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

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Rationale and Implication of Small-Scale Non-industrial Private Forest Ownership

Abstract

The paper explores rationales of the rise and expansion of small scale non-industrial private forestry. The historical aspects of the small scale of forests are also briefly reviewed. In particular, the paper seeks to explain the reason for the increasing number of nonindustrial private forest ownerships with smaller holding size or private forestland parcelization. The main arguments are that small-scale family forestry expands with economic needs that in turn reflect structural changes in demand for and supply of forest products and services. We suggest that the cause of the increasing number of small-scale family forests should be focus on changes in the demand for forest products and services, while the causes of shrinking forest landholding ownerships should be examined with reference to the supply of forestland. Under this interpretation, small-scale family forest owners behave more like forestland consumers than timber producers. Thus efficiency in small scale family forestry is reflected will be found in the efficiency of forestland consumption for non-timber purpose for transaction costs savings, not in efficiency of timer production. Policy analysts should expand their focus beyond the analysis of production to consumption and distribution efficiency.

Key words: forest land parcelization, timber supply, transaction costs, economic efficiency, land use change, the U.S.
1. Introduction

Land ownership is a key factor in many social-economic and environmental issues, and forest ownerships are particularly complicated and diversified. One segment of forest land owners is the non-industrial private forest (NIPF). The NIPF owners are diverse in characteristics and land ownership objectives, and some argued that the name of NIPF is not appropriate (see, Finley et al., 2001; Wiseman, 2003). The number of NIPF owners is large, and they represent an important component in forestry. In the United States in the mid 1990s, an estimated 9.9 million private forest-land ownerships units held about 390 million acres of forest land. About 94% of the private ownerships are individuals, collectively holding 59% of the private forest land (Birch 1996) and supplying about half of the country’s round wood timber supply. The share of timber supply is expected to rise to 60% by the year 2030 (Harrell 1989).

Over the past several decades, there have been many discussions, meetings, articles and arguments that talk about the “problem” of NIPFs (e.g., see Clawson 1957, Binkley 1981, Cubbage 1983, Row 1978, Siry 2002). With the exception of non-industrial private forests owned by Timber Investment Management Organizations (TIMOs), the majority of NIPFs are small scale: 40% owned less than 10 acres, 96% owned less than 100 acres (Birch 1996). In this paper we only examine small-scale forest ownership, and thus use the term small scale non-industrial private forest to distinguish family-owned NIPFs from the institutionally-owned TIMOs. The small land holding is still under subject of Parcelization, the reduction in size of forestland ownerships as a result of properties during land transfer. It refers mainly to the ownership subdivision, rather than forestland fragmentation which refers to the breaking up of large tracts of forest into smaller fragments. In the U.S., large forestland ownerships with a primarily purpose of timber production remain largely intact at present but the acreage in midsize woodlots is shrinking and the class representing the smallest landholdings is growing (Birch 1996, DeCoster 1998). For example, from 1978 to 1994, the total number of all private timberland ownerships in the U.S. South increased by nearly one-third, or 1.1 million units. Acreage held in tracts of <10 acres increased by 51%; 10- to 99-acre tracts increased by 25%; 100- to 499-acre tracts decreased by -15%; 500- to 999-acre tracts decreased by -9%; and 1,000+-acre tracts increased by +9% (Moulton and Birch 1995). Preliminary results from the most recent survey by USDA indicated that the total of family owners had increased by 11% (from 9.3 million to 10.3 million) from 1994 to 2002 (see Forest Inventory and Analysis: National Woodland Owner Survey 2003). Currently, NIPF owners hold an average of 24 acres per individual, and it is expected the average size will drop to 17 acres by 2010 (Tyrell and Dunning 2000).

In order to design appropriate policies that encourage NIPF owners to manage their land to meet social goals, we need to understand these landowners, their objectives and behaviors. Although many studies have been conducted in these areas (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), it is still not clear why NIPFs appear, survive and even expand since, from a timber production point of view this decreases efficiency. In this paper we attempt to provide a rationale for NIPF expansion, in particular, to address why the number of smaller NIPF ownerships has been increasing. We will begin by providing some historical background on the evolution of forestland ownership in the U.S., followed by possible
economic explanation of NIPF expansion. We then address the implications for forest management in our final discussions. Our main conclusions are that NIPF expand due to economic needs and reflect efficient consumption markets since NIPF owners behave more like forestland consumers than timber producers. We suggest policy analysts should expand their focus beyond the analysis of production to include consumption and distribution efficiency.

