Forest Commons in Boreal Sweden

– Influences on Forest Condition, Management and the Local Economy

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Licentiate thesis
Swedish University of Agricultural Sciences
Umeå 2006

Swedish University of Agricultural Sciences
Department of Forest Resource Management and Geomatics
Report 18
2006

ISSN 1401-0070
ISBN 91-576-6893-0
ISRN SLU-SRG--R--18--SE

Tryck: Arkitektkopia, Umeå 2006

Abstract

Holmgren E. 2006. *Forest Commons in Boreal Sweden – Influences on Forest Condition, Management and the Local Economy.*
Licentiate dissertation.
ISBN 91-576-6893-0, ISSN 1401-0070, ISRN SLU-SRG--R--18--SE.

This thesis examines the influences of Swedish forest commons on forest condition, management and the local economy. The approach is rationalistic, i.e. outcomes of forestry activities are assessed in relation to aims. According to the stated objectives, forest commons should serve as exemplars for improved forest management, focusing on increased and sustained timber production. They should provide sustainable economic support for farmers and the local economy, providing a sound basis for taxation and helping to secure the continued existence of the independent farming community. The aims of this thesis were: (i) to compare, regionally, the state of forests under common and other types of ownership; (ii) to compare forest common shareholders with non-shareholders with respect to the harvesting intensity and related business activities on their individually managed forest properties, including consideration of taxes paid to the local municipality; and (iii) to discuss research findings regarding the extent to which the aims of the Swedish forest commons (and, in a broader context, of forest common property regimes) have been fulfilled.

In the first study, the state of the forests comprising all 33 forest commons were assessed, using National Forest Inventory data, and compared to other forests within the same municipalities. A second survey was conducted in the form of a case study with data from a single municipality relating to: forestry production parameters, sales revenues, operating costs and investments, disposable income and local municipal tax revenues. Results highlighted examples where the original aims of the forest commons have been realized to only a limited extent. For instance, the state of the forests in Norrbotten and Västerbotten revealed a comparatively restrictive harvesting policy. Results from the case study showed that shareholders' land was less intensively managed than non-shareholders' land. Both harvesting quotas and sales accounts confirmed this general finding. Shareholders also contributed less to the local economy through taxes. Since there were no indications that the potential to undertake forestry activities substantially differed between the different types of owners and property regimes, the differences in management intensity seem to be at least partially due to differences between the institutional frameworks in which they operate.

The results clearly suggest that it is important to match a property regime with the owners' aims for their properties. It is possible that the Swedish forest commons fulfil aims other than those studied, e.g. enhancing local well-being, providing ecological or amenity services, or promoting synergies between primary production and other rural activities, but these aspects require further investigation.

Keywords: Swedish forestry; forest resources management, community managed forests, Swedish forest commons

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Papers I – II

The present thesis is based upon following papers:

I. Holmgren, E. Lidestav, G. and Kempe, G. Forest Condition and Management in Swedish Forest Commons (published).
II. Holmgren, E. Holmgren, L. and Lidestav, G. Comparison of Harvesting and Business Activities of Non-shareholders and Shareholders in a Forest Common in Västerbotten, Sweden (submitted).

Introduction

Ownership and Property Rights

Two types of bodies own forest land: public bodies or governments, and private entities. The first group includes the sovereign state and the regional and local government authorities, while the second group includes both corporate bodies and individuals (McKean 2000, Berge 2002). Ownership is associated with property rights which, according to Ostrom (2000, p 332), are 'an enforceable authority to undertake particular actions in specific domains'. These property rights imply; the rights of access, withdrawal, management, exclusion and alienation on a cumulative scale moving from the minimal to full ownership rights. Further, these rights, and the resources to which they are connected, can be held by single individuals, collectives or public bodies. Thus, natural resources have often been classified, in terms of their ownership, as private, common or state property. However, Ostrom (2000) and Berge (2002) argue that the key issue is not who owns the property, but how the package of property rights is held, for example how the decision-making powers are distributed, the aims of ownership, and the procedures for exchange of the property.

The Framework of 'Commons'

There is worldwide engagement within the framework of 'commons', which deals with issues such as property rights, resource management and governance i.e. property regimes. This engagement is mirrored in the increasing interest in, and amount of research conducted on 'commons', covering a wide range of aspects of different types of public or private goods, rights and owners. According to Dolšak and Ostrom (2003), this interest in common-pool resources is highly relevant and will continue, as long as humans continue to rely on water, air, and the atmosphere, to be a core resource type, of major significance. In addition, it appears that the number of common-property institutions is increasing over time, and thus, should not be regarded as a 'quaint relics of a hunter-gatherer or medieval past' (McKean 2000 p.35). If the factors and conditions that lead to successful regimes can be identified, common-property regimes may be appropriate ways of managing common-pool resources.

Nevertheless, ever since Hardin published 'The Tragedy of the Commons' in 1968, many people have wrongly associated 'commons' or 'common property' with open access and over exploitation of natural resources. This well-known article, which presented a model for resource governance, showed that in a situation of open access (assuming that all people aim for maximum profit), destruction of natural resources is inevitable. However, from the literature (Ciriacy-Wantrup and Bishop 1975, McKean 2000, Ostrom 2000, Berge 2002) we learn that what Hardin described in the cited paper as 'commons' should, rather, be called open-access resources, non-properties or unmanaged common-pool resources, i.e. a type of resource with open access that no one has the legal right to exclude anyone else from using. In a review of the original article, Hardin (1998)

also regretted that he had failed to distinguish between the resources themselves and the management regimes. This important mistake has also been noted by Ciriacy-Wantrup and Bishop (1975) and Berge (2003), amongst others. McKean (2000) defines common-pool resources as 'resources that can be kept from potential users only at great cost or with difficulty but that are subtractable in consumption and can thus disappear' (McKean 2000 p.28). In contrast, a common property is a property where access is limited to a specific group of users who hold their rights in common (Runge 1981, Bromley and Cernea 1989, McKean 2000).

Berge (2002 p.3) states that commons are regimes or 'social institutions for managing and distributing benefits from resources held jointly or in common'. In a jointly owned common, the ownership is linked to the place and the person, so the right cannot be transferred to descendants or taken with you if you leave the community (Berge 2003). In a common owned in common, the owners hold shares in the common property which can be transferred to descendants and also kept after the shareholder has moved away from the community.

One advantage of establishing common property regimes is that they meet the need for management of a resource when open access or non-management threatens to deplete it. At the same time it offers a way of privatizing the rights to goods without sub-dividing them. There might be situations when parcelling out a resource is impossible or undesirable e.g. many natural resource systems are far more productive when left intact than when sub-divided (McKean 2000). Keeping ownership in the hands of a collective, instead of individually, is, according to Berge (2003), preferable when the desired outcome focuses on shared benefits. Similarly the system is also useful: if there is a need to solve collective action problems and develop synergies between primary production and other rural activities; when exclusion of appropriators is necessary; or when a 'safety net' for the poor and for new generations is required. In contrast, most economists consider individual ownership an essential aspect of economic development because it putatively provides, for example, greater incentives for the individual owner in comparison to those for owners of common properties (Ostrom 2000). Further, according to Ostrom (2000), many economists believe that collective ownership compared to individual ownership, involves three sources of inefficiency: higher transaction costs, higher enforcement costs and rent dissipation.

