia is the most populous region in the world and home to more than 3.8 billion people, representing 60% of the global population (UN 2004). Economic growth rate in Asia is higher than the world average, especially in China and India. For example, China's annual average economic growth rate from 1978 to 2003 was 9.7% (China Statistic Bureau 2003). Asian countries have multi-cultural backgrounds and diverse needs that require different approaches to forest resources management. In the last two decades, rapid economic and population growth and the advancement of the post-industrial and ecological era have caused paradigm shifts in Asian forestry. Links between forests, societies and environment have also changed, and new approaches to sustainable forest management are required in the changing economic and ecological environment.

Based on a review of existing literature and interviews with forest professionals and experts, this chapter seeks to identify some key forest trends and paradigm shifts in Asia. The developments in the low forest cover countries in West Asia are not addressed in this chapter, even though we recognize the importance of the forest sector and the increasing needs and demands placed on it in these countries.

13.2 Forestry Sector in Asia

Forest Resources

The FAO Global Forest Resource Assessment 2000 (FAO 2003) estimates that the total forest area in Asia is 547.79 million ha, i.e. 17.8% of the land area and 0.15 ha per capita. Both indicators are lower than the world averages (29.6% and 0.65 ha of forest land per capita, respectively). Asian forests are subjected to the greatest population pressure in the world. Tropical forest accounts for 61%, subtropical forest 23%, temperate forest 14% and boreal/polar forest 2% of the forests in Asia. Forests are unevenly distributed. Countries with a forest cover of over 50% of the total land area include Brunei Darussalam (83.9%), Cambodia (52.9%), Japan (64.0%), Laos (54.4%), Malaysia (58.7%), Myanmar (52.3%) and the Republic of Korea (63.3%). The forest cover of Arabian countries is generally lower than 5%. Oman, Qatar, Kuwait, Saudi Arabia and Yemen have less than 1% of forestland. The FRA 2000 estimates total natural forest area in Asia to be 432 million hectares or 78.9% of the total forest land. China with 118.4 million hectares (27.4%) and Indonesia with 95.1 million hectares (22%) have the largest natural forest areas in Asia (FAO 2003).

Asia has the largest planted forest area in the world and it is rapidly increasing. In 2000 planted forests in Asia accounted for 115.8 million ha, or 21.1% of the total forest area. The top five countries are China (46.7 million ha), India (32.6 million ha), Japan (10.7 million ha), Indonesia (9.9 million ha) and Thailand (4.9 million ha) (FAO 2003). China, India and Japan account for 77% of the total area of planted forest in Asia. Other Asian countries with over one million hectares of planted forests include Indonesia, the Democratic People's Republic of Korea (DPRK), the Republic of Korea, Turkey and Vietnam. Indonesia has around 3 million hectares of forest plantations, comprising rubber and other industrial species plantations of *Tectona grandis*, *Acacia mangium*, and *Pinus merkusii*. The DPRK has established 2.2 million ha of *Larix leptolepis* and *Pinus koraiensis* plantations, which account for about 60% of the planted area (FAO 2003). The Republic of Korea has also planted over 2 million ha of *Larix leptolepis* and *Pinus koraiensis* and a considerable area of *Populus*. Planted forests in Turkey cover 1.9 million ha; they are mostly planted with *Pinus* species such as Calabrian pine (*Pinus brutia*) and Stone Pine (*Pinus pinea*). In Vietnam, the recent five-year plan set a target of planting 5 million ha of forest, of which 2 million ha will be planted for supplying timber, paper and mining industries.

Most of the industrial plantations in Asia are less than 15 years old. This is largely due to the rapid development of industrial short rotation plantations in China and India in recent years. In Japan, 44% of the forest area is classified as planted forests, of mostly older age classes. The most commonly planted species are sugi (*Cryptomeria japonica*), hinoki (*Chamaecyparis obtusa*), pine and Japanese larch (*Larix kaempferi* or *L. leptolepis*) (Oka 2003). A significant proportion of the planted forest is mature or close to maturity and the proportion is expected to grow in the future. The age structure is still younger than that in some European countries. Trees were planted mainly for timber production in Japan as well, but recently more emphasis has been placed on the protective functions of planted forest. More than two-thirds of forest plantations in India are non-industrial forests. Fast growing hardwoods such as Acacia and Eucalyptus dominate in planted forests. Teak (*Tectona grandis*) is the most important industrial species, covering around 1 million ha. Pakistan and Bangladesh have emphasized fuelwood plantations. Acacia, Eucalyptus and *Dalbergia sissoo* have been planted in Pakistan, as well as in India. Planted forests in Bangladesh are mostly mangroves, with an additional 70 000 hectares of teak plantations for the industry (FAO 2003).

Planted forests in Malaysia extended over 736 000 ha by 2001, with an annual increment of about 40 000 ha (Enters et al. 2004). However, industrial roundwood supply from plantations in Malaysia is still insignificant compared to that from natural forests. The Cambodian Department of Forestry and Wildlife

has established 8000 ha of planted forests; about 500 hectares are planted annually.

Increasing roundwood demand in Asia will, at least partly, be met by increasing roundwood production in planted forests. This can reduce pressure on natural forests. The role of planted forests as sustainable and environmentally sound sources of industrial raw material and renewable energy must be recognized in Asia. Their economic sustainability will depend on global competition.

Deforestation

In some Asian countries, like China, India and Vietnam, deforestation rates in 1990–2000 were lower than during the previous decade. However, deforestation is still a critical problem in other countries like Indonesia and Myanmar. Indonesian lowland tropical forests are mostly at risk. They have been almost entirely cleared in Sulawesi, and are predicted to disappear in Sumatra by 2005 and in Kalimantan by 2010 if current trends continue (FWI/GFW 2002). Forest fires have destroyed significant areas and have had serious environmental, social and economic consequences. For example, the environmental effects of the 1997 forest fires in Indonesia were global.

The main causes of deforestation in Asia are forest fires, unsustainable and illegal logging, inability to effectively monitor and regulate logging operations, inadequate reforestation and afforestation, high population pressure, uncontrolled human migration and settlement on forest lands and conversion of forests to agricultural land, and conflicts over property rights to forests and forest land. Nearly 10–20% of forestlands in the DPRK have been converted to other land uses or degraded in recent decades. The main causes of deforestation in the country are fuelwood production and conversion of forestland to crop lands for food production. The consumption of fuelwood more than doubled between 1990 and 1996 (UNEP 2003). Deforestation has contributed to floods, which have severely affected agricultural production.

Illegal logging is a major cause of deforestation in Asia. Indonesian log production, derived from log consumption by industries, is much higher than that officially reported by the Ministry of Forestry, indicating that a significant portion of logs consumed by industries is harvested illegally. The amount of illegal logs consumed by forest products industries is estimated to be from 8.9 million m³ (1985) to 42.3 million m³, excluding smuggled logs and logs consumed by small scale sawmills, or used as other industrial roundwood (FWI/GFW 2002).

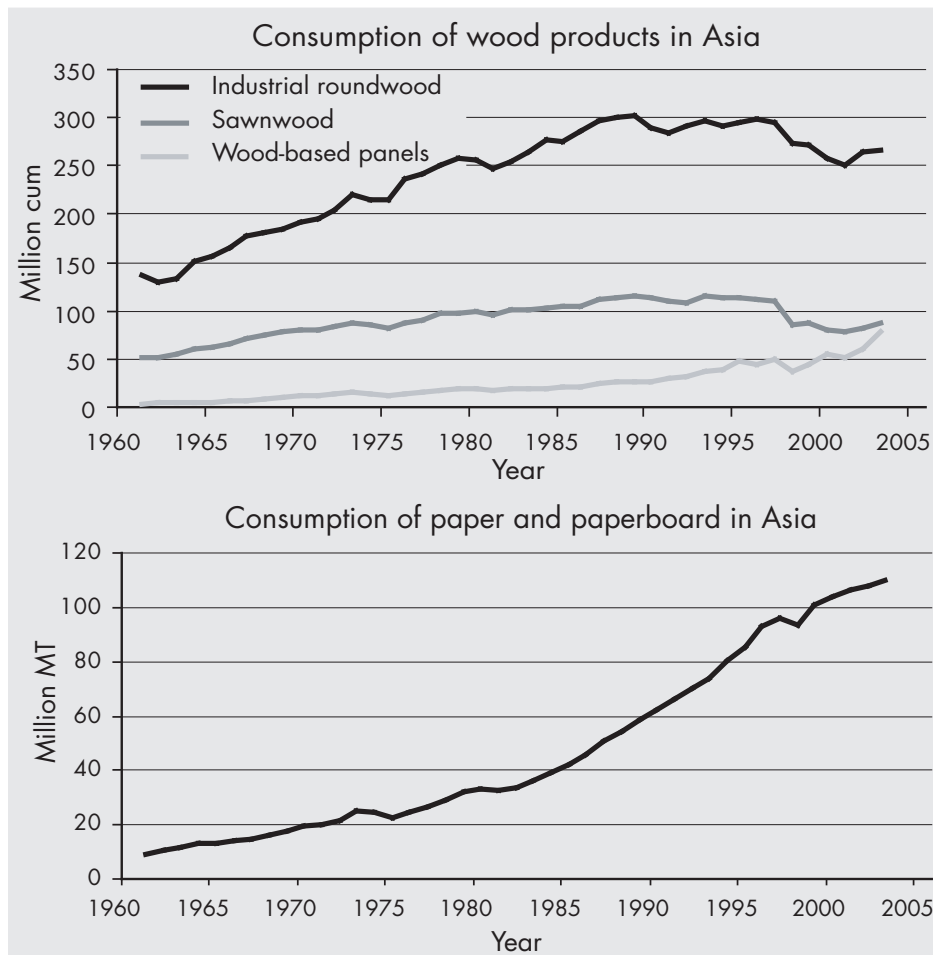


Figure 1. Consumption of forest products in Asia (FAO 2005)

Forest Products Production and Consumption

From the early 1960s to late 1990s, growth in the production of forest products in Asia was substantially higher than the world average. Asia's share of the world's industrial roundwood production increased from 13% in 1961 to 18% in 1993, and after that declined to 14% in 2002. It peaked in 1989 at 269 million m³ and declined to 223 million m³ in 2002.

