BUILDING INSTITUTIONS FOR MARKETS: EXPERIENCES AND LESSONS FROM CHINA'S RURAL FOREST SECTOR

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Abstract. Through the lens of institutional economics, this paper reviews the reform and development experience in China's rural forest sector and discusses lessons that can be learned by China and other countries. We find that the impacts of the reforms, characterized by changes in forest tenures and market settings, hinge on how they are implemented. If farmers are granted not only land use rights but also liberalized market access, as shown in the northern farm region and the production of non-timber forest products, the incentive structure will be improved, and thus forest production will grow and producers and consumers will benefit. If the reforms are implemented in such a way as to cause market control and distortions, as witnessed in the southern traditional timber production region, the incentive structure will improve little. The chances for production increase will thus be diminished, making it difficult for producers and consumers to enhance their welfare. While tenure arrangements have evolved across the country in the 1990s, timber production in the south remains subject to allowable quota, cutting permit, government procurement, and heavy taxation. We wonder what the land use and tree ownership rights mean without the right to access market freely and fairly, and how practical it is to substitute government efforts for private initiatives in a successful forestry program. The time has come for Chinese policymakers to address these problems.

Key words: China, economic reforms, forestry, liberalization, markets, tenure arrangement.

1. Introduction

In its World Development Report 2002 – *Building Institutions for Markets*, the World Bank stated that '[E]ffective institutions can make the difference in the success of market reforms' (p. III). It also pointed out that '[M]arkets allow people to use their skills and resources and to engage in higher productivity activities if there are institutions to support those markets' (p. 3). These statements concisely summarize the relationship between institutions and market functioning and eloquently highlight the importance of building institutions to the success of market reforms.

What are institutions? According to Hayami and Ruttan (1985, pp. 94–95), 'Institutions are the rules of a society or of organizations that facilitate coordination among people by helping them form expectations which each person can

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reasonably hold in dealing with others . . .. In the area of economic relations they have a crucial role in establishing expectations about the rights to use resources in economic activities and about the partitioning of the income stream resulting from economic activities.' The authors further noted that property rights and market arrangements are among the basic economic institutions.

From the above perspective of institutional economics, China's rural reforms since 1978 can be viewed as a drive of institutional innovation. Although there were numerous reform programs, the institutional innovation consisted of two fundamental components: the land tenure and production organizational changes brought on by the household responsibility system (HRS) replacing the collective regime, and the introduction of market mechanisms through the gradual shifting from compulsory quotas and planned prices to market-based transactions of commodities (Lin, 1992; McMillan et al., 1989).

Unlike the unprecedented high-rate growth in agriculture (MOA, 1989; Lin, 1992), however, responses to the institutional innovation in the rural forest sector have been mixed (Liu, 2001; Zhang et al., 2000; Yin and Newman, 1997).[1] In the north-central farm region, including Henan, Shandong, and other adjacent areas (hereafter, north), tremendous afforestation efforts were made since the late 1970s. Not only were plantations and shelterbelts established, but also many commercial trees were introduced into farm fields by means of agroforestry. As a result, the forest coverage increased from less than 5% in 1977 to over 12.5% in 1999. In addition, a great number of trees have been planted across the landscape (SFA,[2] 2000). This change in resource endowments has, in turn, substantially eased the local timber and fuel shortages and improved the agricultural environment.

In comparison, while existing resources were drawn down in the traditional southern forest region – those provinces south of the Yangtze River (hereafter, south), no significant progress was made in the establishment of new forests and management of young stands during much of the 1970s and 1980s. The total stocking volume declined from 1931 million m^3 in 1983 to 1710 million m^3 in 1987 (MOF, 1989). Although major efforts of reforestation and afforestation have been made in the 1990s, which have resulted in a marked expansion of both forest area and volume, these efforts were largely driven by external forces, such as loans, subsidies, public investment, and international financing (Rozelle et al., 2000). Active participation in timber production by individuals and groups in the local communities is still unusual (Liu, 2001). Moreover, the forest quality remains saliently poor, with a stocking volume of only 44 m^3/ha – less than a half of the world average (SFA, 2000).

Meanwhile, the so-called 'economic forests'[3] and bamboo forests have seen tremendous growth all over the country, including the south, since the late 1980s. Nationwide, the former amount to 20.2 million ha now and are still growing at an annual rate of 4.6%, while the latter account for 4.2 million ha and continue increasing at an annual rate of 2.3% (SFA, 2000). These increases have been primarily driven by private initiatives; and as a result, the production of non-timber forest

products (NTFP) has come of age and become the backbone of local economies in many areas (Lu et al., 2002; Ruiz-Pérez et al., 2001).

Why are there these contrasting regional and categorical variations? How have policy changes in different regions affected their performance? What steps can be taken to further the transition of China's forest sector in accordance with developing a market-based economy? And what lessons may be learned for other countries in implementing their forest policy reforms? This paper attempts to answer these questions through the lens of institutional economics. To that end, we will (1) review the experience of institutional changes in China's rural forestry in the last 20 years; (2) synthesize the recent empirical evidence regarding the impacts of the institutional changes; (3) identify steps that should be taken to make the institutional environment more attractive to private participation; and (4) discuss lessons useful in promoting international forest development. We hope that this article will contribute to a better understanding of what are the needed institution-building measures and how they can be made more effective in and outside China.

