

# Small-Scale Non-industrial Private Forest Ownership in the United States: Rationale and Implications for Forest Management

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The transaction cost approach is used to explain why small non-industrial private forest (NIPF) ownerships are increasing in the U.S. We argue that the number of small NIPF owners have increased because: 1) a significant amount of forestland is no longer used economically if primarily for timber production, but rather for non-timber forest products and environmental services (particularly where population density is high), 2) when a person makes frequent use of non-timber products and services, owning forestland is more efficient for them because it saves the transaction costs involved in getting them from the market, 3) forestland parcelization takes place when non-timber value increases faster than timber value, and 4) marginal value for non-timber product is diminishing much faster than that for timber production. The paper also discusses implications of the parcelization of NIPF ownerships on forest management.

**Keywords** non-industrial private forest, forest land parcelization, timber supply, transaction costs, economic efficiency, land use change

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## 1 Introduction

Land ownership has many social-economic and environmental implications. Forest ownership is complex and varies in different regions in the U.S. An important segment of forests in the U.S is owned by non-industrial private forest (NIPF)

landowners, who have diverse characteristics, and their objectives are diverse. While some have argued that the name of NIPF is not appropriate (see, Finley et al. 2001, Wiseman 2003), the term has long historical use and data associated with it. The number of NIPF owners in the U.S. is large. In the mid-1990s it consisted of an estimated 9.9

million ownership units that collectively held about 363 million acres or 49 percent of the nation's forest land, with about 94% of NIPF ownerships (or 9.3 million) being individuals (Birch 1996). A recent survey shows that the total number of individual NIPF owners increased from 9.3 million in 1994 to 10.3 million in 2002 (Butler and Leatherberry 2004). This change has important implications. Harrell (1989) forecasted the share of U.S. timber supply from NIPFs would rise to 60% by the year 2030.

Over the past several decades, many studies have addressed the "problems" of NIPF ownerships (e.g., Clawson 1957, Row 1978, Binkley 1981, Cabbage 1983, Siry 2002). These problems include: 1) discrepancies between individual utility (or profit) maximization and social objectives, 2) the low efficiency of small scale forest management, 3) ignorance of forest management practices among NIPF owners, and 4) reluctance of NIPF landowners to invest in forest and/or undertake timber harvesting. Except for the first of the listed problems, all these problems are related to the nature of small scale ownerships. Indeed, with the exception of forest lands managed by Timber Investment Management Organizations (TIMOs), the majority of NIPFs (mostly owned by individuals) are small: in the 1990s, 40% owners owned less than 10 acres and 96% owners owned less than 100 acres (Birch 1996).

The "problems" identified for small-scale NIPFs have recently received greater attention because of accelerating parcelization. Parcelization is the reduction in size of forestland ownerships. It refers mainly to ownership subdivision rather than forestland fragmentation. Forestland fragmentation means the breaking up of large tracts of forest into smaller fragments. Increase in the number of small NIPF owners is synonymous with parcelization. The increase in individual owners (by 11% from 1990 and 2000) occurred primarily in the small holder category (less than 50 acres). In the U.S., large forestland ownerships with a primary purpose of timber production have remain largely intact, but the acreage in midsize woodlots is shrinking and the class representing the smallest landholdings is growing (Birch 1996, DeCoster 1998). Currently, each NIPF owner holds an average of 24 acres, and it is expected the average size will drop to 17 acres by 2010

(Tyrell and Dunning 2000).

Although many studies have been conducted (e.g., Greene and Blatner 1986, Romm et al. 1987, Hyberg and Holthausen 1989, Kuuluvainen 1989, Newman and Wear 1993, Kuuluvainen et al 1996, Karppinen 1998), there is not any convincing economic explanation on why the number of small NIPFs owners has been increasing. In this paper we attempt to provide such an explanation using the transaction cost approach. Our transaction costs cover both the production and consumption of all forest products. Providing a reasonable explanation for increasing small NIPF ownership will contribute to the design of appropriate policies that address the problems associated with small NIPF ownerships. We first begin with some historical background on the evolution of forestland ownership in the U.S., followed by our economic explanation. We address the implications for forest management in our final section.

