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A Study Based on Forest Owners in Ostrobothnia, Finland

Metsänomistaja ja hänen asenteensa metsätalouden edistämiseen — Pohjanmaan metsänomistajiin perustuva tutkimus

Päiviö Riihinen

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THE FOREST OWNER AND HIS ATTITUDES TOWARD FORESTRY PROMOTION

A STUDY BASED ON FOREST OWNERS IN OSTROBOTHNIA, FINLAND

PÄIVIÖ RIIHINEN

Metsänomistaja ja hänen asenteensa metsätalouden edistämiseen — Pohjanmaan metsänomistajiin perustuva tutkimus

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PREFACE

This study was initiated by the feeling that too little is known about the behavior of forest owners and too few recognize the forest owners' key position in forestry now and in the future. Much to my own happiness, I have had to revise this gloomy picture during the last few years. The number of publications, research workers and research projects dealing with farm forestry and forest owners' behavior is rapidly increasing. A prerequisite for this desirable development has been the adoption of modern research methods and techniques. Also, it seems that the importance of a well-founded frame of reference has been understood more generally than previously. It is encouraging for me and others interested in these problems to have become acquainted with the work done in this field in Finland in the 1960's.

The publication of this study has been delayed by several less important — though not less demanding — duties. Since the objective of this paper is not to produce an inventory of facts, but to explore theoretically interesting invariables, the value of this study is hardly reduced by that delay. It may even have been useful in tightening the grasp on the present problem.

I am indebted to many people for their valuable assistance at various stages of this study. First, I wish to remember with gratitude the co-operation with Professors Seppo Ervasti, Lauri Heikinkeimo, and Kullervo Kuusela, and Mr. Esko Salo in connection with the field work of this study. Likewise, I appreciate the efforts of Messrs. Terho Huttunen and Lauri Miettinen in interviewing the required sample of forest owners. Second, I am grateful for the intellectual contributions made in several discussions by Dr. Kauko Hahtola, Messrs. Heikki Juslin, Veli-Pekka Järveläinen, Matti Keltikangas, and Professor Olavi Riihinen. Precious and careful assistance in arranging the study material and in typing was provided by the late Dr. Rein Riitsalu.

Last but not least my thanks are due to the *Finnish Natural Resources Foundation* and to the *State Commission of Agriculture and Forestry* for their financial assistance.

Helsinki, September 1970

Päiviö Riihinen

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1. STUDY PROBLEM

Forest policy in Finland was traditionally confined to measures designed to maintain the growing stock for future generations. Among the few scientific findings required to guide forest policy in these circumstances were the results of national forest inventories. More recently, the conservation aspect — referred to as sustained yield — has been replaced by mensurational production plans. Attention has turned from mere conservation to the problem of growing a certain amount of harvestable timber during a given period. But even then the mensurational findings, geared to follow trends in the growing stock, have remained the major scientific tool of forest policy. The emphasis of forest policy is thus laid on a quantitative goal as determined from mensurational facts. Other studies to aid forest policy are few and mainly concerned with the scientific methodology of policy studies. — The need to explore the behavior of forest owners in order to provide information for forestry extension is obvious.

The purpose of this study is

(1) to develop, on the basis of sociological and economic theory, of previous studies in the same general field, and of occasional observations, a frame of reference capable of providing a starting point for an empirical analysis of the behavior of forest owners. This frame of reference is expected to give an idea of the method and observations required for an empirical analysis;

(2) to provide an insight into attitudes, or more plausibly, opinions, beliefs and attitudes, and relate these with such general characteristics of forest owners as are theoretically defensible and supported by empirical findings. Our principal interest is in such characteristics of forest owners as are capable of providing forest policy instruments. It is obvious that an empirical analysis is called for to elucidate the association between attitudes and certain environmental variables.

2. FRAME OF REFERENCE

21. Remarks on the Approach

Private forestry as an independent undertaking is unusual. Most often it is integrated with some other occupation, especially with agriculture. Besides, even on unintegrated woodlots forest owners are seldom likely to make their decisions independent of the surrounding world — economic, cultural and so forth. Like farm-forest owners, they evaluate forestry and other circumstances diversely and relate forestry to these in widely differing ways. This leads us to the familiar problem of human behavior being dependent on a diversity of social values. By values we mean here a general predisposition to a given choice which has been learned from the environment. When this disposition is concerned with clearly defined objects we speak of attitudes (ALLARDT 1964, p. 661). It is worth while to attempt to explain how certain attitudes are formed, or at least to discover what general characteristics distinguish people with different attitudes.

Attitudes alone do not explain human behavior, yet they are concrete social values and lead to a certain type of activity unless limited by other values, e.g. norms.

Economists and sociologists put their questions in slightly different ways. Normative economics assume that by behaving in a certain manner, an individual or a group is able to maximize profit. Profit maximization is taken for rationality. No one intends to propose that the aim to maximize profit alone explains economic or social behavior. And it is worth noting that the so-called rationality postulate as a basis for empirical studies has

often been challenged. It may be maintained in empirical analyses to discover how one is actually to behave in order to maximize his profit.

But an economist may be interested in human behavior also in a non-normative sense. Thus, economic policy needs guidance from investigations designed to explore the actual human behavior. The description of reality calls for simplification also then, but it is not conditioned by an objective function. Interest is centered on instrumental variables, i.e. variables that can be controlled by the policy maker.

Sociologists consider human behavior from a somewhat wider angle than do economists. They admit that profit is a value obviously significant for human behavior. But there are many values other than profit which reflect search for rationality. In short, people tend to do what they regard as desirable. If certain values are common for many individuals, their significance for human behavior can be revealed by research. This is one of the central tasks of sociology and of social psychology.

It may be worth noting that we speak of individual or ecological behavior according to whether the unit of observation is an individual or an ecological group. Sometimes mistakes have been made in attempting to translate findings of one of these two different types of research into those of the other. At one time some obviously thought that ecological research aims at analysing the same behavior as that concerned with individuals (fc. Robinson 1950). It was assumed that every study using ecological correlations is ultimately interested in those between individuals. Here the thought may have lost the track, for if we insist on thinking so, we would have to seek operational counterparts for such concepts as 'individual's degree of industrial development',' individual's industrial structure', etc. (Olavi Riihinen 1965, p. 89).

It is natural to point out invariables in the behavior of individual forest owners. But it seems equally defensible to extend the analysis to the relationships between individuals and ecological groups because forest policy embraces all instrumental variables. This presupposes use of ecological variables which then represent the influence of environment on the individual.

22. Selected Hypotheses on Forest Owners' Behavior

221. Restrictive Conditions

Research into the behavior of forest owners is still in its infancy. Results and hence theories in this field are few. Even so, the advance made up to this moment provides part of the hypotheses required to limit the study and to choose an efficient method.

A study of the present type does not easily lend itself to empirical analysis. We are dealing with opinions, beliefs and attitudes that do not develop simultaneously with their holders' functions, or with visible results of these functions (silvicultural condition, size of holding, etc.), to which we would like to associate the attitudes.[1] We must avoid ascribing a past function to a current belief or attitude (Krech and Crutchfield 1948, p. 157). We can thus expect little association between attitudes and mensurational data on woodlots. At least it is hardly possible to suggest that the characteristics of the current growing stock could be explained by the present attitudes towards silviculture or by specific management practices. The reverse order of reasoning would seem equally well founded; some of the forest owners' attitudes may arise from the silvicultural state of their woodlots, which may be a long-lasting environmental factor moulding attitudes. Moreover, the random variation in mensurational data among different woodlots is likely to be so wide as to make it useless for association with other pertinent variables.

Another difficulty arises from the fact that there is no valid method of singling out the processes that have arrived at certain perceivable invariables in the observed data. It is only by inference from given structures that we can draw conclusions concerning the processes that have resulted in them. But it would still seem feasible to attribute attitudes and the level of people's knowledge to certain general characteristics of forest owners — without paying explicit attention to the causal relationship. We believe this can establish a kind of typology helpful in directing forest policy, especially extension.

[1] For the sake of brevity we shall from here on speak of attitudes instead of opinions, beliefs and attitudes.

Broadly speaking, we can distinguish between two major kinds of determinants of attitudes and beliefs, *viz.* cultural and functional (cf. KRECH and CRUTCHFIELD 1948, pp. 176—186). The formation of attitudes is a consequence of the operation of all factors making for perceptual and cognitive organization. The psychological factors operate in a complex but systematic manner and depend on the man's environment. Much emphasis has been laid on certain aspects of this environment in attempting to explain specific attitudes. *Cultural* and *functional* influences have thus been noted as possible determinants of attitudes.

Cultural determinants include such variables as the general and vocational education of the individual, socio-economic status, religion, etc., different aspects of which can be represented by several component variables. By *functional* determinants we mean such factors as the needs, demands, emotions of the individual. But these needs, demands and emotions derive from the situation conditioned by cultural agencies. It is therefore difficult or impossible to make a sharp distinction between cultural and functional determinants (KRECH and CRUTCHFIELD 1948, pp. 182—183). On the other hand, this joint nature of different determinants may be considered as a practical advantage in that it reduces the need to assemble observations on such abstract variables the measurement of which would complicate the study. Again, we must be prepared to find little association between attitudes and most of their hypothesized determinants because the formation of attitudes is a selective process where different people adopt influences from different environmental sources to a varying degree.

Quite apart from what has been said above, the very method of measuring attitudes lends itself to cause a great deal of variance in our findings: we are dealing with oral reactions which may not always correspond to their holders' convictions.

What is known about the formation of attitudes suggests that by changing their determinants we can change attitudes. Some of these determinants can be controlled by man while others change spontaneously and cannot be influenced by policy measures. The interest of forest policy is found in all types of determinants — recognizing that their grouping corresponds in a way to the subdivision of variables used in the theory of economic policy: instrumental variables and other data (TINBERGEN 1966, pp. 3—5).

The recognition of how attitudes are formed in itself suggests the way we ought to consider them in order to provide useful information on their relationship to specific types of forest owners. Each forest owner is subject to certain cultural and functional circumstances, similar for some but dissimilar for most. Different forest owners adopt influences from these circumstances to a varying degree. Knowing the attitudes, we can relate them to the variables representing the circumstances specific to each forest owner.

But we can go a bit further in forming our hypotheses as a basis for the present study. There is some pre-existing information, direct or analogous, which may help in selecting the variables to be related to attitudes.

222. Previous Findings and the Present Study

The hypotheses available for this study mainly relate to ecological invariables. Their relevance in studies based on individuals as units of observation may be questioned but not denied.

It is conceivable from general sociological findings that industrialization undermines the traditional forms of social organization and substitutes a system of stratification in which there is an increasing number of roles to be filled. Achievement on the job becomes increasingly important. (BERELSON and STEINER 1964, p. 399). This development manifests itself most clearly in an increasing division of labor. Other findings suggest that industrialization is one of the major factors responsible for regional differences in economic development. These differences are obviously generated by a cumulative process: the processes of change leading to regional differentation reinforce each other. (Olavi RIIHINEN 1965, pp. 18—70). Economically, this is understandable, for industry and thus the division of labor and other efforts toward efficiency are located where prerequisites for achievement are present.

Industrialization, however, moves people from the traditional rural village settlements

to industrial communities where people adopt their norms differently. In the traditional rural community (*Gemeinschaft*), pressure toward conformity is an important factor in shaping the cultural and functional environment. Hence the norms are highly uniform and are taken for a collective conscience (mechanical solidarity). In industrial society (*Gesellschaft*), instead, different fields of social behavior have become more independent subsystems. These subsystems, including economic, religious and political activity, are not created under pressure toward conformity, but may instead be guided by specialized vocational, political, economic and similar organizations. Norms are not conditioned by tradition but by aims and expendiency.

It can be expected that people's attitudes towards certain activities are influenced by differences in the degree of industrialization. Indeed, such evidence is available also from forestry. True, this evidence comes partly from studies on activity rather than on attitudes, but its hypothetical value for this study is considerable. Thus HAHTOLA's (1967 b) findings on the influence of economic and social environment on farm forestry suggest that industrialization brings about modernization in silviculture in that it increases regeneration cuttings. But there are other industrial influences that impede adoption of rational management practices. Such is, for example, fragmentation of holdings as a result of competition for land by more intensive forms of land use. Fragmentation tends to remove interest in mechanization and in other efficient harvesting methods. Industrialization is linked with a cumulative process in regional development. Its spread effects in the periphery of industrial centers are associated with a higher level of forest management and of labor productivity in timber harvesting. At the same time the factors contributing to improved management practices are associated with a weakening of pressure toward conformity which is characteristic of traditional village settlement areas. Centralized agriculture, typical of village settlement areas, displayed the poorest management practices. Social climate in such areas is mentioned as a possible inducement for maintaining thinning and creaming. Also, farming in village settlements tends to draw attention from forestry. Small farm units, unemployment, and a low standard of forest management, all characteristic of »problem farms,» seem to favor traditional methods of silviculture — considered detrimental today. The poverty resulting from the small size of holdings and the lack of employment reduce both interest in and capacity for long-term silvicultural investments. Even large farms of the traditional type, mainly devoted to animal husbandry and employing plenty of labor, tend to use their woodlots as a source of extra income from stumpage and display a low level of silviculture. (HAHTOLA 1967 b pp. 31—39).

JÄRVELÄINEN (1970) studied variables affecting a series of forest management decisions and included attitudes among these variables. The empirical data were assembled from two rural communes, one of which represented an industrialized economic and social environment, while the other was a non-industrialized traditional rural commune. Comparing the findings from these two different areas led to interesting conclusions on the effect of social change on forestry. It appeared that industrialization and urbanization weaken the silvicultural activity and increase negative attitudes toward silviculture. Further, it was concluded that a differentiation of forestry aims may be expected as a result of the abovementioned social change. It may even lead to specialization in timber growing on large woodlots in modernizing rural areas. Modernization of rural areas was found to differentiate the forest owners' aims so that stumpage revenue becomes the most essential objective, whereas the conservation (saving) aspect loses significance. It was also found that, in forestry promotion work, vocational organizations increase their importance at the expense of personal extension as the rural areas become industrialized and urbanized. These conclusions were drawn from differences between two »ideal types» of rural communities, and they conform to more general sociological theories. (JÄRVELÄINEN 1970, p. 98).

The thoughts expressed in this chapter may be condensed into Fig. 1. Social change (industrialization accompanied by increasing division of labor and by urbanization) results in social stratification (number of values increases; there will be more roles to be filled; vocational organizations gain in importance). With the emergence of new social subsystems,

the number of social values increases. Mechanical solidarity characteristic of traditional village communities (collective conscience) will be replaced by organic solidarity found in vocationally organized primary production. The advancing social stratification as a result of industrialization creates more and more social subsystems. At the same time attitudes toward primary production change. In traditional village communities with mechanical solidarity, attitudes toward primary production are relatively negative. They become more positive as primary production is vocationally organized — only to become more negative again as industrialization advances.[1]

The hypothesis presented in Fig. 1 bears obvious connections with the theories of regional differentiation. Thus mechanical solidarity can in general be attached to areas of economic backwash while organic solidarity characteristic of primary production occurs in areas with economic spread effects, and organic solidarity characteristic of secondary and tertiary production in areas with economic cumulation effects.

Likewise, our hypothesis seems to be in fair agreement with the ideal types (basic dimensions) of the economic and social environment of farming, which were established by HAHTOLA (1967b, pp. 32—39) as follows:

1. degree of industrialization;
2. its equalizing and spread effects;
3. family farming;
4. centralized agriculture;
5. »problem farms»;
6. traditional big farming.

The first two ideal types seem to be linked to cumulative growth and its spread effects. The last four are typical of rural areas in which the basic prerequisites of agriculture permeate the economic and social environment.

Since not all the logically defensible hypotheses can directly be obtained from previous studies, some further elaboration of them may be attempted on an intuitive basis. The effect of industrialization in changing the value hierarchy of people may be thought of as a multi-dimensional phenomenon. Industrialization usually results in a general rise in the income level. Rising income tends to increase both the propensity to educate and to provide improved facilities for vocational training. The level of knowledge and technical know-how is likely to improve as a result of increased education. And it is well known that the level of knowledge also is one of the most essential variables increasing productivity. Thus economic growth would seem to advance as a cumulative process where several variables are interactive.

It may be expected that people's knowledge of forestry increases with industrialization and the consequent rise in income. However, at a certain more advanced stage of industrial development, conducive to fragmentation of land holdings, forest owners may become indifferent to the assimilation of forestry information. Also, the possibilities of learning about forestry through experience on one's own woodlot thus decrease.

We have referred to differences in the level of income as a consequence of differences in the degree of industrialization, which is regarded as the major ecological factor responsible for a cumulative process resulting in a regional differentiation of an industrial society (cf. Olavi RIIHINEN 1965, pp. 42—50). Regional differences in income are, indeed, largely created through such a process. But there may also be individual differences in income of an institutional nature, e.g. based on a long-lived ownership pattern. Thus, there are likely to exist differences in knowledge among rich and poor forest owners independent of ecological environment. The level of income among forest owners is in the main determined by the size and quality of their land holdings.