Successful Common-property Regime Characteristics

From case studies based in different parts of the world, some general characteristics of successful common-property regimes have been identified. In 1990 Ostrom published an influential book in which she considered the problem of collective management of shared resources. Although she insists that each common needs to be examined individually, she delineates a set of eight 'general' design principles or recommendations for successful commons. McKean (2000) has combined these with her own and other researchers' findings to produce a set of recommendations for successful common-property regimes. Examples of these include: the importance of clearly defined boundaries; that managers should be

either resource users or accountable to them; and the need for mechanisms to alter the rules and quickly resolve minor conflicts that are dominated by the users themselves. Further, common-property regimes will be more effective if the user groups are allowed to organize themselves without external interference. If the management institutions are very large, they need to be hierarchical, with considerable devolution of authority to the lower levels. In addition, it is believed that common-property regimes work best when established in areas where the users are already used to cooperating with each other and where there are few conflicts. Institutional overlap and administrative support are also considered to be advantageous. Financial support, in contrast, appears to restrict local cooperation and is, therefore, not beneficial. In addition, Olson (1965) argues that the size of the group is important and it is likely that, above a certain level, success and size are negatively correlated.

Not surprisingly there are differing views on what types of ownership, property regime or property rights are 'best' and in practice it probably depends on the purpose and will vary for each setting. Through studying different commons, however, we may gain insights into their dynamics, the purposes for which they are suited and under what conditions they perform successfully. These insights will add to our knowledge and inform empirically based decisions, for example when establishing new forest commons or adjusting the management of a resource to account for new functions or changed conditions.

In his opening address at the IX World Conference of the International Association for the Study of Common Property, Berge (2002) stressed the importance of conducting more research on commons in Western Europe, and the need to consider perspectives other than historical and legal history. He argued that comparative studies of a variety of commons, in a variety of settings, would be an efficient strategy for increasing our knowledge. In addition, it is important to study both successful and unsuccessful cases in order to understand what factors lead to the development of local institutions that successfully enhance forest conditions (Gibson, McKean, Ostrom *et. al.* 2000). For this purpose, as pointed out by Carlsson (1995), the Swedish forest commons that were established in Northern Sweden between 1861 and 1918 provide excellent opportunities.

Establishment and Features of Swedish Forest Commons

The interior of Northern Sweden was considered unclaimed property until the end of the medieval period, when the Crown realized its value and claimed it. Colonization of the land was encouraged for various reasons, including to populate the area, to increase the total area of farmland and to raise the tax revenues paid to the Crown (Stenman 1983). Thus, it was necessary to establish boundaries. Each farm was allocated some forest land, and the total area awarded to each farmer was primarily based on the extent of their arable land and its productivity, as well as the quality of the forests. By the mid-19th century the interior of the counties of Västerbotten, Norrbotten, Kopparberg and Gävleborg remained unallocated (Pettersson, 2003, Stenman, 1983). In connection with the finalization of the Great Redistribution of Land Holdings in the counties of

Kopparberg[1] and Gävleborg, and the delimitation process[2] in the counties of Västerbotten and Norrbotten, 33 forest commons were established by designating a proportion of each owner's allocated forestland to be managed jointly (*SFS* 1952). Thus, Swedish forest commons are owned in common and managed by shareholders who also own other forest holdings on an individual basis.

The establishment of the Swedish forest commons began in 1861 in the counties of Kopparberg and Gävleborg. The last common areas were established 57 years later in Västerbotten (Liljenäs 1982, Carlsson 1995). During this period, many changes occurred in the general political conditions and forest legislation. At the same time, the forest industry underwent a period of economic and industrial development, whilst the authorities increased restrictions concerning the sharing of benefits from the land tenure reform. This was particularly true for the inner parts of Västerbotten and Norrbotten, where the 1866 regulations[3] (*SFS* 1866) concerning the disposal of forests, and the *Revised delimitation regulations for Lapland in Västerbotten and Norrbotten* from 1873 (*SFS* 1873), reduced the size of the forestland allocated to the farmers and abolished the free right of disposal of the forests (Arell 1979, Enander 2003). Trees could only be felled after permission from a forest official. This made the forests less attractive to sawmill owners and farmers. In contrast, the law still permitted the sale of farms or cutting rights, thus providing forest companies speculative opportunities. The sawmill companies actively bought private forestland and cutting rights in the period from the late 1880s to 1900 (Arell 1979).

The Swedish forest commons are private forest holdings owned in common and managed jointly. Thus, the owners hold shares in the commons which can be transferred to descendants or sold, but only in association with the private estate. Further, the property rights can be retained after the shareholder has moved away from the community (Berge 2002). Consequently, the number of owners has increased considerably since the commons were originally formed and many owners are now non-residents. Today there are about 25 000 shareholders (Carlsson 1999) of approximately 540 000 ha of productive forestland constituting the forest commons (Table 1). The owners range from private individuals to forest companies and public institutions, although individual ownership generally dominates. In total, a significant proportion (22%) of the forest commons is owned by forest companies and 2% are owners other than individual farmers or non-industrial forest owners (NIPF owners). Of the remaining 410 000 ha belonging to NIPF owners, 46% is owned by non-residents. Thus, a minor proportion of the commons is in the hands of local individuals. However, the ownership conditions vary greatly between the different commons and counties. In the counties of Gävleborg, Kopparberg and Norrbotten, the proportion of forest commons owned by companies is 24-26%, compared to 6% in Västerbotten. The low proportion of forest company ownership in Västerbotten is probably partly due to these

[1] The county name was changed to Dalarna on 1st January 1997.
[2] The delimitation process was a reform in which property rights and the boundaries between Crown land (essentially state-owned land) and private land were established (Stenman 1983).
[3] This law restricting the free distribution of the forests expired in 1949 (Arell 1979).

commons being established after 1906, the year which saw the introduction of *'Norrländska bolagsförbudslagen'* (*SFS* 1906a). This law prevented the acquisition of forestland by forest companies and economic cooperatives. The result has been that the extent of the forest companies' forest ownership has remained unchanged in Norrland since the law was introduced. Thus, the efficiency of the forest commons in preventing purchase by forest companies seems not to have been successful.

All forest commons are controlled by the same national laws and regulations, including the *Swedish Forestry Act* (*SFS* 1993), which regulates the management of Swedish forests. However, their formal organization and activities are regulated by a specific law, the *Forest Commons Law* (*SFS* 1952). Each forest common also has its own set of by-laws, authorized by the County Administration, which regulates the direct management of the common (Carlsson 1995). Management is performed jointly through elected boards and executed by professional foresters. The shareholders' rights with respect to decision-making are, in general, proportional to the size of their share. The *Forest Commons Law* (*SFS* 1952) and some of the by-laws, however, contain provisions designed to limit the dominance of the larger landowners. Associated with ownership there are hunting and fishing rights.

From the second half of the 19th century, forest management was mainly the province of the Swedish Forest Service (Domänverket). The Forest Service controlled the nature of the forests; management practices in the state-owned forests often informed the activities of other forest owners[4] (Enander 2000). In 1934, the supervision of the management of the forests was handed over to the County Forest Boards. Gradually, the authorities' control over the commons decreased, and as a result of the *Forest Commons Law* (*SFS* 1952) they achieved the independence they have today.

[4] Until the end of the 1940s, the most commonly used management method was 'exploitation forestry' or 'high-grading' of forests. Such management regimes often created open, low productivity forests (Enander 2001). This management strategy changed around 1950, moving to a system involving final felling, soil scarification, planting, pre-commercial- and commercial thinning, thereby transforming large areas into young even-aged forests dominated by pine and spruce. The forest policy applied by the forestry sector since the 1950s aims to ensure sustainable timber production (including environmental considerations) at a high and even volume level over a specified rotation period. Therefore an even age- and maturity class distribution is sought (op. cit.).

