

Keskusteluaiheita - Discussion papers

No. 343

Jussi Raumolin

**THE IMPACT OF TECHNOLOGICAL
CHANGE ON RURAL AND
REGIONAL FORESTRY IN FINLAND**

This series consists of papers with limited circulation intended to stimulate discussion. The papers must not be referred to or quoted without the authors' permission.

RAUMOLIN, Jussi, THE IMPACT OF TECHNOLOGICAL CHANGE ON RURAL AND REGIONAL FORESTRY IN FINLAND. Helsinki : ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 1990. 84 p. (Keskusteluaiheita, Discussion Papers, ISSN 0781-6847; no. 343).

ABSTRACT: In this study, the focus is on the technological change in forestry in Finland during the period of industrialization and its impact on rural and regional development in the country.

The periodization is the following: the Domestication of Development 1850-1944, the Arrival of Mechanization 1945-1958, the Formation of the Techno-Intensive Forestry System 1959-1973 and the Rise of a Conflict-Ridden Forestry System, 1974 onwards.

Special stress is laid on the alternative strategic opportunities in the period of the arrival of mechanization. In particular, a Finnish model and a North American model are contrasted with each other.

This study presents a new interpretation and a new conceptualization of the development of forestry in Finland and it offers a historical background of actual conflicts of forest use in Finland.

KEY WORDS: Industrialization, technological change, forestry, Finnish model, North American model, rural and regional development

Preface

This study was originally prepared for the WIDER study programme on "Development and Technical Transformation in Traditional Societies: Alternative Approaches" in 1986. It is my final report in conjunction with the Wider study programme and dated December 30, 1986.

This programme was of multidisciplinary and international character, dealing with diverse subjects, and various approaches were used. All this resulted in problems of coordination and of publication because of divergent interests and views involved.

The study has, however, preserved its topicality and gained a certain international interest and appreciation. The problems associated with the impacts of airborne pollution started to change ideas on forest management methods towards being closer to nature in the late 1980s.

The ideas on sustainable development and environmental protection, especially after the publication of the report of the UN Commission on Environment and Development, the so-called Brundtland Report in 1987, have aroused new interest in the sustained management of renewable resources both on the international plane and in Finland.

The transition towards the methods of exploitation of natural resources with heavier emphasis on environmental protection will not, however, be easy because of many conflicts of interests involved. This study, in particular, tries to point out the historical background of actual conflicts of forest use in Finland.

After completing this study, I have pursued studies on theories of forest-based development, destructive economics, sustained-yield and technological transfer and transformation in connection on both the national and international planes.

A list of related papers and publications is given in the following:

1986. Forest, Technology Transfer and Creation and Forest-Based Development in Finland, Canada and Brazil. Proposal for a research project. Mimeo 67 p. 7 appendices. University of Helsinki Institute of Development Studies.

1987a. Metsän suojassa. Poliittisen antropologian ja geopolitiikan näkökulma (Under the shelter of forests: Some thoughts about political anthropology and the geopolitics of forests) in: A. Reunala & Pekka Virtanen (eds.) Metsä suomalaisten elämässä (The forests as a Finnish cultural entity). Special Issue of *Silva Fennica* vol. 21:4, 342-50.

1987b. Myyttinen metsä-Suomi (Myths related to forest-based development in Finland). Suomen metsät (The forests of Finland). Special Issue of *Metsälehti* no 23, 1987, 68-69.

(ed.) 1987c. Special Issue on Swidden Cultivation. *Suomen Antropologi/Journal of the Finnish Anthropological Society* 12:4.

1987d. Introduction to the study of swidden cultivation. *ibid*, 185-98.

1987e. Reflections on Destructive Economy on the Globe in: Valtavirran varrelta. Essays in Honour of Kyösti Pulliainen on his 50th Birthday. Joensuu, 113-25.

1988a. Trooppisten metsien integroituminen maailmantalouteen. Historiallinen ja kehitysteoreettinen näkökulma (The integration of the tropical forests in the world economy as seen from the point of view of history and development theories) in: A. Erkkilä & T. Kuuluvainen (eds.) Trooppiin metsät (Tropical forests). University of Joensuu. Silva Carelica 12., 305-22.

1988b. Paperi, lukutaito ja kehitys. (Paper, literacy and development) in: T. Hujanen (ed.) Lukutaito, kehitys, omaehtoinen viestintä (Literacy, development and self-reliant communication). Publications of the Finnish Unesco Commission 41. Helsinki, 7-22.

Raumolin, J. 1988c. Restructuring and Internationalization of the Forest, Mining and Related Engineering Industries in Finland. The Research Institute of the Finnish Economy (ETLA) Discussion Papers 267. August 18, 1988 85 p.

Raumolin, J. 1990a. Restructuring and Internationalization of the Forest, Mining and Related Engineering Industries in Finland. An abridged version of 1988c published in J.-C.Hansen & M. Hebbert (eds.) Unfamiliar Territory-the Reshaping of European Geography. London, 8-22.

Raumolin, J. 1990b. The Transfer and Creation of Technology in the World Economy with Special Reference to the Mining and Forest Sectors. The Research Institute of the Finnish Economy (ETLA) Discussion Papers 313. February 23, 1990 34 p. Will be published in K.Kiljunen&V.B.Avakov (eds.) World Industrial Restructuring and North-South Cooperation. University of Helsinki Institute of Development Studies. Publication Series B in 1990 (forthcoming).

1990c. The Problem of Forest-Based Development as Illustrated by the Development Discussion, 1850-1918. University of Helsinki Department of Social Policy. Research Reports 4. 1990. 203 p.