Differences in social values held by forest owners result both from industrialization with a consequent rise in income and from differences in income independent of industrialization. But industrialization particularly brings about new values — things that people consider desirable. More opportunities become available for people whose decisions are no longer guided by pressure toward conformity — contrary to the process in a traditional village community. The increase in the number of values, especially when coupled with a rising level of knowledge, induces people to compare values. In such a comparison the

[1] When we speak of mechanical and organic solidarity, the emphasis is on differences in the division of labor in different communities (cf. p. 7).

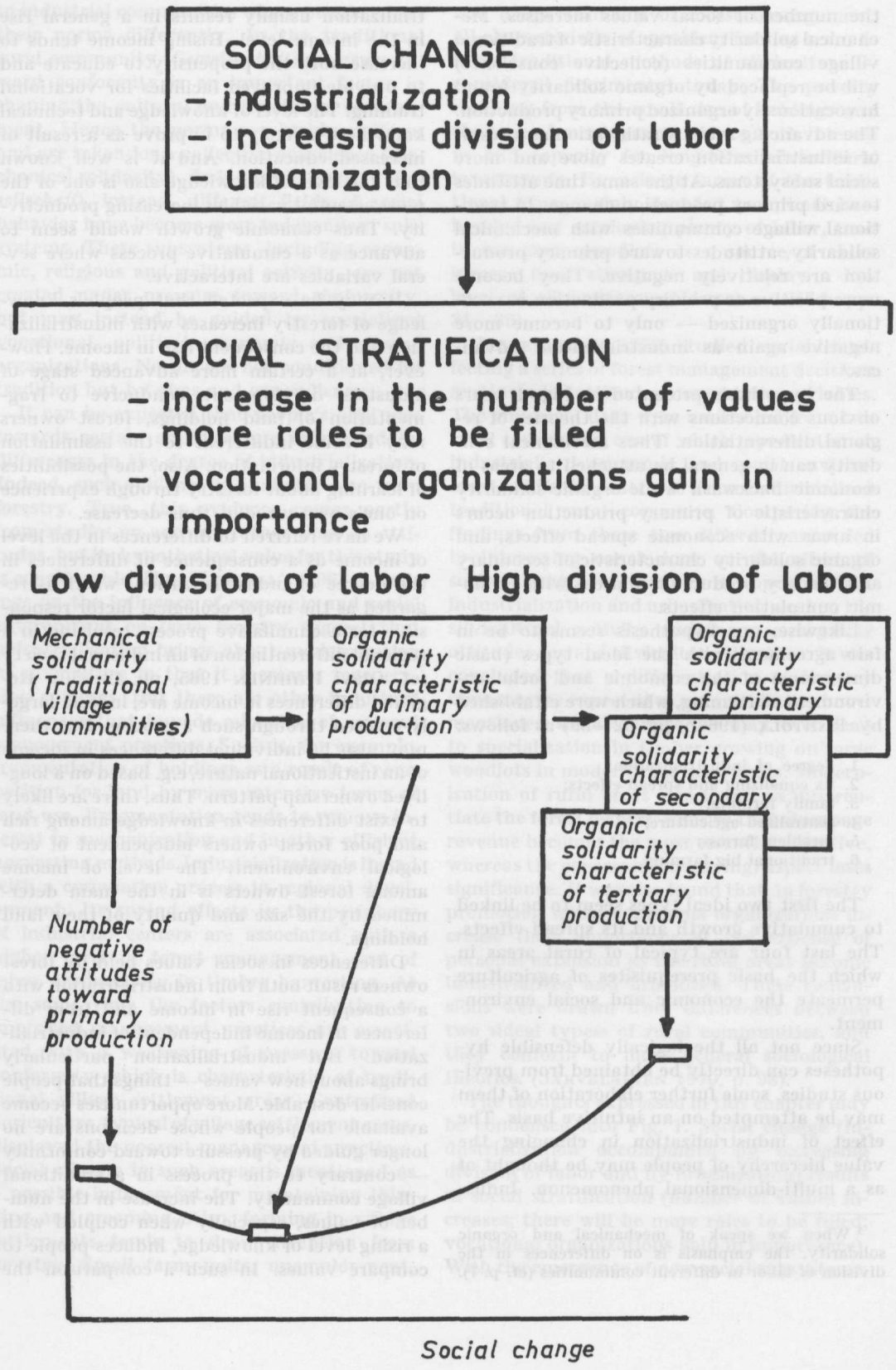

Fig. 1. A hypothesis of the effect of social change on the formation of attitudes toward primary production.

economic values represented by primary production, such as forestry, are likely to be handicapped. Thus, one night expect that industrialization, a rising level of income, and an increasing knowledge would create negative attitudes toward forestry. On the other hand, the measurement of such attitudes is difficult, because it is a matter of convention to decide what is negative or positive. Negative attitudes are simply those regarded as such by professional foresters: attitudes not in agreement with our aims.

Some slight evidence of the attitudes hypothesized above comes from the United States, a highly industrialized country with a high income level. Only four per cent of forest owners in Northern Michigan reported timber sales as their primary purpose of forest ownership (QUINNEY 1961, p. 10).

The possible negative attitudes toward forestry promotion among wealthy forest owners does not mean that they take poor care of their woodlots. The contrary may be true, although the aim of forestry may be other than timber sales. There is some evidence that attitudes and actual silvicultural measures carried out by forest owners are not very closely associated (JÄRVELÄINEN 1970, p. 97). This is in fact what can be expected from our hypotheses: most negative are the forest owners with largest land holdings, yet they have to repeat silvicultural measures more often than smallholders.

There is not, however, enough information on the relationship of different attitudes to different environmental conditions (cultural and functional determinants) to provide a »perfect» system of hypotheses as a basis for this study. What is suggested by inference from previous studies does help to create a rudimentary frame of reference, but the choice of variables to represent different determinants of the attitudes remains the task of more or less haphazard observations. To crystallize our general hypotheses we must return to the theory of how attitudes are formed.

It is clear from what was said previously that attitudes are determined by a wide range of variables called cultural and functional

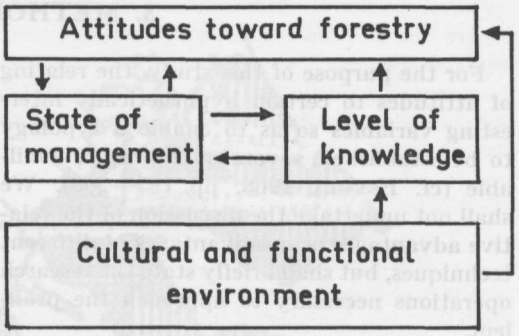

Fig. 2. A hypothesis of the interplay of certain factors involved in the formation of attitudes toward forestry.

environment. These variables can be considered to provide the »facts» involved in the development of beliefs and attitudes, and the functional variables as partly responsible for the manner in which those facts will be used. The manner and degree of adopting influences from a mass of facts depends on or is reflected, for instance, in the level of knowledge. The state of management may possibly be considered indicative of the forest owner's level of knowledge. Since the state of management is in part a result of the owner's activity, it may also have increased his knowledge through experience in creating it. As a long-lasting environmental factor, the state of management may affect the forest owner's attitudes toward forestry as well as being affected by the latter. The scheme in Fig. 2 has been drawn on the basis of these considerations.

Despite this consolidation of hypotheses there remains a large number of more detailed theoretical considerations and of variables representing them. This is true in particular for cultural and functional environment. Since not nearly all of these hypotheses can be crystallized from earlier investigations, the method of this study must account for such a lack of previous information. At the same time, it should recognize the process of forming attitudes, yet striving at no more than certain stages of this process visible in given structures.

3. METHOD OF STUDY

For the purpose of this study, the relating of attitudes to certain hypothetically interesting variables so as to enable a typology to be established, several methods are available (cf. ESKOLA 1968, pp. 195—209). We shall not undertake the discussion of the relative advantages or disadvantages of different techniques, but shall briefly state the research operations necessary to approach the problem.

We need, first of all, measurements of the attitudes of forest owners in order to form one or several variables to relate attitudes to certain environmental (cultural and functional) variables. Secondly, data are required on the variables representing the state of management, level of knowledge, and cultural and functional environment. All these data were assembled by personal interviews, except those on the state of management, which were actually measured in the stands. Collection of data will be further described in Chapter 4.

The attitudes were composed of several variables obtained from the forest owners' responses to statements concerning forest owners in relation to forestry promotion work. Factoring techniques were used in forming the composite variables. This technique was adopted especially because of weighting problems in connection with a multi-dimensional scale. Furthermore, it was considered desirable to reduce the amount of unreliable information. A more detailed account of this procedure will be given in Chapter 5.

A composite variable was also required to represent the forest owners' knowledge of forestry. This was obtained through the number of correct answers to a series of questions. The coherence of the scale was tested as will be described in Chapter 6.

As suggested by the frame of reference, the composite variables on attitudes and on the level of knowledge were associated with the characteristics of growing stock and of cultural and functional environment. Factor analysis has been mentioned as the most promising technique for this kind of investigation (PARTANEN 1963). Indeed, its philosophy contains many valuable aspects, but its mathematical properties in certain cases may be questioned. Thus, when there are both ecological variables and those pertaining to individuals, it may be difficult to single out the interactions between individuals and their ecological environment. We decided however, to try out factoring techniques because of inadequacy of hypotheses for some other technique, of preference given to the most reliable part of information contained in observed data, of a need for a technique to analyse ordinal measurements, and of economy in terms of labor. Yet certain hypotheses outlined in Chapter 22 will first be subjected to statistical testing.

4. DATA

Data for this investigation were assembled as early as in 1963 from Ostrobothnia in cooperation with the Forestry Research Institute, which collected random sample data for a pilot survey on joint inventory and drain statistics. The determination of the sample is described by MÄKINEN (1966) and SALO (1969). The total sample originally determined consisted of two strata which complied with the same accuracy requirement. (cf. Fig. 3). This was simply a precautionary measure in case that not all the data could be assembled with the funds budgeted for this purpose. This fear turned out to be justified for half of the woodlots whose mensurational characteristics could not be measured within the time and funds available. This was due mainly to the complicated land ownership pattern in Ostrobothnia, which required special efforts to identify different ownerships.

The interviews were carried out by two foresters. This was probably not the best setup either in regard to the number of interviewers or to their professional background. It is well known that different interviewers may obtain divergent responses. Similarly, a professional forester as an interviewer may predispose forest owners to color their re-

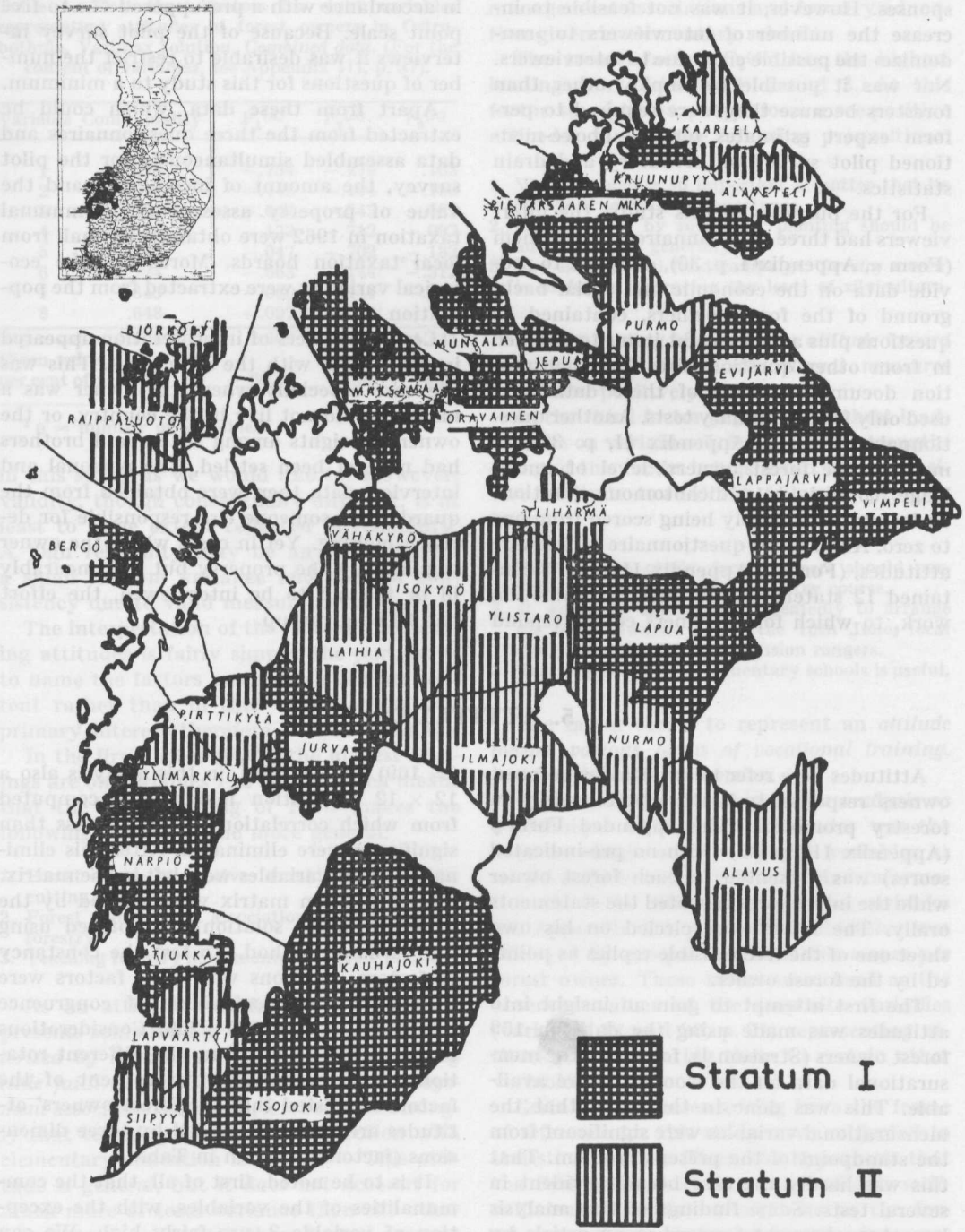

Fig. 3. Study area: geographical distribution of strata I and II.

sponses. However, it was not feasible to increase the number of interviewers to »randomize» the possible error due to interviewers. Nor was it possible to employ other than foresters because they were required to perform expert estimates for the above-mentioned pilot survey on inventory and drain statistics.

For the purposes of this study, the interviewers had three questionnaires. One of them (Form α, Appendix I, p. 36), designed to provide data on the economic and social background of the forest owners, contained 20 questions plus another eight items to be filled in from other questionnaires and mensuration documents. Some of these data were used only for preliminary tests. Another questionnaire (Form β, Appendix II, p. 37), to measure the forest owners' level of knowledge, comprised 14 dichotomous questions on forestry, each reply being scored from one to zero. And a third questionnaire to measure attitudes, (Form γ, Appendix III, p. 37) contained 12 statements on forestry promotion work, to which forest owners could respond in accordance with a presupposed one-to-five point scale. Because of the pilot survey interviews it was desirable to restrict the number of questions for this study to a minimum.

Apart from these data, which could be extracted from the three questionnaires and data assembled simultaneously for the pilot survey, the amount of income tax and the value of property assessed for Communal taxation in 1962 were obtained by mail from local taxation boards. Moreover, five ecological variables were extracted from the population census.

Certain matters of interpretation appeared in connection with the interviews. This was the case especially where the owner was a minor or did not live in the country, or the ownership rights among sisters and brothers had not yet been settled. The personal and interview data then were obtained from the quardian or someone else responsible for decision making. Yet in cases where the owner was holding the property but was incurably ill or too old to be interviewed, the effort had to be given up.

5. ATTITUDES

Attitudes here refer to invariables in forest owners' responses to 12 statements mainly on forestry promotion. The appended Form γ (Appendix III, p. 37) (with no pre-indicated scores) was presented to each forest owner while the interviewer repeated the statements orally. The interviewer circled on his own sheet one of the five possible replies as pointed by the forest owner.

The first attempt to gain an insight into attitudes was made using the data on 169 forest owners (Stratum I), for which the mensurational data on the woodlots were available. This was done in the belief that the mensurational variables were significant from the standpoint of the present problem. That this was hardly the case became evident in several tests. Some findings of this analysis have been brought forward in an article by the present author (Riihinen 1966).

For the purpose of this investigation, another analysis was carried out using data obtained from 302 forest owners (Strata I and II). As in the first attempt with fewer ($= 169$) observations, in this analysis also a 12×12 correlation matrix was computed from which correlations obviously less than significant were eliminated. After this elimination eight variables were left in the matrix. The correlation matrix was factored by the principal factor solution and rotated using the varimax method. To test the constancy of factors, rotations with 2—4 factors were compared using coefficients of congruence (Harman 1960, pp. 257—259). Considerations based on the eigen value, the different rotations, and the interpretive content of the factors suggested that the forest owners' attitudes are best represented by three dimensions (factors) as given in Table 1.

It is to be noted, first of all, that the communalities of the variables, with the exception of variable 3, are fairly high. We can therefore conclude that also their reliability ($\geqq$ communality) is considerable. Instead, the empirically difficult problem of validity (whether the questions asked measure what they are meant to measure) cannot be tackled

Table 1. First three factors for eight variables representing attitudes of forest owners in Ostrobothnia. Varimax solution. *Combined data.* (For the content of variables, see Appendix III, p. 37).