It should be said that there have been some international initiatives recently to examine the current challenges and needed changes in China's rural forest policies. For instance, the International Institute for Environment and Development in Britain has conducted a study to explore major issues facing the private forest sector in China and to evaluate how government policies can promote private involvement in sustainable forest management (Lu et al., 2002). In collaboration with Chinese scientists, the Center for International Forestry Research has investigated the growth of China's bamboo industry (Ruiz-Pérez et al., 1998; 2001). They found that the most important measures affecting forestry have been land reforms and changes in industry, investment, and export policies, which create both opportunities and incentives for expansion and intensification of high-value forest crops, like bamboo. Meanwhile, they observed that timber production in the south was stagnant. A forthcoming book by Hyde et al. (2003) will feature a collection of papers analyzing China's experience in its rural forestry reform and development. These papers cover various topics such as property rights and farmers' behavior regarding tree planting and forest management, policy impacts on forests (including uncertainties in policy implementation), agricultural policy spillovers onto forestry, and the influence of the macroeconomic environment.

These and other similar studies have provided useful information and interesting cases to those concerned with rural forestry in China. Nonetheless, it is our view that a careful review of China's rural forestry and a critical discussion of its future policy directions, particularly from the perspective of institutional economics, are much needed. Indeed, the lack of a clear understanding and a unified analytic framework have led people to view policy issues either in isolation or statically, causing confusions and even misconceptions about China's rural forestry reform. For example, many acknowledge the problem with the incentive structure in the south, but they prescribe very different diagnoses and prognoses. Some insist that harvesting regulation and market control are warranted to prevent excessive forest

liquidation, but these actions do not necessarily conflict with the workings of a market economy (Zhang, 2002). Others attribute the poor forestry performance of the south to the long production cycle and insufficient public funding (e.g., Li, 2002). It is thus imperative to clarify these confusing issues and to debate over the directions of future reforms.

2. The early reform process

China's rural reforms began in 1978. Prior to that time, rural production was organized under the collective system and central planning. Workers received payments based on the average product of the collective as a whole. As a result, incentives to work were low, and productivity and living standards stagnated (Perkins and Yusuf, 1984).

During the commune era, the north and south made up much of the collective, non-state forest sector. The south was a major timber basket of the country because of its favorable resource endowment and suitable natural conditions, and the north was a farm region, where there were not many trees, let alone forests, given the population density and agricultural concentration. Notably, this regional difference in resource endowment led to a significant variation of forestry administrative styles. In the south, the government intervention was extensive – from management and harvest planning, silvicultural practices, to wood procurement and distribution. However, it was limited in the north – mainly carrying out afforestation mandates. This administrative variation has proved to have an influence on how the reform measures were later implemented in the two regions. In both regions, tree planting and forest management featured mass campaigns and communal efforts. Due to the lack of incentive to invest and manage and the drive to industrialize the economy even at the expense of natural and human resources, most of the existing forests were seriously depleted, and newly planted trees suffered from low survival, stocking, and growth rates.

Agricultural reforms began locally in Anhui province with HRS contracts transferring land use rights from the collectives to individual households. Households were also given the right to sell their production in excess of assigned quotas at market prices, although quotas were still delivered at planned, often low, prices. These reforms were a means for government officials to reduce the transactions costs and risks of centralized planning. However, they also improved local incentives and productivity. The reforms spread rapidly. They received the official sanction of the central government in September 1980, and by 1984 the HRS had expanded to 70% of all rural communities. Agricultural productivity exploded. The two-price system was difficult to maintain and eventually, by 1985, farmers were permitted to sell their entire production at market prices.[4]

Rural households observed the success of the agricultural reforms and demanded similar actions in the forest sector. However, authorities in the south were initially less responsive. In general, only fragmented and less productive wood lots and barren lands were contracted to household management. By the end of 1984, more

than 70% of the region's forests remained under collective control, whereas a typical household held only about one ha of land for planting and management (Xin, 1985). As mentioned, this conservative move resulted from concerns for potential excessive logging when the management was devolved to households, and the presumption that family operations could not be conducive to forestry at the time (Liu, 2001).

Later, popular objections overcame the government reluctance, and local authorities slowly responded by adopting a similar HRS system to the forest sector. The forest HRS spread rapidly, too. By the end of 1986, more than 70% of all collective forestland had been allocated to households. Meanwhile, a large portion of the contracted timberlands and private plots was merged; production quota, rather than forest growth status, became a common contract criterion; households were allowed to retain their surpluses above the contract targets; and contracts were extended up to 50 years. Despite these changes in land use rights and internal incentive structure, local farmers were not enthusiastic because they saw the harvesting regulation and compulsory timber delivery to the state procurement agency at low prices as major impediments to their engagement in timber production (Yin, 1994).