Contents

1. Introduction	1
2. Views of Forest, Forest Management and Forest-Based Development	1
2.1 Views of Forest and Forest Management in Germany	1
2.2 Views of Forest-Based Development	7
3. Specific Characteristics of Finland with Special Reference to the Development of the Forest Sector	10
3.1 Nordic Characteristics	10
3.2 Specific Finnish Characteristics	11
3.3 Specific Characteristics of Northern Finland	12
4. The Domestication of Development, 1850-1944	13
5. The Arrival of Mechanization, 1945-1958	24
5.1 The Afterwar Emergency Phase, 1945-1952	24
5.2 The Strategic Period, 1953-1958	28
6. The Formation of the Techno-Intensive Forestry System, 1959-1973	33
6.1 The Great Expansion of Forest Industries, 1959-1965	33
6.2 The Period of Rural Depopulation, 1966-1973	37
7. The Rise of a Conflict-Ridden Forestry System, 1974 Onwards	50
8. References	61
9. Appendices	69
10. Bibliography	71

1. Introduction

The aim of this study is to present an analysis of the impact of technical change on rural and regional forestry in Finland during the period of industrialization. As the main source materials are the studies and writings of forestry professionals, popular views on the process will be only marginally taken into consideration. The lack of studies on popular views and the hard task of consulting such sources as ethnographical archives and local newspapers has prevented the integration of this important dimension to the study.

Some attention is, however, paid to the cognitive aspects on forests at the beginning of the study where a short survey of the German discussion is presented. The focus on the German case is justified because Germany has traditionally been the metropolis of forestry for all the world and interesting discussions have taken place there. Particularly Germany has been a scientific metropolis with regard of Finland traditionally.¹⁾

A short survey on theoretical discussion on the theories of forest-based development and studies on technology transfer in connection is presented as well. After these theoretical surveys, the specific characteristics of the Finnish forest sector will be dealt with and, finally, a historical development analysis of the impact of technical change will be given. Because of limited scope of the study, the analysis will mainly concentrate to structural aspects of the process. It will not be possible to enter deeply in details.²⁾

2. Views of Forest and Forest-Based Development³⁾

2.1 Views of Forest and Forest Management in Germany

One can distinguish traditionally between popular and elitist views of forest in Central Europe. The popular view of forest represented mainly by peasantry saw the forest as

a source for raw material, energy, and food, and as grazing ground for cattle. The peasantry populated forests with mythical representations such as spirits in preindustrial times. The elitist view represented by state bureaucrats, army officials and noblemen saw the forest as raw material and energy source for towns, industries and navy, or as hunting ground for upper class people. There were, of course, conflicts between the interests of the peasantry and other interests: the latter ones normally prevailed. One characteristic was, however, common to both the sides: the devastation of forests with the exception of noblemen who loved hunting over all and tried to preserve forests for hunting grounds.

The notion of sustained yield was the major theme of the scientific forestry which started to develop during the eighteenth century. A basic interpretation of this notion was to keep the forest area unchanged through replacing the cuttings either by natural or artificial means. Another meaning was the maintenance of unchanged cut. A third meaning referred to the maintenance of the growing stock unchanged (cf Saari 1950).

The rising forestry profession tried to impose a sustained-yield forest management through forest legislation, specific forest administration and police control. The aim was to separate agriculture and forestry entirely from each other.

In the middle of the last century, "the industrial mobilization of wood-"interpretation of sustained-yield developed among the German forestry profession. A new branch of forestry called forest economics stated that its principal aim was to produce exchange value from the forest resource. This could be exactly measured by quantitative calculations. It was established that the forest had also other influences but it was very difficult to measure these (cf Endres 1900).

In general, the state should be responsible for forest management. In certain exposed regions, such as in mountains and coasts, the state should establish protective

forests. Because of the long time period needed in the rational management of forests on sustainable basis only governments and perpetual corporations seemed to be capable of such a management. Therefore, the state should regulate the private small woodland forestry for common good.

The ideal condition of the forest was the "normal forest" giving the highest annual sustained-yield. The main target of forest regulation was to transform the existing forest into the "normal forest". The exploitation of both private forests and state forests should be practised for the biggest profit. Clear cutting and artificial regeneration through the plantation of conifers was proposed to increase the yield of the forests.

This kind of view was close to the interests of the governments, the large-scale forest industries and large woodland owners. The rise of stumpage price made many small woodland owners to share this view as well. It was no accident that this view gained a dominant position among the German forestry profession toward the end of the last century.

Marginal views of forest included different romantic-artistic views using metaphorical expressions of the forest as a mystical entity and living organism. Some nature philosophers dealt with the nature as an organic whole and physicians stressed the curative characteristics of forest environment (cf Shepard 1967).

The pioneer conservationists who were mainly university teachers started to struggle for the establishment of nature parks for educative and scientific purposes. The forests in the natural state were seen as a part of the national heritage. The idea of the protection of landscape developed in this context by and by. Some university professors even wrote treatises of forest aesthetics. Uniform forest landscapes were not considered beautiful and the monocultures of conifers were evidently unfavourable environments for many birds and other animals (cf Schoenichen 1948).

After the forest plantations started to experience insect damages, dissenting voices were heard even among the forestry profession. Among others, Karl Gayer started to rehabilitate the mixed forest and the natural regeneration in the 1880s (Gayer 1886).

At the beginning of this century, a criticism was increasing among the German forestry profession against clear cuttings and plantations. The critics demanded a more organic view on forest. New results of natural sciences, especially that of botany, should be integrated to economic principles in view of creating new foundations of forest management (Mayr 1909).

At the early 1920s, the idea of "Dauerwald" propagated by Alfred Möller and his disciples in northern Germany and that of "Plenterwald" promoted in Switzerland and southern Germany challenged "the industrial mobilization of wood"-tradition in forest management. A common denominator of these critical schools was the aim toward "naturnaher Wirtschaftswald", "the commercial forest close to nature." The forest should contain different age classes and Möller emphasized that the forest was a kind of organism (Biolley 1920; Möller 1922).

