

24 Institutions in Forest Management: Special Reference to China

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Abstract: Institutions, the fourth factor of production in the economy, matter because of transaction costs. Unlike other primary industries, silviculture is not “self-contained”, which means that transaction costs are significant and institutions play a special role. Forestry in the less developed countries (LDCs) often suffers from a poor supply of institutions and so not only becomes less competitive than that of developed countries (DCs), but also less well managed than other sectors in the same countries. China’s experience can explain to some extent the special role of institutions in forest management. The poor state of forests prior to the 1950s resulted from continuous wars and disorders of society, while the unimprovement and even deterioration of forests during the last half-century are mainly due to the malfunctioning economic and political institutions. The economic reforms since the 1980s, which are intended to restructure the institutions, have had some positive effects on forestry. However, the effects are still very limited because the development of institutions cannot be timeless and costless.

Key words: Institutions; market; property rights; transaction costs; scarcity; China.



24.1 INTRODUCTION

“Institutions are the rules of the game in society, more formally, they are the humanly devised constraints that shape human interaction” (North 1990). Institutions can be formal constraints, such as laws, constitutions, written contracts, market exchanges, property rights, organizational by-laws, traffic rules, and codes of conduct; and informal constraints, such as norms, customs, conventions, and ethics. Insti-

tutions help the co-ordination of the other production factors, or economize the co-ordination. Institutions always need to be specified as regards to whom, when and where they apply. Otherwise, they are meaningless.

Even though the impacts of institutions on economic performance have been acknowledged since Adam Smith, Karl Marx, and John Stuart Mill, institutions are generally neglected in mainstream economics: exchange takes place without any specification of the institutional setting, consumers are

assumed without humanity, firms without organization, and even exchange without market. Only recently, institutions have received greater attention. No matter how the issues are addressed or what kind of theory is claimed, such as the economics of transaction costs, economics of organization, economics of property rights, economics of information, contract theory or agency theory, they all concern the same theme: institutions, and the scope of institutional economics.

Institutions can be viewed like other goods and services. Their demand and supply evolve (or devolve) from the relative scarcity of production factors in society in the long run. However, there is a special evolution of the demand and supply. Institutional markets are often less competitive, slower to respond to the markets. Consequently, institutions play a more important role than other commodities in society. Institutions play a special role in forest management because of the special characteristics of land and trees. Despite this, the study of the role of institutions in forest management is generally neglected. This study aims to analyze the roles of institutions in forestry by using China as a case study.

24.2 THE NATURE OF INSTITUTIONS

The demand for institutions is related to transaction costs (see Box 1). The functions of institutions are to reduce the transaction costs of production. Therefore, institutions, as factors of production, emerge and evolve along with the needs of society. The shifts in the demand for institutions have probably been derived from the changes of the relative scarcity of the production factors in society. Institutions governing property rights become necessary only when the identity becomes a scarce resource, while institutions governing the market are demanded only when the exchange of the scarce resources can create positive gain. Therefore, the demand for institutional change is driven by the perception that the new arrangement will capture more gains than the old one.

On the other hand, institutions are supplied by society. The supply of institutions depends on the costs of the institutions themselves, and the demand for them. The shifts in the supply of institutions derive from exogenous changes that affect the cost of the factors in providing the institutions, and

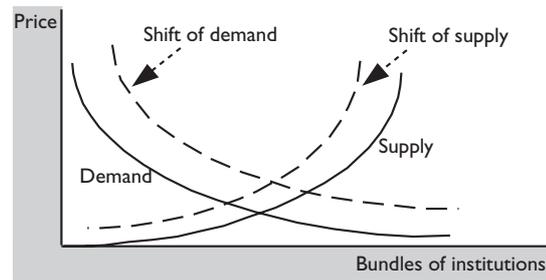


Figure 1: The demand for and supply of “bundles of institutions”

changes of technology in institutional supply and other related institutions. The supply of institutional change is driven by the perception that the new institutions will be more competitive in the institutional markets.

The emergence of institutions depends on whether there is an equilibrium point in the demand and supply. It may help to understand this issue if the property rights and their exchanges are represented as varying degrees of “bundles of rights” that are continuous from 0 to complete rights. Therefore, institutions can also be viewed as “bundles of institutions”, from 0 to perfectly defining and transferring the property rights (see Figure 1). In reality, there is no complete property right delineation.

The final institutional arrangement concerns the equilibrium of the demand and supply, i.e. the value of marginal output of the institution equals the marginal cost of institution supply, assuming a perfect market for institutions. Institutions can change according to their relative scarcity and technology, particularly in the long term.