Consumption of wood-based panels, paper and paperboard has increased rapidly (Figure 1). Production and consumption of industrial roundwood and sawnwood decreased in the late 1990s, mainly due to resource depletion in Indonesia and insular Malaysia. The gap between sawnwood supply and demand has increased the use of wood substitutes, and the increasing scarcity of large diameter logs suitable for sawnwood has encouraged a shift towards using wood-based panels. Southeast Asian people have also changed their building preferences (FAO 1998).

Trends in International Trade of Asian Forest Products

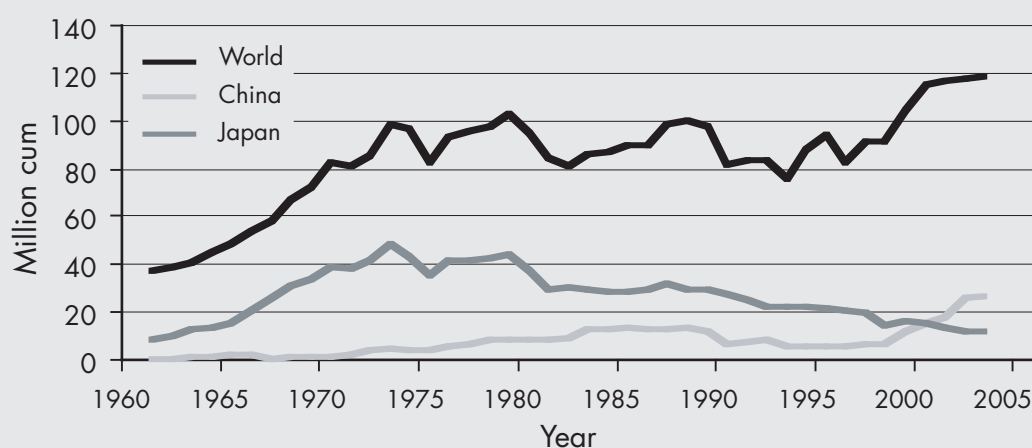
Import and export of forest products to and from Asia have been increasing much faster than world averages. From 1961 to 2002, Asia was a net importer of industrial roundwood, fiberboard and sawnwood. Since 1990, Asia has also become a net importer of wood-based panels (Table 1).

Several Asian countries, such as China, Japan and the Republic of Korea, are traditional importers of forest products. Other countries, such as Indonesia and Malaysia, are traditional exporters. Japan is a net importer of forest products. The reason for this is that the local costs of production are higher than that of its main trading partners. Domestic production of pulpwood in Japan has been rapidly decreasing. In 2000, about 80% of the forest products consumed in Japan were imported either as roundwood, wood-chips or processed commodities.

Ten years ago, China was the tenth largest importer of forest products. At present, it is the second largest, surpassed only by the United States. As a

Table 1. Net import of forest products in Asia (FAO 2005)

	Chips and Particles	Fibreboard	1000 cum Industrial Roundwood	Plywood	Sawnwood	1000 t Paper and Paperboard	1000 t Wood Pulp
1961	0	31	2 546	-453	114	524	433
1970	5 353	50	17 615	-2 177	1 739	1 267	1 395
1980	15 605	71	20 774	-2 354	3 508	3 051	3 520
1990	19 799	513	29 376	-3 404	7 611	4 851	5 586
2000	25 587	3 499	33 473	-565	16 597	8 642	9 834
2003	27 608	3 500	44 039	-2 714	17 085	10 316	11 483

**Figure 2. Industrial roundwood imports in China and Japan (FAO 2005)**

result of this rapid growth, China has become the largest forest products importer in Asia, followed by Japan (Figure 2).

China provides new opportunities for exporters. Between 1993 and 2003, the value of Chinese forest product imports rose by 269%, from USD 3.78 billion to USD 13.95 billion. During the same period the value of exports rose to a lesser extent, from USD 3.76 billion to USD 11.97 billion. In 2003, China imported 26 million m³ of roundwood, 7 million m³ of sawnwood, 6 million m³ of wood-based panels, 6 million tons of pulp, and 10 million tons of paper and paperboard. Chinese prefer to import raw materials for processing in China. However, while the net import of industrial roundwood rose by 529%, that of sawnwood increased by 4694%, particleboard by 642%, pulps by 808%, paper by 1223% and paper products by 144%. China's net export of furniture has increased by 1051%, and export of chips and particle boards by 2.56%. China's main trading partners in forest products are Russia (41.4%), Malaysia (10.9%), Indonesia (9.7%) and New Zealand (5.8%). (Sun et al. 2004).

Asia is leading in the world's NTFP markets. China dominates the world's NTFP trade, followed by

India, Indonesia, Vietnam, Malaysia, the Philippines and Thailand. The most important traded NTFPs for China are bamboo shoots and herbs (EU-FAO 2002). In mid 2000, the Indonesian Ministry of Forestry reported that 30 million people in the country directly depended on the forestry sector for their livelihood. A particularly valuable non-timber product is rattan cane. Indonesia accounts for 80–90% of the global rattan supply (FAO 2001). According to the Indonesian Ministry of Forestry, the total export value of wildlife and plants for the 1999/2000 fiscal year was over USD 1.5 billion (FWI/GFW 2002).

Tariff and non-tariff trade barriers are the key issues that affect international trade in Asia and in the rest of the world. With GATT, WTO, APEC and ASEAN processes, tariffs have been steadily declining for the last two decades. After joining WTO in January 2002, China has reduced import tariffs on plywood from 15 to 10% and on veneer from 8 to 4%. Log and sawnwood imports have remained duty free (Sun et al. 2004).

In addition to tariff barriers, there is a wide range of non-tariff trade barriers ranging from technical and health standards to market price regulations. These measures are much more complex than tariffs and are



Maxim Lobovikov

Labor-intensive bamboo processing industry contributes to rural peoples incomes. In China the bamboo sector employs about 5.6 million people.

difficult to recognize and assess, especially quantitatively. They may also have a complex and ambiguous effect on different trading partners. Even when the trade barriers are not formal, they make international trade more difficult, especially for less experienced exporters from the developing countries.

Direct governmental control is one of the measures used to control international trade in forest products in Asia. For instance, the Government of Myanmar is directly engaged in timber harvesting and marketing. The Myanmar Timber Enterprise, a business arm of the Ministry of Forestry, is in charge of extraction and marketing of timber in the reserved forests. Private loggers can participate in special areas, such as forests under planned dam construction sites. They can also be hired as sub-contractors for harvesting in reserved forests. Timber export is considered important for earning foreign exchange, and is therefore under direct or indirect government control. In the case of teak the Myanmar Timber Enterprise is, in effect, the sole exporter from Myanmar, enjoying the lion's share of the market.

Forest products are not exempted from export tax, which may encourage domestic consumption. The distribution of timber among end users by the Myanmar Timber Enterprise is not based on market mechanism, e.g. distributing timber to the highest bidder. Consequently, the revenue from forest resources is not maximized (Youn 2003). An export ban on unprocessed timber is a policy option used by

Malaysia in 1985 (Vincent 1990) and by Indonesia in 1980–1985 (Gillis 1988). Malaysia has later lifted the ban. The trade ban may have led to inefficiency; however, removal of the ban may stimulate illegal logging. Some authors argue that the trade ban may lead to inefficiency, higher deforestation and increasing unemployment (Gillis 1988; Repetto and Gillis 1989). Sedjo (1986) argues that export subsidies for processed forest products may result in increased deforestation.

Criteria and Indicators and Certification

Many Asian countries are involved in international initiatives for developing criteria and indicators for sustainable forest management. Eleven Asian member countries (including Cambodia, China, India, Indonesia, Japan, Malaysia, Myanmar, Nepal and the Philippines) are involved in ITTO's Criteria and Indicators initiative for the Measurement of Sustainable Management of Natural Tropical Forests. ITTO has pioneered the development of C&I since the early 1990s. After extensive review in 1998 ITTO published its revised C&I, covering both national and local level forest management (ITTO 1998). A manual on the application of ITTO's C&I was published in 1999. In 2004 ITTO adopted a revised set of C&I for the sustainable management of natural

tropical forest (ITTO 2004).

China, Japan and the Republic of Korea are involved in the Montreal Process on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. Members of the Montreal Process meet on a regular basis and continue to refine and develop procedures for collecting and reporting data at the national level. Recent discussions have focused on possible components of C&I at the forest management unit level. The ASEAN Criteria and Indicators for Sustainable Forest Management were developed in line with the Montreal process. In 1999, ASEAN senior forestry officials recommended that member countries adopt standard C&I, based largely on the 1998 ITTO C&I. Representatives from 9 Asian countries (including Bangladesh, Bhutan, China, India, Myanmar, Mongolia, Sri Lanka, and Thailand) have recently launched an initiative to develop and implement C&I for the dry forests of Asia (Appanah et al. 2003). They identified 8 criteria and 49 indicators with particular relevance to the dry forests of the region. The new initiative includes several Asian countries that were not previously involved in the international C&I processes.

China has developed national and sub-national C&I systems, which are consistent with ITTO, the Montreal Process and the Regional Initiative for Dry Forests in Asia. The UNDP and FAO provide support for the effort through the "Capacity Building, Research and Extension for Sustainable Forest Management Project". Currently, these C&I are tested in three eco-zones in China. In July 2003, Japan announced the First Forest Report based on Montreal Process C&I, submitting data on 50 of 67 Montreal Process indicators. The principles of sustainable forest management recommended by the Montreal Process have been incorporated in the forest legislation the Republic of Korea (Youn 2005).

Certification schemes are market-based instruments to improve forest management. Forest managers in many Asian countries have been exploring options for certification through the FSC, the Program for the Endorsement of Forest Certification Schemes, ISO 14000, national standards authorities, etc. Malaysia's National Timber Certification Council and Indonesia's Ecolabelling Institute have taken steps towards certifying tropical forests using their own labels, supported by ITTO. In 2000, a Decree by the Indonesian Ministry of Forestry (No. 4795/Kpts-II/2002) launched C&I (4 criteria and 25 indicators) for Sustainable Natural Production Forest Management at the Management Unit. In Japan, an association for domestic forest certification, the Sustainable Green Ecosystem Council (SGEC), was established in 2003.

