Forest Sector Simulation Models as Methodological Tools in Forest Policy Analysis

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The usefulness of forest sector models in forest policy analysis is discussed, mainly based on experiences from Norway. Forest sector modelling is contrasted to two alternative approaches: (i) Intuitive, verbal analysis, and (ii) econometric models. It is concluded that forest sector models, properly developed in contact with the policy makers, should be of considerable value in forest policy analysis.

Key words: Forest policy analysis, forest sector models.

Introduction

Forest sector modelling and forest policy analysis are topics of high interest in today's research community. Several of the existing forest sector models have been built with the intention just to perform forest policy analysis. A vital question is how useful are such models as methodological tools in forest policy analyses. This paper aims at discussing this question.

The discussion is mainly based on experiences from Norway, where two forest sector models have been developed. The first, the socalled SOS-model developed by J. Randers, K. Kallgraf and L. Stenberg at the Resource Policy Group, Oslo, on initiative of and in cooperation with professor F. Jørgensen at the Department of Forest Economics, Agricultural University of Norway, was one of the first forest sector models in use in the world. This model was a simulation model based on the Dynamo EDP-language. The model is documented in Tank-Nielsen & Høsteland (1979). A more verbal description of the model and the results are presented in Randers (1977), Randers et al. (1978), Randers & Høsteland (1979) and Høsteland (1979). It seems fair to say that this model has not been much applied in Norway. Its significance seems primarily to lie in the influence on later forest sector models based on simulation – like Seppälä et al. (1980) and Lönnstedt (1983).

The second forest sector model tried in Norway is the socalled IBRD-forest model, originally developed by H. Bergendorff and P. Glenshaw in the World Bank (IBRD) for analysing forest industry investments in South-East Asia (Bergendorff & Glenshaw 1980). This model was applied by FAO and then taken to Sweden and used there by professor Sten Nilsson (Nilsson 1980, 1981). In close cooperation with him the Swedish version of this model has been adapted for Norway. The model is a regionalized linear programming model having 15 regions in the Norwegian version. The objective function is to minimize production costs of the forestry (logging and wood transport) and forest industry, covering the domestic demand for forest industry products and having free import/export to given world market prices. This equals an objective function which maximizes the national economic surplus of the forest sector. For Norway the model has about 2300 constraints (not including about 4500 non-negative variable constraints) and 400 zero-one (integer) variables. It is probably one of the more sophisticated forest sector models. Mathematically the model, as it is used in Norway, is documented in Gundersen & Solberg (1984 a). Data input and main results are presented in Gundersen & Solberg (1984 b, c).

The discussion in this paper is not covering all aspects of relevance, but highlights some of, in my opinion, the most essential points.

By "forest sector model" I shall mean a model (numerical or strictly analytical) which takes into account both forestry and forest industries and the interaction between these two activities. For clarification purposes I will divide the set of forest sector models in three main types:

(i) Verbal/intuitive models –i.e. models having very little of quantitative relations
(ii) Econometric models – i.e. models which *totally* depend on empirically testable data
(iii) Simulation models – i.e. models which in addition to econometric relations also contain other elements not based on testable data but on value judgements, general consensus/belief by the user(s) of the model, etc. This class of models I shall call FSS models ("forest sector simulation models").

By "policy means" I shall mean public efforts aimed at changing situations in the society in order to better fulfill major political objectives.

By"forest policy analysis" I mean an analysis of the effects of forest policy means. This definition is narrow and does not include e.g. analyses of *how* and *why* certain forest policy means have come into practice – i.e. my definition does not include analyses of historical and political processes making certain policy means acceptable and others unacceptable[1]. The narrow definition is used because it highlights certain essential features regarding forest sector modelling.

The choice of suitable policy means is a difficult and important task in most countries, also in the forestry sector. The policy means used today are often a result of rather long historical and political processes, and create the framework within which the micro-agents (industrial managers and forest owners) have to adapt according to their individual preferences and socio-economic situation. At the same time these agents are influencing, by organizational and political activities, this framework.