## 2 Historical Context

NIPF ownerships vary greatly from country to country. Historical context explains a great deal of the difference since the institution of ownership has some path dependence and rigidity. The current distribution of the private forestland and the dynamic processes of change in the U.S. are related to the country's historical and institutional arrangements, such as land disposal policy, over the last 300 years. Current NIPF ownerships come from inheritance, market, or land use changes (i.e., from farm to forests). In other countries such as Canada (particularly West Canada), forestlands are largely held in public ownership. Public ownership is less responsive to forestland markets. In Australia, Alexander and Hall (1998) see that the lack of historical farm forestry is the major impediment to small-scale forestry development.

In colonial America, England made large grants of land to the London Company, the Plymouth Company, and later to other individuals and groups. The objective of the colonial governments was to establish compact settlements of small, family-size farms. A fear of monopoly made the governments favor free market and

**Table 1.** Timber land ownership in the U.S., 1952–2002.

Year	Public	Industry	Total	NIPF Farmer	Other private
1952	145, 436	58, 979	304, 441	172, 781	131, 660
1962	146, 157	61, 434	307, 528	143, 645	163, 883
1977	138, 169	68, 937	285, 250	114, 485	170, 765
1987	131, 025	70, 347	283, 564	95, 791	187, 773
1992	131, 493	70, 455	287, 605	82, 484	205, 121
1997	145, 967	66, 858	290, 840		
2002	147, 280	65, 596	290, 663		

Sources: Forest Resources of the U.S., 1992, 1997, 2002. Unit: 1000 acres.

Note: Data regarding the ownership between farmer and other private are not available probably because it is becoming more difficult to distinguish the farmers and non-farmers.

small landownership. Gradually, lands in the 13 colonial states were dispersed to numerous individual owners. As settlement extended westward after the Revolutionary War, the territory beyond the Appalachians was given to settlers through land bonuses to war veterans (61 million acres), grants, and sales (Clepper and Meyer 1965, Cubbage et al. 1993).

The Homestead Act of 1862 was designed to rapidly populate the western part of the country, which had been obtained through the Louisiana Purchase and treaties between the U.S. and Mexico. A clamor for liberalism led to the formation of the Free-Soil party in 1830, which called for free distribution of federal lands. The Homestead Act allowed anyone to file for a quarter-section of free land (160 acres) if improvements were made within 5 years. Acceptable improvements included building a house, digging a well, plowing 10 acres, fencing, or living on the land. Additionally, a settler could claim a quarter-section of land by “timber culture” (commonly called a “tree claim”). This required that the settler plant and successfully cultivate 10 acres of timber (Hibbard 1965). It has been estimated about 287 million acres of public land were claimed by homesteaders (Cubbage et al. 1993).

In 1891, U.S. Congress enacted the General Revision Act in order to reverse the massive process of land disposal. Extensive public ownership of forest land in the U.S. began in the late 1800s, and by the middle of 1900s a private-public division of forest landownership was firmly established. The major reasons for public forestland ownerships were environmental concerns and conservation movement. Today, a large amount

of forestland in the Northwest is still held by the federal government. Private industry, which initially obtained forestland from the federal government, expanded their forestland ownership dramatically in the first half of the 20th century and then gradually stabilized (Table 1).

