

Global Forest Ownership: Implications for Forest Production, Management, and Protection

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About 86% of the 3.9 billion ha of the world's forests are publicly owned. Aggregate statistical analyses of forest data and the research literature indicate that private forests provide more market based goods such as timber, with private forest lands producing a higher proportion of industrial wood than their share of land ownership, while public lands produce more proportionately more fuel wood and multiple use goods and services. In the last few decades, the largest increases in forest industrial forest plantation area have occurred in South America, the Southern United States, New Zealand, and South Africa, while China leads in the area of multiple use forest plantations on public lands. Almost by definition, public forest lands have the largest share of their area covered by forest management plans, but the level of management oversight of these lands is often less than that of natural forests on private forest lands, and certainly less than intensively managed forest plantations. Forest certification has increased forest management standards and practices, and currently covers about 300 million ha, or 8% of global forests. Certification covers both public and private forests in approximately equal shares, and has raised the levels of scrutiny and management of those forests. It also influences the management of other forests and world trade indirectly, as a non-state means of forest governance. Similarly, forest regulations cannot be conclusively linked to more effectiveness based on their application to public or private forests. Studies indicate that countries and states with large amount of public forests often have stricter environmental and forest practice standards, but these laws are often not supported by commensurate institutions; enforcement is often weak; and corruption pervasive. More world consensus has occurred that both public and private lands should more closely link tenure rights and conservation and management control. Private lands have increased environmental conformance with regulations and adopted forest certification for many high production lands. Governments have begun to devolve more control of public lands to communities for forest management. Government ownership and incentives must evolve for both private and public lands in order to produce forest goods and services more efficiently and equitably. Furthermore, pressing economic and budget demands on governments throughout the world mandate that market based policy instruments will be needed to complement or supplant scarce government resources.

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Introduction

Forests may be owned by firms or individuals in the private sector or by the public sector. Public ownership describes the case when a government body exercises ownership jurisdiction over lands. Private ownership describes the situation where individuals, firms, businesses, corporations, or even nongovernmental organizations possess ownership rights to forests.

Ownership implies that an entity claims land tenure rights to a forest. Tenure rights are the ability to acquire, use, control and dispose of a piece of property—either the land itself or the produce derived therefrom. These rights are fundamental to determining how forests will be managed, protected, or neglected. Tenure rights are often, but not always, exclusive. They are seldom absolute (Cubbage *et al.*, 1993).

It is possible for the government or the private sector to exercise strong tenure rights and control over forest land. On the one extreme, the government may rely on unregulated private ownership and free market, which is quite rare. Even in the U.S. where private forests dominate the sector that relies on free markets, the government governs private forestry practices by various means. For example, states in the West and a few in the East have rigorous state forest practice acts. All states implement the federal Clean Water Act, and have regulatory or voluntary Best Management Practices (BMPs) to protect water quality.

Tenure rights change periodically as governments evolve, such as actions to privatize forests in New Zealand and South Africa demonstrate, or increasing laws that restrict forest practices in the U.S. exemplify. Governments also may devolve the level of ownership from the national level to the community level, which has been instituted substantially in the last decade, and may be classed as public or private ownership. The shift to community tenure rights is proposed to ensure that local people who live in forests have the rights to conserve and manage those forests better, via community based forest management (CBFM).

This study examines the role of forest ownership in forest management objectives, forest production, and environmental protection. It examines common ownership objectives, industrial forest plantation development and roundwood production, and environmental regulations as indicators of the effects of ownership on management outcomes.

Methods

Global Forest Ownership

We used data from Hyde *et al.* (2003), FAO global forest assessments 2000 and 2005 (FAO, 2001; 2006), as well as our own estimates to assess global forest ownership (Siry *et al.*, 2005). Overall, approximately 86% of the world's 4 billion ha of forests are in public ownership (Table 1). We included tribal and community forests in the public ownership totals, which cover an estimated 200 million ha and account for 5% of global forests. Tribal and community forests, and collective forests in China and elsewhere, represent a transitional ownership group that has characteristics of both public and private ownership. These forests are primarily located in the Americas, Asia, and Oceania.