According to the FSC report, the total area and the number of certificates are still limited in Asia as compared to Europe and other continents. Less than 0.2% of plantations in Asia have been certified by FSC (Subak 2002). By April 2005, FSC had certified

only 34 forests covering 834 375 ha of forestland in Asia. The certified forestland in China (439 630 ha), Japan (200 046 ha), Indonesia (90 240 ha) and Malaysia (77 242 ha) cover over 96% of the total area certified in Asia (FSC 2005).

Forest Resource Management and Property Rights

In many Asian countries, property rights over forest resources are often unclear, contested, overlapping, or not enforced. Much forestland in Asia is regarded as state land and is administered by governments. However, communities and households have started to play increasingly important roles in forest resources management in the last two decades (see Boxes 13.1 and 13.3 for joint forest management in India and community forestry in Nepal).

Security of land tenure seems to be lacking or vague in many countries, especially in countries in transition to a market economy. Forests traditionally have been occupied by forest communities as well as by migrant encroachers. Future forest development strategies must recognize and support the indigenous cultures and the rights of forest communities, including constructive involvement of recent encroachers. Identification of and consultation with the interest groups involved in a particular forest area should be prerequisites for developing forest management strategies.

Forests and Livelihood

About 450 million people in Asia depend on forests for their livelihood. More than 2 billion people consume three fourths of the total Asian wood harvest as fuel. Forestry and forest related industries are also important sources of employment. According to FAOSTAT, the consumption of fuelwood in Asia has increased from 665 million m³ in 1961 to 811 million m³ in 1997, but decreased to 789 million m³ in 2003. In countries like Indonesia, the Philippines and Thailand, fuelwood production is expected to decrease.

While the poor in most developing countries still depend on fuelwood for their daily subsistence, the share of fuelwood in total energy supply will decline from 70% in 1980 to 55% in 2010 because of increasing supply of other energy forms (Arnold et al. 2003). Fuelwood consumption peaked in the 1990s. In India, trees surrounding villages have been cut by local people for their own fuel consumption and for sale; this has resulted in forest degradation (Pandey 2002).

Forests have an important role to play in the livelihood of the rural poor. In many rural communities in Laos for example, virtually all food except rice is derived from forests. The total value of NTFPs

BOX 13.1 JOINT FOREST MANAGEMENT IN INDIA*Can Liu*

The Indian National Forest Policy of 1988 envisages people's involvement in the development and protection of degraded forests. These forests are seen as a permanent resource base to fulfill local communities' requirements for fuelwood, fodder and small timber. Forest development will also improve the environment. In order to implement the policy, the Indian Government issued guidelines in June 1990 to involve village communities in the development and protection of degraded forests. Communities were entitled to a share of usufruct from these areas. The developed mechanisms formed the concept of Joint Forest Management (JFM).

So far, 27 States have issued a resolution for JFM. By December 1 2002, 14.26 million ha of forest land in the country were managed and protected by close to 64 000 Committees. The activities under JFM programs are monitored by the JFM Cell of the Indian Government. The Ministry reviewed the program after wide consultation with all stakeholders and issued further guidelines to States for strengthening the program. The guidelines, inter-alia, include providing legal backup to the JFM Committees; extending JFM to good forest areas with sharper focus on activities concentrating on NTFP management; in-

creasing women's participation; establishing conflict resolution mechanisms; integrating micro plans with the working plans; and contributing to regeneration of resources and to monitoring and evaluation. In order to monitor the program properly, a format for monitoring of the JFM has been prepared and circulated to all the States. JFM Nodal officers have been appointed in all States for better coordination of the JFM work.

A Committee was constituted by the Indian Government for preparing a JFM Scheme for the 10th Five-Year Plan, in order to ensure long-term success. The scheme will be implemented through Forest Development Agencies (FDAs). A JFM network is also operational under the Chairmanship of the Director General of Forests and the Special Secretary, Ministry of Environment and Forests. A stakeholder forum has been set up to include all stakeholders and to provide a channel for information exchange with the network; the forum is run by NGOs. Almost all States, which have different relevant legislation, have started to implement the JFM policy. The essence in all cases is a partnership between local users and the State Forest Department, in which both management responsibilities and benefits are shared.

a rural Lao family consumes annually is roughly USD 280, which is about 40% of the average family income (ADB 2003). Before any major forest policy is implemented, studies should be done on the impact of forest policy on livelihoods of the poor who depend on fuelwood for cooking and heating, NTFPs for foods and medicines, grasses and fodder for livestock, and wood for house building, tool making, fencing, and so on.

In the Republic of Korea the production of NTFPs is more important than timber production in providing income to rural villagers and forest owners. One of the important NTFPs is oak mushroom, or Shiitake (see Box 13.2).

13.3 Paradigm Shifts and Future Development

During the past two decades, Asian forestry experienced several major paradigm shifts in sustainable forest management, governance, livelihoods, environmental services and planted forests.

From Planned to Market-Oriented Economy

During the last twenty years China, Mongolia, Vietnam, and several other countries have started an historic shift from planned economy to market oriented economy. Shortcomings of the centrally planned economies include investment inefficiencies, distorted patterns of production and consumption, and huge deficits. Optimal combination of regulatory

administrative tools and competitive markets was always an appealing alternative for the Asian developing economies. Market-based instruments have also started to play increasingly important roles in forest resource management.

Economic reform in forestry consists of a multi-dimensional array of changes intended to improve economic performance. Prices and markets are the central factors in the reform. Policy and legislation serve to define the scope and role of governments in the rapidly changing social systems of once centrally planned countries. Forestry does not function independently of the larger national economy, but has close links with other sectors. Public institutions need to pay attention to each other under market reform. There is a clear shift from methods of command and control to market-based incentives. Transparency and greater participation of civil society are objectives in the forestry decisions across Asia.

From Centralization to Decentralization in Forest Management

The last two decades have witnessed an important paradigm shift in forest resource management in Asia, from costly and often inefficient state control towards systems in which local people play a much more active role. These reforms increase participation of principal stakeholders in the decision making around forest management and benefits by granting essential rights to local authorities and reconstituting relations between the central government and forest communities.

Under the former colonial regimes in many Asian countries, forests were often declared public lands in order to generate revenues for the state. Postcolonial

BOX 13.2 MUSHROOM PRODUCTION IN JAPAN AND THE REPUBLIC OF KOREA

THE STATUS AND PROSPECTS OF MUSHROOM PRODUCTION IN JAPAN

Mitsuro Ishihara and Hiroyasu Oka

The value of mushroom production in Japan was USD 1.85 billion in 2002; it accounted for 41% of the annual forestry output (Forestry Agency 2004). As the importance of forestry and forest product industries continue to decline due to high costs of harvesting and processing, mushroom production has a significant role in the forestry economy. Utilization of woody materials, such as logs and sawdust, for mushroom substrates is also important for wood consumption, contributing to the rural economy by adding value while maintaining a managed semi-natural forest ecosystem.

Table A shows the quantitative changes in the production of the major cultivated mushrooms in Japan. Shii-take (*Lentinula edodes* [Berk.] Pegler) is the most important cultivated mushroom with a long history. "Shii" means chinquapin tree (*Castanopsis* sp.) and "take" means mushroom. Shii-take cultivation in Japan can be traced back to as far as Genbeh's hatchet cuts in the 17th century (Furukawa 1992). Freshly cut hardwood logs, such as oak, chestnut, chinquapin and hornbeam, were placed in the forest in wait for inoculation with windblown spores and consequent mushroom production. Cutting the bark of bed logs was found to give shii-take spores easier entrance into the wood and to increase the spreading rate of the fungus. Later, the mushroom production method was much improved by inoculating the logs with mushroom spawn (Kitajima 1937; Mori 1946).

Shii-take mushrooms that are dried before marketing are still primarily cultivated on bed logs. Dried shii-take was formerly one of Japan's main agricultural exports, with 4087 tons exported in 1985. In the 1990s spawned substrates in plastic-bags, consisting of a mixture of sawdust and nutritional supplements such as rice bran, wheat bran, corn fiber and corn cob, became the major culture medium for fresh shii-take, replacing the bed logs. The introduction of air-conditioning allowed year-round cultivation. Shii-take, the second most popular cultivated mushroom in the world, surpassed only by *Agaricus bisporus* (Lange) Imbach, has always been highly prized in Japan and China. Its commercial cultivation has now spread to other East Asian countries, Europe, America, Australia and New Zealand.

The production of other important cultivated mushrooms, such as nameko (*Pholiota nameko* [T. Ito] S. Ito et Imai in Imai), enoki-take (*Flammulina velutipes* [Curt.:Fr.] Sing.), hira-take (*Pleurotus ostreatus* [Jacq.ex Fr.] Kummer), *Pleurotus eryngii* (DC:ex Fr.) Quél., buna-shimeji (*Hypsizygus marmoreus* [Peck] Bigelow) and

mai-take (*Grifola frondosa* [Dicks.:Fr.] S.F. Gray) has expanded by using plastic-bottle or -bag culture techniques in air-conditioned facilities. With the exception of hira-take, which is globally distributed in temperate and subtropical forests, these mushrooms are grown primarily in East Asian countries. Buna-shimeji and mai-take, in particular, are grown primarily in Japan. Enoki-take has been the most produced mushroom in Japan since 1990. The fruit body of commercially produced enoki-take is greatly different in color and shape from the wild enoki-take. The production of mushrooms, such as buna-shimeji, mai-take and *P. eryngii*, has increased steadily since their cultivation technology was established two decades ago. The popularity of these mushrooms is providing competition for hira-take, because they can be stored for a long time and can be used in various kinds of cooking. *P. eryngii* was first introduced from Taiwan in 1993.