The existence of a large number of farms in the 1900s is an important factor in what ultimately became a large number of individual forestland ownerships. In 1920, there were 6.5 million farms in the U.S. with an average size of 149 acres (USDA 1997). Many farmers held forestland, and forestry has often been viewed as a type of agriculture. In the early 1900s, farmers were thought to be most desirable owners of private forestland and able to devote the most care and attention on the management of their woodlots. Farm woodlands contributed to total farm income; and holding some forest land on a farm is often considered to be economically efficient in financial diversity and the use of labor and capital. Even today, forestry is still important for farmers. For example, Selter (2003) observed that farms holding larger amounts of forest land more likely survived in Germany. During the period from 1971 to 1995, 90% of the enterprises that managed more than 5 ha (12 acres) forest land survived. These farms were not only able to continue as forest enterprises, but also as mixed farms, retaining their agricultural land. Over the same period, farms with smaller forest land holding were less likely to survive.

Many farmers who previously had not owned forestland later became forest owners when their farm land reverted to forest. Large scale of conversion from agricultural land to forestland has

occurred since the mid 20th century due to the loss of competitiveness of agriculture on marginal lands, as along with the implementation of government incentives program promoting reforestation. The southern states, previously dominated by agriculture, have seen the biggest expansion in small scale forest ownership due to favorable climate condition for tree growth and the decline of agriculture.

The biggest change since the 1950s has been within the NIPF category, mostly the decline in ownership by farmers and the rise of forestland ownership by individuals outside of traditional farming and forestry operations. More recently, the major trend has been the forest product industry's selling timberland to TIMO and NIPF owners. In the U.S. South, it has been estimated that about 25% of forest industry owned timberlands were sold to TIMO, REIT (Real Estate Investment Trust) and other NIPF owners.

### 3 The Demand for Small-Scale Private Forestland

With the exception of Sutton (1973), a majority of studies (e.g., Clawson 1957, Wilstrom and Ally 1967, Noer 1975, Row 1978, Gardner 1981) have found that small parcel size significantly increases the production costs per unit in harvesting operation, plantation, and management. Since most NIPFs are small in size, it is believed that NIPFs have lower economic efficiency than industrial private forests (Doll and Orazen 1978, Cabbage, 1983). Other studies have shown that timber supply has a positive relationship with holding size (e.g., Binkley 1981, Greene and Blatener 1986, Romm et al. 1987). Towell (1982) claims that, by a conservative estimate, private NIPFs are producing only half or less of what they are capable of, and Siry (2002) shows that NIPFs are generally managed less intensively than their larger counterparts. Only a few studies have found land holding size to have minor influence on timber supply (Dennis 1989, Hyberg and Hothausen 1989, Kuuluvainen 1989).

This raises the question of why the number of NIPF owners, particularly those with small forest landholdings, continues to rise nation-wide, even

though such ownership is less efficient for timber production. It is well known that, like NIPF ownerships, manufacturing began with small family owned firms, but the smaller firms were gradually replaced by larger scale firms over time. In agriculture, although family farms are still important in North America, farm size has dramatically increased from an average size of 149 acres in 1920 to 500 acres in 1997 (USDA 1997). Why NIPF holdings are getting smaller while manufacturing and manufacturing activities are concentrating? What made small NIPF holdings so popular, in spite of its lack of efficiency in timber production, in contrast with manufacturing and agriculture in the U.S.?

It should be noted that parcelization is also occurring in Europe and elsewhere. Harrison et al. (2002) observed, "throughout the world, there appears a trend to move from industrial forestry towards landholder-based forest management and community forestry and small-scale (often referred to as 'smallholder') forestry is of growing importance." Thus, a convincing explanation for increasing small forestland holdings is important to global forestry.

One possible explanation for the increasing number of small forestland holdings is related to the partitioning of forestland during generational transfers. This is not convincing since there are no constraints that prevent inheritors of forest land from selling it. When they choose to keep a small piece of forestland, the revealed value or utility of holding must be larger than selling it. Furthermore, Jacobson (1998) finds 70% of forest owners acquired their land through purchase, and a survey reveals a similar trend in Alabama, where 64% of landowners acquired their land through purchase or trade. Thus the majority of new owners get their land from purchase, not inheritance.

