Effects of Forestry Extension on the Use of Allowable Cut in Non-industrial Private Forests

Veli-Pekka Järveläinen

An empirical analysis of the Finnish non-industrial private forest owners indicates that forestry extension has an effect on the supply of timber and the use of cutting potentials. This effect appears to be indirect rather than direct. The use of extension services is likely to increase the frequency of timber sales, which, in turn, increases the use of the allowable cut via increased volume of actual cuttings. Forestry extension can also be considered as an intermediate variable through which certain background conditions and owner characteristics affect the use of cutting potentials.

Keywords: timber supply, effectiveness of forest policy.

Introduction

Actual cuttings in non-industrial private (NIP) forests in Finland have recently remained below the allowable cut. It is estimated that NIPF owners, who provide about 80 per cent of industrial roundwood, have used under 90 per cent of the allowable cut of their forests during the last two decades (Puuhuollon työryhmän raportti 1985). This development has meant an accumulation of cutting potentials of about 5 million cu.m. per annum. Besides, without special measures, the underuse of NIP-forests may even increase in the future (Riihinen and Tikkanen 1985).

The current level of forest resource utilization in Finland still is quite high. However, in such countries as Finland, where forestry and the forest industries play an important role in the national economy, even a slight underutilization of cutting potentials may have severe economic implications.

In the beginning of the century, NIP-forests in Finland were mainly used by households. The cuttings for household use comprised over a half of the total volume of cuttings. The current situation is, hovewer, very different. The cuttings for sale comprise nearly 90 per cent of the total cuttings carried out in NIP-forests. Therefore, the use of the allowable cut of NIP-forests is today decisively dependent on cuttings for sale, and hence, on functioning of the roundwood market.

The quantity of timber sold is, in turn, dependent on demand for and on supply of timber. As far as the Finnish situation is concerned, it seems obvious that the underuse of NIP-forests has to a great extent been caused by demand side factors. This is because during the economic recessions the forest industries have not been able to use roundwood as much as the NIP-forests would have permitted. Also, the demand for some timber assortments (e.g. deciduous cordwood) has permanently been weak.

However, the underutilization can hardly be explained only by demand factors. The timber supply relative to the (increasing) allowable cut has obviously decreased during the last two decades. One can even claim that as a consequence of general economic and social changes with respective changes in economic and social position of NIPF owners, the non-industrial private forestry in Finland has become inclined to refrain from efficient timber production and use of forest resources. Therefore, weakening of timber supply and changes in timber sales behaviour also have to be taken into account as important factors behind the current development.

Stumpage prices and other market level factors in addition to biological factors have traditionally been considered as main determinants of timber supply. However, owner characteristics and other background factors on the holding level may also affect timber supply (e.g. Tikkanen 1986). For example, the valuation of timber and non-timber outputs of forest land varies among different owners, and may have an effect on timber supply. The cutting programs of different owners become also dependent on owner characteristics in case of the imperfect capital market. This is because consumption decisions become more dependent on current relative to permanent income earning potential, and the liquidity constraints varying between different owners may affect the timing and quantity of timber sold (Loikkanen et al. 1986, pp. 6–8).

In the present paper we concentrate on forestry extension and on its possible effects on timber supply. It seems justified to conclude that forestry extension may function as a supply shifter in the non-industrial private forestry. Extension activities such as instruction, technical assistance and forest management planning are functioning like owner characteristics in that they produce differences between NIPF owners in relation to their knowledge, ability and attitudinal readiness to practise forestry. From the point of view of timber supply and use of the allowable cut, informational elements of extension are of special importance. Timber market information (price information) as well as knowledge of the state of onés forest holding may decisively affect timber supply (Loikkanen et al. 1986; Repo 1985). Technical assistance given by forestry experts can often be considered as an important prerequisite for an efficient use of the cutting potentials. Forestry extension also may change the values and attitudes of NIPF owners, for example, in respect to timber and non-timber outputs of forest land which, in turn, may affect timber supply of NIPF owners.

The new forest policy programme in Finland, the Forest 2000 Programme (1985) considers policy means that would be conducive to a substantial reduction in the difference between actual cuttings and the allowable cut. Special attention is given to forestry extension. However, only a few empirical studies have been made on the subject which makes it difficult to evaluate the effectiveness of extension activities. In the following, the main results of a recent empirical analysis will be presented.