During the interwar years, ambitious biologists in Germany looked upon new integrative concepts and approaches in the study of living nature. The entomologist Karl Friederichs who studied, among others, the reasons for insect damages in German forests coined the notion "das Holocoen" to indicate the integrative factor of the ecological unity of living organizations, these biological systems of higher order capable of self-regulation (Friederichs 1927 and 1930).

Friederichs made an effort to create the general principles of theoretical ecology as well. According to him, the biosphere was an open and dynamic system characterised by a labile self-regulation. Such local parts in the biosphere as peatland and forest were typical holocoenic units. Human being was provoking growing disturbances in the biosphere

and other holocoenic units. That is why a new natural philosophy and regional planning based on ecological knowledge was badly needed. Friederichs protested against the use of organism in scientific discourse: instead, the notion organization should be used (Friederichs 1937).

The forester Heinrich Lemmel, for his part, published a learned treatise about the forest as an organism which was based on the German discussion on principles of inanimate and living nature. He quoted, among others, the work of Ludwig von Bertalanffy. Lemmel tried to support Müller's idea about "Dauerwald" by strong philosophical arguments (Lemmel 1939).

The struggle between the representatives of "the industrial mobilization of wood"-school of forestry and the ones of "the commercial forest close to nature"-school of forestry in Germany during the interwar years clarified basic issues about what to do with the forests in an industrialized country after the sustained-yield management has been established. Such important questions as what is the notion forest; what is the role of the forests in the economy, society, landscape and natural environment, and how should the forests be cut and regenerated were dealt with.

The relative position of these contending schools vis-a-vis practical forestry was affected by changes in political environment. The Nazi takeover of power signified first the victory of "the commercial forest close to nature"-school partly thanks to multiple use interests, such as hunting, among the Nazi leaders, and the centralization of public forest administration in Germany. The situation changed again for the advantage of "the industrial mobilization of wood"-school in the late 1930s when the mobilization for the warpath started in the country. This is a little ironical taking into consideration the fact that the theoretical argumentation for ecological considerations in forest management grew stronger just at this time (cf Rubner 1985).

The different views of forest in the German discussion can be classified as follows:

Table 1.

Views of Forest in Germany, 1800-1939

<u>Popular views</u>	<u>Elitist views</u>
exploitative multiple use view	professional sustained-yield views -industrial-economic view -organic-economic view romantic-artistic view aesthetic view medical view conservationist views -nationalist-geographic view -ecological-holistic view

After the Last World War, a symbiosis between "the industrial mobilization of wood"-idea and a capitalist forest economics developed in U.S.A. and Sweden and spread overall the world including the new Forestry Division of FAO. "The commercial forest close to nature"-idea only prevailed in Central Europe being marginal on the international level.

As concerns the afterwar discussion on forest and forest management in Western industrialized countries few new themes have been introduced as compared with the German discussion in 1800-1939 before the problem of airborne pollution became a serious public concern. Instead economic and social change has been rapid. As a consequence of urbanization, the growth of affluence and the gaining strenght of the middle-class former elitist romantist-artistic, aesthetic and conservationist views have transformed to more or less popular views during the last few decades, and advances

in ecological research together with the rise of environmental consciousness have contributed to a spread of the ecological-holistic view of forest.

2.2 Views of Forest-Based Development

The discussion of the development of forest exploitation has been based on the idea of development stages. During the last century, German theorists of forestry presented the idea according to which the development of forest exploitation passed by stages from destructive exploitation to sustained yield forestry. A shortage provoked by destructive exploitation had been the mother of forestry in Central Europe. By pioneering in establishing the regulated forestry system, Germany pointed the way for others to follow (von Berg 1871).

During this century, these basic ideas have not changed much but different variations of the theme have been presented. For example, the idea about development by stages has been projected outside Europe and new stages have been added, such as the multiple use stage of forestry or the stage of intensified sustained-yield management (cf Heske 1931a; Mantel 1962).

Some authors have tried to integrate technological transformations in the stages view by applying the morphological idea of technological complexes. Typical of the eotechnic, paleotechnic and neotechnic phases is a certain type of energy use, enterprise structure, spatial pattern, and forest exploitation. In stressing the scientific advances in connection to the shift from the destructive paleotechnic phase to the modern neotechnic phase, this kind of analysis seems, however, to forget such problems as pollution, ecological problems of intensive forestry practices, and the impact of mechanization of lumbering operations on rural structures (cf Dinsdale 1965).

Some foresters dealt with the impact of forest-based development on rural communities in the West during the interwar

years. In North America, the forest exploitation connected with the moving frontier was called the roving lumbering industry. Its impact was destructive: deserted farms, deforestation of lands, local shortage of timber, land speculation and community development interrupted. In contrast, an integrated and stable combined farm-forestry system was studied in the Nordic countries based on small woodland ownership and sustained-yield management (cf Dana 1918; Saari 1928).

After the last World War, the linkage approach has been applied to the analysis of the development impact of the forest sector. Some authors have pointed out many potential positive impacts of forest-based development including the ones on regional and rural development. On the other hand, critical analysis has pointed out that many potential linkages leak out of peripheral regions specialized into forestry and forest industries. During the last few decades, the rise of centre-periphery, neo-Marxist and dependency theories, among other things, among the scholars in the resource-based peripheries has confirmed the results of critical analysis (cf Cohn Jr 1954; Westoby 1962; Kromm 1968 and 1972).

In the context of the rapid mechanization of lumbering operations, some models of mechanization were presented in the 1960s. For example, models of diffusion of technology were used. The specific models of logging mechanization, such as the law of discontinuous evolution, were developed as well. These models were quite deterministic excluding alternative development paths. On the other hand, the socio-economic and cultural setting of mechanization was poorly taken into consideration (Silversides 1965 and 1966; Samset 1966 and 1972).