Until recently, Japan's mushroom cultivation was essentially a cottage industry in the mountainous regions. Now, the mushroom industry faces a serious problem of excessive supply due to the entry of new enterprises into the market and, especially, the increase in imported dried and fresh shii-take. The resulting depression of market prices threatens the management of mushroom farms. To maintain mushroom production levels and to revitalize the economy of forested rural communities through mushroom cultivation, some strategic measures, such as formation of community-based producer-consumer networks, are needed. Customers who want good quality mushrooms will be more satisfied with local producers' products than with mass produced mushrooms from large enterprises or with low priced products from overseas.

Mushrooms are a good source of dietary fiber and chemical compounds with medicinal properties. The potential of mushroom components to lower blood pressure and decrease blood cholesterol, and to act as anti-tumor agents, is being explored. Shii-take, for instance, contains "eritadenine" (Kamiya et al. 1969), a natural chemical compound shown to lower blood cholesterol levels, and "lentinan" (Chihara 1995), a beta-glucan used as an anti-tumor drug that improves immune function for cancer patients in immuno-suppressed conditions. Eating mushrooms can contribute to a healthy lifestyle and therefore reduce medical costs. Because the content of the physiologically active compounds varies among mushroom species and strains, screening and breeding of mushrooms with respect to various functional components for health is very important. The development of cultivation technology for these medicinal species and strains holds promise to enhance the prosperity of mushroom industry.

We wish to thank Professor Jody Jellison and Dr. Andrea Ostrofsky, University of Maine, U.S.A., for reviewing the part on mushroom production in Japan.

Table A. Production of major cultivated mushrooms (tons) (Forestry Agency 2004)

Mushroom	1990	1995	2000	2001	2002	2003
<i>Lentinula edodes</i> (dried)	11 238	8 070	5 236	4 964	4 449	4 108
<i>Lentinula edodes</i> (fresh)	79 134	74 495	67 224	66 128	64 442	65 384
<i>Pholiota nameko</i>	22 083	22 858	24 492	23 775	24 818	25 069
<i>Flammulina velutipes</i>	92 255	105 752	109 510	108 444	110 444	110 244
<i>Pleurotus ostreatus</i>	33 475	17 166	8 546	6 796	5 800	5 219
<i>Pleurotus eryngii</i>	0	0	6 734	10 084	19 472	29 942
<i>Hypsizygus marmoreus</i>	29 957	59 760	82 414	86 550	83 790	84 394
<i>Grifola frondosa</i>	7 712	22 575	38 898	44 042	46 843	45 823
Total mushrooms	275 854	310 676	343 054	350 783	360 058	370 183

PRODUCTION AND CONSUMPTION OF MUSHROOMS IN KOREA

Yeo-Chang Youn

Traditionally mountain villagers use forest products such as mushrooms as daily food sources. Forest-based mushrooms are presently a favorite food among Korean city-dwellers. About 350 kinds of edible mushrooms grow in Korea's mountain forests, among which pine mushroom (Matsutake; *Tricholoma matsutake*) and oak mushroom (Shiitake; *Lentinula edodes*) are the most popular. Pine mushrooms grow only in natural pure stands of red pine (*Pinus densiflora*), while oak mushrooms can be cultivated on small bed logs of hardwood species such as oak.

The demand for mountain mushrooms will continue to increase, as the consumption of forest mushrooms is strongly correlated with the level of household income in Korea. The consumption of pine mushrooms, by contrast, is mostly limited to the small, high-income population as the price is very high. As the mushroom markets in South Korea are open to foreign producers abiding by the free trade agreement coordinated by the World Trade Organization, the prospect for Korea's forest-based mushroom production is uncertain (Son and Youn 1994; Park and Youn 1998).

The production of forest mushrooms is important to the livelihood of forest-dependent people, especially in the case of pine mushrooms. The level of pine mushroom harvest is very sensitive to the weather, especially rainfall in the late summer and the resulting condition of the pine stands. The harvest of pine mushrooms in Korea has fluctuated over time, as demonstrated in Table B. The production of pine mushrooms is threatened by the decline of natural pine stands, due to attacks of pine gall midges and nematode. The expansion of hardwoods such as oak species in the southern part of Korea replacing the dominant species, i.e. Japanese red pine, favors production of oak mushrooms over pine mushrooms in Korea (Koo and Bilek 1998).

The production and consumption of oak mushroom in Korea has been increasing, while market conditions are rapidly changing due to the introduction of the WTO system (see Table B). Predictions suggest that demand for oak bed-logs will increase substantially as domestic consumers' incomes increase (Park and Youn 1998). Forest vegetation management is necessary for enhancing the pine mushroom cultivation environment, and thereby sustainable mushroom production. With regard to oak mushrooms, oak stand improvement should be given high priority to ensure a sustainable supply of bed logs. Korean forest owners thus face a situation that requires evaluating trade-offs between pine mushroom and oak mushroom cultivation. (Youn 2004)

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Table B. Production, consumption and trade of pine and oak mushrooms
(Korea Forest Service 1970, 1980, 1990, 2000, 2001, 2002, 2003)

Year	1970	1980	1990	2000	2001	2002	2003
PINE MUSHROOMS							
Production (ton)	191	349	945	536	250	373	306
Export (ton)	94	316	835	402	196	233	158
Import (ton)	0	0	1.3	197	228	209	300
Consumption (ton)	97	33	111.3	331	282	349	448
Per capita consumption (g)	3.1	0.9	2.6	7.2	6.0	7.3	9.4
OAK MUSHROOMS							
Production (ton)	187	1027	1648	4722	4815	5247	5261
Export (ton)	180	696	1001	228	261	291	374
Import (ton)	0	0	333	1088	821	1234	1926
Consumption (ton)	7	331	980	5582	5375	6190	6819
Per capita consumption (g)	0.2	8.7	22.6	121.4	113.5	143.2	142.5

BOX 13.3 EXPERIENCES FROM COMMUNITY FORESTRY IN NEPAL

Pia Katila

In the 1970s, the failure of the Nepalese government to protect nationalized forest resources and to control forest encroachment and clearance led to paradigm changes in forest policy in favor of local level resource management based on community forestry. Since 1990, community forestry has been based on the formation of forest user groups (FUGs). The Forest Act (HMG 1993) and Regulations (HMG 1995) provided a clear framework for the implementation of community forest policy. It meant a total and still ongoing reorientation of the Forest Department (FD) personnel, changing their role from forest protection and policing to providing support to community forestry.

More than one million hectares have been handed over to some 12 800 FUGs, representing around 1.4 million households (Royal Danish Embassy 2002). This represents about 17% of the total forest and other wooded land area of Nepal. Most of the established FUGs are in the Middle Hills. In the Terai-region, only 1 477 FUGs have been established to manage 224 136 ha (DoF 2003 cited in Springate-Baginski et al. 2003). The main reasons for slow progress in the Terai are related to high ethnic diversity, high number of forest users, recent settlement, mobility of the population, strong pressure to convert forest to agricultural land, high value forest resources, and proximity of Indian markets.

The authority to hand over national forest land for community management has been devolved to District Forest Officers (DFOs). In the first phase of the FUG formation process, the local forest users and the forest area that they have traditionally been using are identified. DFOs should also support FUGs in drawing up a constitution and an operational plan. The constitution specifies the membership of the group and the establishment of the user group committee that monitors community forest management. It also defines the rules concerning community forest and benefit sharing, as well as sanctions against breaking the rules. After being registered by DoF, FUGs are recognized as legal, autonomous, corporate bodies which may acquire, use, sell or otherwise transfer community forest products, but they cannot sell or otherwise alienate forest land.

In practice, the forest hand-over has been oriented to fulfill quantitative targets, and serious short cuts have occurred in the process. Also, the needs for post-formation support have not been adequately addressed (Springate-Baginski et al. 2002). In many FUGs, a poor hand-over process has led to unclear borders and boundary conflicts, hampering the development of community forestry activities. Boundary conflicts are also partly caused by out of date or non-existent cadastral maps (Yadav et al. 2003).

Effects on Sustainability and Livelihoods

Most of the forests handed over to FUGs have been degraded forest or planted forest established by the government. Under community management the general trend of forest degradation has been reversed in the hills, and the forests have regenerated significantly (Yadav et al. 2003).

FUGs have concentrated on the protection and improvement of community forests and on allowing regulated subsistence use of forest products. User group members are usually allowed to collect leaf litter, fallen twigs and branches and grass free of charge, but the amount of produce or the collection time have been restricted. Timber and poles are usually distributed through auctions or tender. In general, the regeneration of the forest resource has led to greater forest product flows and has opened possibilities for commercial utilization of forest products. However, sometimes restrictions on forest product extraction and the principle of distributing subsistence products equally among the FUG members have imposed difficulties on poorer households, which depend on community forests for their fodder, firewood and other needs. As well, the practice

of auctioning timber discriminates against poorer households for whom the price is often too high. Some FUGs have tried to incorporate the needs of the poorest households and have, for example, allowed them a larger quota of fuelwood (Springate-Baginski and Blaikie 2003).

Some FUGs are moving towards more production oriented forest management. The majority of FUGs, however, are not utilizing their forests to the full potential. The current regulations strongly restrict FUGs' possibilities to actively manage community forests and benefit from commercial timber production. There is a general lack of consensus among policy makers and FD staff on commercial utilization of community forests, which has led to unclear directions and even contradictory orders to DFOs (Springate-Baginski and Blaikie 2003; Yadav et al. 2003). Funds generated through community forestry activities (through collection fees and, in some cases, sales of NTFPs or timber) have been used for forest development and community development activities, such as improving schools and roads or establishing credit facilities.

FUG activities have not been taxed; however, a new policy initiative (Forest Bill 2001) introduces a 40% tax on incomes from sales outside the user group in the Terai, Chure and Inner Terai regions. The Bill also states that valuable forest resources in these regions will stay under government control, and only degraded areas and patches of forests may be handed over as community forests.

While the community forestry concept entails democratic and participatory decision making, the decision making in FUGs has often been dominated by the elite and wealthier members of the community. This is largely due to the prevailing traditional social relationships, which have also been transmitted to the user groups. The poorer households, women, and low caste members have traditionally had very little say in the Nepalese society. More inclusive decision making, emphasizing participation of all members of the user group, as well as equity and gender issues, are now emphasized in donor funded projects and in training of DFO staff (Springate-Baginski et al. 2002, 2003).