There should be no principal difference between goods and institutions. Figure 2 may help the further understanding of their relationship. The traditional microeconomics only analyses the market of production factors under given organizations and institutions (in the outer circle in Figure 2). Firms can be viewed as commodities in the markets of firms. The prices of the firms are not the sum of their component costs; the owners of the firms may gain or lose after assembling the production factors and designing institutions within the firm. But the firm owner is only a general economic institution taker. Various markets are interactive, e.g. the market of production factors affects the markets of the firms, which affect the markets of the institutions. However, a change of institutions clearly affects the markets of the firms and the markets of the goods.

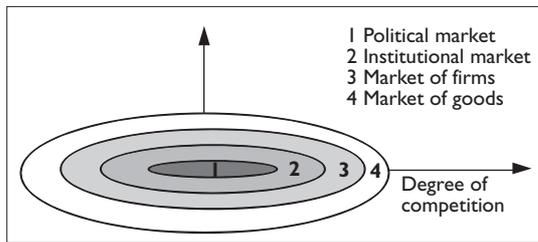


Figure 2: The markets of products vs. market of institutions in societies

Political markets are located mostly in the inner circle in Figure 2. Since Schumpeter (1942), politics has been described as a competitive struggle for authority to obtain the share of economic institutional markets in an analogy to economic competition. If the market for goods is perfect, there is no firm (Coase 1937). If the institutional market is perfect and competitive, the demand for and supply of institutions is always in equilibrium, institutions will not matter, and there will be no politicians.

Powers, Information, and Collective Action

The institutions define the rules of the game. These rules must also be accepted by the players in the game. Therefore, public choice or collective action, e.g. voting in democratic countries for some institutional arrangement, is often required (Olson 1965; Becker 1983). Institutions are never neutral. The weight in the public’s choice is affected by the powers. Existing knowledge, the difference between real cost and expected cost of the institutions, the expected gains for the institutions, etc., all affect the final institutional arrangements. Institutions are only one factor of the economic performance, but our limited information does not allow us to judge them because other factors also contribute to economic results. It is exactly this institutional imperfection that makes institutions matter in economic development. Institutional rigidity and inertia may persist for a considerable period of time. This prevents institutional adaptations to environmental changes and causes institutions to be inefficient. There seems to be five categories of reasons that make institutional markets inefficient: i) costs of supply; ii) the nature of public goods; iii) interdependence; iv) path dependence; and v) knowledge.

It may be worth extending the discussion beyond economic institutions to the political market.

Autocratic countries mainly use guns as means to control the desired economic institutional market. Politicians often receive the greatest reward, but also take the greatest risks, especially in many LDCs (Clague 1997). In democratic countries, voting is used to obtain and adjust the economic institutional market. Distributional conflicts, collective action processes and free-rider problems nevertheless prevent the establishment of what might be viewed as economically efficient political systems. North (1990) claims that competitive markets are scarce enough in the economic world and even scarcer in the political world. North (1997) further pointed out: “We simply do not know how to create efficient political markets. ... The interface between economics and politics is still a primitive state in our theories, but its development is essential if we are to implement policies consistent with intentions”.

Institutional Change

As mentioned above, the rules affect transaction costs. Current economic reforms in countries in transition to some extent amount to changes in institutions and organizations. Transaction costs are usually referred to under the given institutions and political framework. Some costs occur in setting up, maintaining and changing institutions. These costs, which can be viewed as transaction costs, are not likely to be borne by individual exchanges, but shared by the whole society. Furubotn and Richter (1997) define these costs as *political transaction costs* because “they are, in a general sense, the costs of supplying public goods by collective action, and they can be understood as analogous to managerial transaction costs”.

If there is only a small modification of the old institution, the cost of changes need not be significant, but if the new institution is completely different, the costs will be significant. Modifying a system is often much less costly than building a completely new one. However, it should be noted that renewing a system can be more costly than building a new one if the old system is completely useless because costs occur in its dismantling. Thus, transaction costs play an important role in the stability and continuity of less efficient institutions.

The potential gains from economic reforms must consider political transaction costs. If the institutional change in currently capitalist countries is defined as modification, then the reforms in formerly socialist countries are institutional revolutions.

The institutions of the Western world, both economic and political, have been relatively flexible (North 1997). The cost of institutional change may be seen in the transition of the former East Germany, where a substantial investment has been made in the institutional rather than the physical infrastructure.

Institutional change is a complicated rather than an instant process, even though formal rules may nominally change overnight as the result of political or judicial decisions. Changes in the informal constraints embodied in customs, traditions, and codes of conduct are even more impervious to deliberate policies (North 1990). Some trade-off may exist between the costs and the timing of institutional transformation. Some of the problems of the economic reforms in Russia may derive from the assumption of a timeless institutional transformation.