Table 1. *Year of establishment of Swedish forest commons, their size and the proportions held by forest companies, NIPF owners, and others in 1995*

Forest commons[1]	**Established (year)** [2]	**Total area prod. forest-land (ha)** [3]	**Forest company ha (%)**[3]	**NIPF owners**		**Others ha (%)**[3]
				ha (%)[3]	**Fraction Non-resident (%)**[3]	
Counties of Gävleborg and Kopparberg	*1861-1894*	*215 526*	*56 086 (26)*	*153 290 (71)*	*62*	*6 150 (3)*
Enviken	1861	2 168	542 (25)	1 474 (68)	30	43 (2)
Hamra	1879	5 038	1 108 (22)	2 066 (41)	60	856 (17)
Lima	1870	32 532	4880 (15)	24 399 (75)	20	3 253 (10)
Norra Venjan	1861, 1894?	8 756	788 (9)	7 968 (91)	20	0
Orsa	1879	55 482	10 542 (19)	44 386 (80)	63	555 (1)
Svärdsjö-Svartnäs	1861	4 300	860 (20)	3 440 (80)	20	0
Särna-Idre	1879	29 417	15 003 (51)	14 414 (49)	50	0
Södra Venjan	1861, 1894	9 500	570 (6)	8 930 (94)	50	0
Transtrand	1870	19 000	7 980 (42)	10 070 (53)	20	950 (5)
Älvdalen	1885	49333	13813 (28)	35 026 (71)	50	493 (1)
County of Västerbotten	*1916-1918*	*90 736*	*5 284 (6)*	*85 370 (94)*	*44*	*82 (0)*
Dorotea övre	1916	2 736	2 134 (78)	520 (19)	5	82 (3)
Sorsele övre	1916	20 000	2 800 (14)	17 200 (86)	60	0
Tärna-Stensele	1918	33 000[4]	0 (0)	33 000 (100)	25	0
Vilhelmina övre	1918	35 000	350 (1)	34 650 (99)	50	0
County of Norrbotten	*1876-1894 (excl. nybyggesallmän ningar)*	*230 384*	*54 169 (24)*	*171 009 (74)*	*32*	*5 288 (2)*
Arjeplog	1889	22 401	4 480 (20)	17 921 (80)	18	0
Arjeplog nybyggesallm.		5 581	0	5 581 (100)	5	0
Arvidsjaur	1877	22 692	3 404 (15)	19 288 (85)	35	0
Gällivare	1883	44 748	12 529 (28)	32 219 (72)	20	0
Gällivare nybyggesallm.		527	184 (35)	343 (65)	5	0
Jokkmokk	1889	58 000	29 000 (50)	29 000 (50)	34	0
Jokkmokks nybyggesallm.		844	0	675 (80)	35	169 (20)
Jukkasjärvi	1893	27598	276 (1)	27 322 (99)	7	0
Karesuando	1894	5 037	0	0	0	5 037 (100)
Pajala	1876	42 956	4 296 (10)	38 660 (90)	26	0
Total		**536 646**	**115 539 (22)**	**409 669 (76)**	**46**	**11 520 (2)**

[1] The number of forest commons varies between sources, depending on how they are divided up. For example, the forest common of Särna-Idre could be considered either one or two entities. This has, however, no implications for this thesis.
[2] Source; Liljenäs 1982.
[3] Source; Carlsson 1995 p. 13.
[4] This figure, used by Carlsson, is deviant from the one registered by the tax authorities (1994), where TSA is registered to have 38 234 ha of productive forestland.

The most important source of income from the forest commons is from the sale of standing or harvested timber. However, some of the forest commons[5] run subsidiary companies e.g. selling hydroelectric power or processed timber products. The forest commons also hold savings in funds (Ministry of Agriculture 1983).

The Swedish Forest Commons – Some Earlier Studies

Over the years the Swedish forest commons have been the subject of a number of studies focusing on various aspects of their history, impact and achievements. The following is a summary of some of these studies.

From the perspective of property rights and property regimes, Pettersson (2003) described the historical background and the process which saw the establishment of the modern forest commons. According to the author, their establishment was partly prompted by lessons learnt from the traditional type of commons known as "Häradsallmänningar", which originated during the medieval period, or even earlier. The authorities and forest experts had limited confidence in the farmers' ability to manage the forests properly. Maintaining the commons seemed preferable to parcelling out the land, with the proviso that the management should be supervised by the authorities and forest experts. Many politicians and officials were convinced that Swedish forests were in a precarious position, due to the increasing connection of Swedish farmers' forests with the global market economy from the mid-19th century onwards. Therefore, it was believed that strict management restrictions had to be imposed on the owners. At that time 'good forest management' was regarded as management that, with forward planning, provided high and reliable yields of timber for sale (Pettersson 2003). It was assumed that meeting these goals was likely to require the implementation of management plans and regimes drawn up and guided by those with expertise of larger-scale units than were being allocated to individual farmers (Pettersson 2003). Under these circumstances, the new concept of Swedish forest commons was introduced and implemented in the areas that had still not been allocated i.e. in the counties of Kopparberg and Gävleborg, Västerbotten and Norrbotten. These 'modern' forest commons were, in addition, 'supposed to serve as an instrument for launching orderly forest management[6] by compelling the shareholders to follow the forest experts' regulations'. Further, as Pettersson states, 'good forest management involved forest management based on the principle of clear fellings and was focusing on raw material production for sale' (Pettersson 2003, p.230).

[5] Most of these are found in the counties of Kopparberg and Gävleborg.

[6] In the 19th century the regulation of forest husbandry resulted in the introduction of rotation forestry (trakthyggesbruk), as commonly practiced in Germany, based on clear fellings. The basic principle behind the new forest management strategy was both to regenerate the clear felled tracts and to ensure that harvesting did not exceed growth (Pettersson 2003).

Thus, in that sense they supported the concepts of modernization[7].

Stenman (1983) discusses the forest commons in Västerbotten in his doctoral thesis. His starting point is their delimitation. Forest commons were established to serve as an example of improved forest management. He notes that the introduction of forest commons gave the authorities an opportunity to introduce new regulations aimed at reducing the risk of deforestation (Stenman 1983). The yields from the forest commons were intended to provide enduring support for the farms and it was assumed that speculative buying would be less likely if part of the forestland remained unallocated, so the entire forest was not distributed between the shareholders.

In a thesis on the forest commons in Norrbotten, Liljenäs (1977, p.21) stresses that the 'primary aim for the introduction of the Swedish forest commons was to provide a lasting support to the farming population'. Economic returns should be used first for silvicultural activities and thereafter to pay debts and taxes, for social welfare and other purposes benefiting the public. Another aim was to prevent the forest companies from acquiring the farmers' forestland. According to Liljenäs (1977) the common forests are of considerable economic importance to the interior communes of Norrbotten. In the summary of her thesis, and in a later report (Liljenäs 1983), she also stresses the importance of forest commons in promoting lasting jobs within the forestry and agricultural sector in order to support the local population in the interior of Norrbotten, especially its remote areas.

[7] From the 17th century, the Swedish state sought to rationalize natural resource management. The strategy of rural modernization (cf. Van der Ploeg *et. al.*, 2000) involved targeting maximum sustainable yield and strengthening rural services through economic growth. These ideas were later outlined in the *Swedish Forestry Acts*, the first of which was launched in 1903. They were intended to prevent future shortages of forest raw materials. The aim was to increase timber production in a lasting way through introducing regeneration regulations. A goal of the *Swedish Forestry Act* of 1923 was to protect young forests. Regulations prescribing the minimum stand age for final felling were first introduced in 1918, and extended by the *Swedish Forestry Act* of 1948 to protect so-called vigorous forest from premature final felling (Enander 2003). The revision of the *Swedish Forestry Act* in 1948 included a statute requiring an even output of timber over time and better silvicultural methods designed to increase productivity and thus raise economic returns from forest areas. Sustainability, profitability and social considerations were established as priority objectives. In the revised *Swedish Forestry Act* of 1993, production goals and conservation goals were given equal importance (Enander 2000, 2001). Environmental concerns are today considered to be as important as wood production and the detailed regulation of intensive forestry has been replaced by increased responsibility for the forest owners (Kjellin 2001). For a detailed account of the development of environmental concerns, from nature conservation to bio-diversity, connected with forestry see Lisberg Jensen (2002).

