Harvesting and silvicultural activities in Swedish family forestry behavior changes from a gender perspective

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Abstract

Previous reports indicating that forest properties owned by women were less extensively managed than those owned by men were partly attributed to women not having been fully socialized into family forestry. It was assumed that this gap would have been reduced by targeted actions undertaken over the last 10-15 years with the aim of increasing women's interest in and knowledge of forestry, and strengthening their self-identification as forest owners. To examine this assumption, the management behaviors of male and female forest owners in 2003-2006 were analyzed and compared to results for 1992-1994. The data were obtained from the Data Base for Forest Owner Analysis and concerned almost 9000 forest management units. Although harvesting and silvicultural activities increased on both male-and female-owned properties over time, the ''gap'' between male and female owners did not diminish as expected.

Keywords: Data Base for Forest Owner Analysis, forest management, gender, regression model, targeted actions.

Introduction

Previous studies on Nordic family forestry have demonstrated that less harvesting and silvicultural activities take place on forest properties owned by women than by men (Strupstad, 1990; Ripatti, 1999; Lidestav & Ekström, 2000; Kuuluvainen et al., 2011). This is partly because women's properties are generally smaller than men's and partly because women have not yet been socialized into family forestry to the same extent as men (Brandth et al., 2004; Lidestav & Nordfjell, 2005; Lindroos et al., 2005; Follo, 2008; Ha¨ggqvist et al., 2010; Lidestav, 2010). Concerns regarding these differences have been expressed by the Swedish Government, in the latest Bill on new forest policies (2007/08:108) and even more specifically by a national strategy for gender equality in the forest sector that was launched in April 2011 (Landsbygdsdepartementet, 2011). Ripatti (1999) claims that information and education have

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more pronounced effects on females' cutting behavior than on males', while Häggqvist et al. (2010) reported that female participants in the so-called ''forest day'' training exercises exhibited greater increases in knowledge than did male participants.

Over the last 10-15 years, a range of targeted actions have been implemented in order to increase women's interest in and knowledge of forestry and to promote in them a sense of identity as forest owners. These actions have included various courses and women-only forest days. The independent formation of local and national networks of female forest owners has also helped to increase their members' involvement in forestry and self-confidence as forest, as well as increasing their respect and recognition among forest professionals and male forest owners (Lidestav & Andersson, 2011).

One might therefore expect that the gap between male and female forest owners in terms of forest management practices would have decreased or even disappeared. To determine whether this is in fact the case, we compared the harvesting and silvicultural activities on forest properties owned by male and female owners during 2003-2006 to that reported for the period between 1992 and 1994 by Lidestav and Ekström (2000). To facilitate comparison, the new data were gathered using the same methods as were used by the authors of the reference work. While the previous study focused exclusively on single owners, the work reported herein examined both single owners and cases involving joint ownership. The results obtained are discussed in relation to the activities and measures taken by the forest sector (including the forest-owning women themselves) in order to increase women's interest and involvement in forestry.

Materials and methods

The analysis was performed using data held by the Swedish Data Base for Forest Owner Analysis which contains information regarding harvesting and silviculture gathered by the Swedish Forest Agency. The survey was conducted using a standardized written postal questionnaire that was answered by individual forest owners with guidance from a forest ranger at the Swedish Forest Agency. The forest properties owned by the surveyed subjects constituted a stratified random sample, stratified by county and area from the target population of small-scale forest management units in Sweden. (A forest management unit may consist of one or more properties as long as they belong to the same owner or group of owners, and are located within the same municipality. For convenience we will henceforth refer to forest management units using the term ''property.'') A comprehensive description of the methodology and the database was published by Berg Lejon et al. (2011). Table I shows the sizes of the target populations, sample sizes, number of respondents and respondent rates for the study by Lidestav & Ekström (2000) covering the period between 1992 and 1994 and for the data generated in this work covering the period between 2003 and 2006.