24.3 THE INSTITUTIONAL NATURE OF FORESTRY

The nature of forestry has been well discussed by foresters and forest economists. However, few forest economists have linked the nature of forestry into their studies of forest policy, organization and planning. Allen and Lueck (1998) have argued that the seasonal and random nature of farming and the interplay of these two qualities generate a moral hazard, which limits the gains from specialization and causes timing problems between stages of production. Consequently, farming has rarely been converted from small, family-based firms into large, factory-style corporate firms. Forestry is viewed as part of farming in this study. Forestry has a number of characteristics that are similar to agriculture, but some must be identified separately. Forestry usually consists of silviculture, logging and wood processing. Silviculture also has its own characteristics, mostly reflected in the following aspects:

- a) Significant costs arise in evaluating and monitoring the inputs in silviculture because they are less standardized than factory work, or even the work in agriculture. The quality as well as quantity of the effective inputs is difficult to evaluate accurately. Difficulty in evaluation is also caused by the difficulty in measuring elements of the natural environment, such as soil, water, and temperature. So we may not be able to correctly identify the contributions from labor or from natural factors. Consequently, moral hazard (alternatively, monitoring cost) could be made more serious by the use of hired labor or

by teamwork, particularly when the work is conducted manually.

- b) Risk arises from the slow maturing of trees. In principle, there is no reason why the long process of silviculture could not be separated into many stages so that investment in forestry would not need to wait so long a time and face large uncertainties. Allen and Lueck (1998) have argued that seasonal and uncertain production make it unlikely, for example, that one farmer will prepare the soil, a second farmer will plant, a third farmer will apply pesticides, a fourth will harvest the crop, and so on. Borrowing their insights (excluding the seasonality and uncertainty aspects), we can find that the measurement of silvicultural products, particularly prior to mature time, can be considered too costly for the application of market exchange mechanisms at the different stages of production. Consequently, planting trees, as Brokensha and Castro (1984) and Bruce (1986) have argued, more closely resembles the digging of a well or the construction of a fence than the planting of annual crops because the value of the investment is regained quite slowly.
- c) For many forest products, such as environmental goods and services, it is costly to delineate and transfer property rights. They may be more easily handled in the public domain. The free-rider problem is a consequence of high transaction costs. Many environmental goods are public goods (or at least mixed public and private goods) with characteristics of non-rivalry in consumption and difficulty in exclusion. The transaction costs involved in trading environmental products may be high compared to the production costs.
- d) Forests are more sensitive to land tenure problems and theft. There is a strong positive relationship between the security of tenure and the willingness to invest in tree planting. The security of tenure relates not only to political stability and the tenure-system applied, but also to questions of exploitation or theft, and protection against exploitation. In general, land tenure is less secure and illegal access is more common in LDCs. The protection costs may be even bigger than the transformation costs in forest management in many LDCs.

24.4 INSTITUTIONS AND FOREST MANAGEMENT

Traditionally, the comparative advantage of an economy is examined by the relative costs of the inputs and technology. Clague (1991) presents an interesting model of comparative advantage from the institutional approach. He separates the commodities and services as “self-contained” and “non-self-

TRANSACTION COSTS

The concept of transaction costs originated from Coase (1937) who investigated why a firm exists. Firms were found to emerge to organize whenever their costs were less than the costs of carrying out the transactions through the market. The concept is more explicitly explained in Coase (1960). Arrow (1969) defined transaction costs as the "costs of running the economic system". Dahlman (1979) defined transaction costs as "search and information costs, bargaining and decisions costs, policing and enforcement costs". North (1990) divided the total costs of production in the resource inputs of land, labor, and capital involved into transforming the physical attributes of a good (size, weights, color, location, chemical composition, and so forth) and into transacting – defining, protecting, and enforcing the property rights to goods (the right to use, the right to derive income from the use of, the right to exclude, and the right to exchange). Therefore, transaction costs can be viewed as the equivalent of friction in mechanical systems. Matthews (1986) considered transaction costs to be "the cost of arranging a contract *ex ante*

and monitoring and enforcing it *ex post*, as opposed to production costs, which are costs of executing a contract". Transaction costs are associated with the cost of information of the property rights, and also the information and nature of agents engaged in the exchanges: bounded rationality, opportunism, and information impactedness (Williamson 1975, 1985). Allen (1991) defined transaction costs as "the costs of establishing and maintaining property rights, and when transaction costs are positive, wealth from exchange is generated both by the gains from specialization and reductions in transaction costs". According to Barzel (1997), transaction costs are "the costs associated with the transfer, capture and protection of rights". A more complete and general discussion about the concept of transaction costs can be found in Niehans (1987) and Allen (1991, 2000). The concept of transaction costs is very important in economics. It changes the economics from the neoclassical microeconomics that only consider production cost into institutional economics that consider both the production (or transformation) and transaction costs. Williamson (1985) argued that markets, firms, organizations, governments, laws and regulations are all variations of the same underlying transaction cost theme.

contained". Self-contained means that their production does not benefit from an elaborate division of labor that requires coordination within large organizations or across firms. Restaurants, taxicabs, low-class hotels, barbers, repair services, and even agricultural products are examples of the self-contained. He argues that LDCs have a comparative advantage in primary products because they are more self-contained.