Variable	Communality	$F_1^{(A)}$	$F_2^{(A)}$	$F_3^{(A)}$
1	.674	−.754	−.279	.163
2	.601	−.743	−.104	−.190
3	.304	−.042	−.543	−.082
4	.546	−.172	−.712	−.097
5	.530	−.047	−.702	−.182
6	.724	−.663	.144	−.512
7	.643	−.060	−.141	−.786
8	.648	−.097	−.303	−.739
Eigen value	4.670	1.609	1.518	1.541
Eigen value, per cent of n[1]	58.38	20.12	18.98	19.27

[1] n = number of variables.

in this study as we would like to. However, validity, though conceptually different, is at least to some extent reflected in reliability. A high reliability may be an indication of a small random variance and thus of consistency due to valid measurements.

The interpretation of the factors representing attitudes is fairly simple: the purpose is to name the factors on the basis of their content rather than of their causal origin. Our primary interest therefore is in the loadings.

In the first factor ($F_1^{(A)}$) the highest loadings are on variables 1, 2 and 6, which means that the strengthening of $F_1^{(A)}$ makes the following views become more general:

1. Forest owners themselves should mark trees for cutting.
2. Forest management associations hardly promote forestry.
3. Teaching forestry in elementary schools is useful.

As an attitude this factor obviously represents some kind of *»selfsufficiency» characterized by reliance on inherent skills and by little faith in the usefulness of forest management associations.* Instead, it is believed strongly that teaching forestry in connection with elementary education is useful. — This attitude is general, but it does not account for much more of total variance than the other two factors (each of the three factors account for 19—20 per cent). — It is not necessary to try to specify the motives underlying the formation of this attitude. However, one might assume political interests as a possible discriminator between peoples' faith in forest management associations and forestry education given in elementary schools.

The second factor ($F_2^{(A)}$) has the highest loadings on variables 4, 5 and 3. As this factor strengthens, people form more positive attitudes toward the following propositions:

1. Working plan is so important a matter that its cost is of secondary importance.
2. Regeneration by sowing or planting should be adopted more generally.
3. The silvicultural field campaign *'forestry march'* is useful in improving the level of silviculture.

We are dealing here with an *attitude toward planning and, direct silvicultural measures* which are positively correlated.

In the third factor ($F_3^{(A)}$) the highest loadings are on variables 7, 8 and 6. The strengthening of this factor brings about a more positive attitude toward the following propositions:

1. The children of the forest owners should participate in a few months' forestry course.
2. It would be appropriate repeatedly to arrange for forest owners, about the 10th June, local study tours guided by extension rangers.
3. Teaching forestry in elementary schools is useful.

The factor seems to represent an *attitude toward various forms of vocational training, possibly including extension.*

One reason for choosing factor analysis as a technique of analysing attitudes was the need to obtain such composite variables as would include objectively weighted information about the different component variables (cf. Appendix III, p. 37). This objective was achieved by computing the factor scores per forest owner. These scores were used as the observed values of the cmposite variables (variables 19 and 20, p. 21) representing attitudes while relating them to certain other variables.

Certain hypotheses arising from the frame of reference for this study were subjected to statistical testing. Thus, the hypothesis that the first attitudinal dimension ($F_1^{(A)}$: »self-sufficiency», above) strengthens as the forest owners' knowledge of forestry increases proved true at 0.1 per cent level of risk. This test was performed by dividing the forest owners into two according to their knowledge of forestry matters. The mean scores of the above-mentioned attitude per forest owner in

these two groups of forest owners were computed and the significance of the difference between the means was tested. The result implies that the more forest owners know about forestry the more generally they believe in the statements mentioned on page 15. In other words, forest owners tend to become more willing to mark their trees themselves for cutting, more negative toward forest management associations, and more inclined to believe that teaching forestry in elementary school is useful, as their knowledge of forestry increases. Other hypotheses regarding this attitudinal dimension did not seem to be verified.

The second dimension ($F_2^{(A)}$: attitude toward planning and direct silvicultural measures) was first related with industrialization. The hypothesis was set that industrialization reduces interest in planning and direct silvicultural measures. To test this hypothesis, the forest owners were divided into two according to the degree of industrialization [1] of their commune of residence. It turned out that, among forest owners living in the less industrialized communes, attitudes toward planning and direct silvicultural measures were, at 5 per cent level of risk, more positive than among forest owners living in the more industrialized communes.

Closely related to industrialization as a basis for dividing the forest owners into two groups is the level of income. This was approximated by the amount of income taxes paid by each forest owner in communal taxation in 1962. Thus, contrary to the degree of industrialization, the basis of division here was not ecological but individual. The owners with low incomes were, at 25 per cent risk level, more positive toward planning and direct silvicultural measures than those with high incomes. — Since this finding was perhaps contrary to general views, possible reasons for it were hypothesized. The most natural may have been the influence of ecological environment coinciding with the level of income. We therefore adjusted the level of income of individual forest owners for differences in the degree of industrialization among the different communes of residence by »deflating» the amount of income taxes paid in communal taxation by the percentage of people employed in occupations other than agriculture and forestry in each commune. When the attitudinal scores (representing attitude toward planning and direct silvicultural measures) were divided into two according to this adjusted »income», it appeared that the half of owners with a lower income was more positive at hardly more than 2 per cent risk ($t = 2.3$; $N = 302$).

Based on the frame of reference we also set the hypothesis that the more forest owners know about forestry the more negative they become toward planning and direct silvicultural measures. This hypothesis was verified at 0.1 per cent level of risk.

The third attitudinal dimension ($F_3^{(A)}$: attitude toward vocatianal training) did not seem to vary significantly with changes in other variables. The hypothesis that forest owners holding woodlots with a large proportion of productive forest land have more positive attitudes toward vocational training than those holding woodlots with a small share of productive forest land proved correct at more than 10 per cent level of risk. The hypothesis that forest owners with a small total land holding are more positive than those with a large land holding was verified at 25 per cent level of risk.

The level of knowledge was found to be a significant variable in determining the attitudes toward self-sufficiency in marking trees for cutting, toward forest management associations, and forestry education given in elementary schools. These attitudes were not at the same time associated with income or with variables representing the amount of property. A high level of knowledge of forestry among forest owners with such an attitude may have resulted in some kind of criticalness toward the current forestry promotion systems. The fact that forest owners with this attitude consider the »neutral» forestry education given in elementary schools useful would seem to support such a conclusion. On the other hand, a high level of knowledge among forest owners having large incomes and/or living in industrialized areas appeared to be associated with a negative attitude toward planning and direct silvicultural measures, in as much as these measures are to be carried out at the owners' own initiative and

[1] Percentage of population at working age employed by the industries other than agriculture and forestry.

cost. One possible reason for this attitude among its holders might be their possible participation in the activities of forest management associations advocating a state-supported variety of forestry promotion. However, since it was not possible to include in this study variables representing social participation, no such hypothesis can be explicitly tested. Instead, it will be interesting to view the relationship of the level of knowledge — apparently one of the central variables in this study — to certain characteristics of forest owners.

Last, it is to be noted that several variables other than those dealt with in this chapter were considered as possible determinants of the above-mentioned three attitudinal dimensions, but none of those hypotheses remained in force. Further attempts to analyze the relationship of attitudes to certain characteristics of forest owners will be made by factor analysis (p. 21).

6. LEVEL OF KNOWLEDGE

It may seem too elaborate to consider the level of knowledge theoretically as a variable separate from cultural and functional environment (cf. Fig. 2, p. 11). The position of knowledge, however, is interesting in many ways, as can be seen from Fig. 2. We are interested in the level of knowledge especially because of its possible instrumental nature; it may be considered as an instrument of forest policy.

The appended Form β (Appendix II, p. 37) contains 14 questions designed to measure the forest owners' knowledge of forestry. Each reply was scored from one to zero. The internal coherence of the questionnaire was tested by the coefficient of contingency between the distribution of each individual reply and that of all the replies pooled together. On the basis of this test, three questions were eliminated. The sums of the remaining 11 scores provided the necessary composite variable.

We first tested the hypothesis that the half of forest owners living in the more industrialized communes know more about forestry than the half living in the less industrialized communes. This hypothesis held good at 5 per cent level of risk.

What is known about the general effects of industrialization on forestry, to which we referred in the frame of reference (p. 7), suggests a somewhat more elaborate hypothesis. In a traditional village community belonging to an area of economic backwash, forest owners are perhaps less inclined to base their decisions on knowledge than on conformity. Also, there is little motivation for acquiring knowledge and technical knowhow under such circumstances. In the areas of industrial spread effects forest owners are likely to exhibit the highest level of knowledge, the conditions for forestry and thus for forestry information there being most advantageous. A far-advanced industrialization with fragmentation of land holdings may deflect attention from forestry. At least there is little opportunity for private forest owners to learn through experience about forestry on their own small land holdings. To simplify this reasoning, we could hypothesize that the level of knowledge among forest owners, as a function of industrialization, follows a U-shaped curve opening to the axis representing the degree of industrialization. It is to be noted, however, that a hypothesis of this type does not easily lend itself to verification, for there is hardly a way of knowing the degree of regional differentiation required to produce the picture suggested. While industrialization is regarded as the most essential factor in regional differentiation, we find that the differences in the degree of industrial development which are likely to cause the hypothesized behavior of knowledge are difficult to determine with any accuracy.

Ostrobothnia is one of the least industrialized regions in Southern Finland and does not provide a good laboratory to test the above-mentioned hypothesis. Nevertheless, we divided the forest owners into three groups according to the degree of industrialization of their commune of residence. It turned out that the forest owners living in the most industrialized communes knew most about forestry. Second in knowledge were the forest owners living in the least industrialized communes. The difference between the mean

scores of knowledge in these two groups was not significant. The difference in knowledge between the most and second most industrialized groups was significant at 5 per cent risk, whereas that between the second most and least industrialized groups was not significant. The result obtained does not falsify or verify the hypothesis set; it is difficult to conclude whether or not the behavior established represents one part of the curve, and which one. Besides, it is difficult to obtain the influence of industrialization free of the influence of other variables. The problem is analogous to the identification problem in econometrics (cf. e.g. KLEIN 1965).

We also set the hypothesis that the forest owners' level of knowledge is related to their income and amount of property. The level of income was measured by the amount of income taxes paid in communal taxation in 1962. It was observed that half of the forest owners with higher incomes knew, at 0.1 per cent level of risk, more than the half with lower incomes. — The amount of property was represented by several variables: value of property assessed for taxation in 1962, total area of land holding, and total forest area. The last of these represents also the varying possibilities of learning through experience on one's own woodlot. When the forest owners were divided into two, separately according to each of these variables, it appeared that the wealthy owners knew more, at 0.1 per cent level of risk, than the poor ones.

Next, we set the apparently trivial hypothesis that forest owners with more education know more about forestry than those with less education. The amount of education obtained was measured by a special scale explained in Appendix IV (p. 38). This hypothesis held good at 0.1 per cent level of risk. In fact, education proved to be the most significant variable determining forest owners' level of knowledge and technical know-how.

Last, we found enough grounds to hypothesize that young forest owners know more than old. This hypothesis also was verified at 0.1 per cent level of risk.

7. FACTOR ANALYSIS

71. Theoretical Considerations

The frame of reference of this study, as well as the subsequent testing of certain hypotheses in Chapters 5—6, suggests that we are dealing with a complex multi-variable problem. Several functional and cultural variables seem to be associated with both attitudes and knowledge, while knowledge is also an important intervening variable transmitting changes in several cultural and functional variables. The question may be raised whether there exists a simple structure among the different variables, a structure that possibly can be revealed by factor analysis.

We are aware of potential pitfalls and failures owing to such differences in variables as can hardly be duly accounted for by rotating factor matrices with the methods currently programmed for computers. It was for this reason we performed several statistical tests in Chapters 5—6 to reveal what may be hidden by factor analysis. While those tests provided information on the relationship of certain characteristics of forest owners to economic, social and cultural variables, they indicated little about the nature of the economic growth associated with the social change taking place in agriculture and forestry. Chapters 5—6 do suggest, however, that the degree of industrialization, income, amount of property, level of knowledge, etc.,working perhaps as hypothesized in Fig. 2 (p. 11), are important determinants of the social values essential for a decision to use the possibilities for achievement. The creation of these possibilities is obviously a process where several, mainly economic, variables affect each other (cf. ESKOLA 1963, p. 172; Olavi RIIHINEN 1965, p. 22; HAHTOLA 1967, p. 9). We must confine ourselves to approach this problem from a certain angle which recognized the interdepence of many variables.

It is of considerable interest to discover to what extent the economic growth in agriculture and forestry tending to change what in Fig. 2 (p. 11) was called cultural and functional environment, is of a cumulative nature

and what are the positively correlated variables involved in this growth. — Cumulative process was first expounded by MYRDAL (1957) in explaining regional differences in economic development. He means by this process a phenomenon in which several economic and social variables are mutually affected, thus causing a cumulative development to a certain direction. He argues against the classical assumption of an economic equilibrium. A change in one economic variable brings about parallel rather than contradictory influences in the other variables of the system. Economic systems are thus not in rest or moving towards an equilibrium, but are constantly moving away from their points of departure. Free-trade economy and increasing international trade have not been able to level the differences in regional development — on the contrary. The division of social reality into »economic» and »non-economic» factors, and the restriction of theoretical analysis to the former, is unrealistic. It is the »non-economic» factors, commonly referred to as »quality of factors of production» and »production efficiency,» usually assumed constant, that refute the assumption of an equilibrium. Where they operate, they usually result in irreversible changes. (MYRDAL 1957, pp. 8—19).

Myrdal's imposing verbal treatment of the subject, however, never produced a fully operational concept capable of drawing conclusions as to the existence and degree of cumulation and the major variables involved in this process. Olavi RIIHINEN (1965, pp. 74—76) defined the degree of cumulation in terms of factor matrices. It may be recalled that the usual factor explanation of a variable (z_j) consists of m common factors (F_1, $F_2, \ldots, F_m$), of a specific factor (S_k), and an error factor (E_1, $1 = 1, 2, \ldots, n$). The corresponding loadings are denoted by a, b, and c. Variable z_j can then be expressed in the following form:

$$(1)\quad z_j = a_{j1}F_1 + a_{j2}F_2 + \ldots + a_{jm}F_m + b_{jk}S_k + c_{j1}E_1.$$

Perfect cumulation is represented by a factor matrix with only one common factor and with no specific factor. (The absence of a specific factor is readily understandable: if a variable has reliable variance not common with the other variables, cumulation is not perfect). Perfect cumulation in a number of variables, though only theoretically possible, can be reduced into equation (2), in which the factor common for all variables is denoted by F_g, and the error factor by E_1:

$$(2)\quad z_j = a_{jg}F_g + c_{j1}E_1.$$

The corresponding factor matrix would thus be as follows:

(2a)

	F_g	E_1	$E_2 \ldots E_n$
z_1	a_{1g}	c_{11}	$0 \ldots 0$
z_2	a_{2g}	0	$c_{22} \ldots 0$
.	.	.	. . . .
z_n	a_{ng}	0	$0 \ldots c_{nn}$

By analogy, we can also consider the theoretical case contradictory to perfect cumulation: perfect dispersion. If a set of variables is perfectly dispersed, the variables obviously contain only specific and error variance. The theoretical model of such variables would thus be as follows:

$$(3)\quad z_j = b_{jj}S_j + c_{jk}E_k \quad (j, k = 1. 2, \ldots, h),$$

where S_j stands for specific factor.

Models (2) and (3) form two extreme bench marks helpful in gauging the degree of cumulation visible in empirical factor matrices. The more a set of variables resembles model (2) the more cumulated it is; the closer it approaches model (3) the more dispersed it is.

It is obvious from the concept of cumulation that it always relates to the set of variables dealt with. Thus in general we cannot ask: What are the major sources of cumulative growth in joint agriculture and forestry enterprises? The question may preferably be put: Which of the variables actually considered participate in the cumulative growth? The results obtained in different studies may therefore be similar or dissimilar according to the variables used. HAHTOLA's (1967 a) findings on the change in jointly managed agriculture and forestry point to industrialization as a cumulative factor responsible for that change. His frame of reference and the ensuing variables cover most of the appropriate economic and social environment. Hence the results obtained are of a general nature and may be considered as a close approximation for an answer to the first type of question mentioned above. In this study

we are interested merely in discovering which of the variables included in the analysis are mainly responsible for a cumulative growth of some of the functional and cultural determinants of forest owners' attitudes toward forestry promotion.

Apart from cumulative growth, which can be elucidated by factor analysis, there are certain other questions requiring an insight in the structure of forest owners' behavior. There may be — as suggested by the frame of reference — geographical areas where the social climate is still characterized by mechanical and others by organic solidarity. By dividing the data into two according to some variable (degree of industrialization, level of income, level of knowledge, etc., cf. pp. 15—18), we obtained differences between the means of certain test variables (level of knowledge, attitudes). These means may, however, hide such ecological and other differences in the forest owners' behavior as can be considered reservations for conclusions drawn from statistical differences only. An extension of the hypotheses developed in the frame of reference might suggest that the lower-income, less industrialized — less prosperous and less urbanized — half of forest owners lives to a larger degree than the other half in areas with mechanical solidarity, i.e. in regions with traditions maintaining pressure toward conformity of behavior. In such circumstances industrialization and urbanization may at first bring about weakening of the pressure toward conformity and thus tend to substitute organic for mechanical solidarity — with »improvement» of attitudes toward forestry promotion. The extent to which such pressure toward conformity exists would thus effect the degree to which the anticipated social change — industrialization and urbanization and the consequent rise in income and the level of knowledge — will, on an average, make forest owners' attitude more negative toward forestry promotion.