Another possible explanation is that demand for forestland increases as population and income grow while forestland (or land in general) supply is limited. However, agricultural lands are concentrating as population and income grow at the same time when forestlands are parcelizing. It is interesting to note that only the small holders (less than 50 acres) are increasing rapidly, while mid-size holders (50–100 acres) are decreasing. A third explanation is that inheritance taxes during generational transfer of forestland cause forest

parcelization. However, Mehmood and Zhang (2001) have shown that taxes are not a significant factor in forest parcelization.

Finally, a common explanation is that forests have multiple uses and an increasing number of landowners use their forestland for residential purposes, aesthetic enjoyment, hunting, moral commitment, nature conservation, estate investment, etc. in addition to timber production (see, Karppinen 1998, Hugosson and Ingemarson 2004). Recent surveys (e.g., Butler and Leatherberry 2004) indicate that timber production is not a primary objective for most NIPF owners. This explanation is plausible. But our explanation is that it is economically rational to owning forestland (thus the goods and services a forest can provide) rather than obtaining the same goods and services from other means (such as the market) when the demand for the service increases.

Because of the multiple objectives for NIPF owners, studies are increasingly using utility rather than profit maximization to analyze their economic behaviors (e.g., Binkley 1981). Utility maximization can better explain the difference in timber management and supply between different ownerships, and the trade-off among different outputs and management intensity under a given amount of land. But utility models have not considered that landowners also make decisions about whether to own forestland, and how much to own, and adjust the size or quality of their forestland while trying to maximize their utility. Utility maximization has been limited to the trade-off among the different outputs rather than between trade-off between using market and non-market, and this may be why NIPF models have generally failed to capture the dynamics of NIPF landholding changes.

A person who has wants of multiple products and services from forestland is faced with a choice of whether to get them from forests owned by others through the market or by owning forestland. There has been an increase over time in the amount of goods and services that are purchased from market, due to increased specialization and trade. Coase (1937) claims that the relative transaction costs through market versus within the firms determine boundary of firm. Correspondingly, regardless of the objective for owning forestland, if there are no transaction costs it does

not matter who owns the forestland. If a person can buy forest-related goods and services from market for lower cost than forest ownership, there is not need to own forestland.

Although non-timber forest products and services are being consumed more frequently, the market for these non-timber products is not well developed. This results in relatively higher transaction costs of obtaining non-timber forest products from the market compared with getting them directly through forestland ownership. Therefore, as demand for non-timber forest products and services grows, more and more people are purchasing a piece of forestland and entering the ranks of small NIPF landowners. In other words, the gains in consumption efficiency (in terms of saving in transaction costs) outweigh the losses in timber production efficiency; thus the number of small scale forest holdings increases and forest parcelization continues.

We shall further examine the relative changes of the transaction costs in owning forestland vs. getting forest-related services from market. In doing so, we consider all forest products and costs.

*Labor transaction costs:* Forest management used to be labor intensive. For forest landowners who own or control labor, there are some advantages in owning the forestland. The nature of forestry makes it difficult to monitor and measure labor productivity. In other words, transaction costs of hiring labor in forestry are high (Zhang 2001). Traditionally farmers were the major small NIPF owners. The transaction costs of labor can be divided into fixed and variable costs. The fixed cost is viewed same regardless long term (whole year) or short term (seasonal) job, while the variable cost is proportional to working hours. A farmer who works on his own farm for 8 months may wish to find an additional 2 months job (or a farmer who works on his own farm for 4 days a week may wish to find a job one day per week). But it will take time – perhaps a few weeks – to find a job. So the cost of seeking job per unit of earnings is extremely expensive for the farmer. Therefore, considering the cost of seeking an off-season job, it is reasonable for farmers to own some NIPF as a source of self-employment at the off season even though the shadow value of self-employment may be lower than the wage off-farm. In addition, the opportunity cost

of a self-determined working schedule could be small since the work may be a form of recreation. This is similar to the way that many people use their backyards to grow vegetables, even though it does not make sense to use a person's regular wage to calculate the opportunity costs of the time expended. Timberland management for many small land owners is often fun and brings contentment.

