

Policy Reform and Investment in Forestry

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INVESTMENT IS AN INDICATION of the dynamism and the future potential of a sector or an economy. As China has progressed through its period of reform, a wide range of investment opportunities has arisen. This chapter reviews the trends in investment in China's forestry sector and examines the motivations for and limitations on that investment, including investment in both silviculture and the wood-processing industry and from both domestic and international sources.

In Chapter 2, D. Liu and Edmunds described the incentives that the contract responsibility system (CRS) provided for household management. CRS was initiated in the early 1980s, and China's forests began to recover in volume and area in the late 1980s. In Chapter 3, Liu et al. described the remaining disincentives for investment, with emphasis on the high tax burden on forest products. In Chapter 4, Yin demonstrated that new agricultural opportunities provided additional incentives for forest investment, but variations in the administration of the reform policies added to previous uncertainty and restrained further forest investment in some regions.

These chapters focused on the private investment opportunities that arose—mostly for farm households—over the course of approximately 20 years of China's reforms. They contained a fairly complete story for those households. However, the collectives from which those households obtained their land-use rights managed only 55% of China's forest cover and only 30% of its forest volume in 1988. These same lands still only accounted for 58% of China's forest cover and 29% of its standing volume in the most recent forest survey, in the late 1990s.

The investment experiences of the state-owned enterprises that manage almost one-half of China's forestlands and more than one-half of its standing forest volume and the motivations of the smaller numbers of private nonfarm investors and foreign investors are also important for a complete understanding of forest investment over the past 20 years. The combined record of the four sources of

investment has been impressive, particularly during the 1980s, the first 10 years after the initial reforms. Ten years was a sufficient period for some new seedlings to grow to a measurable size for China's periodic forest surveys. Forest cover increased by 13.7 million ha (9.3%) and standing forest volume increased by 600 million m³ between China's fourth and fifth forest surveys (between 1989–1993 and 1994–1998). However, 2.8 million ha of forestland were converted to other uses during this period, and 57 million ha (6% of China's total land area) remained as wasteland—suitable for forest use if an investment in afforestation were made.

This chapter provides an historical overview of these experiences. It examines each of the four categories of investors. It explores their motivations and the bases for their successes, but also inquires why so much potential forestland remains unmanaged wasteland.

My primary observations are that:

- Policy reforms in the collective sector provided some incentives for silvicultural management, but incomplete property rights, high transactions costs for these property rights, and high taxes dampen farmers' enthusiasm and restrict further silvicultural investment.
- The government's regular silvicultural investment has been modest, but project-based forest investment is increasing, largely in response to specific ecological disasters. However, some government funds have been diverted from silviculture to administration, and the costs of monitoring silvicultural activity are high.
- Private nonfarm investment in forestry is low, primarily due to the high risk associated with forestry investment in China.
- Foreign investment in China's forestry sector is small, but significant and increasing as China's economy develops.

The important questions for the future have to do with whether the recent history of gradual reforms will continue—and whether property rights will become more complete, transactions costs and taxes will become less burdensome, and the government will continue its investments in environmental improvement. If the reforms continue in the pattern of the recent past, then private domestic investments in silvicultural management will expand, and the environmental protection services of forests will expand as well. On the other hand, if the reforms in forest policy have run their course, then China's great expanse of wasteland will remain unforested, more forestland will be converted to agricultural use, and China's forests will fail to achieve their potential as environmental assets. The challenge is to continue the pattern of private economic reform and public environmental investment.

Historical Overview

Prior to 1978, China's economy was planned and highly centralized. The planned economy had two units of economic production: the state and the col-

lectives. Investment in forestry, like investment in other sectors, came from these two sources. For purposes of this chapter, state investment includes the public expenditures of the central, provincial, prefecture, city, and county governments. The investment of the collectives includes the expenditures of township, village, and smaller production units, under the guidance of state planning policy. Since the beginning of reforms, the general public has contributed only small increments, first as voluntary citizen action to green-up the countryside and more recently as private investment in industrial forest enterprises. Foreign investment in forestry, from private sources or foreign government loans, was almost nonexistent until very recently, because China emphasized self-reliance in the pre-reform era.

The collectives typically invested small amounts in local afforestation and reforestation activities or in small wood-processing enterprises. The records of these investments are mostly in terms of numbers of trees planted or area afforested or reforested. Records of the costs of these investments are unavailable. Therefore, it is difficult to determine their effectiveness, although it is clear to most observers that the absence of any link between individual effort and individual reward generated many inefficiencies. In general, the collective sector was perceived as supplemental to the state sector, and its investments were much smaller than the state investments in forestry.

The composition of state investment has changed over the past 50 years. The central government's share of state investment in all state-owned enterprises declined gradually from 84% in 1953 to 62% in 1978 to only 5% in 1995. Meanwhile, provincial and local governments, as well as international donors, have played an increasing role. The central government's share of state investment in the forestry sector alone declined at a slower rate, from 100% in 1953 to 35% in 1995. Therefore, while the central government was reducing its role in general economic activity, it was not reducing its role in forestry nearly as rapidly. Forestry's share of total state investment (from all levels of government) increased from 1.5% in 1953 to 5.4% in 1963. Since 1963, forestry's share has declined again to 0.5% of total state investment in all sectors in 1995 (C. Zhang 1999).

State investments in forestry have included expenditures in both silviculture (forest management) and the forest industry (logging and wood processing). In the early 1950s, state investment in the forest industry dominated state investment in silviculture by a ratio of 10 to 1. After 1960, the share of state investment in silviculture gradually increased until it finally surpassed the share of state investment in the forest industry in 1988 (C. Zhang 1999). In recent years, silvicultural investments have accounted for approximately 70% of total state investment in forestry.

Farm Household Investments in Forestry

Two fundamental sets of rural reforms affected the forest investments of farm households: the devolution of property rights and the liberalization of timber markets. The transfer and improved definition of property rights improved the

link between individual effort and reward, the source of low efficiency in forest use, low productivity, and low farm incomes. Liberalizing the markets increased farmers' revenues and farm income and attracted household investments in afforestation and forest cultivation, thereby increasing China's forest resources.

The markets were liberalized in two steps. First, farm households were allowed to sell production in excess of quotas on the local market beginning in 1979. Then, in 1985, the two-price system was dropped, and households were allowed to sell all their timber at market prices, although within harvest and shipment limitations established by the Ministry of Forestry (now the State Forest Administration).