Following some early modifications of procurement quotas and prices, the government opened timber markets abruptly in 1985. Prices rose rapidly and induced more harvests and speculation. Nonetheless, farmers failed to expand their reforestation and management activities once again since they were unconvinced of the new policy direction – risk aversion was the overriding psychology at the time. And, unfortunately, the farmers' fears were quickly realized when the government, out of heightened worries about over-cutting, shut down the opened markets in 1986. Then it returned the timber markets to the control of state procurement firms and enforced the tough harvesting rules. For those trees that remained under household management, farmers had to apply for harvest permits, and they could sell timber only to the monopsonistic state-run firms, which set the procurement prices. Subsequently, the regional and local authorities began to consolidate contracted timberlands and imposed higher taxes and fees on households and their communities to finance forestry and other activities.

Using the timber price decomposition for Sanming, Fujian, as an example, Yin and Newman (1997) documented that, of the average 1990 sales price, 372.69 yuans/m^3, for masson pine logs, government taxation amounted to 22.9%, forest sector revenues 25.7%, local government revenues 7.2%, and procurement and sales costs of timber companies 13.3%. The remaining 30.9% fell in the categories of farmers' timber harvest costs, and collective and individual incomes. Clearly, it is one thing to enforce the timber harvesting and transporting regulations, it is quite another to impose low procurement prices and high taxes. It is due to these market control and distortions that a large amount of benefit was transferred to government agencies over the years. Therefore, as Liu (2001) put it, 'the regulation of harvesting and marketing of trees in [southern] China has prevented farmers from enjoying the full benefits of the shifts from collective to household-based management and discouraged them from investing in afforestation or regeneration' (p. 239).

The experience of the northern farm region was very different. As the HRS swept across the country, the idea of a similar program for forestry gained appeal. A household forest tenure system called 'land carrying trees' quickly followed the HRS in agriculture. Trees on or near the contracted agricultural land were assigned to agricultural landholders, and bare lands suitable for growing trees were also allocated to households. A few larger shelterbelt networks and commercial forest plantations that remained in collective control were also contracted to household management. Overall, the share of forestland under household control in the north rose to 91% by the end of 1984 (Yin, 1994). Further, because its historical shortages of forest resources did not deem the local forest agencies to be involved in stumpage transactions even in the early years, the region always had a more or less open timber market, and farmers could access it freely as sellers or buyers. Harvest permits were unnecessary, state procurement companies were nonexistent, and taxes were low – ranging from 3% to 8% of sales revenues (Zhong et al., 1991). These arrangements were well received by villagers, and they have so far prevailed.

Clearly, the marriage of improved land-use rights, and the absence of market control and distortions made it possible for farmers to respond to evolving market conditions. As a result, timber, fruit, oil, nut, shade, and shelter trees were gradually planted along and inside farm fields as well as along the 'Four Sides' of villages, houses, roads, and waterways. Forestry has thus far been able to flourish in a traditional agricultural region.

3. Evidence of policy impacts

An obvious proposition we can make from the contrasting regional experiences is that land use rights and market liberalization are both essential to improve the incentive structure and thus attract farmers' interest in forestry; further, during the process of implementing these reforms, a stable and expectable policy environment is also critical. This is the proposition originally proposed and tested by Yin and Newman (1997). To our knowledge, in addition to that study, Zhang et al. (2000), Yin and Hyde (2000), and Yin and Xu (2002) are the only published works that have assessed the impact of China's rural reforms on its forestry growth and that of forestry growth on agricultural productivity. In this section, we synthesize the empirical evidence that emerged from these studies.

Based on theoretical characterization as well as data availability, Yin and Newman (1997) first estimated a farmers' supply-response model and then conducted a growth accounting to capture the impacts of the institutional innovation on forestry. They reasoned that land tenure improvements and timber price increases would induce favorable short- and long-run production responses – increased harvesting in the short run and increased investments in reforestation and management of existing timber stands, which will lead to the expansion of forest area and timber inventories in the long run. Eventually, sustainable harvest levels would go up as well. In their supply-response model, they regressed production responses through changing timber harvest, stocking volume, and forest area against the major policy

instruments (the HRS and price liberalization) and other factors (e.g., time trend and cross-sectional dummy). They held that, in addition to giving a complete reflection of the production responses, their approach could account for variations in regional physical and biological conditions.

Their data were collected from four prefectures (Kaifeng, Zhoukou, Fuyang, and Suxian) in the north, and five (Yichun, Ji-an, Fuzhou, Ganzhou, and Nanping) in the south, covering the time period 1978–1989. Their growth accounting results, listed in Table I, indicate that in the north, timber harvest and acreage increased 184.0% and 115.9%, respectively, during the period; and stocking volume increased 94.8%, of which 48.3% was attributable to the institutional innovation (26.5% due to price changes and 21.8% due to land tenure changes). This implies that the policy shifts resulted in an annual inventory growth of 3.5%. In contrast, timber harvest and forest acreage increased 10.4% and 8.3% in the south during the same period, while timber inventory actually decreased by 9.6%. Changes in timber prices were able to offset a higher rate of inventory decline by 13.2%, with land tenure changes having had little impact. This suggests that reform policies as a whole only contributed to an annual rate of 0.1% inventory growth. Using a slightly expanded dataset, Zhang et al. (2000) confirmed these major findings.