2. History

The share forest ownerships in NIPF vary greatly from country to country, and historical context explains a great deal of the difference since the institution of ownership has some path dependence and rigidity. Alexander and Hall (1998) pointed out that the major impediment to small-scale forestry in Australia is the lack of historical farm forestry in Scandinavia and Japan. The present forest ownership in the U.S. has developed over three hundreds years and cannot be understood without considering that long history. Earliest land ownership policies in the U.S. had great influence on the current pattern. For instance, the first objective of colonial politicians was to build economic and military strength and the usual objective in New England was to establish compact settlements of small, family-size farms. Free market thinking and a fear of monopoly plays an important role in shaping the forest ownership throughout the history. American Revolution and the demographic traditions which it fostered strengthened the trend towards small ownership.

Since England intended to claim all North America when it colonized the New World, the Crown made large grants of land to the London Company, the Plymouth Company, and later to other individuals and groups. Gradually, the lands of the 13 original states of the Union came to have numerous individual ownerships. As settlement extended westward after the Revolutionary War, the territory beyond the Appalachians was given to settlers through land bonuses to war veterans and grants and sales (Clepper and Meyer 1965). After the Louisiana Purchase obtained all the western territory, one of the most significant policies was the Homestead Act of 1862, which was designed stimulate populate the new territory quickly. A clamor for ever-increasing liberalism in the disposition of these lands led to the formation of a demand of the Free-Soil party in 1830, which called for free distribution of such lands. The Homestead Act allowed anyone to file for a quarter-section of free land (160 acres) if improvements were made within 5 years. The improvement activities include building a house, digging a well, plowing 10 acres, fencing, or living in the land. Additionally, a settler could claim a quarter-section of land by "timber culture" (commonly called a "tree claim"). This required that you plant and successfully cultivate 10 acres of timber (Hibbard 1965).

Another aspect that needs to be noted is the strong link between forestry and farming. Forest management has often been viewed as kind of agriculture. Farmers were thought to be most desirable owners of the private forest land and able to devote the most care and attention on the management of their wood lots. In 1920, there were 6.5 million farms in the U.S. with average size of only 149 acreages (USDA 1997). The large number of farms could be an important factor in what ultimately became a large number of individual forestland ownerships. Farm woodlands also contributed significantly to total farm income; and holding some forest land on a farm is often considered to be economically efficient because combining forestry and agriculture allow financial diversity and efficient 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 were more likely survive 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.

Table 1: Timber land ownership in the U.S., 1952-2002.

<table>
<thead>
<tr>
<th>Year</th>
<th>Public</th>
<th>Industry</th>
<th>NIPF Total</th>
<th>Farmer</th>
<th>Other private</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952</td>
<td>145,436</td>
<td>58,979</td>
<td>304,441</td>
<td>172,781</td>
<td>131,660</td>
</tr>
<tr>
<td>1962</td>
<td>146,157</td>
<td>61,434</td>
<td>307,528</td>
<td>143,645</td>
<td>163,883</td>
</tr>
<tr>
<td>1987</td>
<td>131,025</td>
<td>70,347</td>
<td>283,564</td>
<td>95,791</td>
<td>187,773</td>
</tr>
<tr>
<td>1992</td>
<td>131,493</td>
<td>70,455</td>
<td>287,605</td>
<td>82,484</td>
<td>205,121</td>
</tr>
<tr>
<td>1997</td>
<td>145,967</td>
<td>66,858</td>
<td>290,840</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>147,280</td>
<td>65,596</td>
<td>290,663</td>
<td></td>
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</tr>
</tbody>
</table>

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.

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. Private industry firms expanded their forestland ownership dramatically in the first half of the 20th century and then gradually stablized (see Table 1). The biggest change since 1950s has been within the non-industrial private forests, most notably the shift from farm forest to other kinds of NIPFs as individuals outside traditional forest business began to acquire more private forest land.

