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Effects of forestry extension courses

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SELOSTE: METSÄNOMISTAJIEN TAVOITTEELLISEN RYHMÄNEUVONNAN VAIKUTTAVUUS

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The attitudinal, behavioral and cognitive effects of four forestry extension and training courses were evaluated. The courses produced positive effects on the participants' forestry knowledge. Further, new forestry skills were adopted, and the courses had some positive behavioral effects. The attitudinal effects of the courses were mainly inconclusive. Differences between the evaluated courses were remarkable.

Tutkimuksessa arvioitiin neljän metsätaloudellisen kurssin vaikutuksia metsänomistajien metsätaloudellisiin asenteisiin, taitoihin, tiedontasoon ja toimintaan. Kurssien vaikutuksesta metsätaloudellinen tiedontaso, metsätaloussuunnitelman lukutaito ja työtaito omatoimisessa harvennushakkuussa kohosivat selvästi. Myös metsätaloudelliset asenteet muuttuivat hieman aikaisempaa myönteisemmiksi, ja metsänomistajien aikomukset noudattaa metsätaloussuunnitelmaa lisääntyivät. On todennäköistä, että kurssit ehkäisivät metsänomistajia vähentämästä omatoimista harvennushakkuuta. Tutkittujen kurssien välillä oli kuitenkin huomattavia vaikuttavuuseroja.

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1. Introduction

In Finland forest owners are offered extension and training courses on various subjects, for example, forest regeneration and thinning. The contents of the courses are fairly standardized, and the courses have explicitly stated goals. Forestry extension and training activities are organized in order to promote the achievement of forest policy goals. When planning forest policy it is useful to know the effects of forestry extension courses. These effects have so far been a slightly explored field in Finland.

Tinbergen (1966, p. 57) defines effectiveness as the ratio between change in target variable and the required change in instrument variable. A causal structure is assumed. When evaluating extension and training activities a common problem is the difficulty in measuring effectiveness. The advantage of Tinbergen's definition is that it can be

operationalized individually. In this study forestry extension and training courses are the instrument variables and the goals specified for those courses are the target variables. When evaluating those courses or other means of qualitative forest policy we are usually interested in whether the course has any effects (Riihinen 1984).

It is useful for the evaluator to be prepared to also measure unexpected effects of a course. If he concentrates merely on ascertaining whether the course achieves its goals, he may miss integral effects. As a rule the effects of forestry extension and training activities cannot be stated in monetary units. Few extension and training programs have been carefully evaluated (Fägerlind and Saha 1983, p.161). In addition to the methodological difficulties connected with evaluation research it is often taken for granted that a course has positive effects (Rogers 1971, p. 324).

There is often a time lag after an extension and training course before possible effects appear. This is especially true of behavioral effects because of seasonal alternations in forestry practices. Behavioral effects are also often hard to identify. The solution to these problems is to measure secondary target variables instead of the primary ones. The primary target of forestry courses is to change forest owners' forestry behaviour. According to Järveläinen (1977) forestry behaviour is connected with forestry attitudes, knowledge and skills. As cognitive and attitudinal effects of a course are easier to identify than behavioral effects, forestry attitudes, knowledge and skills are useful secondary targets (Fig. 1).

In this study an attempt is made to measure both primary and secondary targets. Four forestry extension and training courses were evaluated in order to learn attitudinal, behavioral and cognitive effects of the courses. Main emphasis is on whether there are any effects, and also approximate intensity of the effects is investigated. Causal relations between extension and training courses and the effects are tested. Relations between forest owners' socio-economic background and the effects are also studied. The causes that produce variation in the effects of forestry extension and training courses are not investigated. It would presuppose a pedagogic approach to the learning situation in forestry extension and training courses.

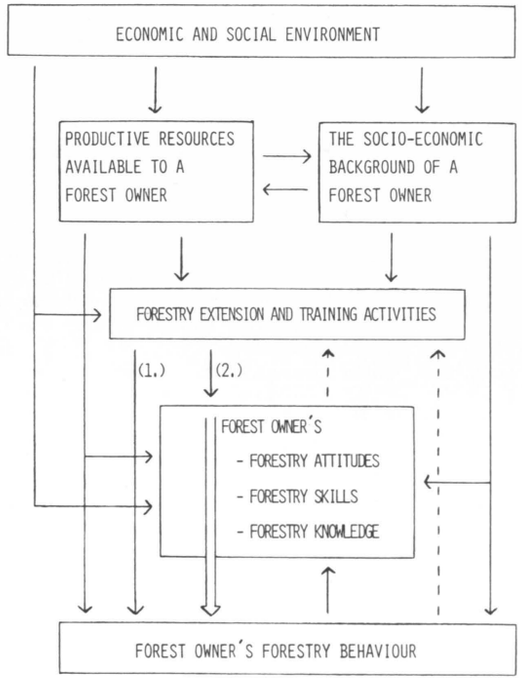

Fig. 1. A model on the effects of forestry extension and training activities (adapted from Tikkanen 1977).