Yet we do not wish to limit ourselves to considering this social change as the sole reason for raising the level of knowledge; this rise may also result from any other source raising the level of income. Indeed, this is the first point in considering the degree and nature of cumulation of variables in the forthcoming factor analysis; the second point is: To what extent are there aspects of social structure that cause revision of conclusions drawn from the earlier statistical analysis (pp. 15—18).

72. Variables

The original set of variables consisted of 40 variables designed to represent different aspects of the cultural and functional environment. It must be borne in mind that the first limitation to the number of variables was imposed by the interview which served also for purposes other than those of this study. The number of variables was further reduced on the basis of their correlation matrix; the variables with almost all their correlations less than significant were eliminated. A preliminary factoring experiment with data on 169 forest owners (Stratum I) (cf. p. 14) suggested exclusion of the mensurational variables which were lacking in reliability and were placed on their own orthogonal factor. Moreover, these variables were not available for all 302 forest owners.

The final set of variables in the analysis carried out with the total number (= 302) of forest owners was 27 and, in the analyses performed with the two strata separately, it was 28. This little difference consisted of the first attitudinal component (»self-sufficiency», p. 15) which was eliminated from the combined data.

The following list is a review of the 27 variables (see also Table I, p. 41).

1. Owner's age
2. Number of children < 15 years of age, living at home.
3. Education. (This was based on a special scoring system explained in Appendix IV, p. 38).
4. Land area under hay crops.
5. Land area under feeder grain crops.
6. Land area under cereal crops.
7. Land area under special crops.
8. Number of milking cows.
9. Number of horses.
10. Number of tractors.
11. Number of heated housing rooms.
12. Level of household equipment (This variable was composed as explained in Appendix V, p. 38).
13. Time (in years) of holding the estate.
14. Amount of income tax paid in communal taxation in 1962.
15. Value of property assessed for taxation in 1962 (without deducting the debts).
16. Number of parcels in woodlot.
17. Mean distance to parcels from house yard.

18. Level of knowledge of forestry (cf. p. 17).
19. Attitude toward planning and direct silvicultural measures (obtained as a factor score, cf.p. 15).
20. Attitude toward vocational training (obtained as a factor score, cf. p. 15).
21. Forest area.
22. Total area of land holding.
23. Percentage of population living in centers of habitation, in the commune of residence. (SVT, 1960).
24. Density of population (number of people per square kilometer of land area), in the commune of residence. (SVT, 1960).
25. Mean number of people per household, in the commune of residence. (SVT, 1960).
26. Percentage of population employed in agriculture and forestry, in the commune of residence. (SVT, 1960).
27. Percentage of population with at least five years of highschool attendance, in the commune of residence. (SVT, 1960).

In the factor analyses performed separately for each of the two strata with 28 variables, the first attitudinal dimension »Self-sufficiency») (cf. p. 15), with slightly different contents, was included. The list of variables for each stratum will be revised in the appropriate context. It is obvious that in the above-mentioned list (p. 20) the five last variables are ecological, whereas all others pertain to individuals. We do not find it worthwhile to motivate the selection of these variables one by one. It is easy to attach them both to certain aspects of the frame of reference and to the subsequent condensing of hypotheses in Fig. 2 (p. 11).

73. Analysis with Combined Data

731. Factoring and Rotation

The factoring of the variables listed above (their means and standard deviations are presented in Table I, p. 40) was started from their correlation matrix (Table II, p. 41). The principal factor solution was employed. Considerations based on the eigen value suggested the limitation of the number of factors to five. The principal factor solution is presented in Table III (p. 42). The resultant factor matrix was rotated by the varimax method. Subsequent rotations also with 3, 4 and 6 factors and the computation of coefficients of congruence between the different rotational solutions supported the decision concerning the number of factors. The varimax solution is presented in Table IV (p. 42).

732. First Factor (F_1)

Observations based on the factor matrices support the conclusion that there is a considerable amount of cumulation among the variables; 23.9 per cent of total variance in the principal factor solution, and 21.2 per cent in the varimax solution, is accounted for by the first factor. The highest loadings in the varimax solution are on the following variables:

			h^2 for 5 factors
No.	4	Land area under hay crops ..	.880 .799
	8	Number of milking cows	.866 .811
	5	Land area under feeder grain crops	.851 .761
	15	Value of property assessed for taxation	.774 .809
	11	Number of heated housing rooms	.759 .671
	10	Number of tractors	.664 .478
	21	Forest area	.627 .894
	6	Land area under cereal crops	.595 .403
	22	Total area of land holding ..	.572 .842
	14	Amount of income tax	.492 .562
	7	Land area under special crops	.424 .229
	16	Number of parcels in woodlot	.352 .156
	9	Number of horses	.272 .235
	12	Level of household equipment	−.211 .177
	18	Level of knowledge of forestry	.198 .240

The highest loadings in this factor are on variables measuring agricultural and forestry wealth with a bias toward animal husbandry. Hence the cumulative growth in jointly managed agriculture and forestry would seem to be characterized by the *interplay of agriculture (mainly animal husbandry) and forestry.*

We may recall at this point that the attitudes of forest owners were associated significantly with hardly any of the income and property variables. Instead, the attitudes, with the exception of that toward vocational training, were in a high degree significantly associated with the level of knowledge, which in turn, was very significantly associated with eight (Nos. 5, 15, 11, 10, 21, 22, 14, 16) of the income and property variables of the fifteen variables in the first factor. Thus we are led to conclude that income and property tend to determine the level of knowledge, which in turn moulds attitudes. The fact that the loading of the level of knowledge in this factor is as low as .198 is not in contradiction with the above-mentioned conclusion about the association between the level of knowledge and certain variables representing income and

property; in the principal factor solution (without rotation) this loading is .305, and we must also bear in mind that statistical tests cannot be replaced by the results of factor analysis with an approximative nature and given descriptional ideals (simple structure, parsimony, etc.). As far as the effect of the rotational solution on the diminution of lower principal factor loadings is concerned, the varimax method tends to enlarge greater loadings in each column, thus bringing lower loadings close to zero.

733. Second Factor (F_2)

The second factor has higher loadings only on ecological variables:

			h^2 for 5 factors
No. 24	Density of population in the commune of residence	.837	.713
27	Percentage of population with at least 5 years of highschool in the commune of residence	.818	.778
26	Percentage of population employed in agriculture and forestry in the commune of residence	−.756	.618
25	Mean number of people per household in the commune of residence	.259	.363

A superficial consideration of this factor, orthogonal to F_1, might suggest that the cumulation present in the first factor (F_1) is independent of this *ecological factor* — a conclusion which would be clearly arbitrary. The apparent independence is due to the factoring techniques and the rotational solution chosen. Thus we can turn the F_2 axis around its origin upwards to a new position (Appendix VI, p. 39) F_2' without changing its number of zero loadings or its interpretive content. At the same time, F_1 remains the same as in the varimax solution except that the ecological variables 24, 26 and 27 have absolute values of .21, with signs that make them logically support a hypothesis of dependence between F_1 and F_2. This oblique rotation brings F_1 and F_2 into a 75-degree angle. If variables 24, 25 and 27 are examined separately, they are found to be associated significantly with several economic and social variables in F_1 (tests similar for those in Chapters 5—6 were performed). Thus, variable 24 is associated with variables 5 and 11; variable 25 with 8; variable 27 with 4, 5, 6, 7, 11 and 15. Hence it is obvious that the cumulative growth in joint agriculture and forestry is not independent of their ecology, although in Ostrobothnia this seems to be a separate factor.

734. Third Factor (F_3)

The highest loadings in this factor are as follows:

			h^2 for 5 factors
No. 1	Owner's age	.751	.580
13	Time in years of holding the estate	.711	.540
2	Number of children < 15 years, living at home	−.446	.215
18	Level of knowledge of forestry	−.284	.240

This factor — the *owner's age* — is trivial except to the extent that it seems to affect the level of knowledge of forestry. The younger the owner, the more he tends to know about forestry. The loading of the level of knowledge in the varimax solution is only —.284, while in the principal factor solution it is —.351 (Table III, p. 42). Then, of course, we must bear in mind that the mean age of the forest owners in Ostrobothnia is >49 years. It may be somewhat stretching it too far to look for ecological invariables in the forest owners' age. However, it seems that half of the owners living in the more industrialized communes is significantly younger than the half living in the less industrialized communes. This conclusion conforms to what is known about migration from the most remote rural areas: young people tend to move to more industrialized regions.

735. Fourth Factor (F_4)

Several variables in this factor have considerable loadings:

			h^2 for 5 factors
No. 14	Amount of income taxes paid in communal taxation	.553	.562
3	Education	.525	.339
21	Forest area	.486	.894
22	Total area of land holding	.411	.842
17	Mean distance to parcels from house yard	.394	.165

9 Number of horses	−.381	.235
15 Value of property assessed for taxation	.371	.809
12 Level of household equipment	−.326	.177
11 Number of heated housing rooms	.265	.671
18 Level of knowledge	.243	.240

It is conspicuous that no agricultural variable proper has a high loading in this factor. Instead, incomes tend to rise, and the owner's education, forest area, and total land holding increase as this factor strengthens. With the present state of land distribution in Ostrobothnia, a large forest area usually means a great number of parcels and thus an increasing probability that some of them are situated at a greater distance from the house yard, thus increasing also the mean distance as suggested by this factor. However, from the standpoint of this study, one of the most interesting variables in this factor is the level of knowledge. Its loading in this varimax solution is .243. It supports the conclusion that education is essential in detaching people from agriculture, as well as in raising their knowledge of forestry (cf. p. 18).

We may conclude from these aspects that this factor represents *detachment from agriculture*, owing partly to the fact that people have an educational background attaching them to an occupation other than agriculture.

736. Fifth Factor (F_5)

In the fifth factor the highest loadings are on the following variables:

		h^2 for 5 factors
No. 22 Total area of land holding	.558	.842
25 Mean number of people per household, in the commune of residence	.529	.363
23 Percentage of population living in centers of habitation in the commune of residence	−.471	.274
21 Forest area	.470	.894
27 Percentage of population with at least 5 years of highschool, in the commune of residence	.304	.779
15 Value of property assessed for taxation	.230	.809

The changes in the variables listed above, caused by the strengthening of this factor, point to *differences between small holdings in remote regions and large holdings in more modernized areas.* In other words, the area of total land holding and of forest land increase, the number of people per household in the commune of residence and the percentage of population living in population centers diminish, and the percentage of people with at least five years of highschool attendance increases as this factor strengthens; the latter aspect may be understood in the light of variable 25 (number of people per household in the commune of residence).

74. Analysis with Strata I and II Separately

741. Attitudes as Determined Separately from Strata I and II

Adhering to the theory of the formation of attitudes, we determined the attitudinal dimensions from their appropriate environments, separately for each of the two strata, thus not using in a partial analysis the attitudinal dimensions determined from the combined data (p. 15). The resultant attitudinal dimensions for Stratum I become as in Table 2.

Table 2. First three factors for eight variables representing attitudes of forest owners in Ostrobothnia. Varimax solution. *Stratum I.* (For the content of variables, see Appendix III, p. 37).

Variable	Communality	$F_1^{(A\ I)}$	$F_2^{(A\ I)}$	$F_3^{(A\ I)}$
1	.700	−.711	−.352	−.262
2	.619	−.741	−.095	.245
3	.297	−.192	−.503	.084
4	.557	−.065	−.739	.073
5	.516	.028	−.696	.173
6	.749	−.745	.086	.430
7	.684	−.063	−.154	.809
8	.645	−.202	−.192	.752
Eigen value	4.768	1.699	1.487	1.579
Eigen value, per cent of n[1]	59.60	21.25	18.60	19.75

[1] n = number of variables.

It is easy to realize that the factors presented in Table 2 have the same interpretive content as those in Table 1 (p. 15). Thus, the three attitudinal dimensions are as follows:

$F_1^{(A\ I)}$ *»self-sufficiency» characterized by reliance on inherent skills and by small*

faith in the usefulness of forest management associations;

$F_2^{(A\ I)}$ *attitude toward planning and direct silvicultural measures;*

$F_3^{(A\ I)}$ *attitude toward various forms of vocational training, possibly including extension.*

The attitudinal dimensions for Stratum II are presented in Table 3.

Table 3. First three factors for eight variables representing attitudes of forest owners in Ostrobothnia. Varimax solution. *Stratum II.* (For the content of variables, see Appendix III, p. 37).

Variable	Communality	$F_1^{(A\ II)}$	$F_2^{(A\ II)}$	$F_3^{(A\ II)}$
1	.583	−.140	.746	.079
2	.702	−.049	.825	−.135
3	.686	−.210	.101	−.794
4	.477	−.569	.315	−.231
5	.530	−.690	.113	−.201
6	.584	−.377	.445	.493
7	.443	−.617	.127	.213
8	.670	−.816	−.010	−.055
Eigen value	4.675	2.058	1.575	1.041
Eigen value, per cent of n[1]	58.44	25.73	19.69	13.02

[1] n = number of variables.

It is conceivable from Table 3 that the attitudinal dimensions determined from Stratum II differ somewhat from those in Table 2 (Stratum I) and hence from those in Table 1 (combined data). To spot the differences in the interpretive content of the factors determined from the combined data, on the one hand, and from Stratum II, on the other, we shall interpret the factors presented in Table 3.

The first factor ($F_1^{(A\ II)}$) in Table 3 seems to correspond to $F_2^{(A)}$ in Table 1 (or to $F_2^{(A\ I)}$ in Table 2) except to the extent that $F_1^{(A\ II)}$ combines also variables representing vocational training. $F_1^{(A\ II)}$ would thus represent *attitude toward planning, direct silvicultural measures, and vocational training.* It may be recalled that in the combined data the attitude toward vocational training was a separate factor ($F_3^{(A)}$, Table 1, p. 15).

The second factor ($F_2^{(A\ II)}$) in Table 3 has the same interpretive content as $F_1^{(A)}$ in Table 1 (or $F_1^{(A\ I)}$ in Table 2). It thus represents *»self-sufficiency» characterized by reliance on inherent skills and by small faith in the usefulness of forest management associations,* while it is also believed that teaching forestry in elementary schools is useful.

The third factor ($F_3^{(A\ II)}$) is difficult to interpret. It may provisionally be interpreted as a tendency to approve silvicultural campaigns but disapprove vocational training. This may in part reflect willingness to promote forestry in as much as it can be done without large financial outlays.

742. Factor Analysis with Data from Stratum I

742.1 Need to Explore the Two Strata Separately

The question may be raised whether there are differences in the factor patterns of the two strata (see Fig. 3, p. 13). Such differences could in fact be expected on the basis of the means and standard deviations of certain of the variables used (see Table I, p. 40). It is obvious that Stratum II represents a wider range of conditions, with an average income and property considerably higher than those in Stratum I. The same applies to the degree of industrialization and urbanization in favor of Stratum II. Some slight difference is found also in the agricultural production; special crops are more generally grown in Stratum I.

Since the two attitudinal components ($F_2^{(A)}$ and $F_3^{(A)}$, p. 15) had hardly any significance in the analysis performed with combined data, certain reasons for this can be hypothesized. One of these could be the fact that the attitudinal components determined separately for the two strata differ from each other and thus cannot be aggregated in such a way that they would be significantly loaded by the factors representing the combined cultural and functional environment. It is therefore interesting to try to gain an insight into the relationships among the attitudinal components and the variables representing the cultural and functional environment in each of the two strata.

The list of variables for Stratum I follows that for combined data (pp. 20—21) up to variable No. 18 (incl.). The variables thereafter are as follows:

19 Forest area.
20 Total area of land holding.

21 Percentage of people living in centers of habitation in the commune of residence.
22 Density of population in the commune of residence.
23 Mean number of people per household in the commune of residence.
24 Percentage of population employed in agriculture and forestry in the commune of residence.
25 Percentage of population with at least five years of highschool attendance in the commune of residence.
26 »Self-sufficiency» characterized by reliance on inherent skills and by small faith in the usefulness of forest management associations.
27 Attitude toward planning and direct silvicultural measures.
28 Attitude toward various forms of vocational training, possibly including extension.

The following factors are based on a varimax solution.

742.2 First Factor ($F_1^{(I)}$)

The highest loadings in $F_1^{(I)}$ are on the following variables:

			h^2 for 5 factors
No.	8 Number of milking cows	−.834	.747
	4 Land area under hay crops	−.778	.640
	5 Land area under feeder grain crops	−.766	.614
	11 Number of heated housing rooms	−.545	.419
	10 Number of tractors	−.537	.419
	9 Number of horses	−.524	.358
	6 Land area under cereal crops	−.461	.425
	15 Value of property assessed for taxation	−.422	.680
	7 Land area under special crops	−.259	.198
	20 Total area of land holding	−.229	.853

This factor seems to represent *agricultural wealth based mainly on animal husbandry.* It is thus related to the first factor in the combined data (F_1), but has hardly any features of forestry. The cumulation aspect is thus less pronouncedly present in Stratum I: 16.4 per cent of total variance in the principal factor solution, and 12.4 per cent in the varimax solution, is accounted for by $F_1^{(I)}$. The interplay of agriculture and forestry may not be here responsible for capital formation in joint agriculture and forestry.