The presentation is divided in three main parts. First, I discuss necessary condition for making forest policy analysis and for developing FSS models. Based on this discussion, an appraisal of such models as tools for forest policy analysis is presented. Finally, some concluding remarks are given.

Some theoretical aspects

Why forest policy analysis?

It follows from the above definitions that forest policy and forest policy analysis are of interest only if

(i) there exist some relatively clearly defined political objectives regarding forestry, and
(ii) those objectives are not fulfilled in the absence of policy means

In mixed economies like those of the Nordic countries the major part of the industrial/business activities also in forestry are done by private enterprises. One main task of the state is to regulate the activities of the micro-agents/enterprises in order to make their contribution fulfill major political objectives. It follows, then, that the choice of policy means is closely related to political views and political power. More interesting, however, in this context of forest sector modelling and forest policy analysis, is to ask why overall political objectives are not fulfilled without policy means – i.e. why do not the sum of the actions of all micro-agents fulfill the overall political objectives without public interference?

There are several reasons for this, and their importance will vary over time and from country to country. Regarding forest policy analysis at present in Norway the following are among the most important ones:

(i) The prevailing timber prices (and other prices) do not reflect the true marginal costs and benefits for the society. Main reasons for this could be:
   - Monopolistic or monopsonic timber market, and relatively strong regulations of this market
   - A regulated forest property market (forest properties can not be sold without public concessions)
   - A regulated labour market (minimum salaries create a labour market where the supply of labour is higher than the demand)
   - A capital market with significant differences between interest on loans and on savings (partly due to the tax systems) and with different rate of returns on marginal investments
   - Fees and taxes (creating major differences between micro- and macro-economic costs and benefits).
(ii) The time perspectives are different between the micro-agents and the society at large.
(iii) Markets do not exist – i.e. prices are lacking. This could be goods and services like e.g. recreation, wildlife/hunting, sportfishing, nature conservation. (Lacking the representation from future generations – i.e. a realistic future market – could be included here or in the above mentioned factor "time perspective").
(iv) Distributional effects. The society at large would in many cases have to consider distributional effects like regional and personal income.
(v) Risk and uncertainty. The society at large can spread the risk on many projects and many agents/inhabitants thus facing another risk environment than the single agent. (This will depend upon e.g. the possibilities and costs of insurance – cf. e.g. Sandmo 1983).
(vi) Conflicts between different interest groups exist. The optimal sharing of the production surplus is not evident – different political opinions exist regarding how the resources of the society should be distributed. One may say that all the above mentioned factors (i)–(v) are valid assuming one decision maker (policy maker) or consensus among various policy makers, whereas the conflict/interest group argument is based on non-consensus, and comes in addition to the factors (i)–(v).

Necessary conditions for forest policy analysis

What conditions are necessary to consider when choosing between policy means? This question is complicated to answer, but at least the following factors are in most cases important:

(i) The number of policy means (instruments) versus the number of policy objectives, and their functioning areas[2]
(ii) The efficiency of policy means

In the following these aspects are discussed in some more detail.

Number of policy means and number of objectives. Functioning areas

A necessary condition for a successful forest policy is that sufficient number of policy means are available. To fulfill a certain number of policy objectives the public must have at hand at least the same number of policy means.