Empirical study

In the Finnish Forest Research Institute a study on the use of the allowable cut in non-industrial private forests was started in 1980. The study is based on a sample of forest holdings the data of which is gathered by making inventories of the sample forest holdings and by interviewing their owners (Järveläinen 1983; Järveläinen and Karppinen 1983). By inventories of the sample forest holdings information is gathered of

- amount and structure of the growing stock in order to enable calculations of the allowable cut for each holding.

By interviewing the owners of the sample forest holdings information is collected of

- actual cuttings during the five years period before investigation;
- owner characteristics and other holding level background conditions;
- timber sales motives; and
- use of forestry extension services.

The data gathering of the study is still going on. However, an empirical analysis based on information of 669 forest holdings and their owners can be made. An inference can be drawn that the results of the analysis represent rather well the non-industrial private forest holdings and their owners in South Finland.

Results

Use of extension services

The results concerning the use of forestry extension services have been presented in Table 1. The results show that the forestry experts can be considered as the most important sources of timber market information among NIPF owners. A majority of the owners has received timber market information from forestry experts of the forest management associations or the timber purchasing firms.

Professional journals, like Metsälehti, play also an important role. 40 per cent of the NIPF owners has used these sources in purchasing timber price and other timber market information.

The results also indicate that one third of the NIPF owners has sometimes attended a forestry extension meeting, and 16 per cent of them has received vocational forestry training. About every fourth owner has participated in joint timber sales assisted by local forestry experts. A foresty plan exists in every sixth forest holding. Because the size of these forest holdings is above average, about one fourth of the forest land owned by NIPF owners can be considered to be under systematic forestry planning.

Use of the allowable cut and extension services

The next step of the analysis was grouping of NIPF owners by the use of the allowable cut, and studying the use of extension services between different groups. The grouping was made by cluster analysis (K-means clustering, see BMDP Statistical Software 1981, pp. 464–473), and a five groups solution was chosen as the basis of further investigation.

As can be seen from the results in Table 2, the volume of cuttings, as well as use of the allowable cut, vary remarkably among NIPF owners. The group I, representing owners of the most efficient utilization, had during the five year study period, used 217 per cent of the allowable cut of their forests, while the group V, representing the least efficient utilization, had used only 13 per cent. In general, a half of the NIPF owners who own nearly two thirds of the private forest land, had carried out cuttings at least in accordance with their cutting potentials. Instead, an another half of the owners owning approximately one third of the private forest land, had used at most only a minor share of the allowable cut.

The results indicate that forestry extension is associated with the above average use of the allowable cut. Professional journals, and especially forestry experts have been commonly used as sources of timber market information among NIPF owners of efficient utilization. The role of extension meetings and vocational forestry training seems to be even more important. NIPF owners with efficient utilization have attended extension meetings and received vocational forestry training more often than those owners who have used only a little share of their cutting potentials. In addition, forestry planning and use of the allowable cut are interrelated. A forestry plan exists for forest holdings under efficient utilization two times as often than for forest holdings characterized by underuse of cutting potentials.

Effects of extension

Finally, a path model for explaining the variation in use of the allowable cut and for evaluating the effects of forestry extension was specified and empirically tested. Path

Table 1. Use of forestry extension services.

	% of owners/ holdings	% of forest land area
Sources of information		
Considered as important source of timber market information		
– forestry experts	63	75
– professional journals	40	55
– journals of owner associations	40	51
Have subscribed Metsälehti[1)]	31	47
Training		
Have attended forestry extension meetings	36	49
Have received vocational forestry training	16	23
Timber marketing		
Have participated in joint timber sales	27	32
Planning		
A forestry plan exists	16	26

[1)] Metsälehti (Forest news) is a professional journal intended to NIPF owners, and published by the Central Forestry Board Tapio, the most important forestry promotion organization in Finland.

Table 2. Owner groups according to the use of the allowable cut and extension services.