742.3 Second Factor ($F_2^{(I)}$)

As in the combined data, the second factor here is also an *ecological* one. The following four ecological variables have the highest loadings:

			h^2 for 5 factors
No.	22 Density of population in the commune of residence	−.853	.746
	24 Percentage of population employed in agriculture and forestry in the commune of residence	.834	.747
	25 Percentage of population with at least 5 years of highschool in the commune of residence	−.758	.687
	21 Percentage of population living in centers of habitation in the commune of residence	−.543	.460

This factor may have interesting connections with other factors. We found it worth while, in analogy with the hypothesis made in connection with the combined data (p. 22), to perform a manual oblique rotation of $F_1^{(I)}$ and $F_2^{(I)}$. It turned out that the axes representing the two factors can be brought into an oblique angle without changing the interpretive content obtained from the varimax solution. Indeed, it appears that here the ecology of the region plays a considerable role in a cumulative growth of the forest owners' economy.

742.4 Third Factor ($F_3^{(I)}$)

This factor has the highest loadings on the following variables:

			h^2 for 5 factors
No.	19 Forest area	−.894	.849
	20 Total area of land holding	−.874	.853
	15 Value of property assessed for taxation	−.698	.680
	14 Amount of income tax in communal taxation	−.467	.318
	18 Level of knowledge	−.433	.306
	3 Education	−.311	.385
	17 Mean distance to parcels from house yard	−.308	.208
	21 Percentage of population living in centers of habitation in the commune of residence	.293	.460

It seems legitimate to interpret this factor as *forestry wealth* which, in conformity with earlier conclusions (p. 18), seems to affect the level of knowledge of forestry: forest owners with a large area of forest land tend to know more about forestry than those with a small area.

Since the loading of variable 21 in this factor may suggest that there is a dependence between this factor ($F_3^{(I)}$) and the eco-

logical factor ($F_2^{(I)}$), a manual rotation was carried out between these two factors. The $F_3^{(I)}$ axis in this rotation was left as in the varimax rotation, but the $F_2^{(I)}$ axis was brought into a new position oblique to $F_3^{(I)}$. The simple structure requirement was complied with at least as precisely as in the varimax rotation, while the variables representing income and property (14—15) and forest ownership had high loadings. At the same time, ecological variables had loadings that support the hypotheses concerning an association among forestry wealth and ecological variables. Thus, forestry wealth would seem to increase as the urban development decreases — when examining a cross section.

742.5 Fourth Factor ($F_4^{(I)}$)

This factor resembles F_3 in the combined data (p. 22), but has certain aspects of interest which may be seen from the following tabulation.

			h^2 for 5 factors
No. 1	Owner's age	−.737	.574
13	Time in years of holding the estate	−.720	.551
2	Number of children < 15 years living at home	.395	.385
18	Level of knowledge	.314	.306
3	Education	.304	.385
26	»Self-sufficiency» characterized by reliance on inherent skills and by small faith in the usefulness of forest management associations	−.295	.133

Stratum I represents environmental conditions with people living more scattered over a wide area, with less contrast between centers of habitation and remote areas than in Stratum II. Industrialization and urbanization in Stratum I have therefore affected fewer forest owners' attitudes. This particular factor ($F_4^{(I)}$) seems to represent circumstances where the movement of young people to centers of habitation is not intense — possibly because of lack of industrial development. Decreasing age would seem to raise the level of knowledge and increase positive attitudes toward forest management associations, as well as to decrease »self-sufficiency» in marking timber for sale. Such conditions may well be expected to prevail in areas of economic backwash. It is likely that in such circumstances certain features of pressure toward conformity are present (cf. Olavi Riihinen 1965, p. 201). This factor could be called either *forest owner's age* or *weakening of pressure toward conformity*. Since the strengthening of this factor apparently increases the favor enjoyed by forest management associations, there may also be a *shift from mechanical to organic solidarity* — an aspect of economic spread effects (cf. pp. 8—9).

It is to be noted, however, that the reliability of variable 26, representing »self-sufficiency», is low ($h^2 = .133$), thus limiting the possibilities for drawing conclusions.

742.6 Fifth Factor ($F_5^{(I)}$)

The highest loadings in this factor are on the following variables:

			h^2 for 5 factors
No. 23	Number of people per household in the commune of residence	−.461	.304
6	Land area under cereal crops	.425	.427
3	Education	.363	.385
10	Number of tractors	.352	.419
12	Level of household equipment	−.304	.196
17	Mean distance to parcels from house yard	.298	.208
7	Land area under special crops	.286	.198
25	Percentage of population with at least 5 years of highschool in the commune of residence	−.256	.687

The content of the variables suggests that this factor refers to *remote areas with large families* (or less remote areas with small families). It does not, however, seem to be associated with forest owners' attitudes.

743. Factor Analysis with Data from Stratum II

743.1 Remark on the List of Variables

The list of variables for Stratum II follows that for combined data (pp. 20—21) up to variable No. 18. The list thereafter is as follows:

19 Forest area.
20 Total area of land holding.
21 Percentage of population living in centers of habitation in the commune of residence.
22 Density of population, in the commune of residence.

23 Mean number of people per household in the commune of residence.
24 Percentage of population employed in agriculture and forestry in the commune of residence.
25 Percentage of population with at least five years of highschool attendance in the commune of residence.
26 Attitude toward planning, direct silvicultural measures and vocational training.
27 »Self-sufficiency» characterized by reliance on inherent skills and by small faith on the usefulness of forest management associations.
28 Approval of silvicultural campaigns, disapproval of vocational training.

743.2 First Factor ($F_1^{(II)}$)

The interplay of agriculture and forestry in Stratum II seems to be much more general than in Stratum I. Hence also the resulting cumulation aspect is more pronounced: 29.0 per cent of total variance in the principal factor solution, and 27.5 per cent in the varimax solution, is accounted for by the first factor. The highest loadings are on the following variables:

			h^2 for 5 factors
No. 15	Value of property assessed for taxation	.954	.935
19	Forest area	.946	.939
4	Land area under hay crops	.904	.884
20	Percentage of population living in centers of habitation in the commune of residence	.895	.836
8	Number of milking cows	.880	.855
11	Number of heated housing rooms	.862	.809
5	Land area under feeder grain crops	.845	.852
14	Amount of income tax in communal taxation	.674	.634
10	Number of tractors	.613	.626
7	Land area under special crops	.614	.483
6	Land area under cereal crops	.520	.546
3	Education	.422	.356
16	Number of parcels in woodlot	.440	.291
18	Level of knowledge	.241	.274

The interpretive content of $F_1^{(II)}$ is the same as that of F_1 in the combined data (p. 21): it refers to *agricultural wealth characterized by the joint nature of agriculture and forestry*, with a bias toward animal husbandry. The cumulative growth due to the interplay of agriculture and forestry does seem to raise the level of knowledge; the loading of variable 18 (level of knowledge) in the principal factor solution is .323 and in the varimax solution .241. This is one of the major points of interest and the conclusion drawn supports our hypothesis and the previous findings (p. 18).

743.3 Second Factor ($F_2^{(II)}$)

Stratum II consists largely of areas with a highly developed agriculture, with little industrial development, but with a high percentage of people living in centers of habitation. This is the reason why $F_2^{(II)}$, the *ecological factor*, behaves in an unexpected way, as may be seen from the following loadings.

			h^2 for 5 factors
No. 25	Percentage of population with at least 5 years of highschool in the commune of residence	−.893	.822
22	Density of population in the commune of residence	−.819	.715
23	Mean number of people per household in the commune of residence	−.675	.501
24	Percentage of population employed in agriculture and forestry in the commune of residence	.620	.459
21	Percentage of population living in centers of habitation in the commune of residence	.430	.256

An oblique rotation subsequent to the varimax rotation with $F_1^{(II)}$ and $F_2^{(II)}$ suggested that there is some slight dependence between these two factors. Hence the ecological variables also participate in the cumulative growth.

743.4 Third Factor ($F_3^{(II)}$)

This factor is the *age of the forest owner* as can be concluded from the following loadings:

			h^2 for 5 factors
No. 1	Owner's age	−.782	.629
13	Time (in years) of holding the estate	−.725	.567
2	Number of children < 15 years, living at home	.511	.314
18	Level of knowledge	.270	.274

743.5 Fourth Factor ($F_4^{(II)}$)

$F_4^{(II)}$ is essentially the same as F_4 in the combined data (p. 22): *detachment from agriculture.*

			h^2 for 5 factors
No. 17	Mean distance to parcels from house yeard	.461	.222
9	Number of horses	−.403	.173
14	Amount of income tax in communal taxation	.391	.638
12	Level of household equipment	−.356	.237
3	Education	.300	.356

As compared with the corresponding factor in the combined data, $F_4^{(II)}$ is narrower in content. Thus the level of knowledge in this factor has a zero loading. In the combined data, the level of knowledge obviously derives its loading in F_4 (p. 22) from Stratum I, where alone there is no factor with the same interpretive content. This is understandable with reference to certain features in $F_4^{(I)}$ and $F_5^{(II)}$, which reflect the difference in the degree of contradiction between centers of habitation and remote areas in the appropriate two strata.

743.6 Fifth Factor ($F_5^{(II)}$)

The highest loadings in this factor are on the following variables:

			h^2 for 5 factors
No. 6	Land area under cereal crops	−.458	.546
10	Number of tractors	−.448	.626
26	Attitude toward planning, direct silvicultural measures and vocational training	.429	.236
18	Level of knowledge	−.355	.241
7	Land area under special crops	−.321	.483
3	Education	−.249	.356
27	»Self-sufficiency» characterized by reliance on inherent skills and by small faith in the usefulness of forest management associations	−.239	.066

Contrary to Stratum I, the owner's age does not determine attitudes in Stratum II. Instead, they are determined by $F_5^{(II)}$. This factor would seem to represent the *contradiction between centers and remote areas*, which is sharper in Stratum II than in Stratum I. Young people tend to move to centers of habitation, thus lowering the level of knowledge in remote areas and furthering there the formation of positive attitudes toward planning, silviculture, and vocational training. The strengthening contrast between centers and remote areas tends to increase, in centers and their vicinity, negative attitudes toward planning, direct silvicultural measures and vocational training. At the same time »self-sufficiency» in marking trees for cutting, positive attitudes toward forestry education given in public schools, and negative attitudes toward forest management associations, become more general.

A check with an oblique rotation of $F_2^{(II)}$ (ecological factor) and $F_5^{(II)}$ supported the above interpretation; all the variables in $F_5^{(II)}$ had somewhat higher loadings, most others remained the same or became lower. In addition this rotation suggested that the ecological variables 22 (density of population in the commune of residence) and 23 (mean number of people per household in the commune of residence) are significantly correlated with $F_5^{(II)}$ — also in conformity with the interpretation of $F_5^{(II)}$ obtained from the varimax matrix.

Another oblique rotation was performed with a view to exploring the possible relationship between $F_3^{(II)}$ (owner's age) and $F_5^{(II)}$ (contradiction between centers and remote areas). This rotation, too, supported the interpretation obtained from the varimax solution. It confirmed in particular the view that the level of knowledge is an important variable determining the forest owner's attitudes in conformity with the hypothesis set for this study (p. 11).

8. CONCLUSIONS

The conclusions drawn from this study are based on two different analyses. First, where it seemed to be warranted by the frame of reference, a statistical analysis was performed in order detect significant differences between two halfs of a given variable when classified according to another variable representing the hypothesis. Second, a factor analysis was carried out with a view to discover whether the social stratification occurring at different developmental stages of the society will cause a revision of the predictive value of the sta-

tistical differences obtained. Special emphasis was then laid on the possible occurrance of conditions corresponding to mechanical solidarity and a shift from this to organic solidarity. Another, no less important purpose of factor analysis was to provide an insight to the growth of cultural and functional environment responsible for the increase of knowledge of forestry. In particular we were interested in discovering whether this growth is cumulative and which of the variables considered participate in it. The resultant condensed picture appears as follows:

The forest owners' attitudes toward forestry promotion in Ostrobothnia are largely determined in accordance with the hypothesis presented in Fig. 2 (p. 11). However, certain revisions to that hypothesis arise from this study. Thus the state of management (as measured by the state of silviculture) is not significantly associated with the attitudes toward forestry. Instead, it does seem, as suggested by the hypothesis that the level of forest owners' knowledge of forestry is associated with such cultural and functional variables as the degree of industrialization of the commune of residence; personal income; amount of property; total land holding; total forest area; education; and age.

There is no valid method of singling out the causal order among these variables. Certain previous studies of a more general nature, however, support the view that forest owner's income is likely to affect their education (QUIST 1960, p. 76) and thus their level of knowledge. Forest owners living in more industrialized communes tend to have higher incomes than those living in less industrialized communes. The level of education alone does not, however, determine the knowledge of forestry matters. The latter is also affected by the area of forest land providing varying possibilities to learn forestry through experience.

Young forest owners in general know more about forestry than do the old. The occurrance of forest owners of differing age depends on the development of the region (cf. pp. 22 and 26). Some regional differentiation of the level of knowledge due to age is obvious. In certain remote areas with little adjoining industrial outlets for rural male labor, forest owners tend to be younger than those in areas with more access to industrial employment. The small size of land holdings contributes to movement to centers. Another degree of regional differentiation peculiar to Ostrobothnia are the agricultural centers where urbanization, despite the lack of industrial development proper, is far advanced. These centers, with a large average land holding, are likely to retain young people more surely than certain remote agricultural areas with a small average land holding and a high propensity to move. All these aspects suggest that the forest owners' age also reflects the ecology of each particular area.

The forest owners' attitudes toward forestry promotion, which were condensed by factor analysis from questionnaire data, differed slightly when determined from the combined data (Strata I and II together) on one hand, and from the two Strata separately, on the other. The three attitudinal dimensions determined from the combined data (p. 15) have the same interpretive content as those determined from Stratum I (p. 23) which represents a narrower range of conditions than Stratum II. These attitudinal dimensions are as follows:

1. »Self-sufficiency» characterized by reliance on inherent skills and by little faith in the usefulness of forest management associations.
2. Attitude toward planning and direct silvicultural measures.
3. Attitude toward various forms of vocational training, possibly including extension.

The attitudinal dimensions determined from Stratum II were as follows:

1. Attitude toward planning, direct silvicultural measures, and vocational training.
2. »Self-sufficiency» characterized by reliance on inherent skills and by little faith in the usefulness of forest management associations while believing that teaching forestry in elementary schools is useful.
3. Approval of silvicultural campaigns; disapproval of vocational training. (This dimension was difficult to interpret, nor was it significant in the subsequent factor analysis.)

It is obvious that the two sets of attitudes, referring to the combined data and Stratum II, respectively, differ little from each other. The first two are practically identical, though in reversed order and, in Stratum II, somewhat larger in content.

Certain hypotheses of the attitudes obtained from the combined data were subjected to

statistical testing. On the basis of these tests (pp. 15—17) certain preliminary conclusions were drawn. Thus it proved that *the more forest owners know about forestry the more generally are they willing to mark themselves their trees for cutting, the more negative toward forest management associations, and the more inclined to believe that teaching forestry in elementary school is useful.*

Similarly, it appeared that *the more forest owners know about forestry, the more negative they are toward planning and direct silvicultural measures.*

The attitude toward vocational training did not seem to vary significantly with changes in other variables.

There was hardly any variable other than level of knowledge closely associated with the above-mentioned attitudes. The level of income, when adjusted for differences in the degree of industrialization, was associated with the attitude toward planning and direct silvicultural measures at more than 2 per cent risk; the lower the income the more positive the forest owner. Similarly the degree of industrialization of the commune of residence was associated with the attitude toward planning and direct silvicultural measures at 5 per cent level of risk; the less industrialized the commune of residence, the more positive the forest owners toward planning and silviculture. Yet we must recognize that the relationships studied were slightly curvilinear; at the very lowest levels of industrialization and of income, negative attitudes are more general than at the lower medium levels.

Since the above-mentioned findings were based on statistical differences with no reference to structural differences in the society concerned, they were considered tentative in as much as their predictive value is concerned. We cannot conclude without insight on the social structure of the society in question that increasing industrialization, rising level of income, and improving level of knowledge will make the forest owners more »self-sufficient» in marking their trees for cutting; more negative toward forest management associations, planning and direct silvicultural measures; more inclined to believe that teaching forestry in elementary shools is useful. The question may be raised whether there exist »isles» of mechanical solidarity, village communities where conformity of social behavior is maintained by traditions. Where this is the case, the social stratification as a result of industrialization, rising level of income and increasing knowledge will at first substitute organic solidarity characteristic of primary production. This would most likely mean that in such areas the favor of at least forest management associations would increase.