Devolution occurred within the guidelines of the "Three Fix" policy, under which local governments introduced various reforms that can be generalized as contracts in the early stage of reform (1980s) and leaseholds and shareholding in the later stages (1990s). Contracts usually have a short duration (3–15 years) and are similar to profit or *profit-à-prendre*, a form of standard property right under common law. Holders of contracts have rights to profits from the management or sale of timber but not to the land on which the timber is grown. Leaseholds are for longer terms (10–50 years). Leaseholders have rights to manage, sell, and profit from trees, and the longer period of the leasehold gives them an implicit interest in the land itself.¹

Farm households typically hold small (less than 0.2 ha) private woodlots for subsistence use. They hold contracts or leasehold rights on responsibility plots for larger areas up to hundreds or even thousands of hectares for commercial timber production. The original contracts and leaseholds were generally allocated to farmers according to the number of persons in a household or group of households. In some cases, the contracts were auctioned. Reallocation was rapid. By 1985, nearly 70% of the forestlands previously under collective control were managed by households (*China Forestry Yearbook* 1986). Subsequently, some communities (especially in Fujian) set up shareholding companies to manage their forests in preference to individual household management. Some others first distributed forests to households but later rescinded the household contracts and reassembled their forestlands under shareholding companies that are controlled by village government officials or officials elected by the shareholders.

Expectations

The impacts of market liberalization and devolution of property rights on timber prices, farm incomes, and forest investment have not been widely examined. However, these reforms are consistent with the economic conditions necessary for improvement in all three areas—prices, incomes, and investment.

The central government had held timber prices artificially low with the objective of facilitating economic development. This policy had sent an undesirable signal, and households and collectives responded by rejecting opportunities to invest in forestry. The new policy of market liberalization allowed the laws of supply and demand to operate. They encouraged investment and improved household income opportunity when and where demand was greater and supplies were scarcer.

The expectations of decollectivization are complex because of the multiple characteristics of contracts and property rights (Pearse 1990; Scott 1990; Posner 1992). Contracts such as those between the collectives and households bestow one or more of the following:

- rights to the yield or income of the property,
- rights to the use or management of the property, and
- rights to the disposal, alienation, or sale of the property.

All property rights have several characteristics, including:

- exclusiveness—the extent to which a property holder can prevent others from freely sharing in the benefits of the asset;
- duration—the time period over which the right can be exercised;
- quality of title or security—the extent to which ownership of a property right is secure, socially acknowledged, and enforceable;
- flexibility—the extent to which the specifications of a particular property right can be modified during its duration;
- transferability—the right of a property holder to transfer the entitlement to another party through sale, donation, bequest, or a similar mechanism; and
- divisibility—the extent to which the holder's management of, or income from, or risk in the property can be subdivided into smaller units or according to different uses (e.g., land and timber, multiple uses).

The first three characteristics yield benefits to holders of the rights, regardless of whether the holders are in a position to adjust the inputs they employ with the property. These characteristics facilitate better use of inputs by preventing any overlap of possession with successors or neighbors. The latter three characteristics yield benefits by allowing holders of the rights to alter their factor–land ratios. Improved freedom to modify, divide, and transfer land makes it more likely that the land will be assigned to its most productive or “highest and best” use.

The related concept of transactions costs is also important (Allen 1991). *Transactions costs* are the costs of creating and maintaining property rights, including the costs of information, negotiation, settlement, enforcement, and monitoring. Income and general welfare improve as these costs decline. Transactions costs become crucial when the political and social institutions cannot effectively control disputes about the land, illegal logging, or timber theft, as well as when government taxation and regulation remove a large share of the profit incentive for investment (e.g., D. Zhang 1999; Zhang and Flick 2001).

The critical issue for this investigation is that the new household contracts and leases bestowed some of the three rights, with some degree of each of the six characteristics. As China's experience with reform continued, contracts and leases have grown to include more of the rights and a greater degree of each characteristic. However, household property rights remain incomplete at this time, and the transactions costs associated with timber and forestland have become increasingly burdensome for many households. The property rights have improved somewhat, and some household incomes have increased as a result—but these effects have

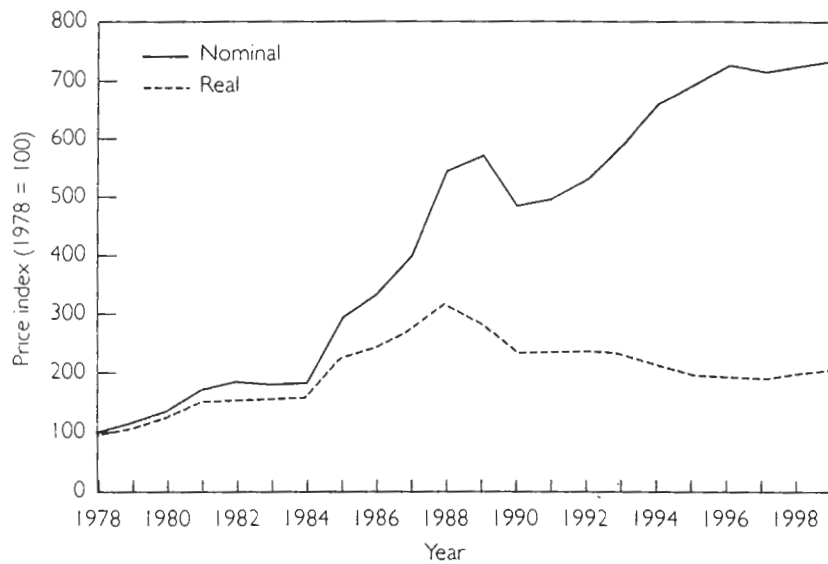


Figure 5-1. *Bamboo and Timber Price Index*

Source: *China Statistical Yearbook 2000*.

not been as great as they could be with even more complete property rights and lower transactions costs.

The Impacts of Reform on Farm Income and Investment

Have China's forest policy reforms improved farm incomes? Did farm households invest more in forestry as a result of these reforms?

Farm incomes have increased steadily since the reforms began in 1978, albeit at a slower pace in recent years. Specifically, per capita farm incomes increased at a nominal annual rate of 15.2% between 1978 and 1999 but at a rate of only 2.1% between 1997 and 1999 (Xiu 2001, Yang 1996). Some of the increase could be attributed to forest policy reforms, and especially to the initial transfers of collective forestlands to households and the liberalization of timber markets in the mid-1980s. Market liberalization was completed in the Southern Collective Forest Region in 1985, and real timber prices increased 43% that year (Figure 5-1).

However, soon after 1985, taxes and charges on timber began to increase more rapidly than timber prices. Since 1988, timber taxes and charges have accounted for as much as 60–70% of the sale price of logs, and the net return available to the farmer has declined to as little as 10% of the sale revenues from logs. Various reviews of farm incomes from forestry all report some level of illegal logging, a behavior that is a direct response to the perception that taxes are too high (Table 5-1). In some parts of the country, the real net farm income from timber sales was lower in the late-1990s than in the mid-1980s (FEDRC 2000).