(1.) = A primary relation
(2.) = A secondary relation
– – → = The feedback of extension and training activities

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2. Material and methods

21. Quasi-experimental design

An experimental model is an ideal design when evaluating extension and training courses. Randomization rules out many factors threatening the internal validity of material (Weiss 1972). According to Blalock (1961, pp. 21–26) randomization does not eliminate all outside effects. Unfortunately a model was not feasible in this study. Experimental and control groups were not randomly chosen out of the same population. Moreover, all measurements were not taken both before and after the course (Fig. 2). It is probable that the design left some outside effects uncontrolled. Attempts were made to control these effects during the analysis of material.

The control group was made as similar as possible to the experimental group. What makes it difficult is the fact that as a rule we don't know in advance the most important variables which should be similar. The model is especially sensitive to selection. There are two alternative procedures to make the control group similar to the experimental one (Rossi et al. 1979):

1) An evaluator searches for controls who are similar to persons in the experimental group.
2) The control group is made on the average similar to the experimental group.

Both alternatives were employed. The first alternative is usually more efficient and more expensive than the second one. The variables used in the similarization are occupation, place of residence, age, sex, forest area and forestry activity. Because there were so many similarized variables, experimental and control groups were not completely similar.

The participants' forestry behaviour was measured before and after the course in experimental and control groups. The design is termed quasi-experimental (Cook and Campbell 1979). As regards forestry skills, the design is non-experimental: the measurements were taken only after the course. Non-experimental design leaves many outside factors uncontrolled. However, the measurements were taken quite simultaneously which reduces the possible influence of outside variables on the results. Elapsed time between before and after measurements was in most cases a few days.

	BEFORE	AFTER
EXPERIMENTAL GROUP	- LEVEL OF FORESTRY KNOWLEDGE - FORESTRY ATTITUDES - FORESTRY BEHAVIOUR	- LEVEL OF FORESTRY KNOWLEDGE - FORESTRY SKILLS - FORESTRY ATTITUDES - PLANNED FORESTRY BEHAVIOUR
CONTROL GROUP	- FORESTRY BEHAVIOUR	- LEVEL OF FORESTRY KNOWLEDGE - FORESTRY SKILLS - FORESTRY ATTITUDES - PLANNED FORESTRY BEHAVIOUR

Fig. 2. The design employed in the study.

Selection is a thorny problem when using a similarized control group. The solution to this problem is active invitation of pupils. Forest owners were contacted by phone and only a few of them did not participate in the course. The practicing effect (Anderson et al. 1976, pp. 287–289) was not controlled by the quasi-experimental design. Forest owners living in the same villages as the experimental group were not taken in the control group. Neither were any relatives of the controls in the experimental group so contamination effect is unprobable. On the whole, the design employed in this study is likely to eliminate the most important outside effects. If the aim were to investigate materialized (not planned) forestry behaviour, it would probably require a more complex design.

22. Sampling procedures and measurements

A sample was subjectively chosen. The experimental group consists of 73 forest owners who participated in one of four forestry extension courses held in Southern Lapland in October 1985. Two of the courses dealt with the utilization of forest management plans, and the other two with thinning. The control group has as many forest owners as the experimental group, but the controls have not participated in the courses. The forest owners participating in forestry courses have above medium size forest holdings. Further, they are more active in forestry than forest owners on average (Järveläinen 1981). The population of this study consists of the forest owners participating in forestry extension and training courses. As the sample was not randomly chosen, results cannot be generalized for forestry extension and training courses, in general.