The Way Forward

Community forestry can provide a path to sustainable resource utilization and protection. It has also shown possibilities and potential in enhancing forest dependent peoples' livelihoods. Currently, it does not specifically address livelihood and poverty issues. To harness its potential requires developing community forestry to be more inclusive and participatory and to pay special attention to the needs of the poorest households. This can only be realized through continuous capacity building in all aspects of community forestry within the FD and communities.

Government policy should provide long-term, continuous support and security to FUGs. It should encourage FUGs to move towards production oriented forest management and to utilize community forests to their full potential in a sustainable fashion, as well as support commercial utilization and marketing of forest products. The benefits from the degenerating forest resource, and especially the establishment of FUGs in the Terai with high value forests, have brought up the issue of benefit sharing between FUGs and the government. An equitable solution needs to be found, which encourages FUGs to move towards sustainable forest management but also creates revenues for the government.

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BOX 13.4 DECENTRALIZATION IN WEST KUTAI DISTRICT, EAST KALIMANTAN

Tetsuya Saito, Makoto Inoue and Yasuhiro Yokota

In Indonesia, a decentralization process started after the enactment of the Forestry Law (No.41/1999) and the regional autonomy laws (Law No.22/1999 on Regional Governance and Law No.25/1999 on Fiscal Balance between the Central Government and the Regions). However, as it stands, the decentralization process is in chaos, due to lack of clear policy direction or central government consultation with the regions.

Before decentralization, forest management in Indonesia was based on a top-down approach, which allowed the government and timber concessionaires to exploit rich rainforest resources without considering the local people who lived in and managed the rainforest according to their customary practices. NGOs could only support these people in their campaigns against exploitation by the government and the timber concessionaries.

After decentralization, stakeholder roles changed significantly. More power over planning, implementation, budgeting and taxation was vested in the district government. In West Kutai District, for example, the decentralization process has so far gone relatively well because of stakeholder coordination. Coordination has been accomplished through the efforts of

foreign donors, who helped to form multi-stakeholder working groups for forest management in 2000 and the Bupati (regent) and his staff who achieved good relationships with stakeholders. Local NGOs, timber concessionaires, research institutes and local peoples' associations collaborated with the government to formulate a forest management system. Consensus building through multi-stakeholder working groups resulted in the creation of a regional forest management plan in 2002, in new regional regulation on forestry in 2002, and in new regional regulation on community forestry in 2003. The working group aims to monitor the actual implementation of planned activities by the government. Management of the working group was transferred in 2002 to the local government, which has promoted a sense of ownership of the process.

Meanwhile, even in West Kutai District, relationships among the government authorities at different levels (central, province and district) are not yet harmonized and their areas of authority are not clearly defined. The case in West Kutai District suggests that decentralization and stakeholder empowerment are needed to ensure that forest management will be based on stakeholder consensus.

governments often continued to refer to the people living on public lands as "squatters". Authorities also often accused them of "illegal land use" even when indigenous rights were indisputable. Government forest departments tend to be highly centralized top-down structures focused more on timber production or forest conservation than on forest related needs of local villagers.

Since the 1970s, widely growing concerns regarding deforestation and increasing pressure for forest conservation have prompted governments to set aside large areas of forest as protected reserves and to focus additional attention on policies that have excluded local people from decision making.

Shifts in ownership and management rights from state to communities began in Latin America in the late 1970s. The shift gained momentum in Africa in the late 1990s, and more recently has spread to Asia (White and Martin 2002). Some Asian countries have developed forest concession systems for the

management and particularly for the harvesting of state-owned natural forests (e.g. Cambodia, Indonesia, India, Nepal, Malaysia and Mongolia). Forest harvesting in Malaysia and Indonesia is regulated and controlled, in principle, by a well-defined concession system. The Indonesian system has undergone several modifications in recent years: a production Forest Management Unit system is being tested in Central Kalimantan and Jambi, and the Indonesian government issued a new policy that limited concession areas to a maximum of 4 million hectares (see Box 13.5).

Asian countries continuously adjust their institutions to further promote decentralization. The Philippines Supreme Court has recently upheld the constitutionality of the Indigenous Peoples Rights Act of 1997, providing legal recognition of ancestral rights pursuant to indigenous concepts of ownership. The case may affect 20% of the total national land area, including well over one third of the previously

BOX 13.5 PARADIGM SHIFTS IN INDONESIAN FORESTRY

Daniel Murdiyarso, Bintang Simangunsong and Hariadi Kartodihardjo

The history of forest resources utilization in Indonesia can be grouped in four periods. The 1970s is considered a forest extraction period, when logs from natural forests were simply extracted and exported as raw materials. The 1980s was the period when large-scale forest concession and management were introduced, followed by the forest industry period in the 1990s. The beginning of 2000 was marked by decentralization of authority to the district government.

The country's forestry sector has faced tremendous challenges since the late 1990s, when various adjustments and regulatory instruments were introduced. The intervention of the International Monetary Fund (IMF) in financial, taxation, and investment policies in the forestry sector led to the issuance of the Letter of Intent, which covers broader policies concerning good governance and the appropriate use of the Reforestation Fund. The World Bank policy on structural adjustment promoted forest policy changes towards reformist elements, away from vested interests and towards more sustainable forest management practices.

These policies have sparked a number of policy formulations and regulatory instruments in a relatively short period. In the midst of frequent change of government personnel, priority setting turned out to be uncertain. The general public was not

sufficiently involved in the development of policy instruments, resulting in their ineffective implementation.

It was expected that the decentralization of authority would enhance local participation in decision-making processes, the administrative burden of the local authorities would be lessened, and they would have more opportunity to concentrate on strategic issues and capacity building. However, the unprecedented pressure did not allow local governments the opportunity to strengthen themselves; this resulted in further depletion of natural resources, including forests, on a massive scale. In addition to the technical issues related to capacity building, decentralization of forest governance is facing tremendous challenges related to many politico-economic and socio-cultural issues.

Fundamental long-term strategies are needed to re-orient the forest sector towards good forest governance, to consider society's welfare and to maintain environmental services. Forest resources should no longer be treated strictly as commercial goods. Some fundamental changes could include harmonization of central and local regulatory frameworks to support sustainable forest management, restructuring of the forest industry, eradication of illegal logging, and reduction of forest and wildland fires.

BOX 13.6 SIX FOREST PROGRAMS IN CHINA

Can Liu

Since 1998, the Chinese Government has initiated trans-regional shelterbelt development programs in the ecologically fragile regions. These programs aim to establish an ecological shield, improving regional ecosystem, ensuring national ecological security, enhancing sustainable forest management and contributing to local socio-economic development, production and people's livelihoods. At the turn of the century the Government made a strategic realignment of the former projects and integrated them into six key forestry programs, including (1) Natural Forest Protection Program, (2) Program for Conversion of Cropland to Forests, (3) Key Shelterbelt Development Programs for such regions as the Three North (i.e. Northwest, North and Northeast) and the Yangtze River Catchments, (4) Sand Control Program for Areas in the Vicinity of Beijing and Tianjin, (5) Wildlife Conservation and Nature Reserve Development Program, and (6) Forest Industrial Base Development Program in Key Regions with the Focus on Fast-growing and High-yield Timber Plantations. Implementation of the six key forestry programs would facilitate refocusing from timber pro-

duction to ecological improvement (Liu 2002). The launching of the six forestry programs marked the advent of a new era in China's forestry development. The Chinese government's policy has shifted in recent years from encouraging maximum timber harvest to promoting protection of existing natural forests and restoration of heavily degraded ecosystems. The overall national goal is to increase the country's forest cover to 26%. China's mid-and long-term objectives are to maintain ecological stability and site productivity of planted forests and develop planting techniques for afforestation of wastelands, deserted industrial sites and decertified land in arid and semi-arid areas.

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publicly owned forests (CIEL 2001).

Decentralization and community forestry management models have been widely adopted in Asian countries, but government agencies still control the allocation and use of forest resources by means of different administrative and economic instruments. India, Nepal and Indonesia (see Boxes 13.1, 13.3 and 13.4) have granted limited rights to local communities to manage and benefit from forests, which are still officially considered in the public domain. These arrangements are known as "joint management" and "co-management", and do not alter state ownership. In India, government officers control planning, and supervise budgets and marketing of timber and valu-

able NTFPs and local communities' decision-making. In the Philippines, a single case of illegal forest use by a local user led to a temporary ban on all forest uses under the community-based forest management program, thereby also punishing responsible users and casting doubt on the government's commitments and intentions.

Management Strategies: Emphasis on Environmental Conservation

Asian countries are in the process of adjusting their forest management strategies from timber production to ecosystem management (see the Indonesian example in Box 13.5). Several Asian countries have imposed total or partial logging bans (or imposed restrictions on timber harvesting) in response to the rapid decline of natural forests. Ecological forest programs have been launched across Asia, such as the recently consolidated six forest programs in China (Box 13.6). These actions are mostly taken in response to natural disasters and are seen as a strategy to protect and conserve forests.

In recent years, forestry in the Republic of Korea has experienced a rapid change, a paradigm shift to emphasize sustainability of forest resources based on ecosystem management. The forest laws have been amended according to sustainable forestry principles, while the policy environment has favored decentralization and public participation in forest issues. This phenomenon has been supported by democratization and economic growth for the last few decades (Youn 2005).

Vast areas in central, northern and northeastern Asian regions are threatened by desertification. Wind and water erosion, waterlogging, salinity, flooding, loss of organic matter and biodiversity have been identified as the major contributors to desertification. Since the 1990s, the United Nations Convention to Combat Desertification has provided a useful institutional umbrella for a number of Asian initiatives in fighting land degradation. Since the late 1990s, the intensification of sandy dust storms in the Northeast Asian region has prompted the governments of Mongolia, China, the Republic of Korea and Japan to undertake closer cooperation in addressing this transboundary environmental problem. A number of international organizations, including the Asian Development Bank, have been involved in a variety of initiatives and activities to help Asian countries implement national action programs. Two trends are evident; namely, regional cooperation as in the case of dust storm mitigation in Northeast Asia, and capacity building for the establishment of early warning systems and for effective implementation of projects at the community level. In recent years, some

international funding agencies such as the Global Environment Facility have intensified their efforts to incorporate forestry programs into comprehensive funding packages, for ecological rehabilitation and environmental protection.