Table 5-1. *Forest-Related Taxes and Charges as Percentage of Log Sale Price*

Source	County or region	Province	Tax rate (%)	Left for farmer (%)	Illegal logging?	Impact on silvicultural investment
Wang 1996	Kahua	Anhui	50		Yes, +15%	Negative
Chen 2000		Guangdong	34.5			Negative
		Guangxi	39.5			Negative
Z. Zhang 2000	Shanming	Fujian	76	6.8		Negative
Wang et al. 2000	Haihua	Hunan	45–55		Yes, +21%	Negative
FEDRC 1999	Jingzhou	Hunan	62	38 ^a	Yes	Negative
X. Zhang 1999	Zhongyi	Jiangxi		31 ^a	Yes	Negative
	Jianglue	Fujian		25 ^a		Negative
Ho 1993	Jinpin	Guizhou		7.5	Yes	Negative
	Shanming	Fujian		15		Negative

^aIncluding logging cost.

The answer to the second question is somewhat clearer: farmers did invest in forestry. Table 5-2 lists the changes in forest cover and standing forest volume on the collective forestlands over the course of four national forest inventories between 1981 and 1998.² Forest cover increased on the farm forestlands in each region and for every periodic forest survey for which the data are complete. Standing forest volume also increased on the collective lands in nearly every region, most notably beginning with the 1988–1993 forest survey. The total collective forest area for all of China increased by 19 million ha (40%) over the course of 20 years of reform. Data for standing forest volume on the collective forestlands are unavailable for the 1981 inventory, but the general opinion is that standing volume declined before it increased. Once it began increasing, the effect was sharp and rapid. Standing volume increased by 742 million m³ (33%) between 1988 and 1998.

The earlier expansion in forest area followed by the later increase in standing volume can be explained by two factors. First, farm households tended to harvest the available mature timber as they received contract responsibility rights and leases in the early 1980s. They also reforested and even afforested some additional unforested lands. The area under forest cover increased, but the standing volume initially decreased as large volume mature timber was replaced by new seedlings and young growth. Second, forest surveys do not typically measure the volume of young trees before they attain a minimum size. Therefore, the increments in new volume were measured only in the later forest inventories once the young seedlings grew enough to become juvenile stands.³

These positive results notwithstanding, the quality of the collective forest is questionable. Many hectares are understocked, and large areas of wasteland have not yet been afforested. Even in the Southern Collective Forest Region, where most of the forestland has been allocated to farm households for more than 15 years, the insecurity of property rights that is embedded in the unpredictable

Table 5-2. *Timber Resources on Collective Forestlands, 1981–1998*

	1981	1988	1993	1998	1988– 1993	1993– 1998	1988– 1998 ^a
	<i>Forest area (million ha)^a</i>				<i>Change (%)</i>		
Northeast	2.3	4.0	3.6	4.2	-8.2	15.4	5.9
Northwest		2.8	2.7	3.2	-3.0	17.6	14.1
Southeast	10.8 ^b	12.0	13.2	16.5	9.8	25.5	37.8
Southwest		12.2	13.0	17.4	6.4	33.6	42.1
South Central		14.9	17.2	22.4	15.4	30.4	50.4
North	1.6 ^c	2.1	2.5	3.4	19.3	35.0	61.0
Total		48.1	52.3	67.2	8.8	28.5	39.8
	<i>Standing forest inventory (million m³)</i>				<i>Change (%)</i>		
Northeast	91.2	167.3	171.1	206.7	2.3	20.8	23.5
Northwest		98.5	117.2	148.6	19.0	26.7	50.8
Southeast	595.4 ^b	499.1	541.2	630.6	8.5	16.5	26.4
Southwest		883.1	917.5	1,162.1	3.9	26.7	31.6
South Central		521.9	569.5	732.4	9.1	28.6	40.3
North	29.0 ^c	49.5	63.9	81.1	29.1	26.8	63.7
Total		2,219.4	2,380.6	2,961.5	7.3	24.4	33.4

^aThe standard for forested land was changed from 30% forest cover to 20% in the 1994–1998 survey.

^bExcluding Shanghai.

^cExcluding Tianjin.

Sources: MOF 1983, 1989, 1994 and SFA 2000.

actions of the political authorities has restrained household enthusiasm for forest investment.

The roots of this insecurity lie in forest policy and its administration. First, local governments can and do impose taxes and charges on timber without the participation and consent of the property holders. The parties involved in the contracts are not equal, and governments have imposed heavy tax burdens. For example, taxes and charges in Jingzhou County, Hunan Province, increased 170% between 1985 and 1999, while local timber prices increased only 9% and farm incomes actually decreased 84%—all in real terms (FEDRC 1999).

Approximately one-half of all forest-related taxes and charges are under the control of forest authorities in provincial, prefecture, and county governments. Many of these forest authorities have raised taxes in the name of good forest management and policy reform. For example, in the Southern Collective Forest Region (the largest farm-forest region of the country), the old price controls have been largely replaced with high taxes, many of which are under the control of forestry departments and outside the provincial budget (Zhang 1990). For example, the forest cultivation fund in Fujian Province increased 670% in real terms between 1984 and 1989. This fund is intended to support forest management. Whether it was more effective in improving forest management or in pro-

viding financial support for the agency staff is a topic for the next section of this chapter on government investment.

Second, the legal protection of property rights is weak. Infringements on property rights are a civil dispute, not a criminal offense, and boundary disputes have led to illegal logging in some regions (SFA 2001). The punishment for illegal logging and timber theft is often minimal, and it does not deter the perpetrators. Furthermore, some local governments implicitly encourage timber theft by threatening to nullify previous contracts. Yang (1996) provides an example from personal experience. He planted six hectares (private lots and responsibility plots) and invested 120,000 yuan in reforestation and management of a 150-ha collective farm under contract to him. Local government officials subsequently threatened to cancel his contract, and his forests were looted with impunity several times.

Worse yet, some local governments may have never intended to honor some contracts. For example, local officials from the Liulong Region of Shanxi Province have advocated unilateral changes in contracts following increases in the consumer price index or upon evidence that the farmer successfully generated a higher income (Liu and Bai 1996). This would increase the transactions costs for defending the property rights, and it can only discourage leaseholders from increasing their investments.

Third, China's reforms have followed a path of "crossing the river by touching stone." That is, the reforms have been gradual, and their gradual nature has created uncertainty in the minds of the land managers. The piecemeal approach to reform, combined with the prior experience from 1949 to 1979 when property rights were changed several times, has left farmers unconvinced of the direction of future policy. As a result, some farmers responded to their new assignments of property rights in the early 1980s by cutting more timber than they would have if their property rights had been more secure. (See Chapter 4 and also He 1989, Lin 1989.)

Summary

In sum, farm households have substantially extended the area and increased the volume of the forests they manage. As time has passed since the beginning of first agricultural and then forestry reforms in the late 1970s and early 1980s, some characteristics of property rights have improved. Divisibility and transferability have been assured under recent lease agreements, although some contracts and leases limit transferability to citizens of the same village or town. Durability also improved in the late 1990s, when many leases were renewed.