3. Economic Rationale
3.1 The efficiency of NIPF

The efficiency of the NIPF for timber production has been questioned for a long time. With the exception of Sutton (1973), a majority of studies (e.g., Clawson 1957, Wilstrom and Ally 1967, Row 1978; Noer 1975; Gardner 1981) have found that small parcel size significantly increases the production costs per unit in harvesting operation, plantation, and management. Since NIPF are in general is smaller in size than industrial forest, it is believed that NIPFs have lower economic efficiency than industrial private forests (Doll and Orazen 1978, Cubbage, 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) even claimed that, by a conservative estimate, private nonindustrial forestlands are producing only half or less of what they are capable of. More recent surveys have also showed that NIPFs are generally managed less intensively than their larger counterparts (see Siry 2002). Only very a few studies have found that land holding size has only slight influence on timber supply (Dennis 1989, Hyberg and Hothenaus 1989; Kuuluvainen 1989).

It is not a surprise that NIPFs have lower efficiency in terms of timber production based on the economy of scale. However, the number of owners with decreased holding size continues to rise across the world. As we know, manufacturing began with small family owned firms also, but smaller firms were gradually replaced by firms with growing scale through time. In
agriculture, although family farms are still important in North America, the farm size has been dramatically increasing, going from an average size of 149 acres in 1920 to 500 acres in 1997 (USDA 1997). This trend is more or less same in Europe. So the question is: What is the difference between agriculture and forestry? There must be some economic rationale for small scale forestry, or it would not have survived for centuries and continue to expand.

One explanation for the larger number of small land holdings is related to the partitioning of forest land during generational transfers. However, if dividing the forestland dramatically reduces the total value (because of low efficiency), there is no reason why it should proceed, as is the case in agriculture and other industries. Furthermore, according to a survey in Florida by Jacobson (1998), 70% of the owners acquired their land through purchase. Similarly, Kennedy and Roche (2003) found that 64% of landowners acquired their land through purchase or trade in Alabama. This is a relatively large number considering that traditionally much of the private forest land used to be inherited by heirs.

Another common explanation is the nature of multiple uses of forests and the increasing number of landowners with non-timber objectives: residential use, aesthetic enjoyment, timber production, hunting, moral commitment, nature conservation, estate investment, etc. This explanation has merit, but to economists it is incomplete. We have multiple needs and a growing number of wants, but we get more and more of our goods and services from markets due to the efficiencies of specialization and market development. So, we suggest that the fundamental reason for increasing number of NIPF must lie in its efficiency, but that efficiency must be understood broadly. More timber produced from the same land is just one aspect of efficiency; efficiency also includes the stages of production, distribution and consumption. If one person is willing to pay higher rent than another, that means the former’s holding can generate higher value (at least the private value) that may come from the saved cost, or increased products value, or saved transaction costs.

3.2. Why more people holding forestland?

Regarding the increasing number of the NIPFs, demand analysis may be more appropriate. Either the total number of households increases, or there is a increased change in preference to hold forestland can lead to more people hold forestland. The first cause is clear in the US, the second cause is likely based on the number of NIPFs has been growing faster the growth of population. The most important characteristic of such demand is the use forest land as a consumption good, not for timber production.

Holding or not holding a piece of forestland depends on the goods and services generated from the forest land satisfying an individual’s needs and the transaction costs he must spend to acquire these goods and services through the market, if he does not already own land. Transaction costs are determined by the numbers of trade and per unit cost of trading. Owning a piece of forest land may be more efficient than buying the multiple goods and services from the land when demands for these goods and services is strong and the transaction costs to acquire these goods and services via market are high. Alternatively, selling the service generated from forest land is not as efficient as selling the land itself. Centuries ago, landlords hired labor, now in general capital hires labors. But in information technology industry, it is often technological labors hire capital, at least a few years ago. Fundamentally, the purposes of holding NIPFs are to save transaction costs from different perspectives (Zhang 2001):
Capital transaction costs: Using borrowed funding to invest in NIPF is unlikely attractive since NIPF may need to pay higher capital costs compared with a large-scale business or forestry operation. But if the owners have extra capital, the owners may still be better off when the return rate is slightly higher opportunity investment value (e.g., deposit interest rate), but lower than the interest rate for money borrowed from banks. The prevailing interest rate (loan) based criterion of investment for NIPF owners may not be very well grounded.