Turning to transfer of technology, these issues have been traditionally mainly dealt with in the context of the "exportation" of the German sustained-yield idea, the assistance for the establishment of Western type of forest administration, forest research institutes and forestry education

in "new", "backward" and "developing" countries. This was one of central themes of "Weltforstwirtschaftlehre" developed in Germany starting in the 1930s. Finally, one was confronting with the problem of cultural role of forester in a different cultural setting (cf Heske 1931b and 1948; Ebner 1953; Westoby 1965; Schlie 1976).

During the last few years, scholars have paid special attention to the relation of forestry to rural communities and special agro-forestry studies have been started as well. finally, questions about appropriate technology in forestry have been posed. Problems of forestry extension work in the developing countries have become socio-anthropological problems to a high degree (cf FAO 1978 and 1982; Cernea 1981; Larman et al. 1981).

The actual state of socio-economic studies of forestry is a little perplexing because the clarification of such basis issues as the classification of enterprise forms, forest exploitation and forestry forms, and technological forms of exploitation is far from being satisfactory. During last few years, new holistic approaches, such as forest sector studies via dynamic systems analysis or using industry complex analysis have been introduced. On the other hand, certain studies in the field of forest sector and forestry sociology have analysed power constellations and social conflicts associated in the exploitation of forest resource (cf Lönnstedt & Randers 1979; Raumolin 1981b, 1984b and 1984d; Marchak 1983; Lee 1984).

Traditionally, studies in the field of cultural geography of forest in dealing with myths, values, and multiple uses of forest introduced a kind of anthropological dimension in the study of forest exploitation. The proper anthropological studies of forest and forest exploitation, except for shifting cultivation, are not, however, well developed (cf Marek 1912; Lorenzi 1918/1919; Hörner 1927; Deffontaine 1933; Conklin 1961; L'Arbre... 1980).

The starting point for a socio-anthropological study of forest exploitation is thus quite open. In this study, the integration of the socio-anthropological dimension will take place only on a limited scale: mainly in dealing with the contact points between the forests, nationalism and national myths.

3. Specific Characteristics of Finland with Special Reference to the Development of the Forest Sector⁴⁾

The importance of specific geographical, historical, and institutional characteristics of a given country is often forgotten when abstract models are applied to development analysis. In the following, certain specific characteristics of the Finnish forest sector in common with the other Nordic countries exporting forest products are first dealt with. Secondly, specific characteristics typical of Finland are summarized and thirdly, those of northern Finland are distinguished.

3.1 Nordic Characteristics

Large parts of Norway, Sweden and Finland are situated in the Northern Coniferous Forest Zone. The predominant tree species are Scots pine and Norway spruce. The most abundant hardwoods in this Nordic part of the Northern Coniferous Forest Zone are birches together with aspen.

Historically seen as typical of these countries has been lack of feudalism, a free peasantry, and strong traditions of local democracy. According to Nordic traditions of customary law, every man has the right to walk and pick berries and mushrooms in other people's forest land. During the last few centuries, a strong rural cooperative movement has developed overall.

Since the Great Partition of Land started in the eighteenth century, peasant small woodland forest ownership has been typical of these countries. At the beginning of this cen-

tury strict laws were passed prohibiting the purchase of farm land by the companies. The reason for these measures was that the viability of small farms in harsh northern conditions depends on the income from their forests.

Most of the forest industries in Norway, Sweden and Finland have been under domestic control and these industries have been important export industries especially since the beginning of the industrialization. Even though they have carried on hard competition with each other in the international market, the Nordic forest industries have also closely collaborated eg. in the case of trade policy negotiations vis-a-vis metropolitan markets.

3.2 Specific Finnish Characteristics

The main parts of Finland are situated on the Precambrian formation which has been moulded by the retreat of glacial sheets. Typical of Finland is an ample network of lakes and rivers. Finland is rather flat. A terminal moraine, the Salpausselkä ridge, crosses southern Finland from West to East. It is a great barrier that dams the water to form a vast lake system in the interior of the country. There are mountains only in northern Finland, especially in Lapland. About a third of the total area is peatland.

Finland is almost entirely situated inside the Northern Coniferous Forest Zone. She is the most forested land per capita in Europe. Among the industrialized countries Finland is still most dependent on the exports of forest products.

Finland is located at the bottom corner of the Baltic Sea. During the winter, the watercourses including the Baltic Sea close to the Finnish coast are frozen. All the shipping has been traditionally interrupted during the winter months. During the great wars in Europe, the shipping through the Baltic Sea has been interrupted as well.

Historically Finland was a province of Sweden from the Middle Ages to the Napoleonic Wars. After these Wars Finland became an autonomous Grand-Duchy of the Russian Empire. The independence of the country dates only from 1917. Traditionally Finland's role in the international division of labour was to provide various staple products, mostly based on forest, such as fur, tar, potash, timber, sailing ships, and sawngoods for the metropolitan markets.

Slash and burn practice persisted as a cultivation method in the interior of Eastern Finland up to the beginning of this century. A large relative rural surplus population has characterised the Finnish industrialization. The Peasant Party representing the interests of private forest owners, among others, has continuously played an important role in Finnish politics in spite of the progress of industrialization. These characteristics seem to be more typical of Eastern Europe than of Western part of the continent. Finland is situated between the West and the East.

Traditionally, the Finnish people has been accustomed to live in the forests and with the forests. Even though the Finnish peasantry carried on an active rural colonization and eventually came to consider the forest as a kind of enemy, it is always difficult for most Finns to live long without being close to the forest. The Finns are a kind of "forest people".