However, the transactions costs of forest operation remain unreasonably high and forest property rights still contain critical elements of insecurity because of

- high taxes and regulations on timber harvest levels and shipments,
- continuing boundary disputes and limited institutional protection for household contracts and leases, and

- remaining general uncertainty about the long-term stability of the general policy environment.

As a result, farm incomes may have increased, but only marginally, and households have limited their investments in forestry. At the intensive margin, households have shown a preference for agricultural and horticultural activities over forestry, and 2.8 million ha of forests were converted to other uses between the 1989–1993 and the 1994–1998 forest surveys.

Arguably, farm households do have the capital to invest in forestry. China has one of the highest savings rates in the world, and its farmers have a stock of untapped financial capital that, to this date, they have restricted to investments in improved personal housing and in the rapidly expanding local township and village enterprises. They tend to invest their labor, but not their capital, in forestry. Therefore, forest investment at the intensive margin with agriculture is less than it could be. At the extensive margin, farm households have converted some wasteland to forests, but more could be afforested if the transactions costs were lower and the property rights were more complete. Farm households do reforest after logging, although they tend to reforest with minimal effort, their silvicultural activities are not intensive, and the reforested lands remain in low-quality forests (He 1989, FEDRC 2000).

Government Investment in Forest Management

Government investment in forest management falls in two categories: regular silvicultural investments and large projects for forest protection and restoration. Funding for both passes through the state-owned forest bureaus and forest farms (state-owned forest enterprises, or SOFEs) that manage the state forestlands. Some government financing is passed on to farm households as an afforestation or reforestation subsidy.

Government Investment in the SOFEs

The two sources for investment in the SOFEs are the government and the SOFEs' own retained earnings. Both sources can be used for silviculture (forest management) or for the forest industry (logging and wood processing), and many of the SOFEs are integrated enterprises that include both in their combined land management, logging, and wood-processing operations.

Since 1978, the central government's funding has accounted for less than one-half of all investment in the SOFEs but more than one-half of the investment in SOFE silvicultural activities (Figure 5-2). (The differences are composed of provincial and local government funding and investments from the SOFEs' retained earnings.) The central government's share of all investment in the forest industry has declined with industrial reform and the "hardening" of budgets for all state-owned enterprises. Its share of silvicultural investments has increased, however, especially since 1997 and with the growing recognition of the important environmental services that forests provide.⁴

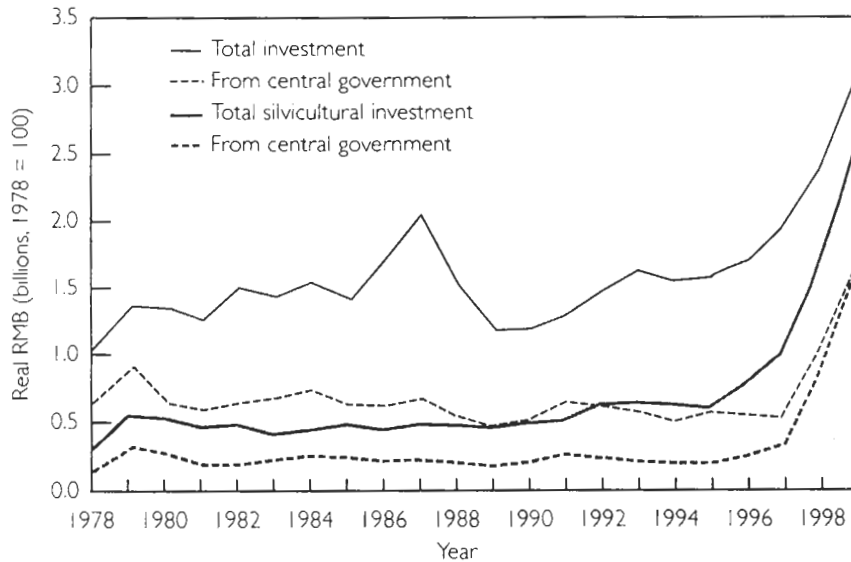


Figure 5-2. State Investment in State-Owned Forestry Enterprises

Source: China Statistical Yearbook 2000.

Total government investment in the SOFEs increased at a real average annual rate of 3.9% between 1979 and 1997. This aggregate rate reflects an average annual increase of 7.9% for silvicultural investments but only 2.3% for investments in the forest industry. The pattern shifted with recent decisions to leave the forest industry to the private sector and to improve the environment.

These aggregate measures mask the substantial impacts of a few large investments. The largest increases in state silvicultural investment occurred in 1979, when the Three North Forest Protection Project (Green Great Wall) was established, and between 1996 and 2001 when the government responded to several large ecological disasters (the 1998 floods of the Yangtze and Songhua Rivers and the dust storms in northern China in 2000–2001) with a decision to restrict timber harvests in some regions and to reforest and protect the upper watersheds. Another large increase in state investment in the forest industry in 1987 was probably related to the costs of controlling the 1.14 million ha fire that occurred in northeastern China that summer and the costs of reforestation after the fire. Clearly, the government of China, like those in other countries, does respond to natural crises.

Figure 5-3 traces the pattern of state investments in selective silvicultural projects since 1990. It shows that investments in large environmental protection and restoration projects have been a rapidly increasing share of the budget. There were 15 of these projects (listed in Table 5-3 along with the objective of each and its general location) before they were combined into five projects in 2001. Thirteen were ecological protection and forest restoration projects that concentrated on afforestation. One was a plantation project begun with two World Bank loans

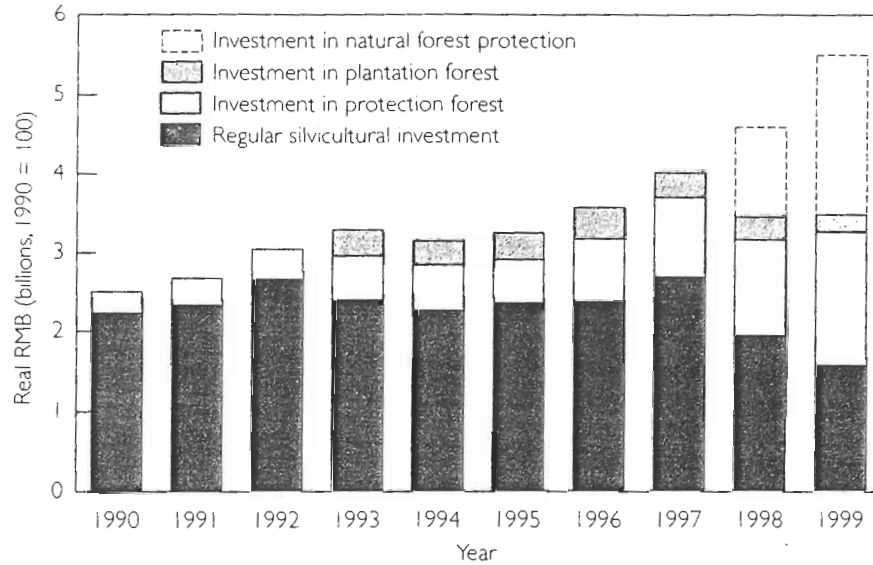


Figure 5-3. *Regular State Silvicultural Investment and Project-Based Investment*
 Source: *China Statistical Yearbook 2000*.

to establish fast-growing forests to alleviate China's potential future timber supply problem. The last was the new Natural Forest Protection Project that began in 2000. Its focus is on the protection and restoration of existing forests. Investments in these 14 projects increased more than sixfold in 10 years.