Forest ecosystems produce wood, and a great variety of other products and services. Removing forests through clear-cutting destroys the great productive power of the forest, and the forest needs a long time to recover. Conventional industrial forest harvesting methods reduce ecological diversity of the forest, and can have social ramifications like depopulation in forest-based communities and reduction of their economic and cultural diversity. Ecosystem management is based on the recognition that sustainable communities depend on sustainable forest ecosystems. Ecological forestry should maintain and upgrade diversity in many respects – biological, social and cultural.

Biodiversity conservation and conservation area management have been emphasized in Asia. At least 28 natural World Heritage Sites containing forests had been established in 11 Asian countries by 2002, including 10 sites in China, 5 in India, 3 in Indonesia, 2 in Nepal, and 2 in Malaysia (McNeely 2002). The Convention on Wetlands of International Importance promotes conservation and wise use of wetlands through national action and international cooperation. Ramsar sites in Asia contain important forest ecosystems, such as mangroves, including Sundarbans in Bangladesh and the Olango Wildlife Sanctuary in the Philippines. Establishing natural World Heritage Sites has promoted natural forest protection all over Asia.

Payment for Environmental Services

In most Asian countries, the importance of the environmental services of forests is increasing as population increases. As the demand for these services grows, the market as well as government intervention for promoting forest environmental services may emerge in many parts of Asia. A new set of forest environmental services is entering Asian markets and changing the value and management paradigm of forest resources. Payments for environmental services can be divided into two categories, governmental

Table 2. Potential roundwood production from planted forests in Asia from 2010 to 2050 under different scenarios (1 000 m³) (Brown 2000)

Scenarios	Industrial roundwood			Fuelwood		
	2010	2020	2050	2010	2020	2050
No growth	190 607	217 796	209 312	119 634	118 284	130 524
Medium growth	195 907	237 584	299 349	125 441	136 178	186 450
High growth	240 364	379 617	686 812	160 135	234 712	389 814

payments and market-based payments. There are a growing number of cases in which environmental services have created income.

Market-based payment is a transaction between supplier and buyer. Price is set through market negotiation. Payments for maintaining watersheds and water quality have created several local markets. There is a good potential for carbon markets as well. Asian countries are also involved in studies on trade models for carbon sequestration and biodiversity conservation.

A recent initiative of the Chinese Government to promote payments for environmental services was incorporated into the newly amended Forest Law (1998). The new policy was accompanied by the release of "Operational Measures on Compensation for Forest Ecological Benefits" (2001). According to the new measures, all public or private entities that benefit from forest maintenance and ecological functions are required to pay for the services, and the funds raised should be earmarked for forest environmental investments. Proceeds will be channeled through "Forest Environmental Benefit Compensation Funds". Seed funding of about USD 1.8 million was provided in 2001 to initiate the establishment of the central Fund. The Fund was increased to USD 241 million in 2003. After the "Farmland Conversion to Forests Program" was launched in 2000, the State Council issued the Decision on Converting Land to Forests and Pastures, which stipulates that the government will pay landholders to convert their degraded lands into forests or pastures. Cash and in-kind payments include 2250 kg of grain/ha in the upper reaches of the Yangtze River, 1500 kg grain/ha in the middle and upper reaches of the Yellow River, and USD 2.41 (20 yuan RMB)/year/ha. The scheme is valid for 8 years.

Planted Forests for Timber Supply

There is a tremendous shift in timber production from natural forests to forest plantations. Asian roundwood production from planted forest needs to be increased to meet, at least partly, the increase in roundwood demand. Three scenarios of potential roundwood production from forest plantations in Asia from 2010 to 2050 are presented in Table 2: no growth, medium growth, and high growth.

During the past 40 years, wood production has shifted from natural forests of the traditional Southeast Asian producing countries to Southern plantation countries. Large tracts of natural forests are likely to confer an advantage in the short term, but these advantages will eventually diminish owing to advantages that are offered by plantations. During the 1990s, the fast-growing plantations of the southern plantation countries began capturing the market share from Indonesia and Malaysia (Enters et al. 2004).

Some Asian countries provide incentives to encourage timber plantation establishment. The Philip-

pine authorities provide free government technical assistance, and tax exemptions for plantation products. Forest plantation establishment is considered a pioneering industry, and it enjoys a variety of incentives: income tax holidays; tax and duty free importation of capital equipment; tax credit on domestic capital; deduction for labor expenses after the tax holiday; exemption from wharf and export duties; and exemption from contractor's tax (ITTO 2003). The government of China approved similar policies, such as income tax holiday and long-term loans, to engage different stakeholders in plantation business.

Increasing Demand of Wood Substitutes

Long-term projections show that Asian demand for forest products will rapidly increase with the continent's population and economic growth. In the foreseeable future, the most important factor affecting forest resources use in Asia will be China's growing demand for timber and timber imports. Asia has become a major net importer of wood products, while tropical plywood has become less important as a commodity. International trade, aggressive planting, and use of wooden and vegetable fiber substitutes for wood, as well as recycling, will be the major vehicles to satisfy wood hunger in Asia. Wood products will be increasingly recycled as recycled paper, fiberboard and particleboard may be partly replaced by non-wood substitutes, as well as by previously less utilized species like rubber, coconut and bamboo.

About three quarters of the world's bamboo forest is in Asia. India has over 9 million ha and China over 7 million ha of bamboo forest (see box 13.7). China's bamboo forests include 4 million ha of monospecies. Bamboo is a fast growing and environmentally friendly material. Due to impressive technological breakthroughs in the last 10–15 years, bamboo has become a valuable wood substitute. Bamboo can replace wood in its long list of uses, including housing, construction, flooring, roofing, panels, boards, furniture, paper, charcoal and composites. More recently, bamboo is being mixed with resin, glue and other fibers to produce high-tech products for very demanding European, North American and Asian markets. China has a long history of bamboo cultivation, research and development, and is hosting the International Network for Bamboo and Rattan (INBAR), which is the world's leading organization concerning bamboo and rattan. The paradigm shift towards bamboo and other non-wood substitutes for timber has emerged in Asia, and is now spreading to several other continents.

The growing demand for wood products may raise prices in Asia. Higher prices will somewhat discourage the growth of consumption and make in-

BOX 13.7 BAMBOO IN CHINA: INCREASING INCOME AND ENVIRONMENTAL PROTECTION

Lou Yiping

At present, the total bamboo growing areas of the world add up to 22 million hectares (Jiang 2002). China has 39 genera of bamboo, with approximately 500 species distributed in 20 provinces and occupying 3% of the total forest area. (Fu et al. 2000). Throughout the world, especially in tropical and subtropical regions, forest area has been reducing dramatically due to heavy exploitation by human beings. In contrast, in some Asian countries the area of bamboo stands is rising continuously. In China, the increase of pure bamboo stands has averaged 2.45% per year over the last three decades (Fu et al. 2000).

Bamboo plays an influential role in the rural economy of China. There are millions of Chinese farmers who grow bamboo as a component of integrated farming systems. Bamboo forests and sectors in China also provide huge ecological and social benefits to the country.

Ecological Benefits of Bamboo

The fast growing and evergreen bamboo, with its vigorous propagation and regeneration capacity, well-developed root and rhizome system and selective harvesting schedule is ideal for conservation of water and soil, prevention and rehabilitation of degraded lands, biomass accumulation, and carbon sequestration. Bamboo growing in forests is also extremely important to the survival of other plant and animal species. There are many endangered wild animals, such as the giant panda, that depend on bamboo for food and habitat. Bamboo gardens are important components of Chinese public parks and tourist attractions. Indirectly, the use of processed bamboo products to substitute for timber products leads to reduced timber harvesting in forests, and subsequently lowers deforestation rates.

Socio-Economic Benefits

Bamboo is used widely in construction, transportation, furniture making, paper and pulp production, and handicrafts because of its rapid growth, easy availability, flexibility of uses and economic value. The bamboo processing industry in China has recently become very dynamic, and as a labor-intensive activity makes a key contribution to increasing the incomes of rural people and farmers, promoting local economies and generating employment.

A survey shows that about 5.6 million employers are currently working in the bamboo sector in China. Among them, about 4.52 million people are involved in natural resource and plantation management and 1.05 million people are involved in the processing sector (Jiang 2002).

Bamboo Production and Economy

Over the past few decades, the average annual consumption of bamboo in the world has been about 15–20 million tons, with about 8–9 million tons consumed in China. In 1999, the gross output of the bamboo industry in China was about USD 2.55 billion (Jiang 2002). Europe, America and Japan are the dominant consumers of bamboo products in the world accounting for approximately 60% of all bamboo products traded globally.

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vestment in plantations more attractive. Declining supply from natural forests will be at least partly offset by increased supply from forest plantations. It is likely that wood products will increasingly be imported, recycled and partly replaced by non-wood substitutes. Among various forest products, supply and demand for particleboard, fiberboard and paper are expected to increase the most; these products can be produced from recycled materials. All of these factors may substantially mitigate the scarcity of logs in Asia.

Asian Forest Industry in the Globalizing World

Globalization has greatly affected Asian forestry development. The management of natural forests changed erratically in the late 1990s in Indonesia. Multilateral financial agencies, the World Bank, the International Monetary Fund and other international donors were involved in reformulating the country's forest sector policies. In addition, the authority of the government was decentralized, increasing un-

certainty as the local institutions and stakeholders lacked the resources and capacity to carry out the new tasks.