Africa, Asia, and Europe have the highest percentage of public forest land by country, at 98%, 95%, and 90%, respectively. This includes all the forest land in China, Congo Democratic Republic, and the Russian Federation. Oceania has 76% public forest land, North and Central America 70%, and South America 82%.

While public ownership predominates, forest ownership structure varies substantially throughout the world. In Europe, all forests are publicly owned in the Russian Federation and most other countries of the Commonwealth of Independent States (CIS). Public forests also dominate in many former communist countries in Central and Eastern Europe, including Czech Republic (84%), Poland (83%) and Romania (95%). Some countries in Western Europe also have large public forests, including Germany (54%), Greece (77%), Ireland (66%) and Switzerland (68%).

Table 1. Forest statistics by region and country, 2005

Region/Country	Total forest area (MM ha)	Forest ownership		Planted forest area (MM ha)	Roundwood production (MM m ³)	Fuelwood production (MM m ³)
		Public (%)	Private (%)			
Africa	656	98.2	1.8	13	79	591
Congo DR	135	100	0	0	4	79
Asia	567	95	5	65	174	189
China	177	100	0	31	89	47
Indonesia	98	100	0	3	12	0
Oceania	208	76.3	23.7	4	54	10
Australia	165	72.9	27.1	2	27	3
Europe	998	90	10	28	543	139
Germany	11	52.8	47.2	0	54	6
Sweden	27	19.7	80.3	1	69	8
Russian Fed.	809	100	0	17	129	51
N&C America	708	70.1	29.9	19	725	112
Canada	310	92.1	7.9	0	220	4
U.S.	302	42.4	57.6	17	490	51
South America	853	82	18	11	225	173
Brazil	493	90	10	5	225	173
World	3 987	86.1	13.9	140	1 670	1163

The U.S. is unique among countries with large forest resource endowments because of the dominant role of private forests. Forest land ownership in the U.S. can be classified into three broad classes: public, forest industry/institutional and nonindustrial private. Public ownership encompasses 43% of all forests, primarily in the West where the majority of national forests were established (Smith *et al.*, 2004). Primary wood products manufacturers, classified as forest industry, used to own about 8% to 10% of U.S. forests, but most of these have now been sold to institutional investors, such as timber investment management organizations (TIMOs), or converted into timber and real estate companies, termed Real Estate Investment Trusts (REITs). TIMOs acquire funds from pension funds, insurance companies, banks, and private financial consortiums. REITs do as well, and also consist of publicly traded investments in stocks or similar assets. Nonindustrial private ownership includes individuals, trusts and corporations, which control about 49% of forests. In total, then, private owners control 57% of forests in the country. Private ownership is even more important in the U.S. South where it covers 88% of forest land, with nonindustrial owners accounting for 71% of forest land and forest industry, TIMOs, and REITs for another 17%.

Large environmental nongovernmental organizations (ENGOS) such as The Nature Conservancy, Conservation International, and local land trusts have purchased and managed forests, grasslands, swamps, and other important natural areas. These organizations purchase land or the development rights to the land, either through fee simple ownership or some form of permanent or temporary conservation easements. ENGOS also advocate actively for government land conservation policies (Albers *et al.*, 2004). As of 2005, the U.S. had about 15 million ha of land under conservation-based fee simple ownership or in conservation easements (Land Trust Alliance, 2008).

Forest Ownership and Management Objectives

Forest owners usually determine the objectives for the use of forest land and its associated resources. The owner establishes management policies and provides the means to achieve them. Public ownership often relies on government agencies in formulating and implementing policies affecting these forests. Private ownership gives management responsibility to individual owners or corporations or trusts.