Effectiveness

How effective were these investments? The level of state investment in forestry has probably been a smaller problem than the effectiveness and the efficiency of the investment.

The data in Figures 5-2 and 5-3 are statistical aggregates. In fact, the monies allocated for forest management do not all go to on-the-ground forestry activities. Some are dissipated in the allocation process. The forest authorities at all levels of government, as well as the SOFEs, have their own interests and responsibilities. They use their revenues to support employment, transportation, and social services for their employees, as well as for on-the-ground forest management.

Once the funding is allocated to actual silvicultural activities, its effectiveness depends on the incentive structure for SOFE employees and also for farm households, if the payment is a subsidy for farm forestry activity.

Silvicultural Investments on State Lands. As in other sectors of the Chinese economy, reforms of the SOFEs have gradually replaced a more centralized, planned system with a more decentralized, market-oriented system. Under the old system, silviculture was vertically integrated with logging and wood process-

Table 5-3. Major State-Funded Silvicultural Projects

Project title	Objective and general location	Date of origin	Area (million ha)	
			Planted	Tended
Three North Forest Protection Project	To build a Green Great Wall in northern, northeastern, and northwestern China that covers 45% of China's territory	1978	17.33	24.31
Central Plain Afforestation Project	To build shelterbelt forests in the region of the central plains that covers Henan, Hebei, Shandong, and Jiangsu	1984	0.42	0.62
Taihang Mountain Afforestation Project	To afforest Taihang Mountain area in northern China	1986	3.63	2.76
Coastal Protection Forest Project	To build coastal protection forests in southern provinces and protect them from hurricane invasion	1988	1.29	1.16
Upper and Middle Yangtze River Protection Forest Project	To reforest and afforest lands in upper and middle Yangtze River in southwestern and central China	1989	5.02	5.21
Plantation Forest Project based on World Bank loans	To replace fire-damaged forest with fast-growing plantation forest in northeastern China	1990	1.42	2.85
Desertification Prevention Project	To prevent the expansion of desert in northern and northwestern China	1991	1.54	0.92
Huai River Protection Forest Project	To establish protection forest in Huai River and Tai Lake watershed in central China	1996	0.20	0.32
Pearl River Protection Forest Project	To establish protection forest in Pearl River watershed in southern China	1996	0.24	0.19
Liao River Protection Forest Project	To establish protection forest in Liao River watershed in Liaoning province	1996	0.32	0.17
Yellow River Protection Forest Project	To establish protection forest in Middle Yellow River watershed in western and central China	1996	0.57	0.35
Special Ecological Protection Project	To protect area with special ecological significance in the country	1998	0.28	0.09
Returning Erosive Farmlands to Forestry Project	To convert erosive and high-slope agricultural land to forestry use	2000	0.88	0.04
Natural Forest Protection Project	To restore existing natural forests in the upper and middle Yangtze and Yellow River watersheds and northeastern China	2000	1.91	3.00

Notes: In 2001, all 14 projects were combined into five: the Beijing Area Protection Forest Project, the National Protection Forest Project, the Returning Erosive Farmlands to Forestry Project, the Natural Forest Protection Program, and the Plantation Forest Project. These five projects and the Wildlife Protection Project are now called the "big six" forest projects.

ing, and silvicultural activities were conducted by individual farms within the SOFEs or by the SOFEs themselves under a soft budget. Silviculture, logging, and wood processing were divided into separate operations in the late 1980s. In addition, the large old forest farms were divided into smaller units that now are managed by individual households or groups of households.

For silvicultural activities within the SOFEs, the first reform was the shift to a piece-rate system of wage payment. Labor is now contracted out, and wages are directly tied to the amount of work accomplished rather than the time involved (e.g., the number of seedlings removed from a nursery or the number of trees planted). This improves the market incentives for labor allocation, although the forest farms still provide general planning, materials, and machinery (Y. Zhang 2001). Arrangements of this sort are now widely used where the margins to be measured are few and the measurement costs are small.

Other payment arrangements also have developed. In one common arrangement, individuals or small teams perform specified tasks in return for a fixed payment. Most contracts stipulate minimum seedling survival rates, although there are many variations. In some cases, the forest farms provide materials and machinery. In others, the contractors possess their own material and machinery—previously purchased from the forest farms. In all cases, any profits belong to the contractors, who are responsible for organizing the labor and materials and for site preparation, planting, and tending the seedlings for the first few years of new growth.

A third arrangement, similar to sharecropping in agriculture, was developed to transfer some state-owned capital equipment to former SOFE employees. Individual workers obtain the use rights to the capital and share the income from its use with the SOFEs. This arrangement was first implemented for vehicles and small sawmills but it has spread to silvicultural and agricultural operations within the SOFEs.

A different procedure has been used to transfer use rights for land and resources. These transfers are negotiated or auctioned (especially for wastelands). The recipients of the new rights are usually limited to SOFE employees. Therefore, the land prices are not entirely determined by the market (Y. Zhang 2001). In recent years, a growing number of SOFEs have allocated lands as a substitute for salaries, pensions, and even severance pay. These payments are called “salary land,” “pension land,” and “employment land,” respectively (CAFLU 1997).

Regardless of the specific contractual reform, the intent has been to link effort with reward, and the trend has been toward a responsibility system similar to those for agriculture and farm forestry. Y. Zhang (2001) assessed the improvements in economic efficiency due to these reforms. He concluded that the reforms reduced labor shirking and administrative costs sufficient to improve efficiency in silvicultural activities by 25% in the 40 SOFEs in Heilongjiang Province. Shen (1991) showed that, with the reforms, the three-year seedling survival rate increased from 32% in 1985 to 94% in 1990 on the Jile Forest Farm. Others (e.g., Teng and Xie 1991, Hong et al. 1992, Zhang et al. 1994) have reached similar conclusions. That is, silvicultural activities organized in a decentralized system are less costly and achieve better results than under a centralized system.