Labor transaction costs: The transaction costs of labor can be divided into fixed and variable costs with the relative transaction costs for searching for jobs (or hiring) being relative high for one person’s partial labor force. Farmers are more likely to own some NIPF since it is more costly when only part-time labor (seasonal jobs) in transaction. In addition, the opportunity cost of occasional and self-chosen time spent working in a farm forest could be very small, even negative since the work may be a form of recreation. Minimum wage (or prevailing wage level) is largely irrelevant for this category of work. Timberland management is often fun and brings contentment.

Forest land transaction costs: High taxation and difficulties in measurement in land transactions lead higher transaction costs. Transaction costs may be relatively lower between relatives or when both sides know the land very well, so it is quite often that NIPFs are transferred between relatives who become new NIPF owners rather than between strangers and private industrial forest owners. It is particular as the value of cultural and heritage of the forests for family and friends is often higher than for other potential buyers. Forest product (wood and non-wood) transaction costs: The transaction costs for timber are high. As Vardaman (1988) argued, “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.” But the transaction cost for timber is still moderate compared to recreational goods. Demands for non-timber services from forests are increasing rapidly. It is not difficult to imagine how costly it is 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. Recreation products generated from the forests cannot be moved and do not have standards. Asymmetric information is serious, so when such demands become frequent, it is likely that the owning and used for one’s own production and consumption is more efficient than partial “buying” the services produced by others.

The above analyses are only for illustrative purposes. The owners may have all the above characteristics, saving the various transaction costs mentioned above. Farm owners of forests were the majority in the past, so saving transaction costs of labor may have been their a major reason for forest ownership. But this has gradually been replaced by saving transaction costs of recreational services for other kinds of owners. Currently the most fundamental drive for the increasing NIPF come from more wealthy individuals who are affordable to buy a piece of land as second home for seasonal residency and recreation, or as an investment (for the appreciation of the land value, not timber value). Evidence shows that more and more retired people and white collar professionals hold NIPF. Investment and timber income is only the 6th and 7th place in the list of their holding reasons (Tyrrell and Dunning 2000, p. 10).

Based on the above argument, some general conclusions about ownership decisions for NIPF owners can be made: (1) many NIPF owners have some saved capital or stable and high income, or is at least free of debt, unless he/she is a farmer and expects to use forestry as
seasonal employment; (2) they also include retired or aging people with low opportunity costs for their time, who enjoy the increased space and peaceful living on forest land the forest, and (3) NIPF owners have some tendency toward continuity from generation to generation since, transaction costs are significantly higher for other owners.

3.2. Why are people holding smaller amounts land?

The shrinking size of forestland holding can be explained from the supply side. Without considering supply or assuming constant price, wealthy individuals will like to hold bigger forestland regardless of whether it is for hunting or for a second home. But increasing demand from OTHERS together with the decreasing supply (land is fixed) due to other competitive uses drive up the forestland price, particularly at the suburban fringe. We contend that it is becoming less affordable for families to the same amount of land (which has increased in value) because the opportunity costs cannot justify the marginal value for them. In other words, the marginal value of increasing wealth cannot catch up the land appreciation (opportunity costs). Hence, holding smaller land is rational even without considering taxation (See Figure 1).

Mehmood and Zhang (2001) also found that taxes were not statistically significant in parcelization. But we should note that for timber production, the holding size is based on the production efficiency of timber production, and holding size may increase further. For the consumption purpose of many NIPF owners, the optimum size is based on consumption efficiency. So it can co-exist that the scale of forestland holding for timber production increases, while the scale of NIPF declines. The small sizes become more concentrated to non-timber purpose for the owner, while the larger size holding still serve as timber production.