3.3 Specific Characteristics of Northern Finland

As Finland is a relatively vast country in the European perspective, a regional point of view should be taken into consideration in the study of forest exploitation in the country. There are geographical, historical, and cultural differences and differences in the interregional division of labour among the regions in Finland. The most distinctive region is northern Finland.

The forests in Finnish Lapland extend further up to the North than in any other Arctic region apart from Central

Siberia. They mainly consist of conifers. About a half of the total area in northern Finland is peatland.

The interior of northern Finland has been traditionally very sparsely populated. Before the Finnish colonization effort toward the North started, this part of the country was mainly occupied by the Sami hunters and fishermen.

In contrast to the southern part of the country, public forest has continuously been predominant in northern Finland. Great distances, transportation difficulties, and sparse population have caused serious problems of control of forest fire. A large-scale concession system was introduced in the public forests in northern Finland in the middle of the last century. The first experiments of large-scale clear cuttings took place there as well. These characteristics of northern Finland bear certain similarities to the conditions in, for example, Canada and Russia/Soviet Union.

From the point of view of southern Finland, northern Finland has been looked upon as a reserve area in the country or a certain internal colony. Northern Finland has been considered an unlimited timber reserve, potential reserve for rural settlement, a place to establish natural reserves and parks, and a promised land for the promotion of tourism.

4. The Domestication of Development, 1850-1944⁵⁾

In what follows, a synoptic view is presented of the development of the logging, floating, and forestry system, with special reference to the transfer of foreign ideas and technology, the rise of domestic capabilities, and the impact on rural development during the period 1850-1944.

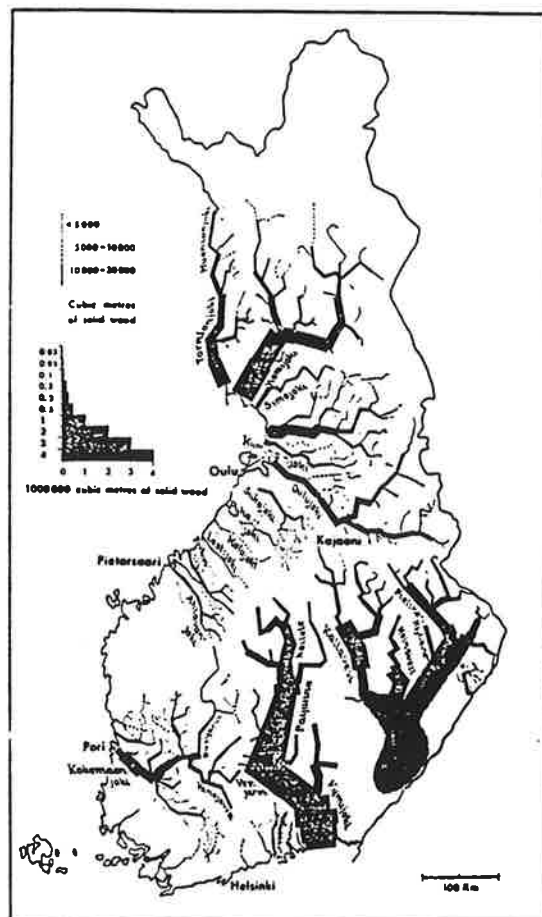
At the beginning of the period under review, a heavy transfer of foreign ideas and technology took place the most pronounced in the case of floating and forestry. The main sources of this transfer were Germany, Sweden and Norway followed by Great Britain, and even U.S.A. and Canada.

Because of common geographical, historical and institutional background, the ideas and technology stemming from Norway and Sweden were the most appropriate for Finnish conditions.

The rise of a domestic capability started at the beginning of this century, and this rise accelerated after Finland achieved independence in 1917. Toward the end of the 1930's, the logging system was mainly based on domestic technology. The floating system had developed to an almost 100 per cent domestic system. The tugboat drawing a bundle raft on a lake had become an integral part of the national landscape. The floating on the rivers took place in spring. A romantic mythology of floating workers characterised a certain type of popular novel and of movies in Finland.

Map 1.

Timber Floating by Floatways in Finland in 1948



Source: P. Yli-Jokipii: Timber Floating: Its Importance and Regional Development in Finland Since the Second World War. Tijdschrift voor Economische en Sociale Geografie 61, 1970, p. 353 (slightly modified)

As far as the forestry system was concerned, the rise of the domestic capability was the most striking. Innovative and pioneering work in a international perspective was made in Finland. The Finnish theory of forest types formed a good starting point for forest research and practical forestry. "The Finnish forestry model" became well-known abroad. A. K. Cajander was the great heroe of this process of a rapid transformation of forestry from an exploitative stage to an appropriate sustained-yield stage.

The basic technology in logging, floating, silviculture and forest improvement was simple and labour intensive. The tools used in logging such as the axe, cross cut saw and bucksaw together with horse were at hand on small farms. A specialized and mechanized equipment was developed for floating on great lakes, but simple tools used in river floating were at hand on small farms as well. The tools and equipment used in silviculture and forest improvement were not specialized.

This low level of mechanization related to the existence of ample and cheap rural labour force. The growth of a relative surplus population in the countryside was a structural characteristics of the Finnish industrialization. During the last century, the growth of rural landless population was rapid.

After the execution of the agricultural reform and rural settlement policy, most of these people became marginal rural dwellers dependent on work outside the farm, mainly forest work. Because the desire for emancipation in the countryside was closely associated with ownership of a parcel of land and forest, the condition of these people considerably improved. They were accustomed to hard work in harsh northern conditions. The increasing shift of the timber sales from concessions and sales on the stump toward delivery sale in the public forests controlled by the National Board of Forestry was dependent on the existence of a permanent labour force in the peripheral regions of the country.