Table 5-4. *Timber Resources on State Forestlands, 1981–1998*

	1981	1988	1993	1998	1988– 1993	1993– 1998	1988– 1998
	<i>Forest area (million ha)^a</i>				<i>Change (%)^a</i>		
Northeast	21.4	20.5	21.5	23.5	4.6	9.4	14.4
Northwest		5.3	4.9	5.8	–6.7	16.9	9.0
Southeast	1.3 ^b	1.7	2.0	2.5	16.1	23.8	43.7
Southwest		8.2 ^c	12.1	13.5	48.3	11.7	65.7
South Central		2.2	2.3	2.5	6.8	9.7	17.1
North	13.3 ^d	13.1	13.5	14.2	2.8	5.3	8.2
Total		51.0	56.3	62.0	10.4	10.1	21.6
	<i>Standing forest inventory (million m³)</i>				<i>Change (%)^a</i>		
Northeast	2,102.8	1,980.9	2,070.0	2,151.9	4.5	4.0	8.6
Northwest		550.6	558.0	618.7	1.3	10.9	12.4
Southeast	79.1 ^b	110.4	140.7	175.3	27.5	24.6	58.8
Southwest		1,594.5 ^c	2,818.0	2,961.7	76.7	5.1	85.7
South Central		156.1	182.7	191.7	17.0	4.9	22.8
North	880.1 ^d	901.7	936.1	1,024.9	3.8	9.5	13.7
Total		5,294.3	6,705.6	7,124.2	26.7	6.2	34.6

^aThe standard for forested land was changed from 30% to 20% forest cover in the 1994–1998 survey.

^bExcluding Shanghai.

^cExcluding Tibet.

^dExcluding Tianjin.

Sources: MOF 1983, 1989, 1994 and SFA 2000.

These observations are grounds for optimism. Nevertheless, room for improvement remains. A recent China Central Television (CCTV) report (2000) shed light on the problems of monitoring silvicultural activities. The Shilinji Forest Bureau was devastated by the 1987 fire. Over the next 10 years, the bureau obtained some 27 million yuan of state funds to reforest about 9,000 ha. The reforestation was completed in 1997. However, when the project was audited, only 2,250 ha had been reforested. The CCTV report blamed official corruption, but the difficulties of monitoring within a multilayer administrative structure and the location of the bureau in the country's most isolated northern region might hide the real intentions and activities of the local officials. In a more general example, the SOFEs have reported accumulated planting over the past 20 years that is greater than the total area under their management. Yet some wastelands remain in the SOFEs. This discrepancy implies that either the reported number of planted hectares was erroneous or that many newly planted seedlings did not survive, or both. Future reforms must consider improvements in these large remaining inefficiencies.

Table 5-4 summarizes the effect of state expenditures on the forest inventory after adjustments for timber harvest removals.⁵ (Table 5-4 is the state land coun-

terpart to Table 5-2 for the collective forestlands.) It shows that the land area in state forests has remained relatively stable for all regions over the course of China's reforms. This is not surprising. Transfers of state forests to other land uses are not generally permitted. The forested area and standing forest volumes on these lands have changed, however, increasing 21% and 35%, respectively, from 1988 to 1998.

State Subsidies to Forest Farmers. State subsidies to farm households for forestry take three forms: payments for farm labor, grain support, and free seedlings. We can only speculate on the effectiveness of these transfers. When land tenure is insecure, farmers have little incentive to plant seedlings, even if the seedlings are free. When the payments for planting are in the form of grain or currency, then the extent of planting depends on the amount of the payment.

C. Zhang (1999) provides an example. She reported that a shortage of funds between 1991 and 1995 severely limited farmers' enthusiasm for the Three North Forest Protection Project. Farmers received 81 yuan per afforested hectare, an amount that was less than one-fifth of the planting cost. It was insufficient to cover even the labor opportunity cost. Zhang identified lack of funding as a prime reason that the Three North Forest Protection Project (and other projects as well) do not meet their targets for tree planting.

The available funding is often dissipated in administrative costs and, therefore, only a small share of it actually reaches the farmers. For example, in the Southern Collective Forest Region, more than one-half of all forest taxes and charges are earmarked for forestry in joint ventures involving forestry departments and farmers. However, the local and provincial forestry departments tend to institutionalize these funds and use them for their own purposes. The farmers seldom receive any monies from the government.

When subsidies are available, they may create an incentive to overreport the areas afforested or reforested. For example, Qi (1996) reported that Fuchen Village in Taihuo County, Jiangxi Province, claimed it planted trees on 40 ha. However, the actual area planted was only 22 ha, and the survival rate of the new seedlings was only 60%—far below the mandatory 85%. Shen (1991) documented overreporting of survival rates in other regions as well. Monitoring is expensive, and forestry departments do not have the means to review all lands that are reported as forested with government subsidies. Furthermore, even when the reports of planting and seedling survival are accurate, the government does not provide financial support for continued management and protection. Therefore, the incentive favors replanting rather than managing the surviving seedlings. In sum, when the lands for forests are not secured with long-term tenures, the level of management and protection declines and the newly forested areas can deteriorate to poor-quality woody brush or even wasteland within a few years.

In recent years, the authorities have extended the period of land tenure and, in some areas, they have begun to provide farmers with low-interest or interest-free loans instead of direct subsidies. These reforms may increase the farmers' interest in long-term activities and improve both initial seedling survival rates and the general effectiveness of forest protection and management.

Social and Private Nonfarm Investment

There are two sources of private nonfarm investments in forestry: voluntary public tree planting (what might be called “social investments”) and private financing.

Social Investments in Forestry. China began an annual voluntary tree-planting campaign in 1981. The campaign has been responsible for the planting of 35 billion seedlings (*People's Daily* 2001). It also has raised public awareness of environmental protection. Thirty-five billion trees is a lot, but the total area planted (estimated as 5.3 million ha, assuming a plant density of 3,300 seedlings per hectare and a survival rate of 50%) is small compared with the country's remaining 57 million ha of wasteland. Furthermore, the newly planted areas tend to be more visible and accessible sites along roadways and railways. These may not be the sites in greatest need of environmental repair. Finally, the government program does not provide resources for the critical tending and protection of seedlings and growing stock that follow successful planting. Therefore, although this public tree-planting campaign has been impressive in its extent, it could do much more. And in any event, it cannot be an effective substitute for investment by the forest industry or for state investment to protect environmental values.

Private Nonfarm Financial Investments. Private nonfarm investment in forestry and the forestry industry began soon after the initial economic reforms in late 1970s. Although no official data reflect the magnitude and impact of this source of investment, anecdotal evidence and personal experience suggest that it increased rapidly in the 1990s.

Retirees and those with personal wealth or power often make private silvicultural investments. They typically return to their hometowns or to places nearby, make some arrangement with the local government to obtain land-use rights, and begin planting trees and raising high-valued animals for the local markets. For example, CCTV documented the case of a vice-president of Inner Mongolia's Textile Corporation (IMTC), who was asked to find a way to increase wool production in late 1980s. He recognized desertification as a major threat for the company's sheep herd and obtained financing from IMTC to afforest the desert fringe near the city of Baotou. Afforestation successfully prevented further desertification of the company's land. This vice-president later resigned from IMTC but continued to plant trees—relying on revenues generated from the sale of domestic animals, from loans and private donations, some government subsidy, and from volunteer labor (CCTV 2000). In another example, an executive of a private chemical company expressed interest in using the earnings of his company to green-up wasteland near Beijing.