In another study, Yin and Hyde (2000) tested the hypothesis that enhanced environmental services from increased forest and tree cover during the late 1970s and 1980s made a positive contribution to agricultural output. Using data from Shandong Province and an agricultural production function with a measure of forest and tree cover as a production shifter, they found that improved property rights were responsible for almost 60% of the increase in agricultural output between 1978 and 1984. Conservation investments in trees, as a response to improved forestry incentive structure, explained 5% of the increase in output through 1984, and 20% thereafter – when newly planted seedlings matured into larger trees and formed better protection against eroding and desiccating winds.

Later, Yin and Xu (2002) calculated the total and distributional welfare impacts of the reform programs based on the results reported in Yin and Newman (1997). It is known that timber supply is partially a function of forest inventory, in which farmers' responses to the institutional innovation are ultimately reflected. With the determined contribution to forest inventory and timber supply elasticity of forest inventory, they evaluated the welfare effects of shifting stumpage supply in the market resulting from the institutional innovation.

Table II shows that stumpage supply and demand are price inelastic in both regions, and that they are so small in the southern market as to sum to less than one. Since price decreases overwhelm quantity increases in this case, it indicates that if stumpage supply shifts outwards, then producers will become losers. To consumers, assuming that the shifts in stumpage supply only result in the alternation of timber sold to other regions, they are neither losers nor winners. In the northern market, the sum of demand and supply elasticities is greater than one. This means that both producers and consumers are winners if stumpage supply shifts outwards, although inelastic demand and supply make the former group better off than the latter. As

TABLE I. A growth accounting for China's rural forest sector during 1978–1989.

Variable	Variable change	Harvest		Inventory		Area	
		Coefficient	Contribution	Coefficient	Contribution	Coefficient	Contribution
North							
Price change	28.57	1.02	29.14 (15.84)	12.59	25.12 (26.51)	17.17	17.51 (15.11)
Tenure change	0.283	89.35	25.29 (13.75)	0.231	20.64 (21.78)	0.408	36.45 (31.46)
Time trend	9.67	11.00	106.39 (57.82)	3.98	43.78 (46.21)	4.89	53.79 (46.43)
Residual			23.18 (12.59)		5.21 (5.50)		10.51 (7.00)
Total growth			183.98 (100.00)		94.75 (100.00)		115.86 (100.00)
South							
Price change	−8.91	1.66	−14.79 (−142.70)	0.81	1.34 (13.90)	−0.38	−0.63 (−7.60)
Tenure change	0.63	63.72	40.14 (387.50)	−0.001	−0.007 (−0.073)	−0.004	−2.55 (−30.79)
Time trend	−4.54	11.00	−49.94 (−482.00)	−1.05	−11.55 (−119.8)	1.07	11.77 (141.98)
Residual			14.23 (137.40)		0.58 (5.97)		0.03 (0.36)
Total growth			10.36 (100.00)		−9.64 (−100.00)		8.29 (100.00)

Notes: 1. This table is adopted from Yin and Newman (1997).
2. Contributions to growth were calculated as products of estimated coefficients multiplied by variable changes.
3. The numbers in parentheses are percentage shares of contributions to total growth (100%).

to the supply elasticity of inventory, it is estimated as elastic in the north, but not so in the south. Provided all the elasticities in the north are greater (in absolute value) than those in the south, the same rate of inventory change resulting from the institutional innovation, other things being equal, will have larger welfare impacts in the north than in the south.

Tables III and IV report the welfare results. In the four northern prefectures, the total benefits went up from 13.6 million yuans in 1985 to 31.64 million yuans in 1990. Also, consumers captured over 75% of the total benefits, with the remaining

TABLE II. Estimated results of regional stumpage markets in China.

Variable	North		South	
	Supply	Demand	Demand	Supply
Intercept	−12.54 (−7.37)**	−2.77 (−6.92)**	−1.02 (−6.43)**	−0.04 (−0.17)
Timber price	0.80 (3.25)**	−0.45 (−0.86)	0.14 (1.79)*	−0.04 (−0.27)
Agricultural price	0.26 (0.60)	−1.58 (−1.65)*	−0.04 (−0.18)	−0.60 (−1.44)
Inventory	1.23 (2.63)**		0.59 (7.48)**	
Income		1.44 (2.58)**		0.43 (1.94)*
Population		4.18 (4.04)**		0.44 (3.06)**
Df	37	36	56	55
R^2	0.87	0.68	0.97	0.48

Notes: 1. These results are originally estimated in Yin (1995).
2. Values in parenthesis are t statistics of two-tail test, * and ** denote significance at the 0.05 and 0.025 probability levels, respectively.

TABLE III. Assessment of the welfare benefits from shifts in stumpage supplies, North.

Year	LB (CB)	CB	UB (CB)	LB (PB)	PB	UB (PB)	TB
85	7.17	10.64	20.52	−6.83	2.99	6.39	13.63
86	9.30	13.80	26.62	−8.65	3.88	8.29	17.68
87	11.02	16.35	31.53	−10.26	4.61	9.82	20.96
88	13.52	20.06	38.69	−12.58	5.64	14.04	25.70
89	15.66	23.24	44.82	−14.58	6.54	13.95	29.78
90	16.64	24.69	47.63	−15.49	6.95	14.83	31.64

Notes: 1. Values, in million yuans, are calculated without deflation.
2. CB, PB, and TB are consumer benefits, producer benefits, and total benefits, and LB and UB represent the lower bound and upper bound of 90% confidence intervals.
3. The northern market is made up four prefectures – Kaifeng and Zhoukou in Henan, and Fuyang and Suxian in Anhui.