Forest owners in the experimental group filled in an inquiry form mostly by themselves. It took place during the courses. The controls were personally interviewed. The material was rather quantitative. The control group was informed about the interview in advance. Only two forest owners refused the interview. As a whole the loss of material does not seem to be a significant source of error. It is possible that the forest owners in the courses did not answer only on the basis of their own opinions but also on the basis of their assumptions about the opinions of other forest owners (Galtung 1967, pp. 125–126). The forest owners were asked to answer on the basis of their own opinions.

Each interview lasted ½–1 hour and it did not seem to exhaust the forest owners. Most of the interviews were carried out at the interviewee's residence without the presence of outside persons. Forest owners' expectations regarding the interviewer's opinions is an obvious source of error (Weiss 1975, p. 364). It was controlled during the construction of the interviewing form. Some questions usually irritate, please, or in some other way affect the interviewee's state of mind which influences the answers given after that question. The level of forestry knowledge was measured at the end of the interview.

23. Statistical procedures

As the effectiveness of forestry extension and training activities is a little explored field it is difficult to specify the important variables in advance. Consequently, it was necessary to measure a large set of independent and dependent variables. A technique developed by Likert (Blalock and Blalock 1968, pp. 94–97) was employed in attitude measurements. When constructing some of the scales there were problems as the items were few in number. Item weights were determined with the aid of factor analysis. Factor analysis can detect the multidimensionality of a scale (Valkonen 1971, pp. 113–114).

The method of principal components was employed in the factoring. Contrary to the standard procedure, no items were excluded from the analysis on the basis of correlation matrix. After the factoring followed a varimax rotation. A scale was interpreted unidimensional if the eigen value of the first factor was clearly greater than that of the second factor. When a scale was interpreted multidimensional the number of factors was decided on the basis of the interpretability of factor matrix (Rummel 1970, p. 362). The items which had low loadings on the interpreted factors were excluded from the final scale. For the other items factor loadings were used as item weights in the final scale. Factor scores were not used for that purpose.

There were 21 independent variables. They were mostly ordinal scales. Nominal scales were analysed with statistical methods allowed for them. Other variables were analysed with statistical methods allowed for interval scales. The use of interval scale methods for ordinal scales did not seem to be a significant source of error. The procedure simplified the analysis of material. Furthermore, when there is an approximate knowledge on the differences between scores, the use of ordinal scale methods means a loss of information compared to interval scale methods.

Analysis was based on the differences between means in control and experimental groups before and after the course. When using an experimental model causal relations can be tested by comparing these differences. With quasi-experimental design it is not possible. A partial correlation approach was tried but it failed, probably because of the small quantity of data. Elaboration was made as follows. Data was divided into two or three classes according to an independent variable. The means of dependent variables were calculated in each class both before and after the course. The means were compared to each other. The statistical significance of the observed differences were tested with the t-test. In addition to average changes, individual changes between before and after measurements were also analysed.

3. Results

31. Forestry attitudes, knowledge and skills

The courses produced positive effects on the participants' forestry knowledge and skills (Table 1). However, 11 % of the participants had less knowledge on forestry after a course than before the course. Forestry skills in the experimental group were on average statistically significantly (at 0.1 % risk level) better than the forestry skills of the controls. The differences between before and after measurements were not statistically significant in attitudinal variables. Affirmativeness to forest management planning, affirmativeness to logging advantages in delivery cuttings and affirmativeness to thinnings seemed to be on average a bit stronger after the course than before the course. After the course 16–34 % of the participants had less affirmative forestry attitudes than before the course.

Table 1. The means of variables measuring forestry attitudes, knowledge and skills before and after the courses for the experimental group and for the control group respectively.

Variable	Means in experimental group		t-value	Means in control group
	before	after		
1. The level of knowledge on the utilization of forest management plans	3.04	4.03	–3.51	2.96
2. Affirmativeness to forest management planning	6.96	8.64	–1.70	7.14
3. Ability to read a forest management plan	. .	5.54	–	1.74
4. The level of knowledge on thinning	2.00	2.55	–3.78	1.83
5. Affirmativeness to logging advantages in delivery cuttings	1.01	1.97	–1.71	2.45
6. Affirmativeness to the training of forest owners	3.03	3.11	–0.21	2.24
7. Affirmativeness to delivery cuttings in thinnings	0.76	1.07	–0.68	1.52
8. Affirmativeness to thinnings	4.27	4.85	–1.95	4.48
9. Confidence in own abilities as a logger	5.46	5.66	–1.09	5.62
10. Working skills in a delivery cutting	. .	29.01	–	24.58

32. Forestry behaviour

The control group seemed to plan on reducing their cuttings whereas the experimental group planned, on average, in maintain-

Table 2. The means of variables measuring forestry behaviour before and after the courses for the experimental group and for the control group respectively.