The report further suggests that, in the future, the distribution of revenues from the commons should be controlled by the authorities. Liljenäs also discusses the different approaches to the distribution of profits[8], and claims that profits going to established activities reduce the outflow of capital from the common forests to other parts of Sweden. Therefore a switch to cash payments would, according to Liljenäs (1977), be inappropriate for interior Norrbotten.

In 1983, the Swedish Commission on Collectively-Owned Forestland published an official (Committee) report (Ministry of Agriculture 1983), one purpose of which was to examine the Forest Commons Law (*SFS* 1952:167). It focused on both regional development policy and forestry policy. The Commission concluded that the Swedish forest commons are 'among the best managed forests in the country'. In addition, the Commission reported that annual cuttings in forest commons generally reached 100% of their approved management plans (Ministry of Agriculture 1983, p. 85)[9]. The Commission, therefore, recommended that no change of forestry policy was required. However, with respect to regional development policy, a number of amendments were suggested including a new forest commons law (this proposal was later rejected).

According to Carlsson (1995) the prime motive for allocating forest commons was to create larger and more productive units that could better meet the growing forest industry's demand for raw materials. This would further balance the power of the forest companies. Second, it was considered important to strengthen individual farmers' finances and, thus, the whole community's economic status (Carlsson 1995). An additional aim, connected to this motive, was 'to secure the existence of an independent class of farmers and thus to maintain political stability' (Carlsson 1999, p.12).

Carlsson has undertaken a number of studies on forest commons, examining them from an institutional perspective. The aim of a report from 1995 was to map and compare the Swedish forest commons with respect to institutional arrangements and to describe local differences in policies, determining how well they have adjusted to different local situations. He was especially concerned with property rights and how transaction costs for the various activities have been maintained at an acceptable level. The analysis and conclusions were based on the assumption that the forest commons are well managed, with higher yearly increments than fellings undertaken at the same time under competitive forest management regimes

[8] The policy controlling the distribution of the dividend differs due to historical arrangements, and regional patterns can be discerned. According to the 1906 decree (*SFS* 1906b), the dividend in Västerbotten is paid to all shareholders as annual payments in proportion to the size of their share in the forest common (Stenman 1983). In most of the other forest commons the dividends are distributed among the shareholders as monetary subsidies for purposes benefiting agricultural development such as drainage and agricultural training, to forest development such as forest management plans and subsidies for plants or to public assistance measures such as sports arenas and road maintenance (Carlsson 1995, Liljenäs 1982) or as a combination of the two systems (Liljenäs 1982, 1983).

[9] Since the forest commons have been managed in accordance with the state's intentions (Ministry of Agriculture 1983, p. 58, 67-68) and the *Swedish Forest Act (SFS 1993)*, a logical interpretation of this statement is that the production capacity of the forest commons, in terms of timber harvesting, has been entirely fulfilled.

(cf. Carlsson 1995, Carlsson 1999)[10]. However, he remarks that despite the toughness of the timber market the commons are competitive, but it is 'puzzling' that the shareholders harvest much less timber than they are allowed to. He suggested that this may be explained by the 'target income hypothesis' (1999 p.18), since it could be a manifestation of a high degree of adaptability, or that the shareholders 'have shown a high degree of innovation to reduce transaction costs' (Carlsson 1999, p.22). Carlsson (1995) has also considered whether the forest commons have served as a model for the shareholders. The question addressed by Carlsson was whether being a shareholder influences the forest owner when managing their own private forestland. Carlsson (1995) found generally more activity among non-shareholders than shareholders both in Västerbotten and Norrbotten. In Norrbotten shareholders undertook the least activity of all. His results did not indicate that the forest common dividend promotes improved silviculture. Further, Carlsson noted that the payments from the forest commons seem to create a state of dependency with a negative effect on activity, especially if they are, as in Norrbotten, paid as subsidies.

With respect to the aims of the Swedish Forest Commons and their achievements, different authors emphasise different aspects, but they do not contradict each other. A summary of all the goals and the means of achieving them that have been addressed by Liljenäs (1977, 1982, 1983), the Ministry of Agriculture (1983), Stenman (1983), Kardell (1991, 2004), Carlsson (1995, 1999, 2000, 2001), Ericsson (1997) and Pettersson (2003) is presented in Table 2. No ranking of their importance has been attempted, since the aims are closely interconnected.

Table 2. *The aims of the Swedish forest commons and advocated means for achieving them*

Aims	**Means**
• To serve as an instrument for improved forest management with the focus on increased and sustained timber production. • To serve as an instrument for sustainable economic support for farmers and the local economy, also to provide a solid basis for taxation and to secure the continued existence of an independent class of farmers.	• By orderly, planned, scientifically based forest management facilitated by professional foresters, larger production units and the exercise of authority. • By serving as a model for the farmers for management of their own forests. • By providing employment. • By preventing forest companies from acquiring the farmers' forestland. • By providing incentives to local agriculture and forestry.

[10] Carlsson refers, in this respect, to an evaluation made by the Swedish Commission on Collectively-Owned Forestland (Ministry of Agriculture 1983) and to interviews he conducted, with the aim of surveying the institutional function of the Swedish forest commons. Representatives of the forest commons were interviewed, as well as staff at the National Board of Forestry, Regional Forestry Boards, District Forestry Boards, Lantmäteriet (which has the overall national responsibility for the Swedish cadastre) and County Administrative Boards (Carlsson 1995).

Objectives, Research Design and Delimitation of the Thesis

Complementing these previous studies, this thesis examines the influences of forest commons on forest condition, management and the local economy. More specifically the objectives were:

- To compare, regionally, the state of the forests in commons and under other property regimes.

- To compare forest common shareholders with non-shareholders, with respect to harvesting intensity and related business activities on their individually managed forest properties, also considering taxes paid to the local municipality.

- To discuss research findings in relation to the aims of the Swedish forest commons and, in a broader context, of forest common property regimes.

Thus, the work includes two comparative studies, one in which all forest commons were included and the other based on a case study in the municipality of Storuman, where all NIPF owners were included. Each study has been presented in a separate paper (Papers I-II).

In the first study (Paper I), which examined 4.8 million hectares of productive forestland in total (Figure 1), a comparison of forest condition between regions and different property regimes was undertaken. The second study (Paper II) was conducted using data from a single municipality – Storuman – with one of the largest forest commons in Sweden.

Summary of the Papers

(I) Forest Condition and Management in Swedish Forest Commons

Introduction

Any assessment of the outcome of the introduction of forest commons, from the perspective of use of natural resources, should be based on objective forest data. Therefore, a study was conducted using primary data from the Swedish National Forest Inventory. Such an assessment requires a comparison with other property regimes under similar biological conditions. As the institutional set-up differs amongst the forest commons, a regional comparison was also made.