The government relies mostly on the policy-making process where decisions regarding programs and budgets are politically determined, although market prices and costs of goods and services are considered in decision making (Cubbage *et al.*, 1993). Public forests are managed, at least in principle, for public welfare.

Multiple uses and environmental services can and often do receive more emphasis than wood production, particularly in industrialized countries. The focus is on common and toll goods such as open range or recreation in national parks. Goods characterized by joint consumption are less likely to be satisfactorily allocated in markets because there is no market price. Therefore, larger government involvement may be appropriate for making decisions with respect to these goods and services.

Private forests are managed for financial or utility benefits of their owners. The private sector relies on prices determined in markets, along a good bit of governmental regulation. Private and toll goods such as timber or hunting leases dominate, while environmental services are produced as external benefits or costs. Still, private forests provide a wide range of uses and benefits, including timber, watershed maintenance, soil retention, range potential, wildlife habitat, and recreation opportunities.

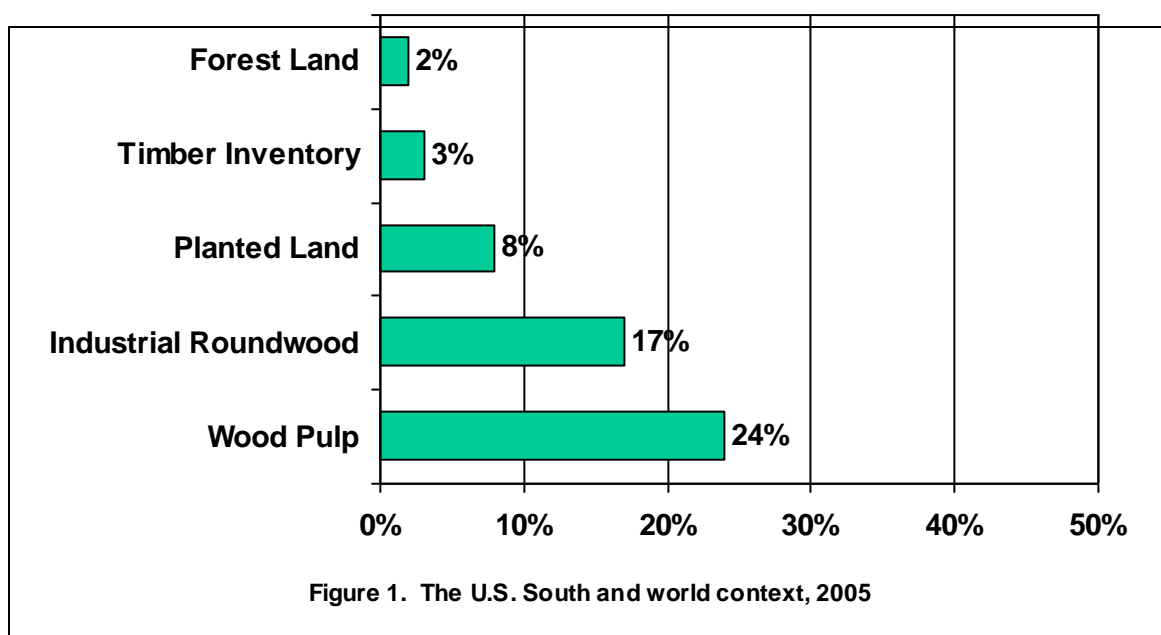
Forest Ownership and Production

While 86% of the forests in the world are publicly owned, private forests provide proportionally more market commodities. In particular, private forests provide a growing share of the global timber output. This is because fast grown forest plantations in the Americas and beyond are privately owned and because private forests, both planted and natural, are utilized more efficiently. While forest statistics providing information relating ownership to forest production are scarce, some countries, including the U.S., provide relevant information about forest production from private lands.