The database contains information concerning the gender and age of the owner to whom each questionnaire was addressed (i.e. the corresponding owner) and if the forest property is certified or not. Forest certification data were analyzed in this work because it seems to correlate positively with active forestry (Lidestav & Berg Lejon, 2011). Moreover, the database also contains information on the ownership of the property in question. The ownership categories considered in this work were: female respondents with single ownership, female respondents with joint ownership, male respondents with single ownership, and male respondents with joint

ownership. The database contains information on 8971 unique forest properties for the period investigated (20032006). Henceforth and in Tables II-IV, the following abbreviations are used to denote the ownership categories listed above: women single, women joint, men single, and men joint. The database also contains information on property size, silviculture and harvesting activities, including the volume harvested during final felling, thinning and other cuttings, as well as area of cleaning, scarification, planting, and supplementary planting. The distribution of ownership categories within the sample was as follows: male respondents with single ownership, 43.0%; male respondents with joint ownership, 14.3%; female respondents with single ownership, 29.2%; female respondents with joint ownership, 12.1%.

We used the same analytical techniques as described by Lidestav and Ekström (2000) to examine whether there are any differences in the harvesting strategies adopted by men and women with single or joint ownership who had reported harvesting that year. The data were analyzed by multiple regression analysis. The variables to be explained were: (1) volume in final felling; (2) volume in final felling per hectare; (3) volume in thinning; (4) volume in thinning per hectare; (5) total harvested volume; and (6) total harvested volume per hectare. The explanatory variables used in the model were: (1) certification (no_0 and yes_1); (2) age of the owner (years); (3) size of forest property (hectare); and (4) forest ownership categories. For the purpose of regression analyses, logarithmic transformation (with base e) of the variable property size was found to be most suitable. So, when referring to the response variable (i)-(vi) and the explanatory variable (c) in the text, it is actually the logarithmically transformed value that are used in the models. To examine whether harvesting and silvicultural activities are affected by ownership categories, or whether other explanatory variables are simply differently distributed between male and female with singly-or jointly owned properties, binary logistic regression was used. The variable to be explained is dichotomous, e.g. equal to 1 if a certain activity has taken place during the year, and equal to 0 if not. The explanatory variables were the same as used in the multiple regressions. The stratification of the data was not taken into account when the logistic regression was performed. Throughout the study, the level of significance is set at 5%.

Results

Women accounted for 26.8% of all forest owners and held 23.3% of the forested land examined in this work. This implies that women generally own smaller properties than men, averaging 46.3 ha whereas the male average is 59.5 ha. Since the beginning of the 1990s (cf. Lidestav & Ekström, 2000) the percentage of forest owners who are women has increased by 5.4% and the percentage of forest land that is owned by women has increased by 4.8%. However, it should be stressed that according to official statistics based on the registration of legal titles to forest estates, the proportion of female forest owners is 38% (Skogsstyrelsen, 2011). As much as 45.8% of the forest properties owned by women are jointly owned, and the mean size of those properties is 56.4 ha. The corresponding figures for men are 40.9% and 62.5 ha. The distribution of single and joint ownership in the sample may reflect the survey design, which overrepresented male owners. This shortcoming is discussed in more detail below. As shown by the area class distribution data in Table II, women tended to own smaller properties. For both women and men, jointly owned properties were generally somewhat larger than those under single ownership.

On average, female single owners were 2.7 years older than male single owners (62.3 vs 59.9 years) which is similar to the situation at the beginning of the 1990s (cf. Lidestav & Ekström,

2000). The average age for women who own their property jointly is 59.6 years while that for men in the same situation is 57.9. The higher mean age among single owners is probably a cohort effect stemming from the fact that a property that is jointly owned by a couple will become singly owned when one of the two dies, and the likelihood of one member of the couple dying increases with age. This is also probably the reason why female single owners tend to be older than male single owners (Table III).