Assume[3] that the central mechanisms in the forest sector of a country can be described as in (2.1).

$$\text{(2.1)} \quad \begin{cases} f_1(x_1 \ldots x_I; t_1 \ldots t_J) = 0 \\ \vdots \qquad \vdots \\ f_I(x_1 \ldots x_I; t_1 \ldots t_J) = 0 \end{cases}$$

where

t_1—t_J are the forest policy means available for the policy makers

x_1—x_I are all other variables necessary for an appropriate analysis

The system (2.1) can under certain assumptions be solved by:

$$\text{(2.2)} \quad \begin{cases} x_1 = g_1(t_1 \ldots t_J) \\ \vdots \\ x_I = g_I(t_1 \ldots t_J). \end{cases}$$

Assume further that the following targets exist for the forest policy in the country:

$$\text{(2.3)} \quad \begin{cases} x_1 = \bar{x}_1 \\ \vdots \\ x_K = \bar{x}_K \end{cases}$$

The set of equations (2.1) can then be described as:

$$
(2.4)\quad \begin{cases} f_1(\bar{x}_1 \ldots \bar{x}_K, x_{K+1} \ldots x_I; t_1 \ldots t_J)=0 \\ \vdots \\ f_I(\bar{x}_1 \ldots \bar{x}_K, x_{K+1} \ldots x_I; t_1 \ldots t_J)=0. \end{cases}
$$

It follows directly from (2.4) that a necessary condition for solution is that:

$$J > K$$

This formulation assumes that all objective elements are specified independently in the meaning that each objective element $\bar{x}_i$ ($i \varepsilon I$) cannot influence another objective element $\bar{x}_j$ ($j \neq i$). If such a relationhip should exist between certain objective elements (for example in forestry between increased clearfelling and regeneration area), such a restriction can in general be expressed as:

$$(2.5)\quad F(x_1, \text{- - -}\ x_I) = 0$$

One may then introduce an additional objective element x_{K+1} defined by:

$$(2.6)\quad x_{K+1} = F(x_1 \text{ - - - } x_I)$$

add this relation to equation (2.1) and introduce the relation:

$$(2.7)\quad x_{K+1} = \bar{x}_{K+1}$$

in the objective matrix (2.3).

This illustrates that for each restriction one has between different objective elements, we have to introduce one new objective element to satisfy the assumption of independent objective elements.

The interaction of policy means used in other sectors than the forest sector, should also be considered here.

Another important issue both from a practical and a theoretical point of view regarding forest policy analysis, is that the objective elements $\bar{x}_1$ - - - $\bar{x}_K$ in (2.3) have to lay within the set (area) which the policy means t_1 - - - t_J can reach. A final requirement in this context is that the targets (2.3) have to be clearly defined. Unclear (fuzzy) objectives complicate the choice of policy means further.

Efficiency of policy means

It is not sufficient for a forest policy scheme to have a sufficiently large number of policy means. One has also to consider the effects and costs of the various means, risk aspects, and the time perspective involved.

Effects and costs. Let us first assume no costs involved in using the policy means, and that we are in a situation characterized by the vector x where the variable $x_k = x_k^\circ$ ($k \varepsilon K$) and want to change to a situation where $\bar{x}_k = x_k^\circ + \Delta x$, and Δx is a relatively small change.

This can be done by changing the use of policy means t_j ($j \varepsilon J$). If we assume that only small changes are necessary, the efficiency of policy means t_j with respect to objective element x_k can be expressed by means of (2.2) as

$$(2.8)\quad \frac{\delta g_k\ (t_1 \ldots t_J)}{\delta t_j} \qquad \begin{matrix} k = 1, K \\ j = 1, J \end{matrix}$$

where g_k is one function in (2.2).

It is logical to choose the policy means which – all other factors equal – is most efficient in reaching the state $\bar{x}_k$ – i.e. to choose the policy means with the highest partial derivative in (2.8). From (2.2) we see that in most cases a change in t_j will also change other x-es than x_k (unless t_j only influences x_k – which is rather unlikely). A change of one policy means must in such circumstances be followed by adjustments of other policy means to get the required total effects.

Because of administration costs, time delays, lack of information, frictions created in the market, etc. the use of policy means will in practice in many cases imply both direct and indirect costs. In addition one may have political costs involved e.g. following the argument that more public interference (i.e. more use of policy means) creates less private freedom – all other factors equal.