The U.S. accounts for only 8% of global forest land area, 9% of timber inventory, and nearly 13% of forest plantations as defined by FAO (2006). These resources supplied 25% of global industrial roundwood. The U.S. South accounts for only 2% of global forest land, 3% of timber inventory and 8% of global planted area supplied approximately 17% of global industrial roundwood and nearly a quarter of global wood pulp production (Figure 1). Total annual wood harvest volume in the South is estimated at 287 million m³, with pine accounting for 65% of wood production (Smith *et al.*, 2004). Forest industry, TIMOs, and REITs produce 28% of the harvest, nonindustrial private forests 68%, and public lands 4%.

Private fast-grown plantations play an even more important role in several countries in South America, which has about 11 million ha of fast-grown plantations (FAO, 2006). In Brazil planted forests covering 5 million ha supply most of its industrial roundwood production equal to 103 million m³ (FAO, 2005). Similarly, private plantations in Chile and Argentina are major suppliers of industrial roundwood to the market, and Uruguay is developing rapidly.

South African forest plantations, which are 70% privately owned, supply industrial roundwood for domestic industries and export. New Zealand and Australia each also have more than one million ha of intensively managed forest plantations, which are the major source of industrial roundwood. While large plantation areas also exist in China and Indonesia, less is known about the ownership status and production, and the data are not considered very accurate. Globally, Brown (2001) estimated that forest plantations provide about a third of the world's industrial roundwood supply. While no precise ownership information is available, it is thought that most fast grown forest plantations are privately owned.



In many countries of Western Europe private lands are major suppliers of industrial roundwood from both planted and natural forests. For example, in Scandinavia, a major world's wood producing region, much of wood harvest comes from private forests. In a study of the U.S. forest inventory statistics, Clawson (1979) found that private forest lands were more productive per unit of area (had faster growth rates) than public forests for the same species groups and regions.

These data indicate that private forests usually are more productive and efficient in supplying timber outputs than public forests. They corroborate the premise that markets do work well in providing timber for industrial roundwood, as one would expect.

Sustainability of Private Forest Management

While private forests may be more productive for market commodities than public lands, it is often implicitly assumed that public forest management is geared towards environmental services and important social objectives. Private forest management is often perceived as less socially responsible and characterized as having lower environmental standards. Measuring sustainability for different ownership types at the aggregate level, however, is difficult. Data are available for at least three important criteria—forest management plans, forest certification, and forest environmental regulation.

Forest management plans

Management plans indicate forest planning and provide some information on the overall quality of forest management. The forest resource assessment (FRA) 2000 defines the area under forest management plan as the area managed for various purposes, such as productive or protective uses, in line with approved national plans covering 5-year periods or more (FAO, 2001). For industrialized countries, this category also includes informal management plans. Overall, FRA data indicate that about 42% of all forests across the world have some type of management plan (Table 2). This includes all the public forest lands in Russia, which accounts for about half of all the managed forests. However, we would characterize this level of management planning intensity and implementation as low given the poor budgets and infrastructure of federal forest agencies in Russia.

The aggregate data do not allow us to determine the contents of forest management plans, but we would presume that the plans for public forests do tend to cover more multiple uses and involve more public input. This could favor a wider suite of environmental goods and services than provided by private lands, if the broader goals could be matched by adequate budgets. In sum, these cases for individual countries suggest that merely reporting that forest management plans exist is little assurance that public or private forests are being protected well.

Table 2. Forest management, protection and certification, 2005

Region/Country	Forest area with management plans		Forest area protected		Forest area certified	
	(MM ha)	(%)	(MM ha)	(%)	(MM ha)	(%)
Africa	6	1	76	12	3	0.4
Asia	134	24	50	9	2	0.3
Oceania	167	80	23	11	10	4.8
Europe	998	100	51	5	101	10.2
N&C America	310	44	111	16	166	23.4
South America	26	3	166	19	11	1.3
World	1 659	42	477	12	292	7.3