As was the case in 1992-1994, men with single ownership were more likely to engage in forestry in 2003-2006 than were female single owners (Table IV). Properties under single ownership generally saw more activity than those under joint ownership even though properties under single ownership are generally smaller. The difference in activity between male and female owners that was observed in 1992-1994 had not diminished in 2003-2006.

The entire dataset was analyzed to determine the incidence of silvicultural and harvesting activities. The estimated logit model showed that female single owners were less inclined to carry out final felling, thinning, other cuttings, planting, supplementary planting, and cleaning than were single male owners (Table V). Female single owners were more inclined to carry out thinning and other cuttings than men with joint ownership but less so than men with single ownership. Final felling, thinning, other cuttings, mechanized scarification, planting, supplementary planting, and cleaning were all more common on larger properties and certified properties. Finally, forest owner's age had a negative effect on all activities. Note that both Tables V and VI present results for the ''full model''; in cases where one or more parameters are not significantly different from zero, a (final) reduced model is also presented.

For those properties where harvesting had taken place, differences in harvesting volume (in total and per hectare) were analyzed by multiple regression. The non-weighted analyses showed that the owner's gender and ownership category had no influence on the volume harvested during the final felling, but increased with age of the corresponding owner. Certified properties and smaller properties tended to have lower total harvested volumes for the final felling (Table VI). However, forest certification schemes seemed to increase the volume harvested per hectare in the final felling, indicating that the standing volume prior to final felling is generally higher on forest certified properties. The total volume harvested during thinning increased with property size and forest certification, but was decreased if the corresponding owner was a man. Certification, property size, and joint ownership with a female respondent all had positive effects on the volume thinned per hectare. Both certification and property size had a positive impact on the total volume harvested (i.e. the combined volumes for final felling, thinning, and other cuttings). Conversely, age and joint ownership with a man as corresponding owner had a negative impact. The total volume harvested per hectare increased with forest certification, but decreased with property size, age, and with a male respondent with joint ownership.

Discussion

From the broad perspective of forest policy and governance (cf. Bill 2007/08:108), the most encouraging finding of this work is that harvesting and silvicultural activities undertaken by both male and female forest owners have increased in recent years. However, from a gender mainstreaming point of view (cf. Landsbygdsdepartementet, 2011), it must be considered

disappointing that the ‘‘gap’’ between male and female owners has not diminished. Harvesting and silvicultural activities are still less common on properties with a female as corresponding owner. Our results are consistent with previous findings; there is a positive relationship between property size and the occurrence of harvesting and silvicultural activities (Lidestav & Ekström, 2000; Lidestav & Nordfjell, 2005), and forest certification seems to increase both the occurrence of forest activities and the volume harvested (Johansson & Lidestav, 2011, Lidestav & Berg Lejon, 2011). On properties where harvesting has taken place, certification appears to increase the volume harvested (both in absolute terms and on a per-unit-area basis), but the owner's gender has no influence. It thus seems that targeted actions aimed at increasing women's interest in and knowledge , as well as strengthening their self-identification as foresters and forest owners has not yet changed the structural condition that properties owned by men tend to be larger and/or are more likely to be certified. While the amount of forestry activities conducted on properties owned by women has increased since early 1990s, the targeted actions have not been sufficiently extensive and effective to close the activity gap between women and men.

In order to increase the efficiency of targeted actions and thereby better meet the expectations raised in the National strategy for gender equality (Landsbygdsdepartementet 2011), it would be desirable to establish a reliable and uniform reporting system that provides information on the type and number of activities performed, the identities of the participants, the objectives of the activity, and its outcomes. This will provide data that can be systematically investigated and evaluated to create a sound basis for effective improvement.

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Table I. Small-scale forest owner's survey, total number of management units, samples, respondents and percentage of answers for 1992-1994 and 1999-2006.