*Capital transaction costs saving:* Investing in timberland for land appreciation or timber production occurs when investors believe that the return is higher than other alternatives. As timberland investment becomes more capital intensive, more capital owners are becoming forestland owners. Using borrowed money to invest in small NIPF is unlikely since NIPF owners may need to pay higher capital costs than corporations or large forest landowners. Evidence shows that many NIPF owners are wealthy, and thus they do not need borrow much money to invest in forestland to meet their growing need from forests.

*Forest product (timber and non-timber) transaction costs:* The transaction costs for marketing timber are high. "No market I know of is like the timber market. A phone call can get you a firm price on many common items: stock, bond, groceries, clothing, commodities, autos, and so on. But a phone call to 20 timber buyers will likely get you 20 different estimates, and each buyer will want to see your timber before making a firm offer" (Vardaman 1988). That is why forest industry owns a significant amount of timberland at least in the past. Transaction cost for non-timber products, especially recreational goods from forests, may be even higher. It is costly to go through the stages of searching, contacting, negotiating, and purchasing these products and services, such as renting a summer house or acquiring hunting access from other owners. Some recreation products generated from the forests cannot be moved and do not have standards (beautiful is in the eyes of the beholder); yet they can be consumed frequently. Asymmetric information is everywhere, and transaction costs become paramount. Thus, with increasing demands for non-timber forest products and services (along with increases in population and income) and high transaction costs for getting these products and services from the market, owning forestland becomes more efficient

and logical.

The above analyses are to illustrative our point that NIPF owners may save various transaction costs. Saving transaction costs of labor may have been a major reason for forest ownership by farmers. Recreational service consumers and capital owners may purchase forestland to save the transaction costs for non-timber forest products and capital. Currently a growing sector of small forestland ownerships in the U.S. is wealthy individuals who buy a piece of land for residence, second home, recreation, or investment. Evidence shows that more and more retired people and white collar professionals are holding NIPFs, and investment and timber income is only the 6th and 7th place in the list of their holding reasons (Tyrrell and Dunning 2000, p. 10).

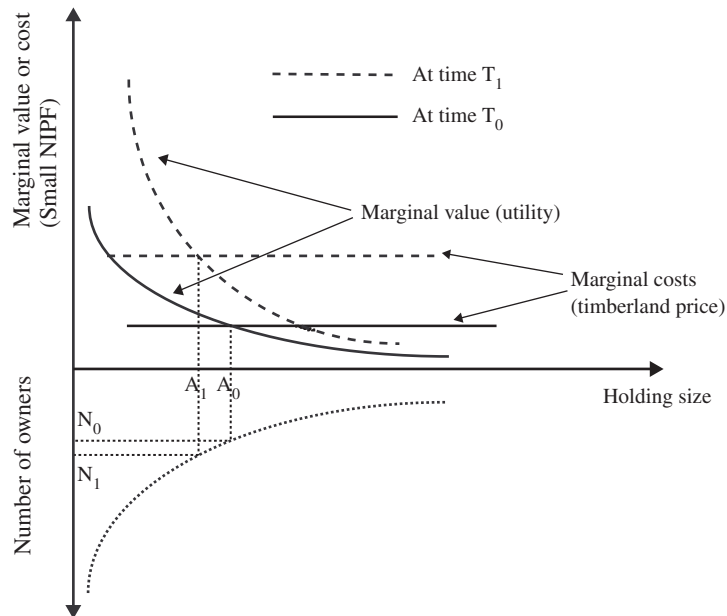
In summary, the growing demand for small NIPF is because:

- 1) many NIPF owners have some saved capital or stable and high income, or are at least free of debt, and are able to purchase forest land (or they are farmers and expect to use forestry as seasonal employment);
- 2) many NIPF owners are retirees whose opportunity costs for time are low and who enjoy the increased space and peaceful living on forest land;
- 3) many NIPF owners have some special interests in nature and environment (such as hunting, bird watching, privacy etc., which are needed and consumed frequently).