Consolidation of forest industries is another strong trend in Asia, caused by globalization forces like international investments. Only 10 companies are responsible for processing roughly 20% of the world's wood production, and the top 100 companies now process 50% of the world's industrial wood. The same shift is observed in Asia. From 1989 to mid 1993, 85% of all portfolio flows to East Asia concentrated in just four countries: China, Indonesia, the Republic of Korea, and Thailand. This caused high consolidation of forest industries. The most important factor in forest use change in Asia is China's growing demand for timber and timber imports. China is expected to dominate global timber markets in the near future. Large companies, such as Asia Pulp & Paper (APP), dominate the forest products market in China. Large domestic and international companies are getting bigger. They buy or rent forestland to satisfy their growing raw material demand.

Asia will likely increase imports from other regions, especially from temperate countries, where

BOX 13.8 CHANGE AND CONTINUITY IN MEKONG FORESTRY

Keith Barney

For most areas in the Mekong region, logging booms have come and gone. Starting with the full logging ban enacted in Thailand in 1989, bans on logging, log transport and log exports have followed in Vietnam (partial logging bans enacted in 1992 and 1997), Cambodia (repeated attempts at log export and transport bans in 1996, 1999 and 2001) and Laos (log export ban in 2000). While central governments have made overtures towards sustainable management, the implementation of improved forest governance practices in the region has been highly uneven. In the remaining natural forests in Cambodia and Laos, unsustainable logging activity is often extremely heavy. Long-term observers in these countries draw the causative link back to elite actors who appear to hold little interest in the shift towards sustainable management.

New trends towards international market-based regulatory practices involving forest certification, payments for biodiversity conservation and carbon sequestration are in initial stages in the Mekong region, although interest has outpaced implementation. Forest Stewardship Council certification of Village Forestry in Laos appears close to being achieved, although questions remain concerning the actual commitment of various actors within Laos towards the type of transparency that certified forestry represents. Thailand recently had its only FSC forest management certificate revoked, due to problems with the plantations of the state-owned Forestry Industry Organization (WRM 2003). Vietnam has also begun the certification process, while in Cambodia continued problems with the concession system, illegal logging and rural violence represents obvious obstacles towards certified forestry. Questions remain in Mekong countries regarding the potential of certification to promote broader policy level changes, or to truly address the complexity of resource tenure issues. Certification may be best considered as a second order response to these issues, which may need to be addressed primarily at the national policy level.

While forest management paradigms are changing rapidly in the Mekong, there is also continuity. The regulatory oversight of the forest sector is uneven. Reliable, quantitative information on the forest estate in Mekong countries, regarding the nature of existing forest resources, forest harvesting information, and forest trade data, remains unreliable in most cases. The fact that this situation remains prevalent in the region, even though hundreds of forestry students graduate every year from higher institutions in each country, suggests that this unreliability is best considered as instrumental to the economic interests of a range of actors within forestry in Mekong countries.

Tensions and conflicts surrounding village land and resource tenure are deeply ingrained in the region. The recognition and promotion of decentralized, community-based natural resource management systems, and the flexible implementation of national level land reforms demarcating the forest estate from village property, arguably remains the single most pressing challenge facing sustainable forestry in Southeast Asia. The Lao Village Forestry system and the passing of a 2003 Community Forestry Subdecree in Cambodia, which guarantees the rights of local communities to manage the forests, represent very important steps forward, but many challenges for promoting true community forest management remain. The issues around community resource tenure are often tied to the heated debates around swidden agriculture. Swidden and the (often upland, minority) groups which employ the practice, continue to be maligned as culturally backward and economically unproductive; this in turn justifies a range of restrictive state programs aimed at eliminating swidden agriculture. The relationship between forest clearing in the uplands and water shortages in lowland areas also becomes embroiled in these debates, although research continues to show that such a correlation is much overstated (Walker 2003). Simultaneously, a suite of industrial development projects and policies result in much more serious deforestation and water shortage effects than traditional swidden agriculture.

As with issues around harvesting and trade data, the tenacity of these notions within forestry institutions in the Mekong region suggests a certain underlying instrumentality. The case of Laos in respect to tenure reform, swidden agriculture, and ethnic minorities is instructive. In Laos, the ongoing implementation of the Land and Forest Allocation Program (LFAP) proceeds in combination with a policy aimed at "stabilizing" (eliminating) shifting cultivation, which has been identified as a new primary source for increasing poverty and food insecurity in the countryside (State Planning Committee 2001). Under the LFAP, national territory is being demarcated by the Forestry Department into village land, state forest or plantation production land, and biodiversity conservation land. Village territories are also being internally zoned into fixed forest and agricultural land use areas.

While the overall goals of the LFAP are surely commendable in terms of promoting village tenure security and enshrining community rights to territory, the implementation of the land use zoning has thus far been inflexible and implemented in a non-participatory manner by poorly trained officials. The overall

forest resources are generally increasing. The structure of forest products trade will change. Some countries in Asia will enter into free trade agreements. For example, the ASEAN countries will trade commodities and services without barriers among themselves in the near future. A common market where goods are freely traded is expected to expand.

Controlling Illegal Logging

Asian governments are taking measures to control illegal logging. In the Philippines, a multi-sector forest protection committee of the Forest Protection Program has been trying to implement some law

enforcement activities like confiscation of illegal timber all over the country, and forest rangers are regularly stationed in specified checkpoints to prevent transportation of illegal timber. In 2002, 7780 m³ of logs were confiscated in the country. Obtaining logging licenses by forgery and corruption is another type of widespread illegal activity, more difficult to detect (FAO 2003).

Governments of forest products exporting countries demand elimination of tariffs and non-tariff barriers on forest products trade. NGOs criticize countries that import tropical timber, including Japan, for importing forest products that might have been produced unsustainably or illegally. International collaborations to eliminate illegal logging by improving

effect has been to limit villagers' access to crucial swidden farmland. Simultaneously, improved rural extension programs, which were to promote higher productivity and sedentary agriculture, have been absent or poorly conceived, resulting in new food insecurity and new impoverishment for upland groups, particularly ethnic minorities. While the case of tenure reform in Laos stands out in many ways in the region, property rights to forest resources are of crucial significance in each of the Mekong countries. Indeed, in October 2004 Cambodian Prime Minister Hun Sen warned of the potential for a "peasant revolution" in the countryside if land and resource conflicts between communities and logging and plantation concession holders are not addressed (Associated Press 2004). Cambodia resumed land concession contracts in March 2005 (Hamilton 2005).

The changing structure of forest processing industries is another key issue in the Mekong countries. With the decline of natural forest logging, Mekong countries are in the process of revamping their wood processing sectors. In Thailand it has been an agricultural product – plantation rubber wood – which has supplied raw materials for a booming MDF and particleboard industry worth USD 150 million in exports per year, and for an export furniture sector worth USD 500 million. Wood processing in Vietnam, largely dependent upon imported timber, now represents an export industry worth USD 1.5 billion per year (Vietnam Economy 2005).

Lastly, the impacts of a new East Asian wood importing complex centered on the Chinese economy are being felt in the Mekong region. While full statistics on natural forest logging and trade concerning the Chinese market are difficult to detail, evidence suggests that China is now a major market for wood products exports from the region (Xiufang et al. 2004). Large eucalyptus plantation projects directly or indirectly associated with China have been proposed for Thailand, and are proceeding in Cambodia and Laos. Evidence from Cambodia suggests that a significant portion of the wood exports during the country's logging boom from the mid 1990s to 2001 was transported to China.

In spite of the rapid depletion of remaining natural forests in the Mekong, substantial areas of intact high forest still remain, particularly in Laos and Cambodia. Effective management of these forests will be crucial. With intensified economic integration seemingly inevitable, on both on a regional scale and a rural-urban scale, the paramount challenge for Mekong

forestry institutions will surely be to coordinate and manage this complex transition in an integrated way, which strengthens the long-term positions of both the poorest communities and the most vulnerable landscapes. Building critical expertise and cooperative abilities of forestry institutions in Mekong countries is thus considered a key strategy. The 1990s witnessed the emergence of cutting-edge resource management institutions in places like Chiang Mai University (CMU). Growing practices of "South-South" collaborative research, and new learning networks between established Southeast Asian forestry research centers like CMU and newer institutions like the National University of Laos, speak to the potential for a brighter future for Mekong forests and forest-dependent communities.

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traceability of forest products have been launched. For example, the Announcement on the Cooperation in Combating Illegal Logging and the Trade in Illegally Logged Timber and Wood Products was made jointly by Japan and Indonesia in 2003. The Asia Forest Partnership (AFP) was launched to promote sustainable forest management in Asia by addressing issues like good governance and forest law enforcement; developing capacity for effective forest management; control of illegal logging; control of forest fires; and rehabilitation and reforestation of degraded lands. The First Meeting for the Promotion of AFP was held in 2002, and the meetings continue to be held on a regular basis. The International Tropical Timber Council proposed in November 2001 to undertake, in collaboration with others, a global study to assess the extent, nature and causes of illegal trade in timber and timber products, and to conduct studies to enhance forest law enforcement. In January 2002, the FAO organized a meeting with representatives from governments, ITTO, the World Bank, NGOs and forest industries to exchange ideas on policy op-

tions to reduce forest crime and to identify common ground for international action.

National Level Paradigm Shifts

Asian countries have different cultural and regional backgrounds, and different institutional arrangements for societies and environment. They are in different stages of economic development, and environmental concerns among countries vary. These differences have resulted in different paradigm shifts in relation to forest management. The differences in national level responses to forest sector development challenges are presented in Boxes 13.8 and 13.9.

BOX 13.9 FORESTS, SOCIETY AND ENVIRONMENT IN JAPAN*Hiroyasu Oka*

Japan is one of the world's largest timber importing countries. At the same time, almost two thirds of Japan's land area is forested, including 10 million hectares of planted forests. The area of planted forests expanded rapidly during the 1950s and 1960s. The annual increment has substantially increased as a result of plantations, and the management regime has been and still is extremely labor intensive. It requires 100–250 man-days to establish one hectare of planted forest. Improvement of labor productivity has been very slow in Japanese forestry, reducing the competitiveness of local forest products.