Year of activity	Population size	Sample size	Number of respondent	Percentage of answers
1992	206, 882	2236	2087	93
1993	203, 551	2232	2070	93
1994	203, 549	2249	2093	93
2003	199, 569	2247	1923	86
2004	198, 056	2240	1192*	53
2005	197, 033	2229	1732	78
2006	196, 169	2192	1680	77

*) The catastrophe due to the severe storm 'Gudrun', is reflected in the significant drop in the number of respondents for the year 2004 (53 %).

Table II. Area class distribution within Swedish NIPF by gender and ownership constellation (%).

Forest area (ha)	Men			Women		
	Single	Joint	Total	Single	Joint	Total
5-24	40.7	39.9	40.4	49.5	43.9	47.6
25-49	24.7	22.3	24.1	23.9	25.8	24.6
50-99	19.5	20.3	19.7	15.9	16.5	16.2
100-199	10.5	11.8	10.8	7.5	8.8	8.0
200-399	3.6	4.5	3.8	2.5	3.9	3.0
400-999	0.9	1.1	0.9	0.5	0.9	0.7
1000-4999	0.1	0.1	0.1	0.1	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table III. Age class within Swedish NIPF by gender and ownership constellation (%).

Age (years)	Men			Women		
	Single	Joint	Total	Single	Joint	Total
0-29	0.2	0.5	0.3	0.1	0.1	0.1
30-39	3.6	4.5	3.8	3.1	3.9	3.3
40-49	12.2	12.4	12.2	7.9	14.7	10.2
50-59	24.8	27.9	25.7	22.7	25.1	23.5
60-69	27.8	31.7	28.8	30.0	24.3	28.0
70-79	21.0	17.0	20.0	21.5	19.9	21.0
>=80	10.4	6.0	9.2	14.9	12.0	13.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table IV. Forestry activity on NIPF holdings by the gender and ownership constellation (% of NIPF holdings).

Forestry activity	Men			Women		
	Single		Joint	Single		Joint
	1992-1994	2003-2006	2003-2006	1992-1994	2003-2006	2003-2006
Final felling	16.7	20.9	19.2	12.1	14.3	13.5
Thinning	32.9	34.0	31.1	20.8	21.5	19.1
Other cuttings	44.5	47.0	44.3	36.2	38.6	33.3
Mechanized scarification	5.5	9.2	8.8	4.5	8.3	7.9
Planting	12.3	15.0	14.2	10.7	10.1	10.6
Supplementary planting	9.2	6.9	6.8	4.9	3.9	4.0
Cleaning	30.2	37.0	35.9	21.2	26.7	24.7
Any activity	75.3	78.6	63.1	59.2	64.1	50.2

Table V. Harvesting and silvicultural activity: logistic regression.