Forest certification

Forest certification also indicates a drive towards more sustainable forest management and better forest protection. It intends to measure, monitor, audit, and improve forest practices at the forest level. By 2007, about 292 million ha of forests were certified worldwide (UNECE, 2007), and this had increased to about 323 million ha by 2008. This included 202 million ha of forests certified by the Programme for Endorsement of Forest Certification (PEFC), and 104 million ha certified by the Forest Stewardship Council (FSC). These and other small systems cover about 8% of global forest area of 3.9 billion ha of forests, but the influence of certification in setting standards for forest management is much greater than the modest area might suggest. Much of the 3.9 billion ha estimate consists of sparsely stocked, open forests, so certification covers a greater share of closed, productive forests. ISO 14000 environmental certification also covers a substantial share of the industrial and public forests in the world, including the USDA Forest Service in the U.S. and many industrial ownerships in the northern and southern hemispheres—perhaps another 50 million ha at least.

In the U.S., the total forest area certified, with the majority under the Sustainable Forestry Initiative (SFI), amounts to 44 million ha out of 292 million ha, or 15% of the area. Most certified forests in the U.S. are privately owned. In comparison, Canada has more than 139 million ha of certified forest land in 2008, or 45% of its forest area. This includes SFI (39 million ha) and the Canadian Standards Association (CSA, 76 million ha) and the Forest Stewardship Council (FSC, 24 million ha). The majority of these are publicly owned.

In Europe, the Forest Stewardship Council and Programme for Endorsement of Forest Certification (PEFC) dominate. FSC is the only worldwide system; PEFC is a system that provides approval for systems developed that are unique to each country. In Europe, FSC is prevalent on private forest lands in Sweden and public forest lands in Eastern Europe countries such as Poland and Latvia. It also is the largest system in the southern hemisphere, with significant areas on private and public lands in Brazil, Bolivia, South Africa, and Uruguay. PEFC approved systems are prevalent on private forest lands in Finland, France, and Germany, and PEFC approval has been extended to private, plantation oriented systems in Australia, Brazil, and Chile.

In sum, these data suggest forest certification demonstrates a commitment by private and public forest land owners to sustainable forest management practices. Furthermore, this commitment extends from planning to practices to external audits—much more substantial than merely reporting that forest management plans exist.

Environmental regulations

A host of environmental and social regulations affect forest practices on private and public lands throughout the world. The general premise behind these regulations is that private markets or weak government control or both, on public and on private forest lands, will lead to excessive exploitation of forests and not protect externalities and common pool and public goods adequately. Thus the public should intervene to require sets of minimum forest protection standards.

Cashore and McDermott (2004) compared the rigor of the forestry laws in many countries, examining five forest practices and four levels of stringency. The forest practice standards examined included (1) riparian width, (2) clear cut limits, (3) road protection, (4) reforestation requirements, (5) and annual allowable cut limits. The four levels of policy stringency were classed as (1) nondiscretionary/substantive rules, (2) mixed: government discretion and/or limited forest area/substantive, (3) mandatory procedural, and (4) discretionary. The results of this rating for the countries or regions selected are shown below, with a possible range from 10 (most strict) to 0 (least strict):

Rating	Countries/Regions
9	Alberta, British Columbia, California, Russia, USDA Forest Service
8	Ontario, Quebec, Washington
7	Indonesia, Mexico, New South Wales, Oregon, Poland
6	Chile, Latvia, New Zealand
5	Bavaria, Brazil Amazon, Idaho, Madhya Pradesh, South Africa
4	Alaska, Finland, Sweden
3	Japan
2	Montana
1	Louisiana, Virginia
0	Portugal, USA: Alabama, Arkansas, Georgia, Mississippi, North Carolina, South Carolina, Texas

The Cashore and McDermott (2004) ranking is somewhat surprising, placing western Canada, California, Russia, and the USDA Forest Service as having the strictest regulatory environments (a 9 rating); Indonesia fairly strict (a 7); and the U.S. South as the least strict regulatory environment (a 0) in the world. This does indicate the spectrum of regulations in law is certainly wide, and that the strictness of the laws does not seem to correspond directly with the general perceptions regarding environmental policy strictness. Cashore and McDermott were not able to collect data on implementation, such as agency budgets, personnel, fines, etc., which surely are crucial in determining actual policy effectiveness.