If the costs of using the various policy means differ, it is favourable to use the cheapest set of policy means which satisfies the objectives. Assuming $c_1, c_2, \ldots, c_j$ are the costs corresponding to marginal changes in respectively $t_1, t_2, \ldots, t_j$, the efficiency of policy means t with respect to objective element $\bar{x}_k$ is defined by

$$(2.9)\quad \frac{\delta g_k\ (t_1 \ldots t_J)}{\delta t_j} . c_{t_j}$$

When $c_{t_j} \neq 0$ ($j = 1, J$), the efficiency concept (2.9) will most often give quite another choice of policy means than (2.8), depending on $\frac{\delta g_k}{\delta t_j}$ and c_{t_j}.

Seen from a governmental point of view it may be of interest to distinguish between public costs and other costs and/or between various interest groups' costs. We are then in the border area of objectives and policy means. In the context of forest sector models and forest policy analysis it is the policy maker (the user of the analysis) who should decide which factors to include – cf. below.

Risk/uncertainty. Only rarely will one have complete information about the relations (2.1)–(2.9). In most cases, even in the static situations described there, we will have considerable risk and uncertainty, for example regarding

- the functions $f_1, \ldots, f_I, g_1, \ldots, g_I$, and F
- the partial derivatives in (2.8)
- the size of c_{t_j} ($j = 1, J$) in (2.9)
- the stability of c_{t_j} with respect to x_k and t_j

If the time perspective is considered (cf. next sections), the uncertainty/risk elements increase even more. However, this more general discussion does not preclude the possibility of mapping the effects of certain type of policy means with reasonable degree of certainty.

Time perspective. The discussion so far has been static in the sense that the time perspective has not been taken into account. In practice this is quite unrealistic, – the various policy means takes time to implement, and for some it is essential for having any effect that they shall be in operation just for a shorter period (for example a time limited felling subsidy). In many cases it will be essential to consider the time dimensions and the time lags involved for getting any reaction by policy means. This implies that all relations (2.1) – (2.9) have to be increased by one dimension – time – complicating the analysis considerably.

Another factor to consider when including the time dimension, is that the objectives may change over time, due to e.g. changes in attitudes (preferences) and political power. In general, the importance of conflict aspects is likely to increase when the time dimension is considered.

Some necessary conditions for forest sector simulation (FSS) models

Solberg (1984) gives an overview of necessary conditions for a good FSS. I shall give a short summary of the most important points regarding using this type of models for forest policy analysis.

(a) Models should be related to solve problems, not the opposite that the model chooses the problem to be analyzed. With regard to forest policy analysis it is important that the forest sector model is structured to capture the relations formulated in (2.1)–(2.9), and that the user of the model understands and agrees on these relations.

(b) The FSS model should be some kind of an optimization model, as otherwise it is impossible to get a meaningful allocation of timber between different kind of forest industries and regions assuming the micro-agents are profit maximizers. The optimization procedure should be used for simulation of different scenarios according to the exogenous assumptions made. As such, there is no great difference to pure simulation models except that the optimization model has an alghoritm securing consistent and realistic allocations as mentioned above.

A vital question here is the choice of the objective function – i.e. what is optimized. This question is closely related to the purpose of the model and, who the users are. For a central government the objective function could be to maximize the surplus over time from the forestry and forest industry sectors seen together. Most likely, this will, as mentioned in e.g.

Solberg (1984), be a different objective function than what the forest owner association would use if they would analyze how to choose among various policy means in order to maximize the profit generated only in the forestry sector.

(c) One should aim at parsimonious FSS models. Too detailed models are difficult to make operational and, most important, make the interpretation of the results difficult. The detailness should be viewed with due regard to the uncertainty/risks of the input data required by the model.

(d) The model should be understood by the users. Both the advantages and the weak points of the model should be underlined. To make possible a good understanding of the model it is important to
- make it parsimonious (cf. above)
- document the model properly –both mathematically and verbally
- emphasize the factors which have the highest influence on the results.