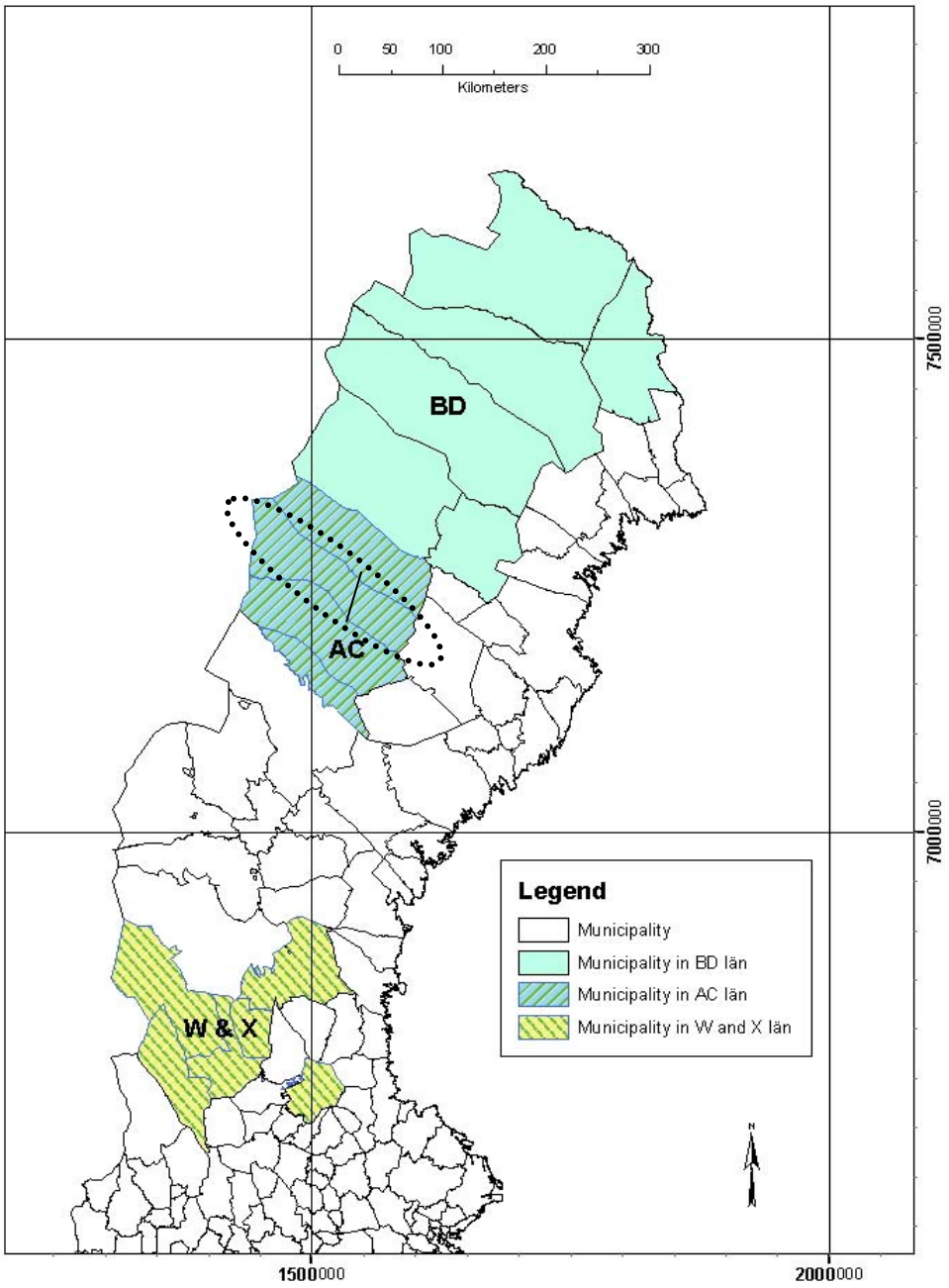

Figure 1. Map indicating the research areas considered in Papers I and II. Paper I examined municipalities with forest commons: the counties of Norrbotten (BD), Västerbotten (AC), Kopparberg (W) and Gävleborg (X). The data presented in Paper II are related solely to Storuman - the municipality marked with a circle. The approximate location of the boundary between shareholders and non-shareholders areas is indicated with a line.

The objective of this study was to compare forest conditions between commons and other property regimes, regionally. Thus, in this study the forests were assessed and discussed in terms of site productivity, degree of maturity of the stands and standing volumes. The intentions were not only to determine the current status of the forest commons, but also to elucidate past management practices, i.e. actions taken (or not taken) by analysing the present forest condition. By sub-dividing the data it was hoped to determine any regional trends. This type of information is useful since, together with data on regional characteristics, it may help to explain differences in the success of the commons. Finally, the analysis sought to evaluate[11] whether the forest commons have achieved their management goals.

Material and Methods

The research focused on the forests comprising the Swedish forest commons and surrounding forests (Figure 1). Only municipalities with a forest common were included in the study. The data used in the study originate from the Swedish National Forest Inventory's (NFI) database from the years 1998-2002.

The forestland was divided into four owner categories: NIPF owners, company forests, forest commons and public forests. Public forests include State-owned forests and forests owned by other public institutions including churches, municipalities and public foundations. Company forests are those owned by joint-stock companies, either private or public. A number of parameters were compared between the four owner categories as well as between and within the three counties and regions involved. The methodology allowed comparisons with sub-divisions down to a regional level.

Results and Discussion

Generally, the mean site productivities were similar in the counties of Norrbotten and Västerbotten for all types of property regime studied. In the counties of Kopparberg and Gävleborg productivities were significantly higher. The mean site productivity in the two former counties was estimated to be between 2.29-2.84 m^3/ha/year and in the latter 3.54-4.66 m^3/ha/year. The lowest values were found in forest commons of Västerbotten together with the Norrbotten public forests and Norrbotten NIPF.

Norrbotten displayed, overall, the most even age distribution among the different types forest property regime of the three regions studied, and the Norrbotten forest commons exhibited the most even age distribution among the forest commons. A lack of medium-aged forest is apparent, particularly in Västerbotten, and its forest commons include a very small proportion of young forests. This implies that the Västerbotten forest commons have a very high proportion of old forests. The distribution of maturity classes provides more specific information on the potential

[11] In this context 'evaluate' refers to an investigation of the outcomes of activities in relation to aims, using a rationalistic evaluation approach (cf. Lind 1979).

for final felling, thinning and other silvicultural activities. As shown in Table 3, there are large differences between property regimes in Norrbotten and Västerbotten, but smaller differences between the counties of Kopparberg and Gävleborg. Three-quarters of the forestland in the Västerbotten forest commons is estimated to be mature enough for final felling compared to 29% of the forestland belonging to forest companies in Västerbotten.

Table 3. *Fractions of forestland area with forest sufficiently mature for final felling, according to property regime and region, 1998-2002 (%, and 95% confidence interval)*

Property regime	Norrbotten	Västerbotten	Kopparberg och Gävleborg
Forest commons	38 ± 9	75 ± 11	42 ± 5
Public forests	51 ± 8	63 ± 11	33 ± 4
Company forests	27 ± 4	29 ± 7	34 ± 3
NIPF	34 ± 5	51 ± 7	39 ± 4

Standing volumes within each age class provide a better picture of forest condition and management practices than the overall mean standing volumes. In Västerbotten, forest commons have, with minor exceptions, lower standing volumes for each age class than all the other property regimes. Harvesting quotas for the period 1998-2000 indicate that considerably less than the annual increment was harvested in both Västerbotten and Norrbotten forest commons – even less than the amounts for 1975-80 and 1980-1993 presented by Carlsson (1995).

The study reveals conclusively that the status of the forests in the Västerbotten forest commons differ not only from the surrounding forests in Västerbotten, but also from the other forest commons. Although the geographical conditions (site productivity, altitude, and proximity to high mountains) are somewhat less favorable for the forest commons in this area, this is not considered to significantly affect the outcome. This interpretation is based on the comparison with Norrbotten public forests and Norrbotten NIPF, which also have low mean site productivities, and in the case of the Norrbotten public forests large areas in close proximity to high mountains. These areas have a more even age structure than the Västerbotten forest commons. Similarly, the proportion of forests mature enough for final felling in Norrbotten, and their harvesting quotas, are closer to the norm. The results from the Västerbotten forest commons should be used to inform estimates of the production capacity of the forestland, considering mean site productivity, standing volumes within age classes, the distribution of age and maturity classes and harvesting quotas.

(II) Comparison of Harvesting and Business Activities of Non-shareholders and Shareholders in a Forest Common in Västerbotten, Sweden

Introduction

Swedish forest commons are collectively owned and managed by shareholders who also own other forest holdings on an individual rather than a collective basis. The aim of this study was to assess differences between non-shareholders and shareholders, with respect to harvesting intensity on their individually managed forest properties, and related business activities. Forest commons are intended to promote local agriculture and forestry and to serve as a model for forestry activities (cf. Table 2). On this basis, the hypothesis examined in this study was that the shareholders' harvesting and business activities, as well as their contributions to the local economy, should be more extensive than those of non-shareholders. The contributions were assessed and discussed in terms of operating costs, investments, disposable income and direct tax revenue.