Variable	Means in experimental group		t-value	Means in control group	
	before	after		before	after
1. Following allowable cut	0.77	0.76	0.08	0.83	0.66
2. The frequency of timber sales	2.31	2.26	0.15	2.86	2.91
3. Following cutting areas in a forest management plan	0.73	0.86	–1.66	0.74	0.76
4. Following forest improvements in a forest management plan	0.76	0.97	–3.68	0.78	0.80
5. Marking the materialized forestry measures in a forest management plan	1.20	1.89	–7.82	1.17	1.60
6. Relative area of delivery cuttings in thinnings	0.34	1.04	–5.58	0.72	0.69
7. The volume of wood from delivery cuttings in thinnings	14.5	38.2	–2.30	27.5	23.7
8. Time passed from the last delivery cutting in thinnings or estimated time to the next one[1)]	3.05	1.60	–	2.24	1.58
9. The share of delivery cuttings in thinnings	2.89	4.32	–3.95	3.24	3.00
10. Purchased or planned equipment needed in forest work[1)]	3.49	0.52	–	3.80	1.75
11. Purchased or planned safety equipment needed in forest work[1)]	3.92	2.18	–	4.24	3.21

[1)] Before and after measurements cannot be compared to each other. Compare experimental group to the control one.

ing their cuttings (Table 2). The reduction of cuttings in the control group was not statistically significant (t-value 1.51). In the experimental group 31 % of the participants had exceeded allowable cut and 17 % planned to do so. In the control group the corresponding percentages were 21 % and 10 %. 11 % of the participants had not sold timber during the last five years and 14 % planned not to sell in the next five years. In the control group the corresponding percentages were 3 % and 13 %. The courses did not have an effect on the frequency of timber sales.

In the experimental group 14 % had exceeded the proposed areas in a forest management plan and 37 % planned to do so after the course. In the control group the corresponding percentages were 21 % and 17 %. The increase of following the forest improvement areas proposed in a forest management plan was statistically significant in the experimental group (at 0.1 % risk level). In the control group the increase was not significant. The control group seemed to have had a bit more active forestry behaviour before the course than the experimental group. ⅕ of the participants had marked the materialized forestry measures in a forest management plan before the course and 89 % planned to do so after the course. In the control group the corresponding percentages were 17 % and 60 %. The differences between before and after measurements were statistically significant (at 0.1 % risk level) in both groups.

In the experimental group 5 % had performed more delivery cuttings in thinnings than was silviculturally desireable and 24 % planned to do so. In the control group the corresponding percentages were 21 % and 18 %. The difference between performed and planned delivery cuttings in thinnings was statistically significant (at 0.1 % risk level) in the experimental group and not significant in the control group. 5 % of the participants had acquired at least 100 m^3 wood from delivery cuttings in thinnings during the 1984/85 cutting period (ie from 1. July 1984 to 30. June 1985) and 18 % planned to do so during the 1985/86 cutting period. In the control group the corresponding percentages were 5 % and 5 %. The difference between acquired and planned volume of wood from delivery cuttings in thinnings was statistically significant in the experimental group (at 5 % risk level) and not significant in the control group.

39 % of the participants had last performed delivery cutting in thinnings before 1975 and 16 % planned their next one in 1989 or later. In the control group the corresponding percentages were 21 % and 21 %. The courses did not have an effect on the frequency of delivery cuttings in thinnings. The difference between the materialized and planned share of delivery cuttings in thinnings was statistically significant in the experimental group (at 0.1 % risk level) and not significant in the control group. In the experimental group 37 % had performed more than ⅕ of thinnings as delivery cuttings and 71 % planned to do so. In the control group the corresponding percentages were 29 % and 26 %. The courses did not have an effect on the forest owners' plans to purchase equipment or safety equipment needed in forest work.

33. Results from elaboration

Differences between the courses were considerable. One course had positive effects on participants' forestry knowledge whereas another course produced positive attitudinal effects (the differences were statistically significant at 5 % risk level). Other independent variables did not clearly influence the difference between before and after measurements. This is logical since there are various influencing factors on forestry knowledge, skills, attitudes and behaviour. Therefore a single factor as a rule cannot effectively explain the difference between two measurements.