This insight is very helpful in understanding forestry. We may observe that few LDCs are competitive in international timber and wood-based product markets (note that logging in natural forests is more like mining. This study may not be applicable to timber production from natural forests). We can infer that LDCs in general do not have comparative advantage in forestry. The reason is that silviculture, unlike other primary industries, is not as self-contained as it looks. Forest management has a relatively large ratio of transaction costs to transformation costs. The advantages of transformation costs are offset by the disadvantage of transaction costs. Agriculture, which needs more technology than silviculture, is not much further behind in LDCs than in DCs, while forests are much more poorly managed in LDCs than in DCs. The distinctive performance of forest management between LDCs and DCs is largely due to the institutional differences.

Institutions are very important in economic development, particularly in forestry and other non-self-contained sectors. Why do LDCs not create

sufficient institutions? It is not necessarily correct simply to blame either market failure or government failure in the LDCs. It is true that LDCs provide "poorer" institutions than DCs, but they are not necessarily less efficient institutions (the most efficient supply is at the level where marginal cost of the institution equals the value of marginal output of the institutions). This is exactly like traffic rules: the rules are more simple but not necessary less efficient in a less crowded city.

As discussed above, institutions are like public goods and often a matter of public choice. Consequently, there are free-rider problems in that the benefits from the public supply of institutions vary from person to person and from one economic sector to another sector. Since the aggregated demand (or market) for institutions in DCs is larger than in LDCs, so is the supply of institutions. Consequently, some economic sectors benefit more than others. As pointed out above, forestry requires more institutions than other sectors; hence forestry suffers from a poor supply of institutions, while some other non-self-contained sectors benefit from such collective choice of low supply. Therefore, forestry becomes comparatively disadvantaged compared with other economic sectors within LDCs, and with forestry in DCs.

Now let us focus the discussion on the institutional arrangements associated with forest land, trees and forest products. Throughout the millennia or centuries, no matter how different the eras and the tenures in trees and land, they generally

change from less ambiguous rights to more defined rights. The classification between public ownership (state or community forest) and private ownership is only arbitrary. It is a continuum from public to private ownership. As Alchian and Demsetz (1972) have argued “there is some ambiguity in the notion of the state or private ownership of a resource, because the bundle of property rights associated with a resource is divisible”.

Public ownership does not mean open access, while private ownership does not mean exclusive access. It means that there are two dimensions in the institutional arrangement: the tradeoff between public and private ownership and tradeoff between open access and exclusive access. We should not confuse public ownership with open access (or private ownership with exclusive access). Some private ownership may provide more free access than public ownership, e.g. hunting is more restricted in many public national parks and natural reserves than in private forests, and vice versa.

Open Access versus Exclusive Access

When trees and land are not scarce resources, open access is the best choice of property rights arrangement because it creates non-negative rent. Much of the land that is found today without active management, particularly in LDCs, has the status of open access. The most often suggested policy remedy for the tragedy of commons is to change the open access land to closed access. However, if the change from open access to closed access can create Pareto efficiency, it is difficult to understand why open access is so common in LDCs. The reason lies in transaction costs. The benefit of change from open access to closed access has been widely recognized, but the cost is often neglected. The costs of ownership, termed as transaction costs, not only include the cost of obtaining titled or recognized rights, but also the cost of protecting those rights. That is why knowing the law of the tragedy of the commons cannot solve problems.

Almost all forest land should be valuable if the land is valued by traditional production economics. However, some land and trees become valueless if the transaction costs of obtaining and protecting the land and trees are considered. A moderate scarcity is often not sufficient for closed access because closing access is not costless. If exercising the right to ownership is too costly, there is no motivation to own it exclusively; if it is owned, ownership be-

comes titular: nominally possessing the legal rights but with no economic rights in practice. In this case, “enforced” closure of access may create negative rent. This is a more common phenomenon of open access to forest land in LDCs than in DCs because of the relatively lower value of the land and higher transaction costs. Historically, open access to forests and forest land was (is) much more common than with respect to other property, e.g. agricultural land. The reasons are that i) forest is not so scarce, and ii) transaction costs are relatively higher for trees and forest land than other property.