## 4 Shrinking Holding Size of NIPF Owners

As the number of NIPF owners increase, NIPF owners' holding sizes are shrinking. This can be explained from dynamic change in demand for and supply of forestland (see Fig. 1).

A few points need to be clarified: First, the optimal holding size is when the marginal utility is equal to market price of forestland. Second, this figure is only used to explain small forestland ownerships whose primary objective is not timber production. Third, marginal cost refers to the timberland price; the marginal value is the utility of the owners who have multiple objec-



**Fig. 1.** Shrinking holding size and increasing number of small NIPF owners.

tives (the utility curve shifts upward as income increases). Fourth, the two utility curves at two income levels are not parallel. The reason behind is that the non-timber value has increased relatively more than timber from time  $T_0$  to time  $T_1$ . Intuitively it means at time  $T_1$ , small NIPF owners place more weight on non-timber value as income increases. A similar illustration can be found in Zhang (2005).

Note that for timber production, the holding size is based on the production efficiency of timber production, and holding size is thus expected to increase further. On the other hand, for the consumption purpose of many NIPF owners, the optimum size is based on consumption efficiency. So it is possible that the size of forestland holding for timber production can increase, at the same time that the overall size of NIPF ownerships decline. The smaller parcels are used more for non-timber purposes, while the larger sizes serve for timber production.

This is consistent with evidence from U.S., Finland and other countries. In the U.S., the largest owners thus far have remained intact, but the acreage in midsize woodlots is shrinking and number of owners in the small holding class is growing (DeCoster 1998). In the Southern U.S., tracts of

fewer than 10 acres increased by 51%, 10–49 acre tracts increased by 83%, and 50–99 acre tract by 18%; but the holdings between 100–1000 acres have declined by 15%; tracts over 1000 acres have increased by 9% from 1978 to 1994 (Moulton and Birch 1995). From 1993 to 2003, the number of the owners who hold less than 50 acres has increased by about 20%, while owners holding between 50 to 100 acres have slightly decreased (Butler and Leatherberry 2004).

Similarly, Bliss and Sisock (1998) find that the share of private forestland owned by the largest 1% of the owners in Alabama increased from 51% to 58% from 1978 to 1993. In Finland the number of medium-sized forest holdings (20–50 ha) is decreasing, while both the number of small- and large-sized holdings are increasing (Ripatti 1999). Our explanation is that production-oriented owners increase their holding size because of the economies of scale for timber production, while consumption-oriented owners (small forest landowners) reduce their holding size when opportunity cost of land holding (timberland price) increase. Put it in another way, the price for forestland used for consumption is increasing faster than that for forestland used primarily for timber production.

## 5 Implications for Forest Management

Due to the economic inefficiency of timber production and potential land use change associated with small NIPF ownerships, there are growing concerns about the impact of parcelization on forestry and the environment. Such concerns are not unique in the USA. In Finland, some attempts have been made to circumvent the partitioning process. It was proposed by the Finnish Forest 2000 program that the partitioning of NIPF holdings into units small than 10 ha shall be made illegal, even though this policy has never been implemented in practice (Ripatti 1996).

We would like to discuss the potential impacts on forestry by the parcelization.

### 5.1 Converting to Non-Forest Use

The United States loses more than half a million acres of privately-owned timberland to development each year, and NIPF has often been claimed to be one of the causes and/or victims. On the one hand, NIPFs might be more easily converted to non-forest use if the value of other land use (e.g., market value for development) is higher. On the other hand, NIPF owners may prevent forestland from converting to other uses, since they value the forest more than the value from sole timber production perspective. Parks or urban forests can be found in many big cities for supplying environmental services. Therefore, forest cover could rise with more NIPF owners. Interestingly, Drzyzga and Brown (2002) find more small scale private forests lead to higher forest cover. Stein et al. (2005) also pointed out that local jurisdictions and states can target efforts to prevent or reduce conversion of the most valuable forest lands to keep private working forests resilient and productive.