This is consistent with evidence from U.S., Finland and other countries. In the U.S., the largest parcels remain intact at present, but the acreage in midsize woodlots is shrinking and the bottom class is growing (DeCoster 1998). Seen from Table 2, the number of small holders with less than 100 acres has increased since 1978; the medium holding size holders has declined (Birch 1996, p.14). 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% (Moulton and Birch 1995). Bliss and Sisock (1998) also found that the share of private forestland owned by the largest 1% of the owners had increased from 51% to 58% from 1978 to 1993 in Alabama. In Finland the number of medium-sized forest holdings (20-50 ha) is decreasing, and the number of small- and large-sided holdings is increasing (Ripatti 1999). This is not surprising, since increasing size may increase efficiency in terms of timber production, while reducing size may increase efficiency for consumption of forest land for non-wood production purpose.
Figure 1: Shrinking holding size and increasing number of forestland owners.

Table 2: Changes in private forest ownership and percentage of total forest acreage

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</tr>
</thead>
<tbody>
<tr>
<td>less than 100</td>
<td>7, 156</td>
<td>21.60%</td>
<td>9, 274</td>
<td>31.60%</td>
<td>11, 550</td>
</tr>
<tr>
<td>100-499</td>
<td>538</td>
<td>30.80%</td>
<td>559</td>
<td>23.30%</td>
<td>570</td>
</tr>
<tr>
<td>500 and above</td>
<td>63</td>
<td>47.60%</td>
<td>68</td>
<td>45.10%</td>
<td>68</td>
</tr>
</tbody>
</table>


4. Implications for Forest Management

Is the boom in forest owners really a bust for forestry? The patterns of forest ownership change have some relation to forest management (e.g., Stanfield et al. 2002), but the potential impacts need to be carefully assessed. Following aspects are our major concerns and questions.

4.1. Conversion to non-forest use and fragmentation?

Although forest fragmentation (large and contiguous forest landscapes broken into smaller, more isolated fragments) differs from land parcelization (larger number of owners with smaller land), they are definitely related. The United States loses more than half a million acres of privately-owned timberland to development each year, and NIPF has often been claimed as one of the causes and/or victims. On the one hand, NIPF might be easier to convert to non-forest use if the value of the other land use (e.g., market value for development) is higher than owner’s perceptional value in forest use. On the other hand, NIPF owners may prevent forestland from going to other uses, since the NIPF owners value the forest use more than the value of timber, thus increasing competitiveness with other uses. So this question may be more complicated than has generally been thought. Parks or urban forests can be found in many big cities, but rarely urban agriculture! Forest land value increases with the rising number of NIPF owners who value...
the land more than the timber and timber productivity. Interestingly, Drzyzga and Brown (2002) found more small scale private forests lead to higher forest cover.

If we look at longer time periods the multiple uses of forests, which may be less intensive in terms of timber production, may reverse the forest decline to forest expansion. A higher population density, under given socio-economic circumstances, increases the absolute land value in every use, but probably most for residential and industrial use value. Land either in agriculture or in forests is likely to be converted to residential and industrial uses as the economy develops and population grows. If forest land is used for more than timber production, the relative value for forestland may rise faster than agricultural use. If that is the case, NIPF owners may play 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). Therefore, NIPF might be a factor in the increase since they consume the forest in situ and do not care about the profitability generated from wood production.

4.2. Reduced management intensity?

As introduced above, evidence suggests that NIPF reduce forest management intensity in terms of timber production. Typically, as the average parcel size declines to some threshold, owners are less likely to actively manage their forests for sustainable timber. New U.S. Department of Agriculture Assessment clearly shows such situation (Table 3).

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Industr</td>
<td>TIMO</td>
</tr>
<tr>
<td>Planted Pine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Superior</td>
<td>46</td>
<td>38</td>
</tr>
<tr>
<td>High Yield</td>
<td>40</td>
<td>56</td>
</tr>
<tr>
<td>Natural Pine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>61</td>
<td>59</td>
</tr>
<tr>
<td>Higher</td>
<td>39</td>
<td>41</td>
</tr>
<tr>
<td>Oak-Pine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>95</td>
<td>75</td>
</tr>
<tr>
<td>Higher</td>
<td>5</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: Siry (2002)

It is likely that there are three major reasons for the reduced management intensity: 1) Intensive management is difficult and more expensive on the smaller tracts that are usually owned by small forest land holders; 2) multiple objectives of the NIPF owners mean that less intensive management is preferred, and that in turn can lead to greater non-timber value of the forests at the expense of timber production; 3) the owners do not know how to improve the management.