Private investment in the forest industry has its roots in the township and village enterprises (TVEs). Prior to economic reform, the TVEs were collective enterprises. Some were small wood-processing facilities and processors of non-timber products (e.g., resin, tea oil, and bamboo roots). Soon after the reforms, some TVEs were transformed into shareholding companies, and private shareholders (often local farmers) gradually increased their shares of control at the

expense of local governments. Later, nonfarmers who had accumulated capital through retail sales, transportation services, and other commercial activities recognized financial opportunity in the forest industry and began organizing their own partnerships or shareholding companies. The products of their enterprises vary, and their size ranges from very small to very large, but the number of enterprises has increased rapidly. Collectively, they produce a substantial share of China's total output of forest products. They are the most rapidly growing component of the pulp and paper industry (Xu 1999), and they account for more than 70% of the production of engineered wood products (plywood, fiberboard, and particleboard) in Fujian, Guangdong, Hebei, Jiangsu, Shandong, and Zhejiang.⁶

The purchase of equity in enterprises that produce forest products is another emerging avenue for private nonfarm investment. The performance of the shares of the larger private forest enterprises on the Shenzhen and Shanghai stock exchanges is evidence of the perceptions of private investors regarding investments in forestry. These two exchanges were organized only in 1992, but some 600 companies meet the guidelines of China's Security Exchange Commission for raising capital in these markets. Three forestry firms meet the guidelines; Yonggan Forestry Limited (based in Fujian), Jilin Forestry Industry Limited (based in Jilin), and Jinggu Forestry Limited (based in Yunnan). Stock in additional firms may be traded as the economic reforms become more established.

We can examine the incentives to invest in these three enterprises with a capital asset pricing model (CAPM) of the risk and return on their stocks (Sharpe 1964, Lintner 1965). [This same model has been used to assess a wide range of industrial investments in the United States and other countries with active stock markets (e.g., Sun and Zhang 2001).] The model states that the required or expected return on an investment should be equal to the rate earned on a riskless investment plus a premium for the assumption of market risk or uncertainty:

$$R_i = R_f + \beta_i(R_m - R_f) \quad (5-1)$$

where R_i is the required rate of return on investment i , R_f is the risk-free rate of return, β_i is investment i 's risk premium (commonly known as its *beta*), and R_m is the market's expected rate of return (often measured by a stock market index).

Jenson (1969) showed that CAPM is consistent with the regression equation or excess return form

$$R_i - R_f = \alpha_i + \beta_i(R_m - R_f) + \mu_i \quad (5-2)$$

where the intercept α indicates the value of an asset that is due to factors other than the market itself and μ_i are random errors. R_f is generally measured by the yield on government treasury bills. Where these data are unavailable, an alternate form of Equation 5-2 has been used:

$$R_i = \alpha_i + \beta_i R_m + \mu_i \quad (5-3)$$

A positive value for α_i indicates that the asset's expected return is greater than what the market requires for its risk class (as measured by β). Thus, a positive α_i

Table 5-5. *Capital Asset Pricing (CAPM) Results for Publicly Traded Forest Products Firms in China and the United States*

Asset	α		β		R^2	\bar{R}^2
	Coefficient	t-ratio	Coefficient	t-ratio		
China's forestry industry portfolio	0.0005	0.55	1.45*	27.93	0.42	0.42
U.S. forest industry portfolio						
Timberland limited partnerships	0.020	1.45	0.52*	2.80	0.15	0.13
Large forest industry company	-0.003	-0.26	1.04*	7.09	0.52	0.51
Medium forest industry company	-0.007	-0.64	0.94*	6.95	0.51	0.50

*Significant at the 1% level.

Source: U.S. forest industry portfolio data from Sun and Zhang 2001.

indicates a superior risk-adjusted return. The coefficient β_i is an indicator of the asset's market risk. If the value of this second term is greater (less) than one, the asset moves more (less) than corresponding moves by the full market. Thus, an asset with a positive (negative) beta is said to be more (less) risky than the general market.

Equation 5-3 can be applied to a portfolio equally weighted with the three publicly traded forestry companies. The market rate of return is an index composed as the simple average of the Shanghai and Shenzhen stock exchange indices. Yongan Forestry Limited was listed on Shenzhen Stock Market in December 1996; the other two enterprises were listed in October 1998 and August 2000. Therefore, the portfolio is limited, especially before October 1998, and the results of this assessment must be viewed with caution.

Table 5-5 lists the results using daily data from December 6, 1996, to May 31, 2001—as well as comparative results for U.S. forest products firms traded on the New York Stock Exchange. The risk of investing in the forest industry firms in China was 1.45 times greater than the risk for the Chinese market as a whole—over this time period. In comparison, the risk level for integrated U.S. forest products firms was only slightly higher than that of U.S. market as a whole, and the risk level for timberland investments in the United States was only one-half the risk level of the U.S. market as a whole. Therefore, the limited information on private investment in China suggests that investments in the forestry sector are more risky than the average investment in the rest of China's economy. They require a higher rate of return before investors will spend their scarce financial resources. If the U.S. comparison is representative, then investment in China's forestry sector is also more risky than investment in forestry in other countries.

These observations identify risk as a deterrent to investment, but they do not identify the sources of the additional risk. Perhaps those sources are related to uncertainties about land tenure, perhaps they are related to a generally uncertain long-term policy environment, or perhaps something else. However, a risk level greater than the general market level suggests that risk itself constrains some investment in forestry and that if the risk were reduced—that is, if the sources of this additional risk or uncertainty were eliminated—then private individuals

would increase their investment in forestry. Furthermore, the U.S. evidence suggests that a high level of risk or uncertainty does not have to be a normal characteristic of the forestry sector relative to other sectors. Therefore, it should be possible to adjust policy to eliminate the abnormal risk. This will be an important task for China's continuing forestry reforms.

Foreign Investment

One of the objectives of China's reforms was to attract foreign capital. In recent years, China has attracted more foreign direct investment than any other developing country. By 2000, China had attracted US\$42.7 billion of foreign capital. The forest industry itself attracted about \$800 million in 1996, \$900 million in 1997, and \$1 billion in 1998 (Lu and Landell-Mills 2001). It accounted for more than 2% of all foreign direct investment in China in those years, a share that was more than double the share of the forest industry's contribution to national gross domestic product and larger than forestry's share of the manufacturing sector. It is also greater than, for example, the share of foreign investment in the U.S. forest industry. Therefore, one could say that China's forest sector has done well in with respect to this objective.⁷

Foreign direct investment in China comes from two sources: private firms such as Sino-Forest Corp. and Asia Pulp and Paper Ltd., and international donors such as the World Bank, Asia Development Bank, and some developed-country governments. Between 1980 and 1999, China obtained some \$600 million in World Bank loans, \$250 million in foreign government loans, and nearly \$300 million in foreign aid. Many of the loans and much of the foreign aid were for afforestation and reforestation. The sum of foreign direct investment in forest plantations was \$100 million during this period (SFA 2001).