TABLE IV. Assessment of the welfare benefits from shifts in stumpage supplies, South.

Year	CB	LB (PB)	PB	UB (PB)	TB
85	0.00	−5.04	−1.25	−0.52	−1.25
86	0.00	−7.39	−1.84	−0.76	−1.84
87	0.00	−9.94	−2.47	−1.02	−2.47
88	0.00	−11.43	−2.84	−1.18	−2.84
89	0.00	−14.21	−3.53	−1.46	−3.53
90	0.00	−14.12	−3.57	−1.45	−3.57

Notes: 1. Values, in million yuans, are calculated without deflation.
2. CB, PB, and TB are consumer benefits, producer benefits, and total benefits, and LB and UB represent the lower bound and upper bound of 90% confidence intervals.
3. The southern market consists of six prefectures – Yichun, Ji-an, Fuzhou, and Ganzhou in Jiangxi, and Sanming and Nanping in Fujian.

less than one forth accrued to producers. In contrast, producers in the six southern prefectures suffered minor losses (1.3–3.6 million yuans annually) from outward shifts in supply due to the policy's offset effect on inventory decline. These findings were supported by the computed confidence intervals (Yin and Xu, 2002).

Of course, the direct reason for producer losses in the south was the extreme inelasticity of both supply and demand. But what caused the extreme inelasticity of supply and demand was at least partly that the prices facing producers and consumers within the region were distorted to such a degree that their behavior became less sensitive to price changes. To assess the effects of government market control and price distortions, Yin and Xu (2002) also estimated the welfare transfers and deadweight losses in the south. Table V presents the imputations.

It can be seen that in 1984, the last year before the central government removed compulsory timber delivery quotas and planned pricing, government revenues via price control and taxation were 224.6 million yuans. This was equivalent to 54.8 yuan/m^3, whereas the average procurement price was just 58.5 yuan/m^3. In 1988 when timber prices and sales reached peak levels, government revenues rose to 785.7 million yuans, or 261.2 yuan/m^3. In comparison, the timber procurement price in that year averaged 174.8 yuan/m^3. Then in 1990, they declined to 435.5 million yuans as timber prices dropped and production was cut back due to a housing sector slow-down. Still, that was 157.6 yuan/m^3, while the procurement price was 177.3 yuan/m^3. It was found that about 70% of the government revenues came from the production side, with the remaining 30% contributed by consumers. Compared to the total benefit transfers, the deadweight losses were very small.

In summary, the rural reforms from the late 1970s brought about an annual forest growth of 3.5% in the north, which in turn pushed up the stumpage supply significantly. As a result, consumers and producers both benefited in terms of increased timber availability and improved agricultural productivity. In the traditional timber-producing south, the policy changes were implemented differently as reflected in the imposition of market control and price distortions, through which about a half

TABLE V. Estimated welfare results of market control and distortions in the South.

Year	TL	Scenario I			Scenario II		
		DL	CL	PL	DL	CL	PL
84	224.56	8.04	69.50	163.10	5.23	55.06	174.73
85	283.94	10.95	89.49	205.40	7.40	72.20	219.14
86	289.61	9.74	88.47	210.87	6.22	69.13	226.69
87	314.75	9.73	94.14	230.35	5.82	71.45	249.16
88	785.71	40.27	268.85	557.14	30.47	229.77	586.42
89	582.32	27.22	194.56	418.97	19.87	163.23	442.97
90	435.48	17.76	139.46	313.77	12.30	113.84	333.93

Notes: 1. Values, in million yuans, are calculated without deflation.
2. Scenarios I and II are results computed with the original procurement prices multiplied either by 1 or 1.15 to account for procurement and selling costs.
3. DL, CL, PL, and TL are deadweight loss, consumer loss, producer loss, and total loss due to market control and distortions.
4. The results represent six prefectures – Yichun, Ji-an, Fuzhou, and Ganzhou in Jiangxi, and Sanming and Nanping in Fujian.

of timber revenues were captured by government organizations. Consequently, the production response was extremely weak, causing only an annual offset to the stock decline of to 0.1%, which led to a reduction of producers' welfare while consumers might not have become worse off.

4. Advances and unsettled problems since the 1990s

The above evidence pertains to reforms and their impacts prior to 1990. A natural question is what has happened ever since. Following the formal decision by the central government to develop a market economy in 1992, the rural forest sector has indeed undergone further transformation. At the same time, while the production of NTFPs has expanded rapidly, timber production in the south has not improved much. Therefore, another overarching question is how we judge these seemingly contradictory phenomena. We answer these questions in this section.

4.1. Advances of tenure arrangements

The principle of the HRS and related contracting regimes is to allow the local communities to retain ownership of the forestland, while encouraging private investment and management by devolving the use rights. For that purpose, early tenure arrangements have evolved across the country as local authorities and the private sector gained experience. Changes include allowance of transferring young timber stands freely, introduction of auctions to allocate community plots to investors, and lengthening of management contracts (Zhang, 2001).