The factor analysis suggested that there do exist »isles» of mechanical solidarity where the weakening of pressure toward conformity brings about an increase in the favor enjoyed by forest management associations as well as decreases in »self-sufficiency» in marking trees for cutting. This did not emerge from the analysis performed with the combined data where the relatively low frequency of such circumstances is overshadowed by more dominant aspects. Instead, the factor analysis with Strata I and II separately brings out the above-mentioned conclusion (p. 26). However, it must be borne in mind that the significance of this conclusion for forecasting future behavior is rather small: the particular factor ($F_4^{(I)}$, p. 26) accounts for no more than 6.35 per cent of the total variance.

There also seem to be forces which tend to maintain mechanical solidarity. Such is regional differentiation as a result of industrialization and urbanization, which absorbs young rural male labor from remote areas thus retarding their shift to organic solidarity. The fifth factor ($F_5^{(II)}$, p. 28) determined from Stratum II may refer to such conditions. Again, it must be borne in mind that $F_5^{(II)}$ accounts for < 5 per cent of the total variance.

It can thus be concluded that the picture obtained from an examination of the means of certain test variables, when classified according to another (criterion) variable, needs little revision. There do exist some »isles» of mechanical solidarity (pressure toward conformity) which may at first be shifted to organic solidarity characteristic of primary production. It is somewhat difficult to foresee whether and how soon the circumstances characteristic of mechanical solidarity (pressure toward conformity) will disappear as industrialization with all its accompanying influences advances. Nor is it in general easy to predict the velocity of changes from one stage to another. All we can conclude is that social stratification works constantly. It un-

dermines some of the existing social values and replaces them by others. At the same time certain social systems characteristic of these values disappear and some new subsystems are substituted. The organic solidarity subsequent to mechanical solidarity tends to favor forest management associations, but it is obviously a transitory stage in the change process followed by other social systems characteristic of more industrial society.

To sum up the findings of this study in a general way, it seems that *the attitudes of forest owners toward forestry promotion in its »traditional» form become more negative as industrialization and urbanization raise the level of knowledge and technical know-how. However, this shift is not linear; there is first a weakening of negative attitudes (shift from mechanical to organic solidarity), while a further social change characterized by industrialization, urbanization, etc. seems to result in increasingly negative attitudes.*

Ostrobothnia is a region with relatively more mechanical solidarity than elsewhere in Finland (Olavi Riihinen 1965, p. 194—201). Yet, as the present study suggests, its occurrence there is of a minor importance for the problem dealt with. Elsewhere in Finland it may not be even of that magnitude.

Another purpose of the factor analysis was to elucidate the participation of functional and cultural variables (economic, social, cultural, etc.) in the (cumulative) growth mainly responsible for a rising level of knowledge. It seems that, depending on the region, agricultural and forestry variables participate in this interplay. In more prosperous circumstances, the cumulative growth seems to take place between agriculture and forestry. Elsewhere only agricultural variables are responsible for cumulation. In all circumstances, the cumulative growth is influenced by the ecology of the particular region.

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SELOSTUS

Metsänomistaja ja hänen asenteensa metsätalouden edistämiseen

Pohjanmaan metsänomistajiin perustuva tutkimus

Tämän tutkimuksen tarkoitus on selvittää metsänomistajien asennoitumista metsätalouden edistämiseen. Sitä varten muodostetaan sosiologisen teorian, alan aiempien tutkimustulosten ja esitieteellisten havaintojen nojalla viitekehys, jonka nojalla tarkastellaan empiirisesti useita asenteiden muodostumista koskevia hypoteeseja.

Tutkimuksen johtopäätökset perustuvat kahteen analyysiin. Ensiksi — missä teoreettinen viitekehys näytti sen oikeuttavan — verrattiin valittujen muuttujien keskiarvoja hypoteeseja edustavissa toisten muuttujien luokissa. Toiseksi suoritettiin faktorianalyysi, jotta voitaisiin todeta, aiheuttaako yhteiskunnan eri kehitysasteilla tapahtuva sosiaalinen hajoaminen tilastollisessa analyysissa ilmenneiden keskiarvojen merkitsevien erojen uudelleen tulkintaa. Erityistä huomiota kiinnitettiin tällöin sellaisten olosuhteiden mahdolliseen esiintymiseen, joissa ilmenee mekaanisen solidaarisuuden piirteitä, samoin siihen missä määrin esiintyy siirtymistä mekaanisesta orgaaniseen solidaarisuuteen.

Mekaanisella solidaarisuudella tällöin tarkoitetaan lähinnä perinteellisille kyläyhteisöille ominaista, uuden omaksumiselle kielteistä normistoa, ihmisten yhteen liittymistä perinnäisten, pitkien aikojen kuluessa omaksuttujen säännösten — yhdenmukaistavan paineen — ns. yhdessäolo-organisaation — vallitessa. Teollistuminen ja kaupungistuminen pyrkii murtamaan tällaiset normit — muuttamaan asenteet siten, että uudistusten omaksuminen käy helpommin. Ihmisille tulee keskeiseksi tehokkuuspyrkimys ja erilaisten arvojen erottaminen toisistaan. Heitä eivät enää liitä toisiinsa kyläyhteisön perinnäiset säännöt, vaan esim. heidän hyvinvointitavoitteisiinsa liittyvät asiat. Tällöin puhutaan orgaanisesta solidaarisuudesta, jonka vallitessa muodostuu asiaorganisaatio.

Faktorianalyysin toinen keskeinen tarkoitus oli valaista sitä kulttuuripohjaisen ja toiminnallisen ympäristön kasvua, josta lähinnä näyttää riippuvan metsänomistajien tiedon tason nousu. Erityisesti kiinnosti tämän kasvun mahdollinen kasautuva luonne sekä mitkä tarkastelluista muuttujista osallistuvat kasautuvaan kasvuun.

Pohjanmaan metsänomistajien asennoituminen metsätalouden edistämiseen pääasiallisesti muodostuu kuvassa 2 (s. 11) esitetyn hypoteesin mukaisesti. Tämä tutkimus antaa kuitenkin aiheen tuon hypoteesin osittaiseen tarkistamiseen. Niinpä metsälön metsänhoidollinen tila ei näytä olevan merkittävässä yhteydessä metsänomistajan asenteisiin. Sen sijaan metsänomistajan metsätaloudellisen tiedon taso on yhteydessä sellaisiin kulttuuripohjaisiin ja toiminnallisiin muuttujiin kuin asuinpaikkakunnan teollistumisaste, henkilökohtaiset tulot, omaisuuden määrä, maaomaisuus, metsäala, koulutus ja ikä.

Ei ole sellaista menetelmää, jolla voitaisiin pätevästi selvittää näiden muuttujien kausaalijärjestys. Jotkut aiemmat luonteeltaan tätä yleisemmät tutkimukset tukevat näkemystä, että metsänomistajien tulotaso vaikuttaa heidän koulutukseensa (Quist 1960 s. 76) ja siten heidän tietämykseensä. Teollistuneissa kunnissa asuvat metsänomistajat nauttivat suurempia tuloja kuin vähän teollistuneissa kunnissa asuvat. Koulutus yksinään ei kuitenkaan määritä tiedon tasoa, vaan siihen vaikuttaa myös mm. metsämaan määrä, joka tarjoaa vaihtelevia mahdollisuuksia oppia metsätaloutta kokemuksen kautta.

Nuoret metsänomistajat yleensä tietävät metsätaloudesta enemmän kuin vanhat. Eri-ikäisten metsänomistajien esiintyminen riippuu osaksi alueen kehittyneisyydestä. On ilmeistä, että tapahtuu metsänomistajien iästä johtuvaa tiedon tason alueellista erilaistumista. Joillakin syrjäisillä alueilla, joilla perheet ovat suuria ja joiden läheisyydestä puuttuu teollisia työpaikkoja, metsänomistajat ovat nuorempia kuin sellaisilla alueilla, joilta on parempi yhteys teollisiin työpaikkoihin. Tilojen pieni koko edistää siirtymistä asutuskeskuksiin. Muuan Pohjanmaalle ominainen alueellisen erilaistuneisuuden piirre ovat maatalousvaltaiset taajamat, joissa kaupungistuminen varsinaisen teollistuneisuuden puuttuessakin on edistynyt pitkälle. Nämä keskukset suurehkoine keskimääräisine tiloineen pidättänevät enemmän nuorta väestöä maataloudessa kuin lähinnä pientiloja käsittävät syrjäiset maatalousalueet. Nämä

näkökohdat tukevat käsitystä, että metsänomistajan ikä heijastaa osaltaan myös kunkin alueen ekologiaa.

Metsänomistajien asenteet metsätalouden edistämiseen tiivistettiin faktorianalyysilla henkilökohtaiseen haastatteluun perustuvasta aineistosta. Nämä asenteet erosivat tuskin mainittavasti toisistaan, kun ne määritettiin toisaalta yhdistetystä aineistosta (ositteet I ja II yhdessä) ja toisaalta kummastakin ositteesta erikseen. Yhdistetystä aineistosta määritettyjen asenneulottuvuuksien tulkinnallinen sisältö on sama kuin ositteen I, joka edustaa jonkin verran alhaisempaa ja vaihteluväliltään pienempää tulo- ja omaisuustasoa kuin osite II. Nämä kolme asenneulottuvuutta olivat seuraavat:

1. »Itseriittoisuus», jolle on ominaista luottamus omiin kykyihin ja vähäinen usko metsänhoitoyhdistysten hyödyllisyyteen.
2. Asennoituminen suunnitteluun ja suoranaisiin metsänhoidollisiin toimenpiteisiin.
3. Asennoituminen ammattikoulutukseen ja mahdollisesti neuvontaan.

Ositteesta II määritetyt asenneulottuvuudet olivat seuraavat:

1. Asennoituminen suunnitteluun, suoranaisiin metsänhoidollisiin toimenpiteisiin ja ammattikoulutukseen.
2. »Itseriittoisuus», jolle on ominaista luottamus omiin kykyihin ja vähäinen usko metsänhoitoyhdistysten hyödyllisyyteen — samalla kun uskotaan, että metsätalouden opetus kansalaiskouluissa on hyödyllistä.
3. Metsänhoidollisten kampanjoiden hyväksyminen; ammattikoulutuksen vastustaminen. (Tämä ulottuvuus oli vaikea tulkita, eikä se ollut merkitsevä jatkoanalyyseissa.)

On ilmeistä, että nämä kaksi asenneulottuvuuksien asetelmaa, jotka koskevat yhdistettyä aineistoa ja ositetta II, eroavat toisistaan sangen vähän. Kaksi ensimmäistä ulottuvuutta ovat jokseenkin identtisiä, ne vain esiintyvät päinvastaisessa järjestyksessä ja ovat ositteessa II sisällöltään hieman laajempia.

Useita viitekehyksestä heräämiä, asenteita koskevia hypoteeseja testattiin tilastollisesti. Näiden testausten perusteella tehtiin alustavia johtopäätöksiä. Niinpä osoittautui, että *mitä enemmän metsänomistajat tietävät metsätaloudesta sitä yleisemmin he ovat halukkaita leimaamaan puunsa itse, sitä negatiivisempia metsänhoitoyhdistyksiä kohtaan ja sitä taipuvaisempia uskomaan, että metsätalouden opetus kansalaiskouluissa on hyödyllistä.*

Samoin osoittautui, että *mitä enemmän metsänomistajat tietävät metsätaloudesta sitä negatiivisemmin he asennoituvat suunnitteluun ja suoranaisiin metsänhoidollisiin toimenpiteisiin.*

Asennoituminen ammattikoulutukseen ei näyttänyt vaihtelevan merkittävästi muiden muuttujien vaihdellessa.

Tuskin mikään muu muuttuja kuin tiedon taso oli merkitsevässä yhteydessä edellä mainittuihin asenteisiin. Paikkakunnan teollistuneisuuden suhteen vakioidut henkilökohtaiset tulot ja asennoituminen suunnitteluun sekä suoranaisiin metsänhoidollisiin toimenpiteisiin olivat keskenään yhteydessä yli 2 %:n riskillä: mitä suuremmat tulot sitä negatiivisempi asenne suunnitteluun ja metsänhoitoon. Tämä asenne oli yhteydessä myös asuinkunnan teollistuneisuuteen 5 %:n riskillä: mitä vähemmän teollistunut asuinkunta sitä positiivisempia metsänomistajat suunnitteluun ja metsänhoitoon. On kuitenkin huomattava, että tutkitut tilastolliset yhteydet osoittivat käyräviivaisuuden oireita: teollistuneisuuden ja tulojen alimmilla tasoilla negatiiviset asenteet ovat yleisempiä kuin niiden alemmilla keskitasoilla.

Koska edellä mainitut tulokset perustuvat tilastollisiin eroihin kiinnittämättä lainkaan huomiota yhteiskunnan rakenne-eroihin, niitä pidettiin alustavina mitä tulee niiden ennustavuuteen. Tuntematta kysymyksessä olevan yhteiskunnan sosiaalista rakennetta ei voida päätellä, että edistyvä teollistuminen, nouseva tulotaso ja kohoava tiedon taso lisäävät metsänomistajien itseriittoisuutta leimauksessa, negatiivisuutta metsänhoitoyhdistyksiä, suunnittelua ja metsänhoitoa kohtaan sekä taipumusta uskoa, että metsätalouden opetus kansalaiskouluissa on hyödyllistä. Voidaan näet herättää kysymys, esiintyykö mekaanisen solidaarisuuden »saarekkeita» — kyläyhteisöjä, joissa perinteet ylläpitävät sosiaalisen käyttäytymisen yhdenmukaisuutta. Missä näin on asianlaita, siellä teollistumisen, kasvavien tulojen ja tietämyksen johdosta tapahtuva sosiaalinen hajoaminen korvaa yhdessäolo-organisaation asiaorganisaatiolla. Tämä muutos todennäköisesti lisää ainakin metsänhoitoyhdistysten suosiota.

Faktorianalyysi tuki hypoteesia, että esiintyy yhdessäolo-organisaation saarekkeita, joissa yhdenmukaistavan paineen heikkeneminen lisää metsänhoitoyhdistysten suosiota sekä vähentää metsänomistajien »itseriittoisuutta» leimauksessa. Tämä ei ilmennyt analysoitaessa yhdistettyä aineistoa, jossa yhdessäolo-organisaatiolle ominaisten olosuhteiden

verraten harvalukuinen esiintyminen peittyy niitä vallitsevampiin piirteisiin. Sen sijaan ositteiden I ja II analysointi erikseen johtaa edellä mainittuun päätelmään. On kuitenkin syytä muistaa, että tämän päätelmän merkitys ennustamiselle on jokseenkin vähäinen, sillä asianomaisen faktorin ($F_4^{(I)}$ s. 26) osuus muuttujien kokonaisvarianssista on vain 6.35 %.

Toisaalta näyttää myös olevan voimia, jotka pyrkivät osaltaan ylläpitämään mekaanista solidaarisuutta. Niinpä teollistumisen ja kaupungistumisen aiheuttama alueellinen erilaistuminen vetää nuorta miespuolista väestöä syrjäisiltä seuduilta siten hidastaen niiden siirtymistä asiaorganisaatioon. Ositteesta II määritetty viides faktori ($F_5^{(II)}$, s. 28) saattaa edustaa tällaisia olosuhteita. On kuitenkin jälleen syytä muistaa, että $F_5^{(II)}$:n osuus muuttujien kokonaisvarianssista on alle 5 %.

Lopulta voidaan päätellä, että kuva, joka saatiin tarkastelemalla tiettyjen testimuuttujien keskiarvoja valittujien muuttujien luokissa, kaipaa vain vähän tarkistusta. Yhdessäolo-organisaation (yhdenmukaistavan paineen) »saarekkeita» todella esiintyy, ja ne muuntuvat ensin primaarituotannolle ominaisiksi asiaorganisaatioiksi. On ehkä vaikea ennustaa, milloin yhdessäolo-organisaation piirteet tyystin katoavat teollistumisen ja sen seurausvaikutusten edetessä. Ei ole myöskään helppoa ennustaa muutosten vaiheittaista nopeutta. Voidaan ainoastaan päätellä että sosiaalinen hajoaminen jatkuu. Se korvaa toisia sosiaalisia arvoja toisilla. Samanaikaisesti joillekin sosiaalisille arvoille ominaiset sosiaaliset järjestelmät häviävät ja tilalle tulee uusia sosiaalisia järjestelmiä. Vaikka yhdessäolo-organisaatiota seuraava asiaorganisaatio pyrkii suosimaan metsänhoitoyhdistyksiä, on se ainoastaan ohi menevä muutosprosessin vaihe, jota seuraa muita teolliselle yhteiskunnalle ominaisia sosiaalisia järjestelmiä.

Yleisenä yhteenvetona tästä tutkimuksesta voidaan todeta, että *metsänomistajien asenteet perinteelliseen metsätalouden edistämiseen tulevat kielteisemmiksi teollistumisen ja kaupungistumisen kohottaessa tiedon tasoa. Tämä muutos ei kuitenkaan ole suoraviivainen, vaan siirryttäessä kyläyhteisöille ominaisesta yhdessäolo-organisaatiosta alkutuotannon asiaorganisaatioon negatiiviset asenteet vähenevät. Yhteiskunnan muutoksen — teollistumisen ja kaupungistumisen — jatkuessa asenteet kuitenkin muuttuvat entistä negatiivisemmiksi.*

Pohjanmaalla mekaaninen solidaarisuus on yleisempää kuin muualla Suomessa (Olavi Riihinen 1965. s. 198—201). Kuitenkin tässä tutkimuksessa sen merkitys päätelmien teolle on vähäinen.