The position of the forest worker was not enviable during the first exploitative phase of the industrialization. He suffered from poor conditions of shelter and food, accidents and bad contracts, and unemployment during downturns in exports. After independence, most of the workers became permanently settled. The combination of forest work and agriculture offered a kind of social security system to him. An insurance system against accidents was adopted, and lodging conditions were reformed by the law. In the 1930's, minimum wage controls were established by the authorities and forest work studies led to improvements in accident prevention and wage scales. Difficulties in organization and resistance by employers, however, prevented the formation of a trade union of forest and floating workers.

As regards logging operations in general, the Finnish horse had the hardest task on its shoulders. It had to haul heavy loads through snowdrifts in trackless backwoods year after year. Thanks to an amelioration of transportation conditions by snow on the ground and ice cover on the lakes, the logging operations took place during winter.

After an exploitative phase toward the end of the last century, the economic and political organization of the independent peasantry, and strong political support of agricultural promotion, the forest owner's position with regard of the industry started to improve considerably at the beginning of the century. The company ownership of farmland was prohibited by law, and the pattern of timber sales developed toward delivery sale and common marketing organizations. The rise of stumpage prices was constant.

As the peasantry gained a powerful position in the New Republic, a law prohibiting exports of pulpwood could not be passed. On the other hand, private forest owners had to accept public regulation of forest exploitation in the interest of sustained-yield forestry. As the administrative system for private forests became indirect and decentralized, forest owners had to impose the discipline of sustained-yield management "by themselves".

The development of forestry and rural development were originally filled with diverse social and economic conflicts. There were conflicts between landless rural poor and landowners, workers and employers, a language battle between the Finnish and Swedish language interests, the National Board of Forestry and the peasantry, the companies and the forest owners, forestry interests and agricultural interests etc. The Finns were struggling against the Tsarist Government which tried to impose a Russification programme on Finland, and finally, a Civil War was waged in the country.

After independence, the political forces of the Centre, the ruralist-populist Peasant Party and the reformist middle-class Progressive Party together with reformist Social Democrats made a great effort to regulate the conflicts and to integrate the population in a united nation, where all the people would feel at home. The question of the landless rural poor was settled and the worker's position improved. Finnish became the dominant language of the country but the Swedish language minority succeeded in making theirs the second official language of the Republic. Conflicts between peasant forest owners and the National Board of Forestry, the companies and the forestry interests were regulated in the interest of promoting agricultural and rural development.

Up to the end of the 1930's the development of the forest industries and forestry had exerted many positive impacts on the development of the countryside in Finland. This development had become well integrated in the structures of the farm and rural structures in general. The integrated system was based on domestic technology and simple tools, and was still close to nature through seasonal adjustment of work and direct contact with the forest. The devastation of the forest had become eliminated and forest owners gradually learned better silvicultural practices. Natural regeneration and direct seeding were the predominant methods of forest regeneration.

It is perhaps no wonder that the development success of independent Finland based on the exports of forest products, and the economic growth rates which were among the highest in the world during the 1930's, led to the formation of a kind of modern version of the Sampo myth in Finland. Sampo was a mythical engine mill in the national epic Kalevala producing wealth and riches for the people of Kaleva in ancient times. Now, large pulp and paper mills produced wealth and riches for the Finnish people. Well known architects such as Alvar Aalto designed new mills and mill communities. The market for the spread of forest fundamentalism was nation wide and A.K. Cajander was the most talented exponent of that fundamentalism (cf Cajander 1935a; Aho & Soldan 1939).⁶⁾

After Cajander's death, the great problem of his inheritance was posed. The overwhelming dominance and impact of one superman left a kind of vacuum behind him. In fact, the development of forestry during the interwar years in Finland could be called "Cajander's period".

A comprehensive evaluation of his work was necessary. Because he was the creator of "the Finnish model of forestry", one should have asked what exactly is this model? What are the reasons for its success? How should we relate this development to international development? There were many open questions. As Cajander died during the World War, which meant the end of an era these questions would have been even more important. There were certainly new tasks ahead in new conditions.

One was to try to specify what is creative scientific nationalism as exposed in Cajander's writings. He had written, among other things, about centre-periphery relations in the development of the sciences, difficulties in carrying out original research in a small peripheral country, the rise of scientific innovations outside the established scientific disciplines, and the dangers of bureaucratisation of research. Because strongly hierarchical attitudes have been typical of the forestry profession and the emphasis has

been on very practical research, the clarification of these issues would have been even more crucial (cf Cajander 1920, 1927, 1935b, 1936).

The War situation, difficulties in grasping Cajander's work in all its ramifications, a certain lack of perspective among the Finnish forestry profession, and the ritualistic traditions of doing homage to the deceased, all together contributed to the fact that no comprehensive evaluation of Cajander's work was made. More general aspects of Cajander work, such as writings about the development of the sciences, were forgotten in the obituaries.

Cajander's work became a kind of totem for the forestry profession, honoured in festival orations but not analysed and deeply understood. The friends and pupils identified themselves in particular with his theory of forest types which became virtually sacrosanct. A new edition of Cajander's work on forest types was published by the Society of Forestry in Finland after his death (cf Aimo Kaarle Cajander in memoriam 1949).