In long term, multiple use forests that are less intensively managed for timber production could contribute to forest expansion. A higher population density, everything else being equal, increases the absolute land value in every use, but mostly for residential and industrial use. Land in either agriculture or forest is likely to be converted to

residential and industrial uses as the economy and population grows. As forest land can provide not only timber, but also in situ value such as recreation, environmental amenity, value of forestland is rising faster than timber prices. Such non-timber value plays a positive role in retaining forests. For example in New York State, 63% of the land was forested in 1780, 25% in 1880 and 63% again in 1980 and the percentage is even higher today (Larson 2000). Evidently, NIPF owners who value the non-timber forest products are willing to pay the opportunity costs for not converting to other uses or more “efficient production forestry.”

### 5.2 Management Intensity

As mentioned earlier, small scale NIPFs have lower management intensity for timber production. Typically, as the average parcel size declines to some threshold, owners are less likely to actively manage their forests for sustainable timber production. As shown in Fig. 2, NIPFs have a much lower percentage of timberland in planted pine, but very high percentage of land in non-stocked category, and within planted pine, NIPF has lower percentage of land in high yield.

It is likely that there are three major reasons for the reduced management intensity: 1) intensive management is difficult and more expensive on the small tracts; 2) NIPF owners prefer less intensive management in order to obtain greater non-timber values at the expense of timber production; 3) the small scale NIPF owners lack the knowledge and technical that would enable them to improve their timber management.

Even though many NIPF owners indicate timber production is not their primary objective, they are still responsive to timber price. McComb (1975) and Newman and Wear (1993) find that timber production and profit maximization are still objectives of many NIPFs owners. Fig. 2 indicates that NIPF owners prefer hardwood and longer rotation. Maybe it is less intensive in terms of timber production, particularly wood for pulp and paper, but more intensive in non-timber forest management, which may be good because it also generates positive externalities to the society.



**Table 2.** Management intensity of Forest Industry, TIMO, and NIPF.

	2000			2020		
	Industry	TIMO	NIPF	Industry	TIMO	NIPF
<b>Planted pine</b>						
Standard	14	6	11	2	2	8
Superior	46	38	64	25	28	46
High Yield	40	56	25	73	70	46
<b>Natural pine</b>						
Lower	61	59	79	71	40	52
Higher	39	41	21	29	60	48
<b>Oak-pine</b>						
Lower	95	75	85	95	73	76
Higher	5	25	15	5	27	24

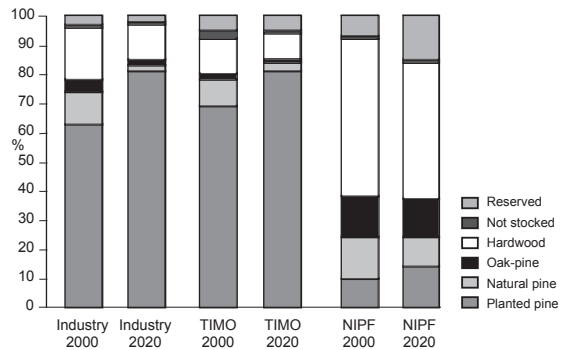
Source: Siry (2002)  
TIMO (Timberland Investment Management Organization)

### 5.3 Timber Supply and Division of Land Use

Decreasing timber supply has been the major concern arising from decreasing land holding size. If timber is seen as a private good, there probably is no need to worry since the market can adjust. When timber prices rise, land value for industrial timber production will also rise, meaning that it will be more expensive for NIPF owners to own land for consumption, not timber production, purposes. At a minimum, high timber prices will defer the land sales from industrial owners to small land holders.