In summary, these aggregate data to measure environmental performance, based on management plans and forest certification criteria, are not very conclusive. They do not provide definitive evidence about any differences between public and private lands in environmental protection. Stated intentions about forest management plans do not differ much by ownership. Forest certification is performed roughly equally by private and public owners, and includes a substantial area of forest plantations in the southern hemisphere. Regulatory forest laws are probably stricter on a greater area of public lands in total, but their implementation may be as strong on private lands, especially in industrialized countries.

Government Ownership and Protection

Public forest management, at least in principle, aspires to achieving high environmental standards and realizing important social objectives. Briefly characterizing public forest management for the 3.4 billion ha of public forest land is not easy. The Cashore and McDermott (2004) ratings generally ranked the forestry laws for countries in the world with mostly public forests very highly. In fact, their laws were usually stricter than those for countries or states comprised mostly of private forest lands, except for the west coast states in the U.S. And of course, public forests provide a wealth of goods, services, and benefits to forest users. These include market and nonmarket goods and services, use and nonuse values, and utilitarian and biocentric values.

However, the more important question is not whether public forests provide diverse goods and services, which they of course do, but whether they do so in efficient and equitable means that provide benefits to human forest users and protect environmental services such as biodiversity, water protection, and global geochemical cycles. Global data and many studies on the status of forest resources suggest that public forests are often not efficient, prone to inequitable political resource allocation, and protected poorly by the

laws and agencies charged with forest management (e.g., Repetto and Gillis, 1988; Deacon, 1994; 1995; and 1999).

To date many studies that examined the relationship between ownership and forest management focused on tropical deforestation. The reasons for tropical deforestation include badly designed and poorly controlled timber concessions, subsidies for alternative land uses, higher profitability of alternative land uses, and lack of well-defined property rights. For example, Mendelsohn (1994) finds that poorly-defined property rights may encourage deforestation and suggests that property rights need to be secure. Further, that property rights are only part of the problem and sustainable forest management must be profitable to take place.

In many cases, tropical deforestation has been linked to sectoral and cross sectoral government policies as well as other institutional factors (Barbier and Burgess, 2001). Repetto and Gillis (1988) provide several examples about the impact of government policies on forest conservation. Timber trade restrictions were introduced in several tropical countries to protect and develop domestic industries, create employment, generate revenue through value added creation, and protect the environment. The restrictions frequently resulted in higher harvests, larger forest areas disturbed, and lower incentives for forest management, which in turn accelerated forest land conversion or degradation.

The majority of forests are government owned, and deforestation and decline do take place primarily in government owned forests. These problems are exacerbated by wood output structure in which fuelwood, frequently produced from natural forests under public ownership, dominates. The link between government ownership and forest decline may result from a variety of reasons. The government may convert forests to other uses to promote the achievement of social and development goals, which in some cases are justified and increase social welfare. In many situations, the government simply lacks resources and expertise to adequately manage its forest resources. Yet in other cases, poor government policies or corruption lead to forest destruction (Repetto and Gillis, 1988).

As noted, devolving lands from distant and perhaps disconnected national governments to local government has proceeded as a means to more closely link tenure rights of ownership and management, and enhance forest conservation and protection. Such community based forest management is intended to blend the advantages of local community/government involvement with quasi private local usufructuary rights.

Private Forest land Issues

Private forest ownership and private markets are efficient at producing commodities. In fact private markets can be exploitive, even when managing or harvesting timber on public lands. When private forest exploitation or market failures cause broad social problems, government interventions such regulation, incentives, or education are recommended.