As the age of forest owners increased or the size of their forest holdings decreased the level of knowledge on the utilization of forest management plans on the average decreased. The forest owners who had above average sized forest holdings had above average affirmativeness to forest management planning. A good ability to read a forest management plan was related to plenty of delivery cuttings and self-accomplished forest improvements. Working skills in delivery cutting and ability to read a forest management plan on the average decreased as age increased, likewise purchased or planned equipment or safety equipment needed in forest work. Young forest owners living on their estate and those whose woodlot area was above average had above average frequency of timber sales. The forest owners who had previously participated in forestry extension and training courses had above average level of forestry knowledge, ability to read a forest management plan, frequency of timber sales and affirmativeness to training of forest owners.

The last mentioned statistical relation was considered interesting. Therefore an attempt was made to investigate causal relations between participation in forestry courses and frequency of timber sales, ability to read a forest management plan and knowledge on the utilization of forest management plans. For this purpose partial correlation coefficients were employed. Elaboration of independent variables did not remove the statistical relations. However, when area of wood lot or total area of estate was held constant the statistical relations weakened. The correlation coefficient between participation in forestry courses and frequency of timber sales weakened from .24 to .17 when total area of estate was held constant. It is to be remembered that the partial correlation approach is non-experimental. It seems that a large estate has a positive effect on the participation in forestry courses and thus promotes good forestry knowledge and skills among the owners of those estates.

4. Discussion

As material was small and many statistical relations were weak conclusions can be regarded as hypotheses for future studies. For example, forestry knowledge was measured with only ten questions which were not tested in advance. It has been established that a large estate, good forestry knowledge and skills, affirmativeness to forestry practices and an active forestry behaviour are related to frequent use of forestry extension and training services (Järveläinen and Vadén 1968, Riihinen 1970, Juslin 1977, Järveläinen 1977, Järveläinen 1978, Tikkanen 1981, Järveläinen and Karppinen 1984). However, causal relations between these variables have not been intensively studied. The owners of large estates have a good possibility to learn forestry through experience. Large forest properties are often considered the fundamental reason for good forestry knowledge and skills, affirmativeness to forestry, frequent use of forestry extension and training activities and active forestry practices. Forestry extension and training activities are thus regarded as intermediate variables which are contributing to fulfilling some ends of forest policy.

Direct relations between extension and training activities and an active forestry behaviour have also been established. According to Tikkanen (1977, pp. 90–95) forestry extension and training activities had an effect on investments in forestry (a primary goal) and affirmativeness to the promotion of private forestry (a secondary goal). Järveläinen (1981, pp.37–38) concluded that the timber sales of forest owners can be prevented from diminishing or even increased through forestry extension and training activities. This is consistent with the positive effect that forestry courses had on the following of cutting areas and forest improvements given in a forest management plan. According to Virta (1971) low frequency of timber sales is likely to be related to a low level of forestry knowledge. Järveläinen (1968) established that the relation between forestry goals and forestry attitudes is stronger than the relation between forestry goals and forestry behaviour.

There were more males and farmers in the courses than there are on average among the forest owners in the study region. This is consistent with previous research results (Järveläinen 1978, Järveläinen and Karppinen 1984). Forestry courses in Finland have largely been organized on the basis of a two-step flow hypothesis (Rogers 1971). Although only active forest owners participate in forestry extension and training activities, it has been assumed that these forest owners act as opinion leaders who have an influence on other forest owners. In this study it seems that two of the four courses were not organized on the basis of the two-step flow model. The model was deemed realistic in many Finnish rural communities in the 1960's and 1970's (Vainio-Mattila 1969, Westermarck 1973), however, the model presupposes that a community is coherent enough. It is to be doubted whether the two-step flow hypothesis holds among present-day urban forest owners.

Future studies under various conditions are essential in order to clarify the effects of forestry courses. When we know the effectiveness of forestry extension and training activities the next step is to find out the causes which produce the effects. Considering the planning of forest policy it is important to know if there are opinion leaders among private forest owners. In the case that the two-step flow hypothesis is refuted it is reasonable to try to get the passive forest owners into forestry courses. According to Järveläinen and Karppinen (1984) about ⅗ of private forest owners and ⅖ of private forests are beyond effective forestry extension and training activities. So far we don't know how the forest owners are nowadays adopting innovations.