This is an important task which is the responsibility of the model builder – the person knowing the model best.

Appraisal of usefulness

How useful are FSS models in forest policy analysis? The question could be answered in two parts: how useful have they been until now, and how useful could they be in the future? My experience, mainly based on the Norwegian cases, is that until now the FSS models have had rather low impact in forest policy considerations. One main reason is that the data input requirements have been too severe and the conditions between the various components involved in the models too complex. Also, since any model is a simplification of reality, it has been easy to find "unrealistic" assumptions in the models. In addition, I believe, the models have looked rather complex for the people influencing the forest policy, creating a rather sceptical "wait and see" attitude towards forest sector models in general.

A vital question is who is the user of the model. The user will, and should, strongly influence what kind of policy problems to be analysed and the choice of objective function. It is also evident that the users of the model must agree on the assumptions underlying (2.1) if the analysis should have any meaning. In my opinion there are many potential users of FSS models in forest policy analysis. A central point, however, is that different users will need different models according to their objective variables and opinions/knowledge about the relations (2.1). This aspect has, at least in Norway, not been sufficiently emphasized.

A necessary condition for using FSS-models in forest policy analysis is that the actions taken by the forest industry influence the part of the forestry sector for which the forest policy is meant to be applied. In Norway this is the case regarding issues influencing the timber supply in the short and medium term (5–15 years) perspective (clearfelling, thinnings, fertilization of older forest stands). The policy issues regarding forestry primary production (planting, weeding, regeneration measures in general) will be of such a longterm character (50 years or longer) that they are of rather small interest for the forest industry. This illustrates the more general characteristic that the interesting time perspective in forest sector models most often is in the range 5–20 years, as the forest industry rarely makes plans on longer term.

FSS modelling is a rather new research area, and the present models are just prototypes. If we look at the relations discussed in above chapters it is my opinion that most of the conditions which are stated there can be satisfied, of course, depending on the data possible to obtain and the resources devoted to data collection and analysis. If so, I quite strongly believe FSS models have an important role to play in forest policy analysis, mainly because the alternatives to using FSS models do not seem to be particularly better.

In my view, there exist just two alternatives: (i) Intuitive, verbal analysis, and (ii) econometric models (i.e. models based on using statistical theory on existing socio-economic and physical data. Comparing intuitive models with FSS-models it is quite clear that the advantage of working with FSS models represented by sets of equations as in (2.1) and (2.2) lies in the de-composition of the process of research into logically arranged

elements, facilitating its being checked. The often somewhat loose talk about "direct and indirect effects" of certain policy measures, usual in verbal analysis, may easily forget one or several of these effects. In the system of equations no such oversight is possible. In addition every "effect" can be traced and localized and its influence determined.

When comparing FSS-models with econometric models, it is evident that the strength of econometric models is that they can give statistically significant results on the past, and in this way empirically justifiable relations for the future. The weakness of econometrics in relation to forest policy analysis is at least two: (i) It is hard to get relevant empirical data for all the relations (2.1) – (2.9) involved, and (ii) to prolong the past directly into the future is burdened with considerable uncertainty.

One important factor here is expectations. The micro-agents' expectations at time t about the future conditions in time t+1, t+2, etc. could be more important for their observed behaviour at time t than the other explanatory variables observed at time t. If not good indicators of these expectations are found, one may easily get curious results when using the econometric model for analysing the future.

The two problems (i) and (ii) stated above are the same also for FSS-models. However, instead of not doing anything because of lacking data one may say that the FSS model builder goes further into the "risky areas" by asking in the terminology used above: "Let us assume that the relationships between policy means t is as stated in (2.1)–(2.9), what is *then* the effects on $\bar{x}_1, \ldots, \bar{x}_K$ of introducing t_j ?" The FSS-model represents therefore a more "Assume this – what then"-type of method than econometrics.