Faktorianalyysin toinen tarkoitus oli valaista toiminnallisten ja kulttuuripohjaisten (taloudellisten, sosiaalisten, kulttuuria edustavien jne.) muuttujien (kasautuvaa) kasvua, josta tiedon taso näyttää lähinnä riippuvan. Joillakin alueilla maa- ja metsätaloudellisten muuttujien vuorovaikutus ohjaa kasautuvaa kasvua, joillakin toisilla pelkästään maatalouden sisäiset muuttujat osallistuvat tähän tapahtumaan. Sen sijaan kaikissa olosuhteissa kasautuvaan kasvuun vaikuttavat myös ekologiset tekijät.

APPENDICES

Appendix I. Questionnaire used in interviewing forest owners. (Ref. p. 14).

Form α

UNIVERSITY OF HELSINKI DEPARTMENT OF SOCIAL ECONOMICS OF FORESTRY

Owner's (holder's) name .....
Address .....
Estate No. ..... Commune .....
Ownership group .....

1. Owner's (holder's) age ..... years
2. Number of children <15 years of age, living at home .....
3. Owner's (holder's) education .....
4. Land area under hay crops (cultivated range land included) ..... ha
5. Land area under feeder grain crops ..... ha
6. Land area under cereal crops ..... ha
7. Land area under special crops ..... ha (oil plants, sugar beet, seed crops, etc., together)
8. Number of milking cows .....
9. Number of horses .....
10. Number of tractors .....
11. Number of heated housing rooms (kitchen incl.) .....
12. Is there running water in the house? Yes □ No □
13. Is there a greenhouse on the estate? Yes □ No □
14. Is there commercial gardening on the estate? Yes □ No □
15. The estate has stove heating □; central heating using wood □, chips □, coke □, oil □, other fuel: what? .....
16. The kitchen is equipped with range using wood □, liquid gas □; electric range □.
17. How many years have you managed your present estate yourself? —5 □, 6—10 □, 11—20 □, 21—30 □, 31—50, 51— □.
18. The estate has been managed by the same family for —5 □, 6—20 □, 21—50 □, 51—100 □, 101— □ years.
19. The estate has been
    (a) bought on the free market □
    (b) inherited as a whole □
    (c) » after division □
    (d) a tenant farm on state land □
    (e) » private land □
    (f) established by 1936 Land Settlement Act □
    (g) » 1945 Land Procurement Act □
    (h) » 1958 Land Use Act on state land □
    private land □
    company-owned land □
20. Distance to woodlot from house yard (if in several parcels, specify) .....ha .....km; .....ha .....km; .....ha .....km

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21. Score of the level of knowledge (Form β) .....
22. Scores of attitudes (Form γ) .....
23. Forest area .....ha
24. Total area of land holding .....ha
25. Productive forest land, per cent of total forest area .....
26. Proportion of *Myrtillus* site type and better of productive forest land, per cent .....
27. Proportion od stands classified »good» or »satisfactory» of total forest area, per cent .....
28. Amount of income taxes paid in communal taxation, 1962 .....Fmk.
29. Value of property assessed for taxation (without deducting debts), 1962 .....Fmk.
30. Percentage of population living in centers of habitation in the commune of residence .....
31. Density of population (number of people per sq. km. of land area) in the commune of residence .....
32. Mean number of people per household in the commune of residence .....
33. Percentage of population employed in agriculture and forestry in the commune of residence .....
34. Percentage of population with at least five years of highschool attendance in the commune of residence .....

Appendix II. Questionnaire used in measuring forest owners' level of knowledge.

Form β

		Correct	Wrong
(a)	1. How many per cent of the assessed net revenue from a woodlot is the forest management fee?		
(b)	2. What is made with the equipment called scarifier?		
(c)	3. What is the central organization for district forestry boards?		
(d)	Which site type is more fertile, *Myrtillus* type or *Oxalis-Myrtillus* type?		
(e)	Is spruce a rawmaterial for sulphite or for sulphate pulp?		
(f)	4. What is the so-called creaming?		
(g)	Is the shelterwood cutting more general in regenerating spruce or pine?		
(h)	5. Does one- or two-meter-long pulp wood make a denser pile?		
(i)	6. Where are the State Timber Auctions held?		
(j)	7. From what work distance on are the loggers paid for travelling by their own means?		
(k)	8. Who has conducted the national forest inventories to date?		
(l)	9. Who is the Director General of the State Board of Forestry?		
(m)	10. If you had the opportunity to choose for yourself either ten hectares of fully stocked 50-year-old spruce stand growing on the *Myrtillus* site type or an equal area of fully stocked pine stand growing on the same site type, which one would you choose?		
(n)	11. Does the condition of a woodlot affect its taxation?		

The small alphabet refers to the questions actually presented to forest owners, the numbers (1—11) to those accepted for computation of composite variables (cf. text, p. 17).

Form γ

Appendix III. Questionnaire used in measuring forest owners' attitudes toward forestry promotion.

In the following I shall present certain statements on forestry. Will you please respond to them according to your own conviction. To indicate your response, use one of the following possibilities:

'Fully of same opinion'
'Almost of same opinion'
'Not prepared to state'
'Of opposite rather than same opinion'
'Fully of opposite opinion'

		Fully of same opinion	Almost of same opinion	Not prepared to state	Of opposite rather than same opinion	Fully of opposite opinion
(a)	Forest owners should weed seedlings stands at their own initiative	5	4	3	2	1
(b) 1.	Forest owners themselves should mark trees for cutting	1	2	3	4	5
(c) 2.	Forest management associations hardly promote forestry	1	2	3	4	5
(d) 3.	The silvicultural field campaign 'forestry march' is useful in improving the level of silviculture	5	4	3	2	1
(e) 4.	Working plan is so important a matter that its cost is of secondary importance	5	4	3	2	1
(f) 5.	Regeneration by sowing or planting should be adopted more generally	5	4	3	2	1
(g)	If there is too little fuelwood stumpage on the woodlot, the owner should buy fuelwood elsewhere	5	4	3	2	1
(h) 6.	Teaching forestry in elementary schools is useless	1	2	3	4	5
(i) 7.	The children of the forest owner should participate in a few months' forestry course	5	4	3	2	1
(j)	The forest owner himself should pay the regeneration cost	5	4	3	2	1
(k)	It is not right to oblige the forest owner to pledge security for completion of a regeneration plan	1	2	3	4	5
(l) 8.	It would be appropriate to arrange repeatedly to forest owners, about the 10th of June, local study tours guided by extension rangers	5	4	3	2	1

The small alphabet refers to the statements actually presented to forest owners, the numbers (1—8) to those accepted for factor analysis and computation of composite variables (cf. text, p. 14).

Appendix IV. The scale used in scoring the educational background of forest owners.

1. Less than public school
2. Public school with no additional training
3. » a short additional training (courses of <6 months' duration)
4. Public school with a medium long additional training (6—23 months)
5. Public school with a long additional training (≷2 years)
6. Five years of highschool with or without a short additional training (<6 months)
7. Five years of highschool with a medium long or long additional training (≷6 months)
8. Highschool graduate with no academic degree or its equivalent
9. Forest owner with an academic degree or its equivalent (equivalent to an academic degree was taken, e.g. a degree received from: teachers' college; institute of business administration; domestic science teachers' institute, etc.).
0. No information

In those cases in which the respondent had more than one kind of additional training, it was scored according to the most extensive course or curriculum taken. Thus, most of the brief courses scored three points.

Appendix V. Composition of variable 12 — 'level of household equipment'. (Ref. p. 20)

Variable 12 — 'level of household equipment' — was represented by a joint variable obtained as a factor score computed subsequent to factoring the following five variables:

1. Is there running water in the house?
2. Is there a greenhouse on the estate? (This variable was included to detect whether the occurrance of running water was correlated with that of greenhouses.)
3. Is there commercial gardening on the estate? (The reason for inclusion was same as under 2, above.)
4. Is there central heating in the house?
5. Is there a liquid gas or an electric stove in the kitchen?

The principal factor solution and the subsequent varimax rotation gave the following matrix:

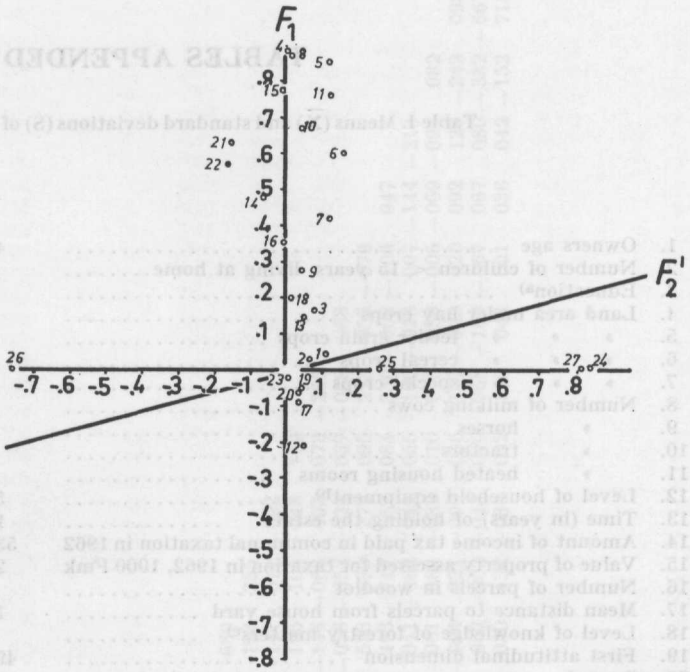
	h^2	F_1	F_2
1	6393	−114	−791
2	7327	−850	−097
3	7309	−853	048
4	6453	−077	−799
5	2892	290	−452
Eigen value	3.0374	1.555	1.481
Eigen value, per cent of n^1	60.75	31.11	29.64

[1] n = number of variables.

F_2 was interpreted as the 'level of household equipment'. A manual oblique rotation of F_2 with F_1 did not support the hypothesis that the occurrance of household equipment is correlated with F_1 which was interpreted as 'gardening'. In a preliminary factoring experiment, no variable was significantly loaded by F_1. It was therefore left out of further analyses. Instead, the factor scores for F_2 were included in further analyses to represent 'level of household equipment'.

Appendix VI. An example of manual oblique rotation of two factors based on varimax solution. — Of two factors F_1 and F_2, F_2 is brought to position F'_2, oblique to F_1. Comparison of the tabulated loadings below shows that the shift from an orthoognal to an oblique solution does not change the interpretation. (Ref. p. 22).

Variable	F_1	F'_1	F_2	F'_2
1	.04	.01	.11	.11
2	.03	.01	.07	.07
3	.16	.14	.07	.08
4	.88	.87	.01	.00
5	.85	.82	.12	.13
6	.59	.55	.16	.11
7	.42	.39	.12	.13
8	.87	.86	.01	.02
9	.27	.26	.04	.04
10	.66	.65	.05	.05
11	.76	.73	.12	.13
12	−.21	−.22	.05	.06
13	.15	.13	.04	.04
14	.49	.50	−.06	−.05
15	.77	.77	−.01	−.01
16	.35	.35	−.09	−.01
17	−.09	−.10	.04	.04
18	.20	.19	.01	.02
19	−.05	−.06	.05	.05
20	−.06	−.07	.03	.01
21	.63	.67	−.15	−.15
22	.57	.62	−.16	−.16
23	−.02	−.02	.11	.01
24	.09	−.21	.84	.87
25	−.00	−.06	.26	.27
26	−.04	.21	−.76	−.78
27	.10	−.21	.82	.85



TABLES APPENDED

Table I. Means ($\bar{X}$) and standard deviations (S) of variables used.

		Stratum I		Stratum II	
		$\bar{X}$	S	$\bar{X}$	S
1.	Owners age	48.70	12.10	50.09	12.38
2.	Number of children < 15 years, living at home	1.38	1.58	1.01	1.39
3.	Education[a]	2.57	1.52	2.60	1.40
4.	Land area under hay crops	6.53	5.23	7.70	8.09
5.	» » » feeder grain crops	2.45	3.05	3.46	4.18
6.	» » » cereal crops	1.43	1.89	1.87	2.43
7.	» » » special crops	0.35	0.99	0.22	0.72
8.	Number of milking cows	3.96	3.41	4.69	4.55
9.	» horses	0.73	0.70	0.87	0.69
10.	» tractors	0.47	0.57	0.56	0.58
11.	» heated housing rooms	3.88	1.92	4.43	2.85
12.	Level of household equipment[b]	50.36	8.13	49.50	7.89
13.	Time (in years) of holding the estate	14.45	9.83	14.99	9.67
14.	Amount of income tax paid in communal taxation in 1962	537.70	525.00	736.10	1146.50
15.	Value of property assessed for taxation in 1962, 1000 Fmk	24.95	19.20	34.72	85.10
16.	Number of parcels in woodlot	2.73	1.80	3.22	1.91
17.	Mean distance to parcels from house yard	11.83	35.02	10.43	28.67
18.	Level of knowledge of forestry matters[c]	5.39	2.21	5.21	1.84
19.	First attitudinal dimension	499.98[d]	83.43	499.96[g]	82.31
20.	Second » »	499.98[e]	76.11	500.04[h]	80.63
21.	Third » »	500.08[f]	81.64	500.01[i]	75.22
22.	Forest area	52.17	58.43	55.04	92.02
23.	Total area of land holding	80.88	85.92	81.73	103.83
24.	Percentage of population living in centers of habitation in the commune of residence	30.54	12.88	32.15	15.27
25.	Density of population in the commune of residence	13.08	3.29	15.28	4.26
26.	Mean number of people per household, in the commune of residence	3.81	4.19	3.76	2.58
27.	Percentage of population employed in agriculture and forestry in the commune of residence	66.37	8.02	63.93	10.15
28.	Percentage of population with at least 5 years of high-school in the commune of residence	55.84	20.61	59.51	23.21

a) Scoring system explained in Appendix IV, p. 38.
b) Factor scores (Appendix, V, p. 38).
c) Scores obtained from questionnaire data (cf. p. 17).
d) 'Self-sufficiency' characterized by reliance on inherent skills and by little faith in the usefulness of forest management associations.
e) Attitude toward planning and direct silvicultural measures.
f) Attitude toward various forms of vocational training, possibly including extension.
g) Attitude toward planning, direct silvicultural measures, and vocational training.
h) As c above.
i) Approval of campaigns, disapproval of vocational training. c – h obtained as factores scores from questionnaire data (pp. 14–17 and 23–24).

Table II. Correlation matrix of variables used in analysis with combined data (strata I and II). (For description of variables, see pp. 20–21).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1																											
2	−351																										
3	−099	084																									
4	085	001	154																								
5	035	046	233	774																							
6	049	082	128	436	517																						
7	036	019	125	297	357	462																					
8	004	050	075	828	792	378	289																				
9	049	−016	−188	312	245	223	−045	309																			
10	−026	021	135	538	599	474	341	545	072																		
11	053	098	270	652	648	507	338	652	126	449																	
12	033	−057	−201	−123	−122	−167	−104	−129	037	−196	−328																
13	627	−242	−179	097	073	127	120	079	101	051	113	002															
14	050	−055	330	447	411	249	226	378	−063	262	514	−290	028														
15	067	−034	298	754	677	387	341	678	023	423	719	−148	116	680													
16	028	−024	−032	308	188	147	115	308	119	211	294	−076	166	193	255												
17	038	−066	257	−089	−048	049	077	−158	−129	010	025	−116	−013	147	011	−092											
18	−219	112	244	172	225	139	136	182	090	200	205	−167	−107	195	165	048	162										
19	069	−177	−114	−051	−069	−055	−012	−053	064	−023	−104	148	047	−148	−068	093	−073	−266									
20	−027	−017	−039	−093	−097	−016	−037	−021	−002	−085	016	031	002	−058	−053	−024	−037	−068	068								
21	028	030	317	599	534	309	244	518	038	321	631	−187	091	573	839	276	095	273	−055	−079							
22	004	084	261	548	511	292	211	475	093	307	553	−161	070	493	717	252	081	330	−062	−106	947						
23	084	−076	−024	−044	−132	−038	−021	−080	−003	−029	−012	−022	125	041	−082	042	−055	−180	−018	007	−144	−213					
24	062	035	070	067	193	198	080	089	051	116	140	033	018	−001	084	−082	−010	−015	039	−005	−069	−094	082				
25	031	086	−080	047	081	−053	021	152	101	−029	113	059	−011	−024	021	−000	036	172	−023	020	092	127	−242	098			
26	−126	005	005	−049	−054	−080	−042	−027	−082	−033	−111	−074	−111	052	−002	−045	040	068	−109	−067	067	080	−382	−667	−095		
27	071	135	120	158	231	167	165	144	068	079	189	036	−003	030	132	−030	032	130	043	001	036	042	−152	715	439	−563	

Table III. First five factors for 27 variables used in analysis with combined data. Principal factor solution. (For description of variables, see pp. 20–21).