Policy-makers need to pay attention not just to the growing number of NIPF owners, but also the total acreage they hold. From 1993 to 2003, the total holding land by small NIPF owners (less than 50 acres) had increased by 10 million acres, which is small when compared with total forestland in the U.S. A slight increase in timber productivity or timberland expansion can compensate the reduction of reduced timber supply from the expanded small ownership.

Globalization of timber supply and increase in timber productivity has prevented substantial increase in timber price. Other goods and services from land, such as residential houses, cannot be imported. Consequently the value of other uses/or multiple uses (particularly the residential and recreational) for forestland rises in some regions (e.g., the U.S.) faster than that of the value for



**Fig. 2.** The structure of species of the forest land in forest industry, TIMO (Timberland Investment Management Organization) and NIPF (Data sources: Siry 2002).

timber production. It is likely that private forests, particularly those in smaller ownerships, will not intensively be used for timber production, simply because it is not wise emphasizing timber production at the expense of large non-wood benefits from the forests. Timber supply from the Southern hemisphere is becoming more and more important since it is more economically efficient.

What we have witnessed in the last few decades is an increasing number of small forestland holders due to division of land use ownership. Domestically, some forest lands are parcelized and used primarily for non-timber productions, a phenomenon that can be explained by transaction costs. While some forestlands have been used more intensively for timber production as technology changes, more forestlands are managed less intensively for timber production in order to get more non-timber benefits. Globally, timber supply from other countries has largely filled in the widening gap between domestic supply and demand.

## 6 Final Remarks

Before World War II, farmers were seen as the best managers for private forests, while the forest industry was viewed only as loggers and speculators. Since then, forestry industry has come to

play a major role in private forest management while NIPFs have been criticized for managing their land less intensively.

Like Tyrrell and Dunning (2000), we ask whether we need to prevent or slow parcelization. First, land parcelization is a process of exchange between the land rich but cash poor people and land poor but cash rich people. The exchange generates social welfare and leads to welfare redistribution. Some studies have found that more small private forest ownerships lead to social-economic development (Sisock 1998). Second, as argued throughout the paper, small scale NIPF expansion has its own economic rationale – the efficiency of direct consumption of forest-based products and services that save the transaction costs. NIPF expansion may not necessarily be associated with forestland loss. Decreased management intensity and timber supply could be compensated through productivity increase in large industrial lands and international trade. The dynamics of holding size change (or parcelization) is an adjustment of the supply for and demand of the forestland. Any changes in individual characteristics (e.g., change in income and age), society (e.g., population growth and wealth), and environment (e.g., the accessibility to recreation resources from public lands) will change the holding size and management strategies.

We do not suggest that there are no problems with small-scale NIPFs. Forests not only produce timber but also generate many ecological and environmental services that are public goods. It is widely agreed that parcelization, when accompanied by fragmentation, has negative effects on biodiversity, watersheds, and ecosystems. We argue that the greatest need is for more effective policies to deal with the fragmentation effects of parcelization. As pointed out in Larson (2000), “attention should focus on the more important goal of helping new and old forest owners manage their forest effectively, rather than preventing ‘[parcelization]’ per se.”

There is a need to compare and examine the costs and benefits (both social and private) of different policies. So far, a variety of management approaches have been suggested to reduce the diseconomies of small NIPFs. The most common way is to provide technical and financial support from government to the small land owners.

Row (1978) suggested that effects on financial returns can be reduced by managing small tracts in groups, cooperatives, or other aggregations of owners. There are practices in other countries, such as collaboration and changing practices in timber selling, road construction, capital markets, and tools and machinery, that could be implemented in the U.S. to support small scale of NIPF landowners (e.g., Uusivuori and Kuuluvaainen 2001).

Schelhas (2000) proposed several means to support small land owners: 1) establishing business entities for multiple-owner forest management, 2) fostering forestry activities across ownership boundaries; 3) developing multi-purpose forest management to meet forest owner’s multiple objectives; 4) using different management strategies for different sized forests, and 5) developing partnership with diverse forest interests.

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