After its striking success in the 1920's a strong attitude of self-confidence developed among the Finnish forestry profession. It was thought that Finland had become a major forestry nation, an example to follow, and that Finnish forest research had attained the leading position in the world. This attitude was already becoming an illusion in the 1930's. Finnish research did not participate in new developments in the field, such as the rise of world wide comparative botany, definition of basic concepts of ecology, resource survey through aerial photography, and creation of "Weltforstwirtschaftslehre".⁷⁾

No new innovations took place in Finland in the 1930's. It was thought that after the basic problems of forest management had been solved through the theory of forest types, the main emphasis should be directed to practical applications, such as peatland forestry and research in the field of forest economics and technology. After the death of Lauri

Ilvessalo who prepared the second survey on world forestry resources, studies in international forestry were not pursued any more. Some comparative botanical research was undertaken on the basis of the theory of forest types in Patagonia, Argentina and eastern Canada but no major international publication originated from this research (cf Ilvessalo & Jalava 1931).⁸⁾

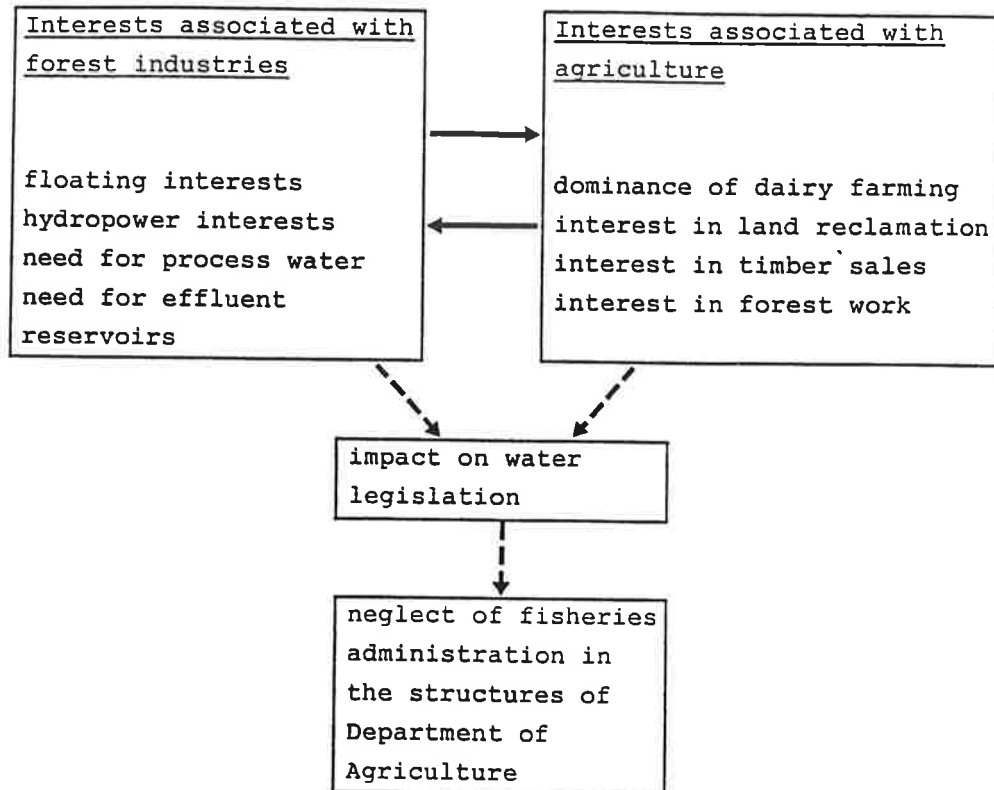
The strength of the Finnish theory of forest types was its simplicity and practical applicability, as it used plant indicators as the basis of forest classification. The competitive schools of forest classification, such as the Russian school represented in particular by V.N. Sukachev or the Zürich-Montpellier school of plant sociology used more complicated criteria for classification. The simplicity eventually became a weakness, as it was more difficult to integrate Finnish ideas with the ecosystem approach, as compared with other ideas. Finnish scholars, A.K. Cajander included, defended the Finnish system rather than trying to develop new original research taking the new challenges into consideration. In this sense, Cajander was not able to follow his own view of innovative research.

The idea that yearly forest growth could be doubled up to 80 million m³ in Finland, put forward by the leaders of the Finnish forestry profession, can be called a technocratic silvicultural supermyth of the profession. The attainment of this target would mean a massive drainage of peatlands, and a change in the composition of tree species to the absolute favour of conifers, i.e. a radical transformation of Finnish nature (cf Saari & Ilvessalo 1929).

This transformation would be the greatest since the transformations produced after the last Ice Age or an event that would be significant in a geological perspective. The total appropriation of Finnish nature in the interest of the promotion of production of raw material for the forest industries would certainly irritate popular sensibilities.

Figure 1

The Marginalization of Fishing Interests in Finland During Industrialization



The propagation of this supermyth: in Cajander's view this was the Great National Task, pointed out that if the forestry technocracy had led to many positive results in the interwar Finland, it could produce other kinds of results as well. As the forestry profession wanted to assume the leadership of nature conservation and as the use of water resources served mainly the interests of the forest industries, the expression the total appropriation of Finnish nature by the aims of the forestry profession is not so far-fetched. Because technical means were still limited during the interwar years, these ideas could not, however, be taken too seriously.⁹⁾

The rise of stumpage price contributed to the better understanding of foresters' arguments by small woodland owners in the countryside. As the development of the transportation

network was crucial for the rise of stumpage price in poorly accessible areas, the interests of forest owners and the forest industries run parallel as concerns the promotion of floating. The protection of fishing which was very strong in the legislation in pre-industrial Finland became more and more marginal vis-a-vis the forest sector interests.

When Soviet troops attacked Finland late in 1939 and the so-called Winter War started between the Soviet Union and Finland, these troops met with the resistance of a united nation. The Finnish development model during 1917-1939 was put to a hard test and the test was passed successfully. In no other country in Europe was there so large a share of population accustomed to hard work in the Nordic forests under harsh winter conditions. Modern mechanized warfare was not possible in forests with poor transportation networks. The success of the Finnish defence relied heavily on the combination of difficult forest terrain, harsh winter, and the large rural population accustomed to forest work.¹⁰⁾

The great forests were once more the protector of the Finns against foreign invasions as they had been against Viking raids in the Middle Ages and many times there after. During the Continuation War between the Soviet Union and Finland in 1941-1944, the expansion of firewood use again replaced the bulk of imports of fossile fuels, and the pulp and paper industry produced many substitutes including fuels. The war experience in general seemed to strengthen beliefs in forest fundamentalism. As Finland was associated with Nazi Germany in the Continuation War the population was no longer as united as it had been during the Winter War. A shortage of forest workers was a new experience in logging operations during the War.