Today, not only are production targets and financial payments for barren land increasingly waived, but also local communities are often willing to transfer rights to premature forests (Lu et al., 2002). Given the demographic dynamics among households and other factors, this effort can ensure a more efficient allocation of land and forests. Transferability also provides a mechanism for managing investment risk since it permits villagers to sell the rights in the face of unexpected shocks or family circumstances. Moreover, the government allowed the auction of remaining barren and marginal lands to promote afforestation. Auctions are thought to counter problems of inefficient administrative land distribution and associated fragmentation by allocating the use rights to the highest, and thus more efficient bidder. Also, local communities favor auctions as a tool to maximize their revenue from selling the use rights. The land use rights are now extended up to 100 years (SFA, 2001). In general, the lower the value of use rights, the longer the tenure is required to attract investment (Zhang, 2001). No doubt that these advances are steps along the right direction, and they have been welcome by farmers (Lu et al., 2002). Indeed, these more attractive tenure terms were written into the Forest Law when it was amended in 1998 (SFA, 1998). However, timber harvested by farmers in the south is still subject to allowable cutting quota and permit; their shipped logs remain subject to transport permit and inspection. Also, farmers are mandated to sell their

logs to the state procurement firms at prices lower than what these firms get from reselling them in the open markets; and when they sell logs, heavy taxes and fees are levied.

4.2. Some unsettled problems

Unfortunately, while the government acknowledged the land use rights and private ownership of timber stands and trees grown on lands contracted from local communities, it has failed to address issues associated with the harvesting regulation and market distortions. In fact, the new Forest Law stipulates that timber harvesting shall be regulated, and any removals must be permitted by the forest administration (see Chapter V, Articles 29, 32, and 37).

It has been claimed that the harvest regulations are imposed to prevent excessive and illegal logging on forests that were contracted out for household management. However, that rule is applied to any cuttings, including even the cases where trees to be harvested are grown by farmers on bare lands. Farmers have argued that, while it is reasonable to impose certain regulation on the removal of existing forests owned by communities, it is unjustified to restrict cuttings of trees grown by households on their contracted lands (Yin and Newman, 1997). Further, even if the government would insist on harvesting and transporting regulations, it should not deprive farmers of the opportunity to sell their timber in the open markets, and should not impose hefty taxes and fees. Otherwise, how is it possible for them to realize their land use rights and ownership of trees?

On the other hand, officials in the administration have even enlisted international evidence to support their position. They note that even in advanced countries, like the United States and Canada, the use of the allowable annual cuts (AAC) to regulate timber removal is common (Zhang, 2002). Amazingly, they fail to recognize that the AAC is applied only to national forests, and it is nothing but a technical approach for the purpose of management operations by federal agencies (Xu, 2002). The ACC has never been imposed on private forests. For instance, in the US south, where over 90% of the timberland is under private ownership, timber harvesting and log transport are landowners' own decisions. And even for national forests, the ACC is not a legal requirement as it is in China.[5]

Ironically, without the extensive involvement of private households, the government has had to resort to public investments and other sources to boost forestry. As a matter of fact, public forest investments have been used as a major justification for regional and local authorities to collect more revenues from harvested timber through taxation and levying. But the truth is that most of the revenues have been incorporated into the general budgets for forest administration, including the enforcement of those harvesting and transporting regulations. Only a small portion of the revenues has been actually reinvested in forestry (Wang et al., 1991).

Moreover, history has shown that the efficiency of the government's forest investments is far from satisfactory. In Anhui province, for example, among the

total government forestry investment of 64.6 million yuans during 1981–1985, the northern part, a plains farm area, and the southern part, a long-time timber-producing area, received 13.4% and 57.8% of it, respectively. On the other hand, newly forested areas by the northern part and the southern part were 20.0% and 48.7% of the provincial total, even if agroforestry regimes, such as the shelter-belts and intercropping that are a common feature of the northern landscape, were excluded from the calculation (Zhong et al., 1991).

4.3. 'Bright spots' of growth

While the recent tenure changes have not affected timber production substantially, exceptions exist. As reported by Lu et al. (2002), when large-scale community lands and/or forests are transferred to domestic and oversees entrepreneurs, guarantees are often made by regional and local authorities that future timber harvesting would not be strictly regulated, and logs and processed wood products could be sold in the open markets. In certain instances, even taxes and fees are waived or deferred. Under these circumstances, understandably, investments have been attracted and the performance has been spectacular.[6]

Another more phenomenal exception is the growth of NTFPs. We illustrate this with the case of bamboo below, because it has been well examined (Kant and Chiu, 2000; Ruiz-Pérez et al., 1998; 2001). Bamboo now represents 3% of China's total forest area, and it contributes to some 25% of total forest exports. The total value of bamboo raw material and industrial production in 1999 amounted to 23.14 billion yuan (US $2.8 billion). Approximately 5.6 million people work part- or full-time in the bamboo sector. Ruiz-Pérez et al. (1998; 2001) and Kant and Chiu (2000) agree that secure management rights and favorable economic incentives have paved the way for a gradual intensification and expansion of bamboo plantations. They add that it is because of this development, various technical practices, such as fertilization, pest control, and silvicultural measures, have been broadly adopted, allowing for significantly increased productivity.