In order to address the hypothesis, a comparative study was conducted of NIPF owners in the municipality of Storuman, where one of the largest forest commons is located. Besides the size of the forest common, the choice of Storuman was guided by the useful feature, in the context of this study, that there is a fairly balanced distribution of forestland between shareholders and non-shareholders within the municipality. Furthermore, only NIPF owners (private individuals) own shares in the forest common, while a significant proportion of most other forest commons is held by other types of shareholders.
Material and Methods

Material and Methods

Storuman is a mountainous municipality in the County of Västerbotten, which contains 271 000 ha of productive forestland[12] (Regional Forestry Board of Västerbotten 2000). In 1918 about half of the farmers' forestland in the western part of the municipality of Storuman was allocated for a forest common to be called the Tärna-Stensele forest common (TSA), while the other half was to be individually managed. At that time, the farmers in the eastern part of Storuman had already received their forestland, all of which was to be individually managed. NIPF ownership, including the Tärna-Stensele forest common (TSA), accounts for 54 % of the forest area. The area that the shareholders manage individually amounts to 41 600 ha, and the area jointly managed (the TSA forest common) to 38 400 ha. The area of non-shareholders' forest is of the same magnitude; about 65 000 ha (District Forestry Board of Storuman 2005a).

The study involved a total of 1583 individuals, defined as NIPF owners, of which 871 were residents within the municipality and 712 were not. Of the total 1583,

[12] The forestland referred to throughout this study was productive land defined as 'land suitable for wood production and not primarily used for other purposes and where the potential yield under ideal management conditions is at least 1 m^3 per hectare per year' (*SFS* 1979, §2).

901 were shareholders in the TSA. NIPF owners included in the study were defined using the same data and method as employed by Holmgren *et. al*. (2005). Secondary data from Statistics Sweden (SCB) for 2000 were used, including the Total Population Register (TPR), the Register of Real Estate Assessment (FTR), annual income tax returns and excerpts of accounting items from SCB business statistics (SCB 2003). With assistance from SCB, the TPR and the FTR were used to identify each individual who owned agricultural property within the municipality. Forest data were supplied by the District Forestry Board of Storuman (2005a-c) and the Regional Forestry Board of Västerbotten (2000). Using these data sources, a comparative assessment of shareholders and non-shareholders of the TSA was based on the following: forestry production data, sales revenues, operating costs and investments, disposable income and local municipal tax revenues.

Results and Discussion

Based on the criteria applied in the sample selection, the shareholders and non-shareholders should have similar potential to operate sustainable forestry across the municipality. Nevertheless, the shareholders displayed lower activity with respect to annual felling (m^3 over bark per hectare per year). In fact, the levels of felling on shareholders' individually managed land were less than a third of the levels on non-shareholders' land, and below the level that could be expected from land classified as productive forestland, i.e. forestland with the potential to produce more than 1 m^3 per hectare per year. This was unexpected, since only minor differences in average mean site productivities (0.2 m^3sk/ha/year: Table 4), to the disadvantage of the shareholders, were found. The differences in timber extraction between shareholders and non-shareholders were also verified by accounted sales revenues. Shareholders declared timber sales revenues of SEK 214/ha (including dividend) and non-shareholders SEK 484/ha.

Table 4. *Standing and harvested volumes on non-industrial private forest (NIPF) owners' land, including shareholders and non-shareholders, in the municipality of Storuman in 2000*

Forest category	Mean site productivity (m^3sk/ha/y)	Average standing volume (m^3sk/ha)	Productive forestland (ha)	Harvested volume total (m^3sk)	Harvested volume per hectare (m^3sk/ha)
NIPF non-shareholders	2.7[1]	66[1]	65 000[4]	118 603[2]	1.83
NIPF shareholders	2.5[1]	67[1]	41 600[4]	22 088[2]	0.53
TSA forest common[3]	2.5	58	38 400	21 000	0.55

[1] Source; District Forestry Board of Storuman (2005a).
[2] Estimates based on final felling area in the year 2000 provided by the District Forestry Board of Storuman (2005c), an assumed average yield of 120 m^3sk/ha for final fellings and thinnings, assuming that final fellings account for about 88.5 % of the total fellings (Regional Forestry Board of Västerbotten 2000).
[3] Source; S.son-Wigren (2001) and the TSA management report for the year 2000.
[4] In total NIPF owners individually managed 106 600 ha (source; Regional Forestry Board of Västerbotten 2000).

In total, the accounted sales revenue amounted to SEK 37.6 million. The dividend from the TSA forest common, SEK 795 200 for the year 2000, was distributed to the shareholders as annual payments, so it was declared within the shareholders' sales figures. Linking the timber sales revenue to the area of individually managed forestland, shareholders had sales values of 191 SEK/ha[13] after the dividend from TSA had been deducted. The non-shareholders revenues amounted 484 SEK/ha. Thus, the felling statistics (Table 4) and the declaration data are consistent, since both indicate lower activity among shareholders for the year under consideration.

Differences were found also in harvesting behavior, in accordance with the findings of Carlsson (1995). The shareholders' individually managed lands, as well as the TSA, displayed one pattern and the non-shareholders another (Table 4). Thus, in this sense, it seems that the forest commons have served as role models for the shareholders. It also appears that the shareholders' less intensively managed forestlands generate economic returns that are inferior to those of the non-shareholders'. In addition, the impact of the TSA (including the dividend) on shareholders' individual results does not seem to help the shareholders to achieve a comparable level of economic return to the non-shareholders.

The higher activity among non-shareholders generates more local tax revenue. In contrast, besides the local tax revenue, the tax system can be seen as an essential part of the institutional framework that the NIPF owner operates within. Non-shareholders seem, with their higher activity and lower operational and investment costs, to have other incentives than the shareholders for their forest ownership. High costs for operation and investments can be considered positively from the perspective of the local society, assuming that the money is mainly spent within the municipality, thus stimulating local private enterprise and the public sector.

Final Discussion and Conclusions

In this thesis, the effects of the Swedish forest commons are assessed in terms of their influence on forest condition, management and the local economy. There are various ways to do this. Here, a rationalistic evaluation approach was chosen, focusing on the outcome of activities in relation to their aims (cf. Lind 1979). In the first study, this was done by examining how forest condition and management have been affected by the introduction of the forest commons. This was accomplished by studying all the forest commons, as well as other forest property regimes within the municipalities containing them. All data were sub-divided according to region. A second study compared forest common shareholders and non-shareholders, with respect to their harvesting intensity and related business activities on their individually managed forest properties.

[13] The TSA forestland contributed, through the dividend, to the shareholders revenues of 21 SEK for each hectare of forest common land.

What, therefore, have been the effects of the Swedish forest commons on the variables considered in this thesis? Re-examining the results from the two studies (Papers I-II), we find that the aims of the forest commons have not, generally, been achieved. The condition of the forest commons in the counties of Kopparberg and Gävleborg is similar to that of the surrounding forests. From a timber production perspective, the forest commons of Norrbotten and Västerbotten have a less favourable status than the surrounding forests (Paper I). The case study (Paper II) demonstrated that, in comparison to NIPF non-shareholders in the same municipality, the NIPF shareholders in Storuman undertake less harvesting and fewer business activities on their individually managed land. Furthermore, the shareholders undertake a similar level of harvesting activities on their individually managed land as in the forest common. The impact of the TSA forest common (including the dividend) on shareholders' individual finances does not seem to help them achieve a level of economic return comparable to that of the non-shareholders. Comparing the economic outcomes from the shareholders' two categories of forestland with non-shareholders' individually managed forestland, shareholders appear to have been affected by, or have affected, the operations of the TSA. Further, since non-shareholders undertake more activity than shareholders, they also generate more local tax revenue.