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Seloste

Metsänomistajien tavoitteellisen ryhmäneuvonnan vaikuttavuus

Tutkimuksen tarkoituksena on selvittää metsänomistajien tavoitteellisen ryhmäneuvonnan, jonka tärkeimpänä toimintamuotona ovat 1–5 päivää kestävät kurssit, vaikuttavuutta. Tutkimus on luonteeltaan tutkittavaa ilmiökenttää alustavasti kartoittava; syitä ryhmäneuvonnan vaikuttavuuseroihin ei analysoida. Sosiologisen teorian ja tarkasteltavaan alaan liittyvien tutkimustulosten perusteella muodostettiin viitekehys metsänomistajien neuvonnan vaikutuksista.

Tutkimuksessa arvioidaan metsänomistajille Etelä-Lapissa lokakuussa 1985 järjestettyjen kahden harvennushakkuu- ja kahden metsätaloussuunnitelmakurssin vaikutuksia osanottajien metsätaloudellisiin asenteisiin, taitoihin, tiedontasoon ja toimintaan. Harvennushakkuukursseille osallistui 38 ja metsätaloussuunnitelmakursseille 35 metsänomistajaa. Tutkimusasetelma oli kvasi-kokeellinen, sillä kurssien osanottajille muodostettiin vertailuryhmä samanlaistamalla. Kurssin jälkeisestä metsätaloudellisesta toiminnasta mitattiin pääasiassa metsänomistajien aikomuksia. Osa tutkimuksessa käytettävistä muuttujista muodostettiin faktorianalyysin avulla. Päätelmät perustuvat havaittuihin keskiarvoeroihin. Päätelmiä ei voi yleistää kaikkia harvennushakkuu- ja metsätaloussuunnitelmakursseja koskeviksi.

Tutkitut kurssit kohottivat selvästi osanottajien metsätaloudellista tiedontasoa sekä metsätaloussuunnitelman lukutaitoa tai työtaitoa omatoimisessa harvennushakkuussa. Kurssien havaittiin vain suuntaa-antavasti muokkaavan metsätaloudellisia asenteita aikaisempaa myönteisemmiksi. Harvennushakkuukurssit todennäköisesti ehkäisivät metsänomistajia vähentämästä omatoimista harvennushakkuuta. Metsätaloussuunnitelmakurssit lisäsivät metsänomistajien aikomuksia noudattaa metsätaloussuunnitelmaa. Puunmyyntien toistuvuuteen tutkitut kurssit eivät vaikuttaneet. Harvennushakkuukurssit eivät vaikuttaneet metsänomistajien aikomuksiin hankkia metsätyövälineitä tai metsätöiden turvavarusteita. Tutkittujen kurssien välillä havaittiin huomattavia vaikuttavuuseroja.

Appendix: The similarity of experimental and control groups

The similarity of an experimental and a control group heavily influences conclusions in quasi-experimental designs. As social phenomena are dependent on many factors it is rather difficult to get a control group similar to an experimental group. When similarization is used in the construction of a control group it is useful to clarify how similar the groups are in regard to variables which were not used in the similarization (Sherwood et al. 1975, pp. 204–205).

In the similarization variables No (1), (3), (4), (6) and (10) were used, see table below. The experimental group was not similar to the control one in regard to variable No (10) and some of the variables not used in the similarization. The control group seems to be more strongly oriented to agriculture than the experimental group. It is probable that the groups were similar enough for an explorative study.

The similarity of experimental and control group in regard to some variables.

Variable	Experimental group (n = 73)	Control group (n = 73)
(1) Place of residence	Simo, Tervola or Tornio	Simo, Tervola or Tornio
(3) Sex	1 female	2 females
(4) Age, $\bar{x}$	51.2 a	51.1 a
(5) Total area of estate, $\bar{x}$	156.5 hectares	171.9 hectares
(6) Area of a wood lot, $\bar{x}$	86. 5 hectares	89.3 hectares
(7) Cultivated area, $\bar{x}$	11.3 hectares	12.8 hectares
(8) Self-accomplished agricultural work	57 cultivated by themselves	60 cultivated by themselves
(9) Living on an estate	61 lived on their estates	71 lived on their estates
(10) Main source of livelihood	32 agriculture	48 agriculture
(11) Schooling	57 elementary school or less	69 elementary school or less
(15) Self-accomplished forest improvement work	29 did all forest improvements by themselves	46 did all forest improvements by themselves