They also discover that under the present circumstances, farmers prefer to plant economic forests or bamboo on land earmarked for reforestation and afforestation (Kant and Chiu, 2000; Ruiz-Pérez et al., 1998). Their explanation is that NTFP products are in increasing demand and are far more profitable than timber, which is subject to greater market risks and heavy taxation. As a whole, the total output of economic forests increased from 7 million tons in 1980 to 53 million tons in 1997; similarly, the total output of bamboo forests went up from 4.4 to 14.2 million tons (Ruiz-Pérez et al., 2001). In Anji, Zhejiang, the production of culms and shoots has risen 1.86 and 3.66 times, respectively, since 1980 (Ruiz-Pérez et al., 2001). The county's bamboo manufacturing has been growing at an annual rate of 34.5% from 1980 to 1999.

In short, different institutional structures have induced villagers to respond and perform differently. While conventional timber forests have been depleted

and timber-based forest industry is showing sign of stagnation, economic forests and bamboo plantations and their associated industries are thriving, offering farmers opportunities to increase income and rise out of poverty.

5. Challenges and lessons

It should now be clear that farmers will be interested in the production of NTFPs as well as timber as long as the incentive structure is set appropriately. Otherwise, if harvesting regulation and market distortions are imposed, the incentive structure will not be attractive, and thus farmers will not be interested in the production of timber, or NTFP for that matter. In this case, it is wrong to say that the lack of interest is because timber has a longer production cycle or that the public financing is insufficient.

Looking more deeply, incentive structure is predicated on not only the definition but also the realization of property rights, including land use and forest ownership rights. Without realization of property rights, their definition is meaningless (Hayami and Ruttan, 1985; Williamson, 2000). Despite breakthroughs in property rights definition – 'who plants who owns,'[7] the defined property rights cannot be realized in the marketplace in the vast south, leading to 'who owns who benefits little.' Because producers benefit little, they are not attracted to timber production; because they are not attracted to timber production, the sector has been stagnant. Therefore, the time has come for Chinese policy makers to address the harvesting regulation and market distortion problems associated with timber production in the south. A crucial task here is to liberalize markets in a real sense, so that farmers can see and seize the opportunities of benefiting from timber production.

Certainly, the forest administration has faced challenges during the past 20 years. For one, officials were and still are concerned with the possibility of resource depletion should harvesting regulation and market control be lifted. They see this as a risk too great to be taken. Indeed, they would assert that it was the market-opening trial in 1985 that caused massive over-cutting and led to the policy reversal in 1986. Based on this assertion, significant efforts have been channeled into implementing the harvest quota system, controlling illegal logging, and preventing the conversion of forestland to agricultural use. Nevertheless, it must be emphasized that between complete market shutdown and complete opening-up there exist alternatives. For instance, as a transitional measure, farmers indicated their willingness to accept regulated logging on existing resources owned by communities. But at the same time, they are waiting for the government to declare that any newly planted trees and added inventory through active management will no longer be subject to harvesting regulation and government procurement.

Regrettably, the forest administration has failed to try other options out. Instead, they have taken the most simplistic but bureaucratic approach – regulating all removals and shutting down all markets. This has disappointed and discouraged the local farmers greatly. Moreover, the forest administration's dual roles, as a

policy enforcing agency and a wood dealer, have made it a typical rent-seeker. The substantial difference between market and procurement prices for timber and the multiplicity of taxes and fees collected from farmers are all proofs of this. One wonders why state procurement firms could not offer farmers higher purchasing prices, whether the administration sincerely wants to change the status quo given its vested interests, how efficiency and productivity of timber production can be achieved without changing the status quo . . ..

Therefore, the forest administration must be more proactive in order to change the status quo, which, to us, is a precondition of any real development. It is critical for policy makers to understand how forestry functions in a market economy. For private goods like timber and other products, the market, driven by actions of individual households and local communities, can allocate resources more efficiently and effectively than the government. That is a fundamental lesson China has learned from its recent past and a primary reason that it has decided to adopt a market economy. To do so, the key is to cultivate new institutions for markets (World Bank, 2002), including more beneficial contractual terms to farmers, more transparent and easier access to markets, broader participation of individuals and organizations. It should be absolutely clear that it is impossible to substitute private initiatives and investments with government participation.

In light of these changes, a shift of government function is called for. Stumpage procurement and distribution should be carried out by the private sector, procurement prices be determined by the markets, unjustifiable taxes and fees be removed, the current state procurement firms be reorganized. Meanwhile, the administrative system should enforce forest laws and regulations and monitor the macro resource conditions more effectively, provide the private sector with more extensive technical and informational assistance, and devote more efforts to protecting the environment and meeting society's demand for increased public goods, including ecosystem services. In this regard, we believe that China can learn a great deal from its diverse experience in different regions and sectors.

In addition, a dynamic view of forestry must be embraced. Some policy makers tend to be too concerned about over-cutting, but not worried enough about planting and management (Yin and Xu, 2002). It should be known, however, that without benefiting from cutting trees, people would be rarely interested in planting more trees and making more management efforts. Only through making profits from cutting will interest in planting and management develop and sustainable resource use becomes practical. Also, it should be said that the opportunity costs of market control and distortions are of no small measure, because these restrictions will dissipate incentives, leading to little efficiency enhancement and productivity growth. If there are no efficiency enhancement and productivity growth, then there will hardly be gains in economic and ecological benefits. China must prevent this no-winner situation from repeating in any part of its forest sector.