While market failures are often used to justify government intervention, widespread losses in government owned forests suggest that government policy failures may be equally serious factors behind forest decline. In situations where governments lack resources and are unable to develop workable approaches to managing their forests, a greater reliance on private or communal property and free markets has been or should be considered. When considering forest ownership changes, the whole process should amount to more than just a simple transfer of property rights; it should improve the quality of forest management.

Political constraints along with concerns about protecting the environment and fulfilling important social needs make forest privatization difficult, however. To date, several countries attempted to privatize some of their forests resources; the results of forest ownership changes have been mixed.

In Chile, government incentives helped to create two million ha of private plantations which today support a thriving forest industry sector. New Zealand began to privatize its plantations in the late 1980s; today, nearly all plantations (94%) are privately owned (FAO, 2005). Similarly, in South Africa 70% of plantations are privately owned. Several other African countries consider privatizing their planted forests.

On the other hand, forest restitution (the return of previously nationalized private forests to their former owners) in Central and Eastern Europe has sometimes resulted in neglect and forest overexploitation due to unfavorable regulations and lack of management incentives, and also resulted in very fragmented ownership with limited potential for improved management (Siry, 2003).

Since the 1980s, China has also tried to privatize forest management and use rights, while retaining for the time being land ownership. The results are also mixed, depending on the quality of local regulations and incentives for better management (Hyde *et al.*, 2003). These are fairly recent efforts and more time will have to pass before evaluating their long term effects.

Forest ownership should not be considered in separation from other important factors, including government policies, profitability of alternative land uses, and environmental protection needs. Present outcomes only underlie the importance and need to develop effective institutional frameworks for forest production, conservation, and sustainable management, which remains a challenge in many countries. While their exact impact is oftentimes hard to estimate, one cannot underestimate the role that formal and informal institutions play in forest management and its outcomes. Institutions understood as the rules of the conduct are important because they influence production and transaction costs (North, 1997). In this respect, forest management and production do not differ much from other sector of the economy (Barbier and Burgess, 2001; Deacon, 1997). Some countries and regions have managed to successfully develop institutions that promote economic growth and environmental improvement; others have developed institutions that lead not only to economic stagnation but also to environmental decline.

Conclusion

Forest ownership, management, and protection are always dynamic. This importance of land remains crucial in natural resources, for both production and for provision of environmental services. Probably the largest factor influencing land management and protection is ownership. Public forest ownership dominates global forests, with 86% of the area. Private land ownership produces proportionately much more than its share of market commodities that are traded in private markets, most notably timber. Public forests produce a broad variety of goods and services.

Private forests' role in industrial roundwood production is increasing. Much wood volume is harvested from planted forests, where sustainability of harvest is generally accepted; although long-term multiple rotations still need evaluation. Fuelwood, on the other hand, is primarily produced from publicly owned natural forests, where the sustainability of harvest and forest management is a major concern.

Aggregate statistical analyses and the research literature of forest resource data indicated that private forests probably provide more market based goods such as timber; that their environmental performance is not measurably different than that of public forests; and that public forests have no lack of their own problems. Private forests geared towards industrial roundwood production probably provide less biodiversity and environmental benefits in plantation stands, but often contribute well to biodiversity at the landscape scale.

Public forests have a plethora of objectives for forest management, such as dispersed recreation, amenities, fuelwood, and environmental services. While public ownership has protected large areas from exploitation, in many regions poor management, overexploitation, and environmental damage persist. Public forest management is often impeded by government agencies seeking to maximize their budgets and influence, while public oversight and market and business checks are modest. Further, even if laws, management and intentions are good, budgetary and personnel constraints remain a problem. Increasing reliance on private forests and private markets is likely to produce more goods and services efficiently. Private forests also may contribute their fair share to equitable outcomes for landowners, forest users, and society as indicated by the quantitative and qualitative analyses performed here.

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