Since no evidence was found of any substantial biological differences between the different types of owners and property regimes in the potential to undertake forestry activities, these difference appear to be, at least partially, due to differences between the institutional frameworks in which they operate. These structures differ in the incentives associated with increased forest production, as well as in their effects on owners' finances and the owners' contributions to the local economy through taxes. The studies provide examples where the state of the forest in forest commons differs from that associated with other property regimes. They also show that there are regional differences within the institutional framework in which the forest commons operate. These differences are, in turn, likely to be linked to differences in regional characteristics that may contribute to variations in the forest commons' success. Thus, there are factors connected to the different types of property regime (individual, forest commons, public forest or forest company property) and also factors connected to the regional differences.

This supports the general conclusions presented by McKean (2000), who asserts that many factors probably affect the success of a forest common. The regional differences identified in the first study could be linked to regional characteristics influencing the success of the forest commons. These could coincide with the general characteristics described by Ostrom (1990) and McKean (2000), but there may also be more specific characteristics, such as local differences in how the dividend is distributed.

The reliability of the observed differences depends on the quality of the data. In this respect, the use of NFI data, which allows sub-division down to the regional level, has many advantages: the data collection and handling procedures used by the NFI are established, scientific and standardized, providing objective data that have been collected in the same way for the whole research area. Furthermore,

they allow significance levels to be calculated. Thus, the observed differences appear to be well established.

The second study included the whole population of NIPF owners within one municipality and relied on data from two sources: official forestry data and data from annual income tax returns. The forestry data from this study could be considered less reliable than the forestry data in the first study. However, the results from the two different sources suggest the same patterns, thus supporting the conclusions. Furthermore, they are consistent with the findings of Carlsson (1995), who also identified higher levels of activity among non-shareholders than shareholders in both Västerbotten and Norrbotten.

A key issue raised by the results is why some of the Swedish forest commons do not meet their aims. Berge (2003) argues that the commons represent an appropriate institutional system, if the desired outcome focuses on shared benefits, if there is a need to solve collective action problems and to establish synergies between primary production and other rural activities. The system is also appropriate if there is a desire to exclude potential appropriators, or to provide a 'safety net' for the poor and for subsequent generations. However, none of the aims considered in this thesis appear to be fulfilled. Like Berge (2003) and Ostrom (2000), we can conclude that holding property rights collectively is less effective than individual management for fulfilling these aims. The results presented in this thesis confirm this theory.

An additional difficulty in the case of Swedish forest commons could be that, in contrast to many commons worldwide, they are owned in common and not jointly. This means that the number of owners tends to grow proportionally to the growth of the population, as long as the properties are inherited by all of the children of each generation of owners; a factor that according to Olson (1965) adversely affects their success. Further, the proportion of non-resident owners tends to keep pace with migration from these rural areas, another factor that might have a negative impact, at least from the local perspective.

Another possible explanation for the observed performance of forest commons may be related to factors other than those studied in this thesis; their owners may have chosen or been forced to concentrate on aims that compete with timber production Some of the initiatives that have prompted a shift in the forest commons' aims may have originated from the owners' themselves, but many others may have arisen from other sources within their communities, e.g. pressure groups seeking to promote reindeer husbandry, hunting, fishing, tourism, biodiversity and conservation (Paper I). Of course, the owners' interests and those of such pressure groups may also heavily overlap. These demands and expectations appear to be higher on the forest commons than on the individually managed land, even if the owners in many cases are the same private individuals (c.f. S.son-Wigren and Sandström 2001a, 2001b, Lisberg Jensen 2002). These considerations raise questions about whether the changed property rights have led to a lack of clarity regarding whose interests should dominate: those of the general population or the shareholders?

A different research approach could have examined many other aspects of Swedish forest commons, since the forests should not be considered a source of just one commodity. It would, for example, be interesting to study the contribution of the forest commons to local well-being, a sense of place and the ecological or amenity services they provide, their importance for the reindeer industry or the occurrence and importance of berries, fish and game and, possibly, their relationship to other types property regime. Many such aspects could be considered. However, as long as producing timber for sale is a stated aim for the management of the forest commons their influence of on timber production cannot be ignored in any analysis of their success, especially given the emphasis on timber production in earlier research and its importance for the Swedish economy.

Uses other than timber production certainly have relevance for any future research agenda relating to forest commons. Today, general expectations regarding the services forest commons can deliver differ from the expectations when they were created. Several of the non-timber aspects that are now highly relevant meet criteria described by Berge (2003), such as shared benefits, collective action problems and excluding appropriators. A viable hypothesis, in this context, is that the Swedish forest commons could be more effective than individual management; and perhaps even more so now than in the timber production era. Thus, more research should be conducted to examine how efficient the Swedish forest commons have been with respect to these goals.

Thus, we find that it is important to match the property regime to the intended outputs. In addition, there are local characteristics that should be considered before forest commons are established. These specific characteristics, in the case of Swedish forest commons, are still to be identified.

Acknowledgements

The work underlying this thesis was financially supported by the Kempe Foundation and the research program The Utilization of the Boreal Forest, partly financed by EU Structural Funds. The author is grateful to her supervisors, Ass. Prof. Gun Lidestav and Professor Ljusk-Ola Eriksson, for their support, for enlightening discussions and for valuable comments that considerably improved the manuscripts. I would further like to thank Göran Kempe and Sören Holm, of the Department of Forest Resource Management and Geomatics and Professor Urban Bergsten, Hans Sjögren, Lina Holmgren and Inga-Lis Johansson, Department of Silviculture, all from the Swedish University of Agricultural Sciences, Umeå, for support, cooperation and valuable comments on earlier drafts. I would also like to thank the District Forestry Board of Storuman and Managers of the forest commons for helpful support with data collection and valuable comments. Finally, I thank my family for keeping me afloat and especially my children Albert and Agnes for not complaining when I had to work late instead of spending time with them.

References

Arell, N. 1979. Kolonisationen i lappmarken. Esselte Studium AB, Berlings, Lund. In Swedish.

Berge, E. 2002. Reflections on Property Rights and Commons in Economies of Western Europe – the Commons in an Age of Globalization. Opening address at the IX World conference of IASCP, Victoria Falls, Zimbabwe.

Berge, E. 2003. Joining the Northern Commons: Lessons for the World, Lessons from the World (Opening address), the IASCP Polar Conference, Anchorage, USA.

Bromley, D.W., Cernea, M.M. 1989. The Management of Common Property Natural Resources: Some Conceptual and Operational Fallacies, World Bank Discussion Papers No.57. World Bank, Washington DC. USA.

Carlsson, L. 1995. Skogsallmänningarna i Sverige. Forskningsrapport Tulea 1995:22, Luleå. In Swedish

Carlsson, L. 1999. Still going strong, community forests in Sweden, Forestry 72(1):11-26.

Carlsson, L. 2000. Towards a Sustainable Russian Forest Sector. Natural Resources Forum 24 (2000) 31-37. United Nations, Elsevier Science Ltd.

Carlsson, L. 2001. Keeping away from the Leviathan: the case of the Swedish forest commons. Management of Social Transformations – MOST, Discussion Paper No. 51, UNESCO.

Ciriacy-Wantrup, S.V., Bishop, R.C. 1975. 'Common property' as a concept in natural resource policy, Natural Resources Journal 15, 713-727.

District Forestry Board of Storuman 2005a. Virkesförråd och bonitet för ö.s.i områden inom Storumans kommun uppdelat på ovan och nedan odlingsgränsen. Unpublished. In Swedish.

District Forestry Board of Storuman 2005b. Personal communication.

District Forestry Board of Storuman 2005c. Excerpt from 'KOTTEN' for the years 1998-2002. Unpublished. In Swedish.