It is particularly useful to understand the property rights of trees and land given the insights of the “divided rights” theory. Many of property rights for owned forests maintain an open access regime, e.g. most environmental outputs from forests, such as carbon sequestration, biodiversity base and pleasant (also unpleasant) environments. Private land may be in the public domain for hunting and non-forest product collection (even fuelwood in some cases). Environmental goods have no price because it is too costly to price them. However, the situation is changing, some of the most beautiful (or scarce) forests have become exclusive, either by collecting fee or simply by prohibiting access. The role of other environmental outputs from forests, such as carbon sequestration and biodiversity are already being discussed. That means there are some hopes for gain to be achieved by exclusion. However, it seems that many discussions, including the Rio Summit in 1992, have been fruitless. This is because the products are still not scarce enough and the institutions are still too costly. Contrary to the general trend, some exclusive rights in forest management are being lost. Clear-cutting is gradually coming under regulation, and the logged-over land can no longer be abandoned while the shift to other uses is increasingly regulated.

Public Ownership versus Private Ownership

Public ownership means ownership by the state or public institutions, while private ownership refers to ownership by individuals, families, and private institutions. Both are partly under the exclusive access domain category, and partly under open access domain. As with the relation between open access and exclusive access, it is also arbitrary to separate public and private ownership if property rights are viewed as bundles of rights.

Compared with other sectors, the share of state-

owned trees and land is significant in both LDCs and DCs. Public ownership is usually justified by arguing that forests have multiple functions that conflict with the profit-seeking often associated with private ownership. This phenomenon can be better explained from the standpoint of transaction costs. For some less valued trees and forest land, more ambiguous ownership is often superior because the demand for institutions is weak and extra costly institutions are not affordable. Private forest land is often highly productive land, while public forest land is often marginal land. It should be noted that public ownership does not necessarily mean ambiguous ownership. For some environmentally sensitive forests that provide public goods, public ownership is also superior because it is too costly to define and transfer the outputs from the private domain (producer) to the public domain (demander) if it is managed in the private domain. Public ownership is also found in all city parks. But the ownership of the city parks is never ambiguous, only the rights of usage are in the public domain.

The popularity of community forests in LDCs should also be understood together with the characteristics of property rights in labor, capital, trees and forest land. The transaction costs of labor and capital, as well as forest products through market mechanisms, are relatively costly in LDCs. Labor and capital are often rooted within the community. Ostrum (1986) argued that groups arise when the user population lives close to the resource and is relatively small, supply is moderately scarce compared to demand and is subject to multiple uses requiring management and coordination. In other words, trees and forest land are still not scarce enough to justify private ownership and exclusive rights. Community agriculture is much less common than community forestry, even in the LDCs.

With population growth and economic development, the trees and land become scarcer. In addition, population migration becomes more common. Forest land becomes subject to rapid exogenous change – settlement by outsiders, logging by local and multi-national firms. Consequently, the community forests are devolved into private ownership. In the DCs, private forest land, particularly the productive land, becomes dominant except in those countries, which have plenty of low-valued natural forests. Some concession systems are often applied to the transfer of the state-owned trees to private logging firms. Private forest land is usually either owned by (or in long-term contract with) big forestry corporations or non-industrial private owners.

In many cases, trees can be owned separately from the land on which they grow, as in leasehold and freehold arrangements. Failure to recognize the relationships between property in trees and property in land has led to many problems. The socioeconomic history of rural areas is to a large extent a history of the evolution of the relationship between land and agricultural crops, from i) open access land and wildlife products, to ii) both group-shared land and crops, iii) group-shared land but private-owned crops, and finally to iv) both private land and crops. There are many sub-categories in each type. For instance, in the last category, there are many kinds of contractive arrangements between the private land of the landowner and private crops of the farmers. Every kind of arrangement has its advantages and disadvantages. The relationship between property rights concerning trees and land more or less follows the same path of development as in agriculture.

Market Exchange versus Non-Market Exchange

Without delineating property rights, there is no exchange. If it is too costly to define property rights, there will be no exchange either. For instance, property rights are very ambiguous within a family; a market for exchange within a family does not exist. Exchange resulting from specialization is a fundamental source of the growth of wealth. However, exchange is not costless. The market is an institution designed to facilitate exchange and reduce the costs of exchange. The market not only includes physical facilities, but also rules. In the medieval period in England, the fair or market provided not only physical facilities, but it was also responsible for security (important in unsettled times with a relatively weak government) and administered a court for settling disputes (North and Thomas 1973).