China's market is large. Its growth has been a source of increasing timber demand even though the country has only a limited domestic timber supply—as indicated by its increasing net imports of forest products (D. Zhang 2001). As China's per capita income continues to grow, its demand for forest products and related imports will also grow. The market's size and its growth are incentives for foreign forest investment. These have been reinforced with long-term tenures offered to foreign investors in forest plantations in southern China. However, improved tenures have not yet been especially successful in attracting investments in forest management. Rather, the foreign investments in the forest sector have been concentrated in wood processing, and especially the pulp and paper and plywood industries. These industries benefit from the lower labor costs that have also been so important in attracting investments in other components of China's manufacturing sector. China's coastal wood processors have attracted most of the foreign investment. For example, more than 85% of China's plywood production comes from eight coastal cities and provinces—Fujian, Guangdong, Jiangsu, Liaoning, Shandong, Shanghai, Tianjin, and Zhejiang—where domestic demand is high, access to foreign suppliers of logs and machinery is good, and the re-export of products is easy.

Conclusions and Discussion

This chapter reviewed the impacts of forest policy reforms on farm household investment, government investment, private nonfarm investment, and foreign investment. The reforms have produced increases in the investments of farm households, expanding both the area under forest cover and standing forest volume, and they have improved the environment for private domestic and foreign investment. Meanwhile, the government has shifted its own forest investments from the forest industry to forest management itself and especially to management intended to improve the environmental services that forests provide.

Nevertheless, policy constraints—some remaining and some new—prevent China from achieving its forestry potential. China's large market and growing economic wealth, low labor costs, and favorable tax policies for foreign investors encourage foreign investment. However, remaining uncertainties in policy and land tenure, combined with burdensome new taxes and regulations, reduce the incentives for domestic investment in long-term forest production.

Two policy improvements are central to further enhancement of the incentives for farm households to invest in forestry: one, reducing the taxes and charges on production to a level that is related to the value of the services provided and, two, improving the property rights. Property rights could be improved by allowing the transferability of forestland and young forest stocks, lengthening tenures, and auctioning wastelands to the highest bidders. In addition, landowners should receive compensation when the government takes forests and forestlands for other uses. Knowledge that compensation is likely would increase farmers' confidence that they will reap the rewards of their long-term investments.

Providing farmers and other private investors with the right set of property rights and other incentives will probably achieve better results than increased government investment. Government investment suffers from two substantial problems:

- high administrative costs in multiple layers of government administration and the misuse of forestry funding; and
- high monitoring costs to control shirking behavior.

In the long run, controlling the size of government activity is the only way to reduce administrative costs.

In the future, China must address a growing imbalance between domestic demand and supply that could reach 25% by 2010 (Zhang et al. 1997). This will necessitate an increase in imports, encourage wood substitutes, act as an incentive to improve production efficiency, and ultimately, reduce consumption as prices rise. Two of these prospective results—imports and substitution—warrant further examination.

Wood imports may become more expensive as Southeast Asian sources are drawn down and the Russian economy recovers (and Siberian imports become more expensive). Could China increase its own production to offset rising import costs? D. Zhang (2001) pointed out that net wood import costs are four to seven times China's state investment in forestry. He also calculated that the stumpage portion of net wood product imports is approximately 60% of state silvicultural investment in any year. This means that China is already spending the financial

capital that, if transferred from purchasing imports to growing domestic timber, would produce its own supply. Poor planning and inadequate policy constrain the investment.⁸

Substitution is a different option. The substitution potential of bamboo is most intriguing, but little is known about its full economic potential. China is the world's leading producer of bamboo, its bamboo production is increasing, and bamboo is a substitute for wood in almost all forest products. But what are the limits of bamboo substitution for wood, and what effects will rising wood prices and household incomes have on it? These important questions merit further inquiry.

In conclusion, China has the "hardware" of forest production—the land, labor, financial capital, and entrepreneurial skills. Its shortfalls are related to policy, in particular to taxes and regulations, secure property rights, and a stable policy environment. Improvements in each of these areas would reduce the risks and transactions costs for private forest investment. If the government addresses these issues in a satisfactory manner, it will attract private investment to commercial forest management. Government forest investment could then focus on the forest-based environmental services that private investment does not provide as well.

Notes

1. Although most contracts do stipulate that contract holders should replant trees after harvesting timber, the short-term nature of contracts gives contract holders little *de facto* interest in growing trees or in managing the land. Leases, on the other hand, give their holders enough time to reap the benefits of their management efforts on those lands. Therefore, leaseholds provide a *de facto* incentive for land and forest management.

2. In fact, Table 5-2 reflects impacts of all private investment, including private nonfarm investment and foreign private investment. However, the latter two are both very small and also recent. Therefore, farm households have been responsible for the vast bulk of direct impacts on the collective forestlands over our period of inquiry.

3. Qiao et al. (1998) supported these aggregate observations with a local examination of 28 villages in Yunnan. They found that farmers in Yunnan did invest. They afforested local wasteland and significantly expanded the area in household-managed forests.

4. The retained earnings of the SOFEs themselves are another source of silvicultural investment. The local autonomy of the industry-oriented SOFEs (mostly in the Northeast) has increased. Yet these SOFEs remain underfunded relative to the demands for their timber. Eighty percent of the SOFEs have exhausted their mature timber resources. One-third were unprofitable in 1994, and this unprofitable share rose to one-half three years later as the total indebtedness of all SOFEs rose an additional 4.5-fold. With this much indebtedness, new investment is unlikely until many conditions change. However, there are prospects for change and, as some SOFEs begin to behave more like private operations, the experiences of private nonfarm forest investors (presented in the next section) will become relevant for the SOFEs as well.

5. In fact, Table 5-4 reflects impacts of all investment on state lands, including voluntary private investment and international donor investment. However, the latter two have been small in comparison with state investment, and investment by foreign donors has been recent. Therefore, state investment, including the retained earnings of the SOFEs, has been responsible for the vast bulk of direct impacts on the state forestlands through the period of China's fifth forest inventory.

6. These six provinces account for approximately 60% of China's production of engineered wood products (Tang Xiaowen, personal communication, April 2002). The absence of data on foreign-owned enterprise makes the accurate estimation of capacity and production rates difficult.

7. However, foreign investment is concentrated in the manufacturing sector. As China opens its financial and service sectors for foreign investment, the manufacturing share of foreign investment will probably decline. Because forestry is one component of the manufacturing sector, its share of foreign investment will probably decline as well.

8. Furthermore, domestic production would have favorable effects on income distributive and regional development. It would include some production in the Northeast and the West, regions that are the focus of China's Western Regional Development Program and its Natural Forest Protection Program. Imports would encourage further development of the wood-processing industries in the coastal regions.

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