Dolšak N., Ostrom E. 2003. New and Old Challenges to Governing Common-Pool Resources, in Dolšak N., Ostrom E. (Eds.), The Commons in the New Millennium – Challenges and Adaptations, Massachusetts Institute of Technology, Cambridge.

Enander, K-G. 2000. Skogsvårdslagen 1903 – dess förhistoria och några huvuddrag i utvecklingen. Swedish University of Agricultural Sciences, Department of Silviculture. Reports No. 46, Umeå. In Swedish.

Enander, K-G. 2001. Skogsbrukssätt och skogspolitik 1900-1950. Swedish University of Agricultural Sciences, Department of Silviculture. Reports No. 48, Umeå. In Swedish.

Enander, K-G. 2003. Skogsbrukssätt och skogspolitik 1950-2000. Swedish University of Agricultural Sciences, Department of Silviculture. Reports No. 54, Umeå. In Swedish

Ericsson, S. 1997. Alla vill beta men ingen vill bränna. Skogshistoria inom Särna-Idre besparingsskog i nordvästra Dalarna. Skoglig vegetationsekologi, Rapporter och uppsatser no 8, Swedish University of Agricultural Sciences, Umeå. In Swedish.

Gibson, C.C, McKean M.A., Ostrom E. 2000. Explaining Deforestation: The Role of Local Institutions, in C.C. Gibson, M.E. McKean and E. Ostrom (Eds.), People and Forests: Communities, Institutions, and Governance, Massachusetts Institute of Technology, Cambridge.

Hardin, G. 1968. The tragedy of the Commons. Science 162.

Hardin, G. 1998. The tragedy of the Commons. Science 682.

Holmgren, L., Lidestav, G., Nyquist, S. 2005. Taxation and investment implications of non-industrial private forestry within a Boreal Swedish Municipality. Small-scale Forest Economics, Management and Policy 4(1): 35-51.

Kardell, L. 1991. En skogshistorisk skiss. Lima och Transtrand. I: Pettersson T.J. (Ed.). Ur två socknars historia. Malungs kommun. Malung. In Swedish.

Kardell, L. 2004. Svenskarna och skogen. D. 2, Från baggböleri till naturvård. Skogsstyrelsens förlag, Jönköping. In Swedish.

Kjellin, P. *et. al*. 2001. Skogspolitiken idag – en beskrivning av den politik och övriga faktorer som påverkar skogen och skogsbruket. Skogsvårdsstyrelsens förlag, Jönköping. 90 pp. In Swedish.

Liljenäs, I. 1977. Allmänningsskogarna i Norrbottens län – deras betydelse för det enskilda jord- och skogsbruket. Kungliga Skytteanska samfundets handlingar, No 16, 1977, Umeå. In Swedish.

Liljenäs, I. 1982. Besparingsskogarna I Kopparbergs och Gävleborgs län samt allmänningsskogarna i Norrbottens och Västerbottens län, Gerum, Rapport A:34, Umeå. In Swedish.

Liljenäs, I. 1983. Allmänningen – en lokal resurs i Norrbottens inland. Länsstyrelsen i Norrbottens Län, No 6 Planeringsavdelningens Rapporserie, Luleå. In Swedish.

Lind, R. 1979. Utvärderingsforskning – En litteraturöversikt. Stockholm: School of Economics, the Economic Research Institute, Research paper 6133. In Swedish.

Lisberg Jensen, E. 2002. Som man ropar i skogen: Modernitet, makt och mångfald i kampen om Njakafjäll och i den svenska skogsbruksdebatten 1970-2000. PhD diss., Human Ecology Division, Lund University. In Swedish.

McKean, M. 2000. Common Property: What is it, What is it Good for, and What Makes it Work, in C.C. Gibson, M.E. McKean and E. Ostrom (Eds.), People and Forests: Communities, Institutions, and Governance, Massachusetts Institute of Technology, Cambridge.

Ministry of Agriculture, 1983. Skogsallmänningar – Betänkande av allmänningsutredningen. Ds Jo 1983:15, Norstedts tryckeri, Stockholm. In Swedish.

Olson, M. 1965. The Logic of Collective Action: Public Goods and the Theory of Groups'. Cambridge, MA, Harvard University Press.

Ostrom, E. 1990. Governing the Commons. Cambridge University Press, New York.

Ostrom, E. 2000. Private and common Property Rights. In Encyclopedia of Law and Economics, Vol. II: Civil Law and Economics. Bouckaert, B. De Geest, G., (Eds.) Cheltenham, England: Edward Elgar.

Pettersson, R. 2003. Ett reformverk under omprövning, Skifteslagstiftningens förändringar under första hälften av 1800-talet. Kungl. Skogs- och Lantbruksakademien, Skogs- och lantbrukshistoriska meddelanden nr 27, Stockholm. In Swedish.

Regional Forestry Board of Västerbotten 2000. Logging statistics for year 2000 in Västerbotten, Regional Office, Umeå.

Runge, C.F. 1981. Common property externalities: Isolation, assurance and resource depletion in a traditional grazing context. American Journal of Agricultural Economics 63: 595-606.

SCB 2003. Statistics Sweden, Ordered data from the Total Population Register (TPR) (2000-12-31), the Register of Real Estate Assessment (FTR) (2001-01-01), the business statistics (financial year 2000) and personal communication, Örebro.

SFS (Swedish Code of Statutes) 1866. Kunglig förordning angående dispositionsrätten över skogen. *SFS* 1866:63', [Act Relating to Regulations over Forest Disposal]. Government of Sweden, Stockholm.

SFS (Swedish Code of Statutes) 1873. Stadgan om avvittring i Västerbottens och Norrbottens läns lappmarker, *SFS* 1873:26, [Act Relating to Delimitation of land in Västerbotten and Norrbotten]. Government of Sweden, Stockholm.

SFS (Swedish Code of Statutes) 1906 a. Kunglig Maj:ts nådiga kungörelse angående förbud i vissa fall för bolag och föreningar att förvara fast egendom, *SFS* 1906:21, [Act Relating to Regulation Against the Acquisition of Forestland by Forest Companies and Cooperative Economical Associations]. Government of Sweden, Stockholm.

SFS (Swedish Code of Statutes) 1906 b. Kunglig Maj:ts nådiga kungörelse angående vissa ändringar gällande bestämmelser rörande afvittringen inom Västerbottens och Norrbottens läns lappmarker, *SFS* 1906:36, [Act Relating to Delimitation of Land for Lapland in Västerbotten and Norrbotten]. Government of Sweden, Stockholm.

SFS (Swedish Code of Statutes) 1952. Lag om allmänningsskogar i Norrland och Dalarna. SFS 1952:167, [Act Relating to Collectively-Owned Forest Lands]. Government of Sweden, Stockholm.

SFS (Swedish Code of Statutes) 1979. Skogsvårdslag, SFS 1979:429, [Swedish Forestry Act]. Government of Sweden, Stockholm.
SFS (Swedish Code of Statutes) 1993. Skogsvårdslag, SFS 1993:553', [Swedish Forest Act]. Government of Sweden, Stockholm.
S.son-Wigren, C., Sandström, H. 2001a. Skogsbruk i fjällkanten - Tärna-Stensele Allmänningsskog. Ord & visor förlag, Skellefteå. In Swedish.
S.son-Wigren, C., Sandström, H. 2001b. Skogen vi ärvde – Sorsele Övre Allmänningsskog. Ord & visor förlag, Skellefteå. In Swedish.
Stenman, L. 1983. Delimitation in the Lapland region of the county of Västerbotten. Forskningsrapporter från Kulturgeografiska institutionen, Uppsala universitet, no 83, Uppsala, Sweden. In Swedish.
Van der Ploeg J.D. *et. al.* 2000. Rural development: From practices and policies towards theory. Sociologia Ruralis, 40(4):391-408.