Today, most governments provide security and help to settle disputes. The biggest innovation of the market should be money and the stock market, which greatly reduce transaction costs. Credit cards and Internet transactions are also becoming of great importance. Non-market institutions, e.g. family, firms, are also designed to facilitate non-market exchanges. Currently, modern corporations use their hierarchical organization to combine both market and non-market mechanisms (Williamson 1975, 1985).

In the above discussions on property right institutions, state-owned forests, community forests and

private forests are all associated with the institutional dimension of exchange. Many large wood-based processing firms have their own trees and land to provide raw materials. They often have long-term contracts with other forest owners. Probably, the transaction cost of timber through the market is more costly than other products; therefore the in-house supply of raw materials has been adopted. The non-industrial private forest is another good example of the combination of the advantages of both the market and non-market mechanisms in transactions (Zhang 2001).

24.5 FOREST MANAGEMENT INSTITUTIONS IN CHINA

Informal and Formal Institutions

There is no clear distinction between formal and informal institutions. Formal institutions, in general, are refereed by law or regulations. Informal institutions include norms, conventions, beliefs, religions and ethics. Both formal and informal institutions jointly govern forest management. During ancient and Imperial China, informal institutions were dominant in governing forest management, since forest land, particularly marginal land, was not valued enough to use formal institutions to govern them. Various local circumstances also made formal institutions less applicable. Formal institutions, which governed other property rights, such as agricultural land, have a much longer history.

Customs and conventions were important institutions governing the management of the commons. The common lands usually infer kinship, village, and communal ownership. Ren (1925) classified commons into three categories: ownership by one village, ownership by several villages and clan ownership. A “mountain council” (or village council) was quite common as a quasi-government organization governing the common forest land in southern China. The mountain council delineated the boundary of land, designated and regulated the hunting rights, harvesting and even output-sharing. The head of the council would expel anyone violating the regulations (Wu 1962). Various management methods existed on the common land. In some villages, some charters concerned the allocation of the revenue from forests and were quite effective in the common forest management.

The rules governing human interaction were partly based on common beliefs and conventions.

Religions and beliefs were other important informal institutions for forest management. Buddhist and Taoist temples helped maintain substantial forests in China. Most temple forests were maintained to preserve the natural beauty of the area rather than for the timber harvests. The timber harvests were often viewed merely as by-products. Most villages had (have) their own *Fenshui* (geomantic) forests, which were often believed to support the physical and spiritual prosperity of the villages and communities. Fenshui trees were (are) also found associated with tombs and graveyards to protect descendants. Cutting a tree beside the tomb was viewed as a serious crime in Chinese convention.

Although informal institutions played a dominant role in governing forest management, China had a long tradition of formal institutions. In the Zhou Dynasty (BC 1100–221), according to classical literature *Zhou Li*, (*Shan*) *You* and (*Lin*) *Han* were appointed by the emperors to administer mountains and forests and regulate hunting and forest harvesting. Some policies concerning private forest protection and plantations had also begun to emerge, while the roadside trees were administered by the state. Since the Qin and Han Dynasties (BC 221–AD 220), some taxation on forest land and subsidies for tree planting can be found from *Han shu* literature. During the Sui and Tang Dynasties (AD 581–907), land and trees began to be allocated to private households for planting economic forests, and the ownership was regarded as permanent. Formal taxation based on the quality of land was also introduced. Laws also applied to forest fire prevention measures. Military forces were also ordered to plant trees.

Since the Song Dynasty (AD 960–1279), more regulations concerning forest protection, hunting, tree planting and timber trading can be found from the classical *Song shi* literature. Taxation and tax exemptions had been applied as means to regulate forestry. The free trade of timber was forbidden, and was monopolized by the state. In the Ming (AD 1368–1644) and the Qing (AD 1644–1911) Dynasties, more formal laws on forest product trade were formulated. Taxes on timber production and trade were also widely applied. The emperors also ordered the public to plant trees. Zoning (particularly nature reserve zoning) was also applied in forest management, while the technology for measuring timber volume was developed at that time.

The Ministry of Agriculture and Forestry was established soon after the Republic of China was established in 1911. The Forest Law and the Hunt-

ing Law were enacted in 1915. More formal institutions gradually replaced the informal institutions governing forest management. A series of comprehensive institutions concerning property rights, trees, and land zoning, timber harvesting and trade were also established. The capitalist movement since the 1911 revolution, following western countries and Japan, had undermined the tradition of village and clan forest ownership, and had promoted the transition from informal institutions to capitalist institutions. The early period of the Republic of China was also one of the best times in China's forestry development. Unfortunately, fighting between warlords, the Japanese invasion and civil war made the institutions difficult to implement while society fell into disorder. China's forest development suffered greatly from the continuous wars and disorder during the first half of the 20th century. Confronted with such unrest, long-term investments, such as forest management, were not possible. It has been estimated that about 10% of the total inventory were destroyed during the 8-year war with Japan alone.