	h^2_6	F_1	F_2	F_3	F_4	F_5
1	6318	047	248	625	315	158
2	2165	055	−027	−426	−171	−024
3	3395	301	−121	−310	319	−186
4	8078	841	057	148	−255	001
5	7688	827	126	001	−239	−053
6	4770	549	162	024	−104	−251
7	3208	420	096	005	026	−205
8	8162	800	081	098	−391	040
9	2347	176	167	148	−360	152
10	5106	592	064	020	−217	−273
11	6708	809	056	−004	039	−102
12	1931	−251	145	091	−150	249
13	5940	117	203	653	212	116
14	5728	619	−193	−007	343	−150
15	8396	878	−090	070	153	026
16	1753	317	−028	211	−096	020
17	2234	033	−097	−151	359	−053
18	2813	305	−130	−351	027	070
19	1100	−100	145	201	−067	109
20	0141	−082	054	015	−020	004
21	9318	822	−280	−005	273	252
22	8601	769	−290	−057	203	348
23	3666	−108	173	236	123	−400
24	7185	129	781	−240	145	−081
25	3896	106	215	−224	−034	503
26	7000	−051	−754	044	−184	096
27	7870	219	720	−371	130	236
Eigen value	13.5529	6.449	2.273	1.704	1.256	1.070
Eigen value, per cent of n[1]	50.20	23.89	8.42	6.31	4.65	3.96

[1] n = number of variables

Table IV. First five factors for 27 variables used in analysis with combined data (strata I and II). Varimax solution. (For description of variables, see pp. 20–21).

	h^2_5	F_1	F_2	F_3	F_4	F_5
1	5796	043	108	751	−042	−015
2	2154	032	070	−446	023	096
3	3392	164	074	−175	525	005
4	7993	880	006	038	−039	144
5	7606	851	119	−080	006	123
6	4033	595	159	−044	066	−130
7	2293	424	124	−005	154	−100
8	8115	866	011	−053	−162	175
9	2347	272	040	030	−381	112
10	4776	664	049	−120	024	−135
11	6706	759	117	017	265	093
12	1775	−211	053	086	−326	127
13	5404	146	041	711	−091	−045
14	5624	492	−058	093	553	042
15	8092	774	−014	137	371	230
16	1563	352	−091	141	−052	037
17	1655	−090	038	005	394	023
18	2396	198	011	−284	243	244
19	0881	−052	049	187	−218	007
20	0103	−065	035	012	−062	−025
21	8936	627	−147	144	486	470
22	8423	572	−161	088	411	558
23	2738	−018	114	191	033	−471
24	7128	094	837	−017	0.000	−052
25	3627	−003	259	−050	−113	529
26	6179	−044	−756	−156	040	131
27	7786	102	818	−070	−001	304
Eigen value	12.7511	5.737	2.189	1.598	1.798	1.427
Eigen value, per cent of n[1]	47.23	21.25	8.11	5.92	6.66	5.29

[1] n = number of variables

Table V. Correlation matrix of variables used in analysis with data from stratum I. (For description of variables, see pp. 24–25).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1																												
2	−283																											
3	−133	099																										
4	099	002	−071																									
5	011	054	014	604																								
6	072	−054	−002	286	352																							
7	086	−071	033	117	276	401																						
8	−022	063	−189	702	687	188	125																					
9	086	014	−253	453	345	263	−031	459																				
10	−058	−021	006	408	486	391	269	393	040																			
11	037	114	149	395	420	467	176	446	279	304																		
12	047	−021	−215	−105	−140	−190	−069	−119	−036	−209	−342																	
13	634	−222	−245	025	059	120	115	036	152	008	041	084																
14	−023	−009	331	155	130	097	061	082	020	134	247	−296	−062															
15	037	021	179	531	380	318	152	319	254	305	335	−155	011	530														
16	−012	−037	−102	180	022	057	061	200	116	167	229	−040	111	085	098													
17	046	−086	351	−047	−009	160	123	−189	−128	077	066	−018	−005	152	138	−070												
18	−210	053	227	131	150	050	098	126	043	114	264	−247	−104	262	289	071	211											
19	−011	042	220	250	210	148	019	132	114	130	295	−178	−013	299	714	145	194	359										
20	−022	062	157	296	298	154	030	197	148	173	294	−166	−039	327	712	135	153	377	949									
21	169	−054	031	−008	−092	052	044	−030	−015	−006	058	033	131	−045	−164	002	−088	−284	−258	−323								
22	056	037	090	012	078	128	152	−065	019	068	005	−002	091	−023	−019	−164	014	−127	−208	−224	463							
23	017	100	−106	064	083	−121	065	226	095	−048	166	047	016	057	087	017	022	192	139	149	−128	−040						
24	−150	−005	−095	011	023	−083	−136	062	−008	012	−087	−042	−169	054	082	084	034	148	200	225	−662	−761	113					
25	070	133	123	156	142	031	204	087	055	001	054	−028	048	076	095	−069	070	116	−064	−044	169	666	424	−529				
26	172	−129	−175	−013	−076	043	−128	−044	095	−099	−118	149	166	−096	−141	−063	−083	−199	−121	−142	098	−039	026	043	−114			
27	084	−226	−079	−058	−013	−001	043	−038	028	042	−130	094	054	−221	−151	−012	−082	−229	−082	−080	126	071	−065	−104	−003	090		
28	071	029	−004	079	034	006	037	−031	101	−018	−088	−052	−021	042	101	099	036	026	113	138	−114	−035	−023	070	032	−114	−061	

Table VI. First five factors for 28 variables used in analysis with data from stratum I. Principal factor solution. (For description of variables, see p. 24).

	h^2_{11}	$F_1^{(I)}$	$F_2^{(I)}$	$F_3^{(I)}$	$F_4^{(I)}$	$F_5^{(I)}$
1	6601	031	−307	235	−648	−044
2	2622	−074	060	−166	342	−180
3	4377	−145	102	−559	017	197
4	7116	−660	−301	301	134	−068
5	7188	−644	−312	226	216	056
6	5709	−416	−303	057	−072	391
7	4012	−232	−290	−075	−035	228
8	7827	−594	−284	434	325	−133
9	4876	−358	−231	368	025	−199
10	4924	−464	−217	098	149	352
11	5818	−585	−215	−002	085	151
12	2851	315	−006	177	−087	−238
13	6351	012	−332	294	−592	−052
14	5481	−435	085	−323	−083	099
15	7707	−782	030	−151	−202	−049
16	2522	−213	013	170	−027	038
17	3225	−140	091	−335	−190	176
18	3760	−428	210	−258	093	−057
19	9652	−717	346	−224	−372	−159
20	9529	−759	341	−169	−306	−191
21	6557	250	−596	−137	−083	126
22	7893	124	−728	−433	032	−106
23	4986	−185	−016	−019	073	−514
24	8132	−179	748	383	077	044
25	7581	−088	−542	−421	094	−445
26	2356	173	−058	264	−165	−038
27	2116	161	−143	143	−106	058
28	1563	−101	071	−012	−070	−068
Eigen value	15.3344	4.606	2.880	2.039	1.503	1.162
Eigen value, per cent of n^1	54.77	16.45	10.29	7.28	5.37	4.15

[1] n = number of variables.

Table VII. First five factors for 28 variables used in analysis with data from stratum I. Varimax solution. (For description of variables, see p. 24).

	h^2_5	F_1	F_2	F_3	F_4	F_5
1	5737	−037	−142	−087	−737	−024
2	1868	−031	−071	−029	395	−152
3	3847	183	−172	−311	304	363
4	6403	−778	−038	−167	−011	−073
5	6138	−766	−059	−115	080	055
6	4270	−461	−093	−087	−129	425
7	1976	−259	−206	−051	−055	286
8	7472	−834	034	−001	088	−204
9	3585	−524	0.000	−043	−149	−244
10	4191	−537	−002	−037	070	352
11	4190	−545	−094	−242	087	214
12	1961	181	014	186	−187	−304
13	5512	−103	−128	−042	−720	−052
14	3183	−109	−059	−467	154	245
15	6796	−422	−019	−698	017	111
16	0770	−224	128	−075	−067	012
17	2081	135	−066	−308	026	298
18	3063	−120	044	−433	314	050
19	8491	−154	159	−894	−008	022
20	8529	−229	183	−874	028	−026
21	4599	009	−543	293	−217	177
22	7462	−013	−853	119	001	058
23	3045	−117	−124	−222	112	−461
24	7475	−020	834	−149	129	−108
25	6871	−089	−758	−133	143	−256
26	1327	024	075	161	−295	−114
27	0816	014	−035	180	−217	013
28	0251	−013	040	−145	−016	−045
Eigen value	12.1909	3.483	2.542	3.085	1.777	1.300
Eigen value, per cent of n^1	43.54	12.44	9.08	11.02	6.35	4.64

[1] n = number of variables.

Table VIII. Correlation matrix of variables used in analysis with data from stratum II. (For description of variables, see p. 26).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1																												
2	−438																											
3	−056	065																										
4	070	020	362																									
5	042	078	463	874																								
6	017	266	268	526	623																							
7	−034	172	303	563	534	615																						
8	018	064	345	905	860	507	553																					
9	−009	−029	−103	199	139	171	−051	161																				
10	003	101	307	656	706	551	495	687	095																			
11	057	120	399	787	781	526	599	778	−020	574																		
12	021	−128	−181	−137	−096	−139	−182	−133	144	−173	−322																	
13	617	−268	−089	157	082	132	139	118	030	101	174	−102																
14	089	−075	379	557	532	316	435	511	−135	351	621	−317	080															
15	086	−047	430	861	819	452	603	842	−049	557	862	−183	175	716														
16	058	030	054	402	305	208	238	391	097	244	334	−105	228	253	344													
17	029	−039	102	−138	−090	−075	−023	−128	−128	−086	−009	−277	−025	179	−025	−119												
18	−230	202	273	237	341	262	207	266	176	339	176	−052	−111	196	194	031	068											
19	057	027	422	781	729	411	533	752	−024	482	816	−203	180	682	936	383	009	221										
20	030	115	384	728	681	405	487	694	036	446	745	−157	186	602	844	371	−007	286	959									
21	−010	−091	−089	−078	−181	−123	−107	−131	−002	−063	−074	−077	115	077	−085	068	−012	−049	−072	−118								
22	041	113	051	066	222	214	053	162	030	128	183	102	−069	−033	091	−092	−027	142	003	001	−254							
23	073	029	−027	053	123	064	−124	088	147	021	089	078	−061	−093	019	−005	067	122	059	111	−464	404						
24	−092	−019	115	−069	−078	−055	058	−072	−132	−057	−104	−125	−049	074	−005	−132	044	−036	−010	−036	−141	−585	−475					
25	064	167	118	152	289	272	134	181	067	152	281	120	−066	−003	160	−012	−015	161	104	120	−464	775	543	−586				
26	−040	−008	−223	−112	−206	−154	−091	−099	055	−177	−148	202	−035	−148	−101	127	−045	−291	−087	−109	−050	−061	090	−118	012			
27	−023	049	074	027	129	079	089	126	066	173	044	058	−004	110	085	−078	073	215	067	078	−021	021	−085	045	006	−119		
28	036	−047	−018	052	092	007	013	098	006	015	040	091	089	011	097	131	−006	019	104	110	−201	035	089	086	141	059	001	

Table IX. First five factors for 28 variables used in analysis with data from stratum II. Principal factor solution. (For description of variables, see p. 26).

	h^2_9	F_1	F_2	F_3	F_4	F_5
1	6636	052	027	−729	149	−266
2	4617	101	−169	514	−097	034
3	3815	465	068	243	264	−070
4	9235	904	046	−080	−232	044
5	8977	904	−104	052	−118	−081
6	6309	620	−138	137	−174	−304
7	6152	658	087	128	−047	−154
8	8897	894	−022	−018	−228	041
9	2536	064	−160	−045	−374	−033
10	6470	693	−031	118	−217	−287
11	8579	891	0.000	−038	113	005
12	3956	−222	−238	−107	−306	158
13	6526	168	171	−656	−018	−280
14	6683	665	281	−014	339	007
15	9725	934	129	−108	104	154
16	3715	384	099	−214	−244	165
17	2747	−034	065	065	456	−061
18	4176	323	−131	352	−003	−166
19	9703	896	165	−094	141	280
20	9546	850	106	−054	097	299
21	5653	−132	405	−079	−141	−218
22	7796	168	−793	−028	148	−181
23	6082	091	−646	−127	127	205
24	6977	−075	618	257	050	046
25	8402	259	−852	−043	164	−014
26	2788	−171	−080	−172	−186	368
27	1696	111	015	144	003	−179
28	1385	083	−077	−106	−006	188
Eigen value	16.9792	8.114	2.687	1.711	1.096	.971
Eigen value, per cent of n[1]	60.64	28.98	9.60	6.11	3.92	3.47

[1] n = number of variables.

Table X. First five factors for 28 variables used in analysis with data from stratum II. Varimax solution. (For description of variables, see p. 26).

	h^2_5	F_1	F_2	F_3	F_4	F_5
1	6287	040	−104	−782	049	032
2	3141	053	−091	511	−065	−192
3	3558	422	−032	153	300	−249
4	8838	904	−042	−043	−218	−114
5	8517	845	−196	036	−129	−282
6	5463	520	−163	038	−191	−458
7	4832	614	016	044	−014	−321
8	8551	880	−101	019	−222	−141
9	1731	049	−082	005	−403	−032
10	6257	613	−064	016	−210	−448
11	8094	862	−159	−050	109	−161
12	2371	−202	−139	030	−356	221
13	5671	173	064	−725	−072	−029
14	6377	674	092	−088	391	−114
15	9354	954	−049	−072	126	−007
16	2913	440	068	−121	−233	153
17	2221	−056	−028	−019	461	−068
18	2739	241	−126	270	006	−355
19	9393	946	−016	−018	177	109
20	8359	895	−051	037	126	119
21	2560	−100	430	−198	−067	−130
22	7147	008	−819	−001	−039	−205
23	5006	036	−675	041	−024	200
24	4588	008	620	160	216	−026
25	8223	120	−893	056	−030	−068
26	2358	−089	−031	019	−205	429
27	0659	067	016	056	018	−239
28	0599	112	−098	−011	−028	191
Eigen value	14.5807	7.703	2.701	1.611	1.180	1.382
Eigen value, per cent of n[1]	52.07	27.51	9.65	5.76	4.22	4.94

[1] n = number of variables.

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Table IX. First five factors for 28 variables used in analysis with data from stratum II. Principal factor solution. (For description of variables, see p. 26).

	h^2_5	F_1	F_2	F_3	F_4	F_5
1	6636	052	027	−729	149	−266
2	4617	101	−160	614	−097	034
3	3815	465	068	243	264	−070
4	9236	904	046	−080	−332	046
5	8977	904	−104	052	−116	−051
6	6309	620	−165	137	−174	−304
7	8152	853	087	128	−047	−154
8	8997	884	−022	−018	−228	041
9	2526	064	−160	−045	−374	−033
10	8470	803	−031	118	−217	−287
11	8579	801	0.000	−038	113	006
12	3956	−222	−238	−107	−306	158
13	6526	168	171	−656	−018	−280
14	6683	665	231	−014	339	007
15	9725	934	129	−108	104	164
16	5715	384	099	−214	−244	165
17	2747	−034	005	065	400	−061
18	4176	230	−171	302	−003	−166
19	9705	898	105	−094	147	260
20	5546	860	108	−054	007	229
21	5653	−193	405	−079	−111	−218
22	7798	168	−793	−028	148	−181
23	6082	091	−646	−137	127	205
24	6977	−075	818	257	050	046
25	8402	259	−852	−043	164	−014
26	2788	−171	−080	−172	−198	368
27	1096	111	015	144	003	−179
28	1585	053	−077	−106	−006	188
Eigen value	16.9792	8.114	2.687	1.711	1.096	.971
Eigen value, per cent of n^1	60.64	28.98	9.60	6.11	3.92	3.47

[1] n = number of variables.

Table X. First five factors for 28 variables used in analysis with data from stratum II. Varimax solution. (For description of variables, see p. 26).

	h^2_5	F_1	F_2	F_3	F_4	F_5
1	6287	040	−104	−763	049	032
2	9441	063	−061	511	−065	−192
3	3558	422	−032	157	300	−240
4	8858	904	−042	−049	−318	−114
5	8547	845	−196	038	−139	−252
6	6463	820	−163	038	−131	−458
7	4893	614	−016	044	−014	−321
8	8551	880	−101	019	−222	−141
9	1731	049	−082	006	−403	−082
10	6257	613	−084	019	−210	−448
11	8094	863	−159	−050	109	−161
12	2371	−202	−139	030	−358	231
13	5671	173	064	−725	−072	−029
14	6377	674	392	−088	391	−114
15	9354	954	−010	−072	126	−067
16	2913	440	068	−121	−233	155
17	2221	−056	−025	−019	461	−068
18	3739	241	−126	270	006	−355
19	9992	949	−016	−018	127	163
20	8359	895	−051	037	126	110
21	2560	−132	430	−195	−067	−130
22	7147	008	−816	−001	−030	−305
23	5006	036	−675	041	−024	209
24	4589	098	620	160	216	−036
25	8323	130	−893	054	−030	−068
26	2058	−089	−091	019	−205	129
27	0659	067	016	036	018	−239
28	0538	112	−088	−011	−028	101
Eigen value	14.5807	7.703	2.701	1.611	1.180	1.382
Eigen value, per cent of n^1	52.07	27.51	9.65	5.76	4.22	4.94

[1] n = number of variables.

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