	Owner group I	II	III	IV	V	
Use of the allowable cut						
Volume of cuttings m^3/ha/year	10.1	4.3	3.1	1.4	0.5	
Cuttings % of the allowable cut on the basis of sustained yield	217	102	76	32	13	
	% of owners					
Size of the owner group	7	19	21	30	23	(100)
	% of forest land					
	8	23	28	24	17	(100)
	% of owners/holdings					
Sources of timber market information						
– forestry experts	81	72	80	66	67	
– professional journals	63	50	49	36	45	
– journals of owner associations	48	43	56	46	38	
Training						
Have attended forestry extension meeting	56	36	45	27	27	
Have received vocational forestry training	29	16	24	8	12	
Planning						
A forestry plan exists	21	17	20	10	11	

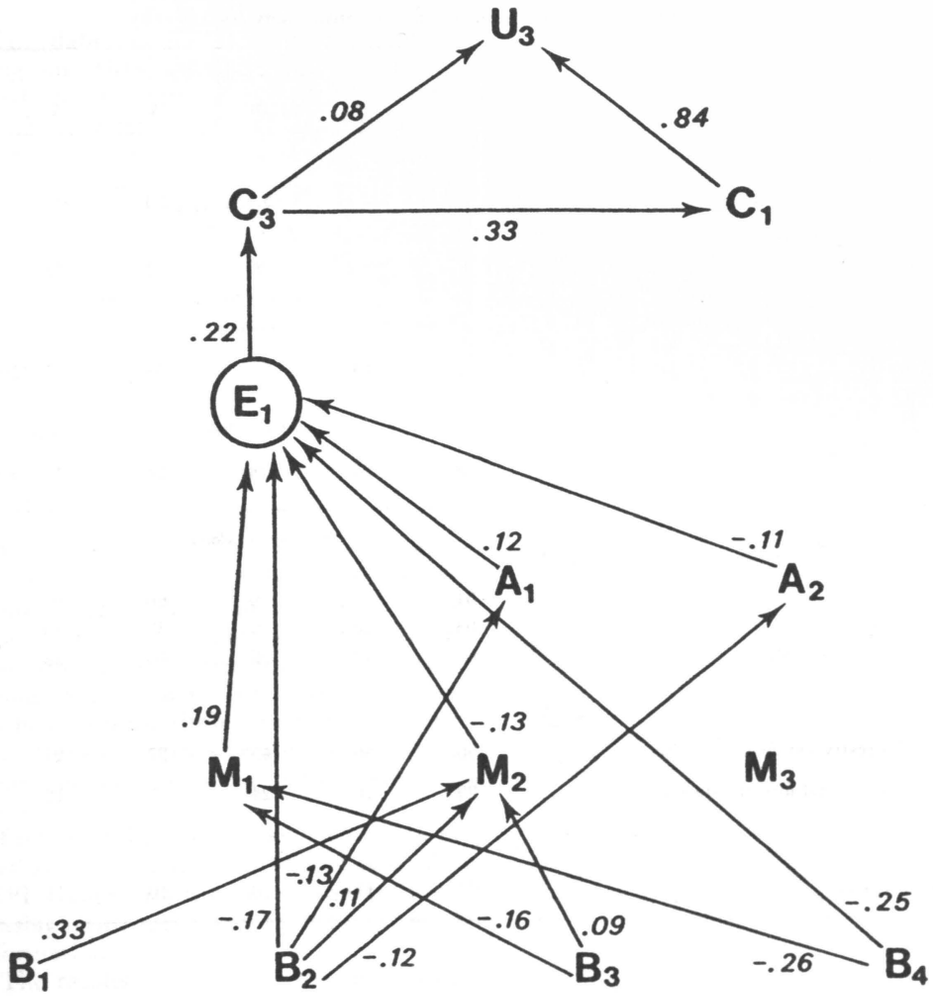

Figure 1. Effects of forestry extension. Related coefficients of the path model.

U_3 = Actual cuttings of the allowable cut on the basis of sustained yield.

C_1 = Volume of cuttings.

C_3 = Frequency of timber sales.

E_1 = Use of extension services.

A_1 = Volume of the allowable cut on a silvicultural basis.

A_2 = Volume of the allowable cut on the basis of sustained yield.

M_1 = Timber sales motivation "Cutting potentials on a silvicultural basis".

M_2 = Timber sales motivation "Pure silviculture".

M_3 = Opinions about timber market development.

B_1 = Holdings in the ownership of non-farmers.

B_2 = Holdings used mainly for recreation or residence.

B_3 = Ownership phase.

B_4 = Holdings in the ownership of heirs.

analysis as a method for constructing causal models allows analyzing both the direct and indirect effects (paths) of explanatory variables on the variables to be explained. The result of the path analysis is usually a recursive multiequation model, and the path coefficients of the model are standardized (partial) regression coefficients (Tikkanen 1981, pp. 55–57).