The Institutional Revolution Against Forestry

China's land tenure had developed to a level similar to the early period of capitalistic countries already at the beginning of the 20th century, even earlier. China used to be a country with long-term land security. Almost all agricultural land and a large part of forest land had been owned by landlords (mountain lords) and some rich peasants for centuries. Prior to the founding of the People's Republic of China, about 80% of forest land were owned by landlords and rich peasants, while about 5% were owned by poor subsistence farmers (Liao 1986). Some institutions and land market mechanisms for such private ownership had also been developed. Those institutions are the most fundamental basis for socioeconomic development, including forestry.

The People's Republic of China was founded in 1949. Since then, forestry development has suffered from mis-specified institutions. During the political struggles, afforestation measures, more specifically institutions governing the afforestation measures, proved to be ineffective. The land reform of 1949–1952, and the subsequent socialist transformation, completely destroyed the most basic institutions (property rights) that had been developed for hundreds, even thousands of years. The reforms also broke the rules governing private property rights. In the short term, the land reform did have

some positive effects on rural development and equal income distribution, but the long-term negative impact has been significant and far-reaching. Private land and forests were confiscated and redistributed to the public. The once clear boundary between different communities became ambiguous. Forests suffered greatly from such changes and uncertainty.

The Cultural Revolution from 1966 to 1976 to some extent further damaged the former institutions, not only the institutions governing trees and land, but also the institutions governing human rights. Not only were the markets for capital, labor, land and trees prohibited, but so were the markets for ideas. It was also during this time that the informal institutions, such as Buddhist and Taoist temples together with their forests were destroyed. Thus, some exclusive forest land was converted to open access.

If the poor status of forests prior to the formation of the People's Republic of China was to a great extent because of wars, the deteriorated status of forests under the planned economy regime of the post-war period is because the most fundamental institutions of society were destroyed. It should be noted that the property right institution does not necessarily advocate private property rights, but concerns both private and public property rights and the voluntary exchange of property rights. Without these institutions, society cannot operate. Under such circumstances, the transaction costs become extremely high, and property rights become extremely low, even zero.

Making Institutions Right for Forestry Development

A series of economic reforms has been launched in Chinese forestry since the early 1980s (see e.g. Zhang et al. 1999). Current economic reforms are clearly intended to correct the institutional infrastructure. The reforms can be summarized as follows:

- The property rights of labor are being liberated and privatized. Forced team work in People's Communes is giving way to family or voluntary co-operation in both agriculture and forestry. This change greatly reduces the monitoring cost and moral hazard.
- The rights to trees and land are being clarified through ownership titlement, e.g. by granting deeds. Private land property rights have not yet been recognized, but economic rights to trees and private land-use rights are legally granted for a significant period of time. The state-

owned forest land has been decentralized through dissolution of the management authority and budget regime. Auction and other methods have been adopted as means of property right transactions. Land and trees were de-collectivized and reorganized through the Household Responsibility System, the Share-Holding System and other types of joint or co-operative management. Local institutions resume their role in both community and private forest management.

- Sales of timber and even some pre-mature trees are allowed by free trade. In the southern provinces, timber selling licenses, quotas, and prices imposed by the timber procurement agencies were abolished only in 1985, then re-imposed in 1986 and abolished again in the southern provinces in 1993. The trade of timber produced from the state-owned forests has also been liberalized.
- Formal institutions, such as land law, contracting laws, and regulation, are widely applied in forest management. Governmental policing and the courts have gradually replaced the informal institutions. The Forest Law was first issued in 1985 and revised in 1998.

The institutions, which have shown great improvement recently, may nevertheless be poorer than those of the centralized economy regime, even after a decade's efforts at reform. More formal institutions, such as the forest law, which was introduced overnight, still need time to function well. Informal institutions, which were once well established and which were destroyed prior to the 1980s, are still poor. Conventions and beliefs, once destroyed, take a long time to re-establish.

Unlike the great success in agricultural reforms, economic reforms in forestry have met more problems and their positive effects on forest management are still very limited (Yin and Newman 1997; Zhang et al. 2000a; Zhang 2000a). This is because of the nature of the institutions and of silviculture. The supply of institutions following the economic reforms is now sufficient for private agricultural management, but insufficient for forestry development.