Predictor	Coefficient	SD	*p*-value	Odds Ratio
Final felling (no activity=0. activity=1)				
Constant	-3.144	0.523	0.000	
Certification (no=0, yes=1)	0.448	0.065	0.000	1.57
Log(property size)	0.493	0.024	0.000	1.64
Log(age)	-0.163	0.121	0.176	0.85
Male respondent – single owned	0.593	0.110	0.000	1.81
Female respondent – single owned	0.229	0.130	0.079	1.26
Male respondent - joint owned	0.116	0.122	0.341	1.12
Constant	-3.720	0.115	0.000	
Certification (no=0, yes=1)	0.420	0.063	0.000	1.52
Log(property size)	0.499	0.023	0.000	1.65
Male respondent – single owned	0.454	0.053	0.000	1.58
Thinning (no activity=0. activity=1)				
Constant	-1.685	0.464	0.000	
Certification (no=0, yes=1)	0.449	0.061	0.000	1.57
Log(age)	-0.297	0.107	0.006	0.74
Log(property size)	0.331	0.021	0.000	1.39
Male respondent – single owned	1.043	0.103	0.000	2.84
Male respondent - joint owned	0.476	0.112	0.000	1.61
Female respondent – single owned	0.488	0.119	0.000	1.63
Other cuttings (no activity=0. activity=1)				
Constant	0.095	0.434	0.827	
Certification (no=0, yes=1)	0.309	0.060	0.000	1.36
Log(age)	-0.305	0.101	0.002	0.74
Log(property size)	0.043	0.019	0.022	1.04
Male respondent – single owned	0.887	0.091	0.000	2.43
Female respondent – single owned	0.553	0.105	0.000	1.74
Male respondent - joint owned	0.437	0.100	0.000	1.55
Mechanized scarification (no activity=0. activity=1)				
Constant	-2.324	0.634	0.000	
Certification (no=0, yes=1)	0.608	0.074	0.000	1.84
Log(age)	-0.724	0.147	0.000	0.48
Log(property size)	0.678	0.030	0.000	1.97
Female respondent – single owned	0.263	0.158	0.097	1.30
Male respondent - joint owned	0.049	0.148	0.742	1.05
Constant	-2.284	0.622	0.000	
Certification (no=0, yes=1)	0.608	0.074	0.000	1.84
Log(age)	-0.725	0.147	0.000	0.48
Log(property size)	0.678	0.030	0.000	1.97
Male respondent – single owned	0.329	0.076	0.000	1.39
Female respondent – single owned	0.226	0.113	0.046	1.25

Planting (no activity=0. activity=1)

Constant	-2.246	0.562	0.000	
Certification (no=0, yes=1)	0.865	0.066	0.000	2.38
Log(age)	-0.509	0.130	0.000	0.60
Log(property size)	0.524	0.026	0.000	1.69
Male respondent – single owned	0.534	0.121	0.000	1.71
Female respondent – single owned	0.227	0.143	0.113	1.26
Male respondent - joint owned	0.219	0.132	0.098	1.24
Constant	-2.055	0.551	0.000	
Certification (no=0, yes=1)	0.865	0.066	0.000	2.38
Log(age)	-0.509	0.130	0.000	0.60
Log(property size)	0.523	0.026	0.000	1.69
Male respondent – single owned	0.350	0.059	0.000	1.42

Supplementary planting (no activity=0. activity=1)

Constant	-2.779	0.753	0.000	
Certification (no=0, yes=1)	0.610	0.086	0.000	1.84
Log(age)	-0.544	0.174	0.002	0.58
Log(property size)	0.440	0.033	0.000	1.55
Male respondent – single owned	0.713	0.182	0.000	2.04
Female respondent – single owned	0.183	0.218	0.400	1.20
Male respondent - joint owned	0.519	0.195	0.008	1.68
Constant	-2.662	0.739	0.000	
Certification (no=0, yes=1)	0.608	0.086	0.000	1.84
Log(age)	-0.543	0.174	0.002	0.58
Log(property size)	0.439	0.033	0.000	1.55
Male respondent – single owned	0.597	0.114	0.000	1.82
Male respondent - joint owned	0.403	0.134	0.003	1.50

Cleaning (no activity=0. activity=1)

Constant	-0.988	0.453	0.029	
Certification (no=0, yes=1)	0.541	0.061	0.000	1.72
Log(age)	-0.461	0.105	0.000	0.63
Log(property size)	0.452	0.021	0.000	1.57
Male respondent – single owned	0.665	0.093	0.000	1.94
Female respondent – single owned	0.276	0.109	0.011	1.32
Male respondent - joint owned	0.419	0.102	0.000	1.52

Table VI. Harvesting volume: multiple regression.