The Basic Law of Forestry, enacted in 1964, had the principal purpose of increasing forestry income. It was replaced by the Basic Law of the Forest and Forestry in 2001, with emphasis on promotion of multiple functions of the forest. The reason for the amendment was a change in public expectations, from emphasizing timber production to valuing environmental conservation. It was increasingly difficult to justify a national forestry program for the purpose of increasing forestry income alone, as imports had dominated forest products market for more than three decades.

The consumption of forest products, especially sawnwood, is no longer increasing. Population, an important factor in determining the demand, may currently be at its historical peak, and it is expected to decrease in the coming decades. At the same time, the longevity of houses is increasing and the frequency of reconstruction is decreasing. As a result, demand for sawnwood is not expected to increase in the near future.

Government policy has encouraged domestic forestry production for the past several decades. However, forests are mostly managed by the private sector. Unexpected deterioration of competitive strength of forestry in Japan resulted in the decrease of timber harvest. The government has revised and lowered the planned level of production several times in response to changes in the economic conditions of forestry. At the same time, it has increased the area of protected forests in recognition of the increased relative importance of forest ecosystems. However, the decrease of timber harvest is not a result of the policy for local environmental protection, but rather a result of the increasing comparative disadvantage of forestry in Japan.

Policy Issues

The forest economy in Japan is now in transition. There has been a great effort to expand the area of planted forest to meet domestic demand. However, the area of planted forest may now start decreasing as a result of the changes in economic conditions. There are conflicting views on whether, how, and to what extent planted forest should be transformed into semi-natural

forest. On one hand, an increasing number of people seem to consider the area of planted forest to be excessive, partly as a result of allergies caused by the pollen of a few major planted species, and partly as a result of the competitive weakness of domestic forestry. On the other hand, other people, the forest industry, and national government are concerned with the inadequacy of forest operations such as thinning and replanting. The decrease in forest investment has resulted in forests being left unmanaged. There is concern over a change of managed forest into unmanaged, neglected ecosystem, as well as decrease of economic value of the forest.

A major policy issues is how to keep forest owners managing their forests or transfer ownership to someone who is interested. The number of forest owners and their family members involved at least part-time in forestry decreased from 1 980 000 in 1970 to 600 000 in 1990, and by 2000 it had decreased a further 19% (MAFF various years).

Current forest policy focuses on thinning, corresponding to the age structure of the forest. Thinning is recognized to be desirable for long rotation management and to be an environmentally sound method of production, as well as a policy measure to increase employment opportunities in rural areas. Subsidies to thinning operations may help long rotation management, avoiding frequent clear-cutting and subsequent high-cost replanting or forest abandonment.

The forest area is almost stable; the steep terrain where the forests are located is an obstacle for land use conversion. Standing volume of forest is substantially increasing because of decreased timber harvest. The loss of natural forest areas has decreased as well. The critically threatened sustainability of local forestry and forest-based communities are the major problems identified in the forest sector of Japan. Comparative disadvantage of forestry and the resulting crisis in forest based communities in Japan is at least partly a result of the success of the manufacturing industry. Without dramatic improvement in labor productivity in the forestry sector, private forestry cannot afford to pay wages as high as those in other industrial sectors. A dramatic increase in labor productivity, unaccompanied by higher rate of increase in production, will result in decreased employment in the forest sector. A new balance is needed between forests and forest based communities, and between rural and urban populations, to improve general welfare.

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13.4 Linking Forests, Society and Environment in Asia

Sustainable forestry aims to sustain a delicate balance between ecosystems and social and economic structures. Forest management goals should fall within the intersection of three spheres: ecological, economic and social. There is a need for innovative approaches to meet the emerging and on-going paradigms in Asian forestry.

Forest Sector Employment

In Asia, forestry is one of the important sectors of employment creation, but in general employment in the sector has decreased. In Indonesia, the number of employees in the forest sector sharply increased from 113 000 in 1980 to 300 000 in 1989 as production of plywood and sawnwood increased. When an export tax on sawnwood was imposed, the number of employees decreased slightly to 285 000, and peaked with 389 000 employees in 1997 when plywood production was at the highest level. The number of employees decreased slightly again to 362 000 in 2002 (FWI/GFW 2002). The number of employees



John Parotta

Natural forests have often been converted for cash crop production, e.g. for rubber plantations as in Thrissur District, central Kerala, India. The world's largest areas of rubber tree plantations are in Indonesia (34%), Thailand (21%) and Malaysia (18%).

in the forest sector would be much higher if people who work in small-scale sawmills and other wood processing industries (furniture, particleboard, fiberboard, and veneer sheets), as well as people who are involved in forestry activities like agro-forestry, were taken into account.

The work force in the forestry sector in Japan is decreasing and aging. The number of people working in the forestry sector decreased from 519 000 in 1955 to 67 000 in 2000 (Statistics Bureau various years). From the current age distribution of forest workers, it is obvious that the majority of existing forest workers will retire in a decade or two. The contribution of forestry and wood processing to economic growth has declined in most Asian countries, and the employment in the forest sector may decrease in the future (see Box 13.9).

Inter-Linkages, External Policies and Information Needs

Forestry in Asia is at a crossroads. Forest benefits can no longer be taken for granted. Forestry cannot directly meet diverse and often opposite expectations of different stakeholders. Forestry should be a justifiable economic activity with a sound role in land use and in the national economy. Governments of Asian countries have not yet fully developed for-

est policies that provide medium to long-term vision for the sector. The policies should integrate poverty reduction, social development, and environmental protection. Inappropriate macro-economic policies often misallocate resources, and the willingness to invest in the forest sector is reduced. Inappropriate fiscal policies, such as selective subsidies and pricing policies, also contribute to distortions.

Establishment of effective forest products markets is not possible in the forestry sector alone. Providing the necessary market environment for forestry is highly dependent on national macro-economic policies and market institutions. Significant problems of fuelwood consumption and pricing for firewood can be fundamental market issues, but are rarely addressed as such.

Sustainable forest management requires forest inventory and other activities to compile information and data to support policy decision-making. Many Asian countries have recognized the need for regular forest inventories. Capacities for implementation vary widely among countries. Insufficient monitoring of resource and environmental changes constrain policy makers in evaluating impacts of governmental policies, strategies, programs and projects. Even in many countries where basic inventory data are available, their effective use for planning is limited (Brown and Durst 2003).

Constraints and Opportunities to Forest Environmental Services

There are several constraints to stimulating forest environmental services: (1) Difficulty in excluding “free riders” is a fundamental constraint for setting up payment systems. Unless service providers can exclude free riders, it is difficult for them to convince others to pay; (2) Pressure on governmental budgets; (3) Weak participation of suppliers; (4) Absence of a standardized formula for calculating charges. Various techniques adapted by numerous scientific studies have caused confusion and reduced credibility of the estimates; (5) High transaction costs. Various transaction costs are associated with the process of paying for forest environmental services, e.g. pricing the services, negotiating payments, setting up an institutional mechanism for payments, monitoring, and enforcement. As with any new system, these costs are in many cases higher than the potential incomes.

Forest management should include both administrative and economic levers to ensure sustainable income. The set of measures may include: educating beneficiaries regarding the importance of environmental services for their welfare, and threats associated with discontinuing these services; consultation on fair systems for raising funds to pay for the maintenance of the environmental services; and effective enforcement systems to penalize free riders.

Logging Ban, Environment and Society

Logging ban and natural forest protection programs have dramatically affected local societies and environment. Logging bans have the effect of improving the local environment and forcing reconsideration of basic purposes of forest resource management. Roundwood production has declined thanks to logging bans in several countries (Thailand, China, etc.), but rapidly increased in the neighboring countries, transferring the environmental burden to new regions. The Report of Informal Technical Workshop, which was organized by Asia-Pacific Forestry Commission in Manila, on December 13–14, 1999, pointed out that:

“All of the case study presentations reveal the great complexity and variability of the issues related to implementing logging bans and other restrictions on timber harvesting. Most logging bans have been imposed to promote concepts of forest conservation. But most countries have conducted only a minimal degree of analysis of the social and economic impacts of logging bans prior to their imposition. Moreover, assessment of the supporting policies necessary for successful implementation has generally been inadequate. The impositions of logging bans and harvesting restrictions have, in all cases, involved

substantial hardship in terms of economic costs and social dislocation or disruption.”

And “the case studies also highlight a complex array of approaches and methods that have been pursued to formulate and implement natural forest harvesting restrictions, with varying degrees of effectiveness. It was noted that where the goals and objectives of logging bans are poorly formulated and implementing legislation, policy and operational guidelines are inadequately elaborated, subsequent implementation is generally weak. The need for supporting changes in institutional structures, clarification of public and private roles in both forest policy and management, investment in infrastructure capacity (including human resources), and related changes was recognized and discussed in some detail (FAO 2003).”

13.5 Concluding Remarks

During the past two decades, Asian forestry experienced a series of major paradigm shifts and smaller changes including transition from planned to market economy, urbanization, trade liberalization, decentralization, logging ban, increased role of plantation, recycling, wood substitutes, and tentative experiments with forest ecosystem management and payment for ecosystem services. Forest ecosystem monitoring with reference to Criteria and Indicators of Sustainable Forest Management, certification, and international collaboration to prevent illegal logging are all new experiences. Rapid economic development, population growth, information technologies, and the emergence of a post-industrial and ecological era accelerate and complicate the shifts. Asian societies and economies will continue to develop, and the relations between forests, society and environment will also continue to change. Inter-regional as well as inter-sector income distribution patterns form a rapidly changing socio-economic background to forestry. Asian national and local forestry institutions need to be more dynamic, flexible and responsive to address the changes in population, resource base, technology, and value systems.

Asia is one of the most diverse continents in the world, in terms of geographical conditions, stages of economic development, political systems, and cultural backgrounds. This diversity has had impact on virtually all aspects of forestry. The emerging paradigm shifts in managing forest resources to meet various human needs call for greater attention, on the part of policy makers and other stakeholders, to the roles that forests play in securing economic prosperity, social cohesion and environmental soundness.

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Map 13.1 Forest cover in Asia (percent of land area) and total forest area per country (countries over 500 000 ha) (Data: FAO FAOSTAT 2005; map designed by Samuel Chopo)