The lessons from China's reforms are also important for the rest of the world. Many Eastern European and some Asian countries are undergoing similar economic transitions from central planning to more market-oriented economies.

Others, like Indonesia and the Philippines, are attempting to undertake transitions from economies with highly concentrated political and market power to a wider distribution of economic authority and less administered markets. Countries like India are moving toward broad market deregulation. Each can learn from China's experience – devolution of management requires both a stable policy environment and a freely accessible market. Lack of either will result in resource stagnation and even depletion, as we have recently seen in Indonesia and the Philippines.

China's experience is even more broadly relevant, because about half of China's forests, as those of most countries, developing and developed, have been under the control of a central forest ministry. China, like most countries, faces the difficulties of centralized forest management in the presence of multiple and substantial local values. In fact, the decentralization of forest management and the development of contracted management regimes that are more responsive to local economic and social pressures may be the most common theme of modern forest policy. It is known as 'community participation' in the United States, Canada, and Finland, as 'joint forest management' in India and 'collaborative forestry' in Uganda, and as 'community forestry' or 'community-based resource management' in Nepal, the Philippines, Zambia, Tanzania, Uganda, and a host of others.

The common question has to do with just how far we can go with decentralization and even privatization of forests and still satisfy the broader public values that forests provide. One common perception is that farmers have little experience planting trees and, furthermore, they would not plant trees even if they had the experience. Additionally, foresters and development experts around the world continue to express doubts that farmers and other small landowners will plant and manage forests. Their time horizons are just too short. China now has more than 20 years of experience to put these arguments to rest. Apparently farmers and other small landowners will plant and manage forests – once they are given the rights to the land and the forest resources and these rights are allowed to materialize, in the marketplace. It is critical to vest villagers with full rights to their forests and trees, and to give them a greater stake in these properties.

6. Closing remarks

The primary objective of this paper is to review the reform and development experience in China's rural forest sector and discuss lessons that can be learned by China and the rest of the world. For that purpose, we overviewed the early reform process and reported the empirical evidence of its impacts first. Then, we presented the advances and unsettled problems since the 1990s and summarized the major challenges facing China and some lessons other countries can learn. We approached these tasks from the institutional economics perspective.

Overall, we demonstrated that the institutional innovation, characterized by changes in tenure arrangements and market settings, could be important steps in driving productivity growth and welfare increase. However, their impacts hinge critically on how they are implemented. If farmers are granted not only land use rights but also liberalized market access, the incentive structure can be improved and therefore forest production will increase. As a result, producers and consumers will benefit. The experiences of the northern farm region and the production of NTFPs are good examples of this. If the reforms initiatives are inappropriately implemented, as partly reflected in market control and price distortions, then the incentive structure cannot improve much. Thus, the chances for timber production increase will be diminished, leading to the difficulty for producers and consumers to enhance their welfare. This is what has happened in the southern traditional timber production region. These sharp contrasts in the performance of the Chinese forest economy not only reveal the importance of market-oriented economic reforms but also pinpoint the close relationship between the policy impacts and how these policies are implemented (McMillan and Naughton, 1992).

China's diverse experiences provide rare insights on many questions of modern forest policy in the world, and these insights come at a moment when global concerns for greenhouse gas, biodiversity and the preservation of endangered species, and many more regional concerns with water supply, erosion control, and the general environmental services provided by forest ecosystems have heightened everyone's awareness of forest policy. To address these issues, we are confident that China will learn from its own experiences and lessons, and thus accelerate its forestry development. Similarly, the rest of the world can benefit a great deal from China's experiences and lessons.

Finally, it should be stressed that, as China and other countries search for their solutions to sustainable forest management in the new century, a lot can be gained from the new institutional economics (NIE). As illuminated by Professor Williamson (2000, 2002), the NIE is instrumental for institutional environment design and governance structure optimization. While property rights are at the core of institutional environment design (the rules of the game), transactions become the focus of governance structure (the play of the game). If a crucial task of forestry development is to build institutions for markets to function more effectively, then we need to get both the rules of the game and the play of the game right. In this regard, the NIE has much to offer.

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Notes

[1] A detailed characterization of different regions and their performance variations in the forest sector can be found in Yin and Newman (1997).

[2] After being restructured, the Ministry of Forestry (MOF) was renamed as the State Forestry Administration (SFA) in 1998.

[3] In China, 'economic forests' loosely refer to forests of cash-crops producing such goods as tea, oil, fruits, rubber, and nuts.

[4] The experience of agricultural reforms is well documented. See Lin (1988) and Chai and Chai (1994) for good reviews.

[5] It is noteworthy that the forest agencies know of the widespread violations of the ACC rule by state forest bureaus who manage national forests, but these cases are rarely prosecuted according to the Forest Law. Clearly, the government has discriminated against the private forest owners.

[6] The question, though, is why local farmers cannot get fair treatment, let alone this kind of favored treatment.

[7] Of course, room exists for improvement over time, including security and enforcement.

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