Evidence and study also support that timber production and profit maximization is still the objective of many NIPFs owners (McComb 1975, Newman and Wear 1993). In addition, NIPF prefer hardwood and longer rotation of timber management (see Figure 3). Can we say this is less intensive management? Maybe it is less intensive in terms of timber production, but more intensive in non-timber forest management--that is good since it generate positive externalities to the society.
4.3. Impacts on timber supply?

Decreasing timber supply has been the major concern from decreasing land holding size. But do we really need to worry about the future supply due to the parcelization? If we see timber as a private good, then we do not need to worry since the market can use price to adjust the demand and supply. In spite of the fact that NIPF may not be very sensitive to timber price as incentive to timber management investment, most owners still get some economic returns from timber production, particularly the medium size of holders. If the timber price rises, the land value for industrial timber management will rise too, then it will be more expensive for the NIPF to hold larger forest tracts, and opportunity costs cutting timber will be greater. At a minimum, that will defer the land transition from industrial to small land holder, and it may induce even more intensive timber management.

Another important point is that we need to pay attention not just to the rapidly growing number of NIPF owners, but also the total acreage they hold. In spite of the fact that NIPF landholdings are increasing in both number and rate, the percentage their holdings of all forestland or timber land is still small. For example, the total acreage of holding size less than 100 acres had doubled from 1978 to 1994, but only 10% of the total forestland (from 21.6% to 31.7%). In other words, if the rest of 70% of the forestland can increase 5% of timber productivity that that can compensate the reduction of productivity of 30% of the increased amount of holding size less than 100 acres (10% of the total forestland).

Globalization of timber supply has prevented substantial increase in regional wood price. Other goods and service from land, such as residential houses, cannot be imported. Consequently the value of other uses/multiple uses (particularly the residential and recreational) for woodland rises in some regions (e.g., the US) faster than that of the value for 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 too trial to pay attention the benefit from the wood production at the expense of non-wood benefit from the forests. It is also not worth obtaining the technology to increase management intensity for small woodlands. Globalization leads to land allocation for timber production globally. If we are concerned with timber supply, we need to think globally. Timber supply from Southern hemisphere is becoming more and more important since it is more economically efficient (Zhang 2004).

5. Discussion

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. The fact is that, as 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.”
“Are we trying to hold back the tide?” as raised in Tyrrell and Dunning (2000). Our answer may be “don’t trying to hold back the tide”. First, generally speaking, land parcelization is the 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). 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 should be made illegal, but this has never been implemented in practice (Ripatti 1996). Secondly, as argued throughout the paper, NIPF expansion has its own economic rationale—the efficiency of consumption of forest based products and services. From the perspective of the whole society, the sum of millions of individuals’ net benefits (demand or value minus transaction costs) in each owning a small piece of forestland may far outweigh the sum of the benefits in fewer large scale private forestland ownerships (the latter benefits come primarily from economy of scale) largely because the production and consumption is more directly connected. NIPF expansion may not necessarily be associated with forest land loss, decreased management intensity, and reduced timber supply. The impacts may be more reflected in the form of forest land, type of management, and type of timber supplies. As the demand and supply change, so do number of owners and their holding sizes. The dynamics of holding size change (or parcelization) is actually the 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 intend to suggest that there are no problems with NIPF, since some policy changes are definitely needed. Forest land not only generates timber but also provides many ecological and environmental services that are public goods. It is more widely agreed that parcelization break down the integrity of biodiversity, watershed and ecosystem. That means the private costs and benefits differ from public costs and benefits. Therefore, welfare loss occurs and public policies are desired. We need to carefully evaluate and design effective policies to reduce the negative impacts. 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 ‘fragmentation’ per se.”

We need to compare and examine the costs and benefits (both social and private) of different policies. So far, a variety of management approaches are suggested to reduce the diseconomies of NIPF or small track of land. The most common way is to provide technical and financial support from government. Row (1978) suggested that effects on financial returns can be reduced by managing small tracts in groups, cooperatives, or other aggregations of owners. Uusivuori and Kuuluvainen (2001) also suggest collaboration in timber selling. These are important questions that need to be addressed. It is unclear what policy is more efficient, but this is an interesting and important field for future study.
**References**