The path model of the present analysis includes the share of actual cuttings of the allowable cut on the basis of sustained yield as a variable to be explained (U). As explanatory variables there are actual cuttings (C) and cutting potentials (A) as well as a number of composite variables measuring holding level backgrounds (B), timber sales motives (M), and use of extension services (E)[1)]

The results of the path analysis is presented in Figure 1 and in Appendix I. On the basis of the estimation results, it can be stated that forestry extension has an effect on the supply of timber and on the use of cutting potentials, but this effect appears to be indirect rather than direct. The results indicate that the use of extension services (E_1) is likely to increase the frequency of timber sales (C_3), which, in turn, increases the use of the allowable cut (U_3) via increased volume of actual cuttings (C_1). However, the effect of extension is not especially strong. Therefore, an inference can be made that forestry extension really can not be considered as a main determinant of timber supply or use of cutting potentials in the nonindustrial private forestry.

According to the estimation results, forestry extension can also be considered as an intermediate variable through which the effects of certain background conditions and owner characteristics affect the use of the allowable cut. The coefficients of the path model indicate that the use of a holding mainly for recreational purposes or residence (B_2) and the heirs ownership (B_4) are likely to decrease the use of cutting potentials via decreased demand for extension services (cf. Järveläinen and Karppinen 1984) "Pure silviculture" as a ruling motivation of timber sales behaviour (M_2) seems to have an effect of same kind. Instead, the cutting potentials on a silvicultural basis as motivation of timber sales (M_1) as well as their actual amount on a forest holding (A_1) seem to increase the use of the allowable cut via increased demand for extension services.

Concluding remarks

On the basis of the above empirical analysis, one can conclude that with the aid of forest extension it is possible to stimulate timber supply and use of cutting potentials. Forestry training and planning seem to be the most effective extension activities. However, it also can be concluded that forestry extension as a means of forest policy can not play a major role in increasing timber supply and use of cutting potentials. In order to achieve an efficient use of the allowable cut in the nonindustrial private forestry, effective economic policy means affecting both the demand for and the supply of timber are urgently needed (Riihinen and Tikkanen 1985).

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[1)] Price variables have not been included in the model. This does not, however, cause troubles in interpretation, because the inclusion of price variables would not have had any noteworthy effect on the coefficient of the model (cf. Loikkanen et al. 1986, p. 38).

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Appendix 1. Regression equations for path analysis.

	C_1	C_3	E_1	A_1	A_2	M_1	M_2	M_3	B_1	B_2	B_3	B_4	100 R^2
U_3 stand. c	.84	.08	–.01	–.03	–.34	.01	–.02	.02	.03	–.08	.05	.01	78.6
t-values	39.3	3.4	–0.3	–1.1	—16.1	0.6	–1.2	1.1	1.5	–4.0	2.8	0.4	
C_1 stand. c		.33	.07	.33	.02	–.01	–.11	.06	.13	–.02	–.08	.03	29.1
t-values		8.5	1.9	8.6	0.4	–0.2	–2.9	1.6	3.6	–0.5	–2.4	0.9	
C_3 stand. c			.22	.09	–.05	–.04	–.04	–.05	–.26	–.13	–.13	–.24	29.3
t-values			6.1	2.3	–1.4	–1.0	–1.2	–1.6	–7.4	–3.8	–4.0	–6.8	
E_1 stand. c				.12	–.11	.19	–.13	–.01	–.03	–.17	.03	–.25	19.0
t-values				2.9	–2.8	5.1	–3.4	–0.2	–0.7	–4.8	0.7	–6.9	
A_1 stand. c						.05	–.01	.07	.06	–.13	.03	.03	2.9
t-values						1.2	–0.2	1.9	1.4	–3.2	0.7	0.8	
A_2 stand. c						.07	–.01	.03	–.02	–.11	.04	–.04	2.4
t-values						1.8	–0.3	0.8	–0.5	–2.9	0.9	–0.9	
M_1 stand. c									.07	–.06	–.16	–.26	9.9
t-values									1.8	–1.5	–4.3	–6.9	
M_2 stand. c									.33	.11	.09	.01	12.7
t-values									9.1	3.1	2.6	0.2	
M_3 stand. c									.00	.01	.02	.05	0.2
t-values									0.0	0.2	0.4	1.2	