As I see it, this attitude has at least three strong advantages compared to pure econometrics:

(a) It makes possible holistic analyses of the future which embraces if not all at least most of the relevant relations stated in (2.1)–(2.9) (although some of them are more speculative in the sense that they are not, at present, empirically testable).

(b) These analyses give insight to the decision maker and to the research community as to what are the most essential relations to explore more in detail empirically and theoretically. In a way one may say that FSS-modelling gives new insight which stimulates empirical research on the relations which the model indicates to have highest influence on the objective variables $x_1, \ldots, x_I$. Another aspect in this connection is that FSS models allow for checking if inconsistences between aims exist – i.e. to what degree one has situations where some of the targets t_j are incompatible with other targets in (2.1).

(c) Other sectors than the forest industry can be considered when discussing certain forest policy issues. What happens in the other sectors may be very decisive for the effects and functioning areas of certain forest policy means. An advantage of FSS-models compared to other types of forest sector models is that the former more easily can be linked to domestical multi-sectoral models and models of world trade of forest products, e.g. as described in Solberg (1986).

There is no direct contradiction between FSS-models and econometric models regarding forest policy analysis – they should be looked upon as complementary approaches. It is important in FSS-models to use econometrics to statistically justify as many as possible of the relations g, f, and F asumed involved (for example regarding timber supply, investment behaviour, consumption development, etc.). One may say, that one severe reason for the still relatively low interest for using the FSS models is that one has applied too little of statistically proven relations in the models.

How do we know anything about the socio-economic relations in the forest sector, asks Löfgren (1985), and answers: Only by putting forward hypotheses and testing them statistically. The partial analyses done on the effects of forest policy means applying statistical methods as for example Egeberg (1975), Tufte & Tømmerås (1976), Tikkanen (1981), Göransson & Löfgren (1986) and Vehkamäki (1986), are examples of important elements in FSS-models to be used in forest policy analysis.

The optimal solution of a FSS-model is not of particular interest in itself. Its main contribution is that it makes possible a mapping of the possibility area of $\bar{x}_1, \ldots, \bar{x}_K$ with various use of $t_1, \ldots, t_j$. In this way one can get a more realistic view of the flexibility one has by using various policy means.

FSS models must be quite rude both on the forestry and the forest industry side. One important result of this kind of models is as exogenous input for more detailed study of the forestry sector respective the forest industry sector. This is a typical characteristic of economic modelling in general that the output of higher level models (i.e. aggregated models) is most important as a check of the exogenous input variables on the next lower (i.e. the less aggregated) level.

Concluding remarks

As econometric modelling using large sets of simultaneous equations incorporation feedback structures between explanatory and explained variables (for example multivariate transfer function models as defined in Jenkins 1979) becomes more common, the difference between FSS-models and econometric models will be considerably smaller than today. At the same time, the FSS-modellers will gradually increase the efforts of getting empirically tested relationships into the models.

The society consists of different groups with different political power, different opinions about the objectives in the forest sector as well as other sectors, different views regarding the mechanisms (2.1), different views regarding how conflicts should be settled and what policy means to be applied, different views about the future development, etc. It may therefore look naive to assume clearly defined goals and mechanisms as in (2.1)–(2.9). As I see it, there are two ways of meeting this kind of critics. One way is to increase the complexity of the model trying to incorporate more realism in the model. This could be done for example by using game theory to incorporate how power aspects influence the choice of objectives and policy means over time – cf. for example Johansen (1974, 1983), Stahl (1980).

Or it could be done by applying fuzzy set theory (cf. Zadeh 1973) assuming the environment as well as objectives and effects of policy means are "fuzzy" – i.e. not possible to define clearly and has to be described in an approximate way. This approach may seem interesting, but it has the serious drawback of making the FSS-models technically still more complex. The second way is to accept the shortcomings of the present type of FSS-models compared to reality and do sensitivity analysis by changing the assumptions, and interprete the results with careful considerations to the weak points of the model. Personally I think one should try to incorporate game theory and fuzzy set theory in the research activities. In contact with policy makers, however, the present type of FSS-models seem complicated enough, and one should emphasize to "educate" the policy users of such models to apply them in the correct way.