Another important, but often forgotten, institution that may be detrimental to forestry but encourage agriculture, is the taxation system. The site productivity-based tax applied in agriculture is more transparent, predictable, less costly in implementation, and provides greater incentives for agricultural management, while the output tax applied in forestry is less transparent, more uncertain, and more costly in implementation. The taxation system in forestry provides many opportunities for local governments and officials to exercise arbitrary taxes, fees and corruption (e.g. Zhang and Liu 1999).

Information as a Basic Institution for Forestry Development

Transaction costs belong to information costs. The efficiency of an economy can be more or less deduced from the efficiency of information collection and processing. In a market economy, price is the most important signal to reveal relative scarcity and introduce resource allocation. In a planned economy, statistical information is the only signal for decision-makers when allocating resources. It is not the purpose here to discuss whether the decision-makers are able to make the right decisions. The question is rather to assess the quality of the statistical information: accurate information being the first condition for good decision-making. North America has not encountered timber famines in the 20th century as forecasted in the beginning of the century. Was the forecast wrong? No – it is exactly the correct forecasts that prevent timber famines from occurring. Because of this signal, efforts can be made to look for alternative materials and ways to save timber and plant more trees. Because information on forests is very costly, and tree growth is much slower than growth in other products, information matters greatly in forestry development.

The largest food famine occurred in China around 1960. It was caused by incorrect information: the agricultural outputs were falsely reported by a factor of hundreds at the time of the Great-Leap-Forward around 1958. Forestry development also suffered from false reports on afforestation and harvesting. For example, in the case of afforestation, the annually reported afforestation area between 1950 and 1995 is simply summed in statistics, arriving at a total area of 220 mill. ha. This is 7 times greater than the existing plantation forest (34 mill. ha) according to the inventory completed in 1995 (MOF 1996). Some plantation forests might have been logged. However, based on the assumption of 30–40 years for one rotation, and that the most reported afforestation activities were undertaken after 1955, only a small part of the forest planted since 1955 should have been logged. In addition, about 2.3 billion trees had been planted from 1942 to 1947 according to Chen (1982). There are three possible explanations for the figures: a) low survival rate; b) greatly exaggerated figures; and c) early destruction of the premature trees. All three reasons are likely to co-exist.

Since it is very costly to conduct forest inventories, the status of the forests and their change is difficult to monitor. Incomplete data concerning Chi-

na's forest resources was published in 1943, stating that forest cover ranged from 5% to 8% of the land area. Chu (1988), among others, pointed out that these figures are completely misleading. Unfortunately, these figures are sometimes still cited. Jiang and Chou (1992) considered that forest cover rate in 1949 was 13%. A formal first national forest inventory was conducted between 1973 and 1976. Since then, 4 additional national forest inventories have been conducted. These results provide good information about the status of China's forests. However, it is still unreliable to use such data for comparison purposes. FAO (1995) also believe the data quality for change assessment is reasonable (grade 2 on a scale of 1–3). The main problem concerns how the forest has changed during the past 50 years.

There are three factors determining the quality of the data: 1) technical limitation; 2) definition changes; and 3) institutional and political biases. The afforestation efforts in China were mainly organized by the government as "campaigns". Workers, peasants, students and the army were mobilized to plant trees. Input was often voluntary. Careless planting and a total lack of or inadequate tending of the seedlings were often associated with this kind of target-oriented afforestation. Every year the lower authorities had to report to the higher ones the area and numbers of trees planted. However, with the planting targets decided annually by the higher authorities, bias to a higher figure in the reporting was inevitable.

24.6 DISCUSSION

From the theoretical perspectives and the evidence from China there seems cause for pessimism concerning the development of forestry in the LDCs. Because of the very nature of silviculture, forestry is virtually impossible without economic development and a good supply of institutions. Economic development is a condition for creating the relative scarcity of forests and the higher level of aggregated institutional demand and supply. However, under certain economic conditions and a general framework of institutions, some innovations in institutions in LDCs still potentially exist (e.g. Zhang et al. 2001). Evidence of successful state-owned, community-owned and private-owned arrangements of property rights concerning trees and land can be found in various countries and even within one country. The same applies to state-pro-

vided institutions versus local-provided institutions, formal and informal institutions. If we are optimistic about China's economy, we have no reason to be pessimistic about China's forestry in the long term (Zhang 2000b).

Currently, decentralization and devolution have become important themes in forest management (Fisher 1999). Institutional changes are unavoidable when the relative scarcity of resources (including technology) changes. New developments reflect this trend. However, institutional changes cannot occur instantly, nor are they always costless or efficient. The demand and supply of institutions in forestry development must therefore be an important topic for future study. Institutional economics would seem to offer a very useful approach to such a study. The "bundles of rights" concept, the characteristics of the market for institutions and path dependence theory are also important when we consider institutional evolution or devolution.

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