Predictor	Coefficient	SD	*p*-value
Log(harvested volume in final felling)			
Constant	3.0583	0.00260	0.000
Certification (yes=1, no=0)	0.0031	0.00099	0.002
Log(property size)	0.0011	0.00031	0. 000
Age	0.0168	0.00003	0. 000
Male respondent – single owned	0.0010	0.00140	0.475
Female respondent – single owned	-0.0002	0.00164	0.899
Male respondent - joint owned	0.0021	0.00154	0.172
Constant	3.8834	0.00794	0. 000
Certification (yes=1, no=0)	-0.0280	0.00522	0. 000
Log(property size)	-0.0089	0.00162	0. 000
Age	0.0042	0.00006	0. 000
Log (harvested volume per hectare in final felling)			
Constant	5.3824	0.07776	0. 000
Certification (yes=1, no=0)	0.1514	0.02377	0. 000
Log(property size)	-0.0025	0.00873	0.776
Age	-0.0010	0.00078	0.197
Male respondent – single owned	0.0012	0.04468	0.978
Female respondent – single owned	-0.0076	0.05290	0.885
Male respondent - joint owned	-0.0265	0.04940	0.592
Constant	5.3152	0.00970	0. 000
Certification (yes=1, no=0)	0.1365	0.01951	0. 000
Log (harvested volume in thinning)			
Constant	2.2694	0.17270	0. 000
Certification (yes=1, no=0)	0.3897	0.05227	0. 000
Log(property size)	0.6662	0.01865	0. 000
Age	-0.0023	0.00170	0.178
Male respondent – single owned	-0.3270	0.10640	0.002
Female respondent – single owned	-0.1884	0.12280	0.125
Male respondent - joint owned	-0.3995	0.11540	0.001
Constant	1.9665	0.09734	0. 000
Certification (yes=1, no=0)	0.3962	0.05116	0. 000
Log(property size)	0.6720	0.01822	0. 000
Male respondent – single owned	-0.1980	0.06025	0.001
Male respondent - joint owned	-0.2676	0.07448	0. 000
Log (harvested volume per hectare in thinning)			
Constant	3.6192	0.07612	0. 000
Certification (yes=1, no=0)	0.1103	0.02304	0. 000
Log(property size)	0.0544	0.00822	0. 000
Age	-0.0002	0.00075	0.779

Male respondent–single owned	-0.1233	0.04689	0.009
Female respondent – single owned	-0.0822	0.05410	0.129
Male respondent - joint owned	-0.1456	0.05085	0.004
Constant	3.4869	0.03771	0. 000
Certification (yes=1, no=0)	0.1012	0.02263	0. 000
Log(property size)	0.0548	0.00807	0. 000
Female respondent- joint owned	0.1154	0.04508	0. 010
Log (total harvested volume)			
Constant	1.8528	0.15630	0. 000
Certification (yes=1, no=0)	0.6532	0.05301	0. 000
Log(property size)	0.7715	0.01742	0. 000
Age	-0.0052	0.00158	0.001
Male respondent – single owned	-0.0152	0.09261	0.870
Female respondent – single owned	-0.0082	0.10630	0.938
Male respondent - joint owned	-0.1504	0.10110	0.137
Constant	1.8390	0.12840	0. 000
Certification (yes=1, no=0)	0.6532	0.05296	0. 000
Log(property size)	0.7715	0.01739	0. 000
Age	-0.0052	0.00157	0.001
Male respondent - joint owned	-0.1372	0.05265	0.009
Log (total harvested volume per hectare)			
Constant	1.8528	0.15630	0. 000
Certification (yes=1, no=0)	0.6532	0.05301	0. 000
Log(property size)	-0.2285	0.01742	0. 000
Age	-0.0052	0.00158	0.001
Male respondent – single owned	-0.0152	0.09261	0.870
Female respondent – single owned	-0.0082	0.10630	0.938
Male respondent - joint owned	-0.1504	0.10110	0.137
Constant	1.8390	0.12840	0. 000
Certification (yes=1, no=0)	0.6532	0.05296	0. 000
Log(property size)	-0.2285	0.01739	0. 000
Age	-0.0052	0.00157	0.001
Male respondent - joint owned	-0.1372	0.05265	0.009