In any case one should always be aware that a model per definition is a simplification of reality. One cannot include all factors influencing the micro (individual enterprise) level, for example liquidity, risk preferences and portfolio aspects, tax effects, firms' objectives, management and labour skill, price expectations, conflicts. Uncertainty and risks can to a certain degree be incorporated through stochastic programming techniques, but can neved be eliminated.

The following statement from Tinbergen (1967:27) is still of importance, not least regarding FSS-modelling:

> "Exact specification is necessary to avoid confusion and misunderstanding, for, on the basis of such specification only can the economist put precise questions and try to give precise answers. Problems of practical policy have therefore to be interpreted in terms of such simplified models and, after the analysis has been made, an interpretation back (i.e. an application of the findings of the model back to the real situation) has to be attempted. Here, of course, divergencies of opinion may, and necessarily will, arise. It is an initial advantage for mutual understanding however, if consensus of opinion can be obtained on the precise problems and answers constructed with the aid of the models; this helps to narrow down differences of opinion. And if somebody believes that model A does not fairly represent the actual situation to be discussed, he will be forced to indicate in what respect that model has to be changed. For the revised model, the problem can be considered anew".

No FSS-model can replace the forest policy decision makers. It can, however, make them take wiser decisions, or, perhaps more realistic, avoid obviously wrong means to be applied in pursuing certain ends. That is not a small contribution.

Notes

[1] For this type of analysis, the readers are referred to e.g. Lunnan (1984).

[2] The functioning area includes not only technical/behavioural aspects as to *how* the policy means influence the microagents' action, but also considerations of what is possible to get politically accepted.

[3] The presentation is based on macroeconomic planning theory as presented in Johansen (1965: 7–13). Other targets and policy means have to be used in forest policy analysis than in macro-economic planning, but the structural issues are in many ways strongly related, particular in this context of policy analysis and forest sector modelling. One advantage with this approach to forest policy analysis is that it makes it rather easy to expand the set of policy means to include also more general means used in other sectors of the economy and analyze the mutual effects of these means and the more traditional forest policy means.

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KÄSIKIRJOITUSTEN TARKASTUS VUONNA 1986
Appraisal of manuscripts in 1986

Suomen Metsätieteellisen Seuran julkaisusarjojen Acta Forestalia Fennican ja Silva Fennican toimituskunta on saanut arvokasta apua lukuisilta asiantuntijoilta, jotka ovat hyväntahtoisesti arvioineet painettavaksi tarjottujen käsikirjoitusten tieteellistä tasoa ja kieliasua. Vuonna 1986 tehdystä tarkastustyöstä toimituskunta esittää parhaat kiitoksensa seuraaville asiantuntijoille.

The editorial board responsible for the scientific series (Acta Forestalia Fennica and Silva Fennica) published by the Society of Forestry in Finland has received invaluable assistance from a large number of experts who have kindly provided assessments of the scientific level and linguistic style of manuscripts submitted for publishing. The board would like to express its sincere thanks to the following experts for appraising the manuscripts during the year 1986.

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The 1st International Conference on Classification, Phylogeny and Natural History of Scolytidae (Coleoptera)

July 3–9, 1988

Vancouver, British Columbia, Ganada

This symposium, held in conjunction with the XVIII International Congress of Entomology, will focus on current research relating to the morphology, systematics, phylogeny, zoogeography, ecology, physiology and behavior of the Scolytidae. Potential participants and topics are now being solicited. Anyone interested in participating in the symposium is asked to notify one of the co-conveners listed below.

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Biosystematics Research Centre
Canada Agriculture
K. W. Neatby Building
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Manuscripts for Silva Fennica should be addressed to the Society of Forestry in Finland in three copies. Author's full name and address must be stated. The typography should be in accordance with the latest volumes in the series.

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