Traditionally, strong masculine values have characterized the value system of the forestry profession and the forest workers. The typical expression in Finnish used by them is "metsien mies", the Brave Man of the Forests. This Man is a strong, courageous, straight, hard working, and hard drink-

ing fellow, capable of great performance. Of course, he is a good soldier as well.

Female participation in forestry and forest work was very limited during the interwar years. There were female cooks in logging camps and in floating fleets but that was all. Although there was, relatively speaking, a large share of female students at University in Finland, they were not on forestry courses. Women were, of course, represented in the myths of the Brave Men of the Forests. A typical theme of popular novels and movies was a Don Juan-like floating worker charming women in various parts of the country.

As a general labour obligation was established during the War, Finnish women including office employees in the capital had to participate in logging for firewood. Because many office employees had roots in the countryside and slimness was not a mode at that time, the task was not excessive. The traditional woman in the Finnish countryside has been accustomed to very heavy work.

Even though women were not active in forestry in the sense of the industrial mobilization of wood, the multiple use of the forests was a part of their activities. In the division of labour inside the farm, women were responsible for cattle raising. As cattle on small farms grazed in the forests, the grazing-ground forest was part of their territory. And women were active in picking berries and mushrooms in the forests.

Because Finnish foresters wanted to change deciduous forests close to farms to coniferous forest valuable as industrial raw material, there was a certain conflict between the rural woman's view of forest and the forester's point of view. No studies have been made on the dialogue between the rural woman and the forester (cf Lampimäki 1939).¹¹⁾

5. The Arrival of Mechanization, 1945-1958¹²⁾

5.1 The Afterwar Emergency Phase, 1945-1952

It can be argued that the forests saved again Finland in the critical afterwar years. The rapid expansion of the exports of the forest products to the Western market prevented the suffocation of the nation economy in the pressure of war reparations. On the other hand, the rapid settlement of the Karelian refugees and their integration in the society, the elimination of the social problem of landless people by a new rural settlement and colonization policy, and the relief of many related problems would not have been possible without the existence of large unoccupied forest lands and labour intensive techniques in the logging operations.

Director-General of the National Board of Forestry Mauno Pekkala was perhaps the most sophisticated exponent of forest fundamentalism in the afterwar situation when he wrote an article about the significance of forestry for Finland's national economy in 1950. He said, among others, that Finland's present economic, social and cultural standard would not have been attainable without recourse to the forests (Pekkala 1950).

The problem of relative surplus population in rural areas transformed to a problem of a multitude of dwarf farms. The absolute number of rural dwellers did not decrease in Finland after the War and the share of rural population of the total population kept on an exceptionally high level being about 70 per cents in the late 1940s.

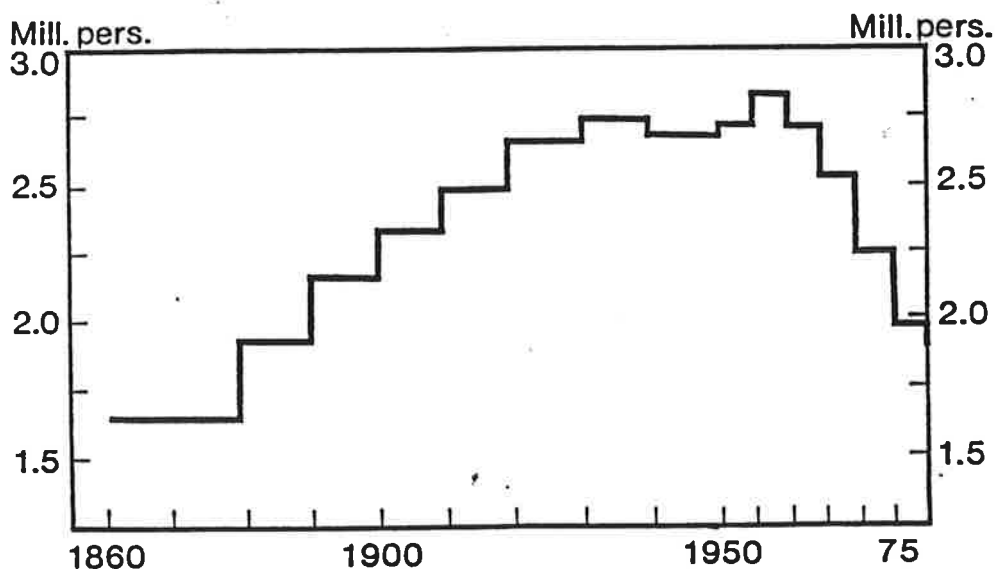
This kind of occupational structure was untypical in after-war Europe. Urbanization proceeded rapidly in Scandinavia and Western Europe resulting in a discussion about the problems of rural depopulation. Rapid industrialization characterized new Eastern Europe under the Communist rule. The only part in the European continent where the share of rural population kept continuously on a very high level was

Southern Europe. Taking into consideration the fact that Finland is not at all provided with good conditions for agriculture, this "agricultural vocation of the country" may seem paradoxical.

This paradox becomes somewhat understandable in view of the fact that most of new dwarf farms were forestry farms in the sense that their viability was strongly dependent on resources, income and work provided by the forests. A disguised unemployment was typical of the peripheral regions of the country. This kind of rural structure was very vulnerable to technological change in construction works, agriculture and logging operations.

Figure 2.

The Rural Population in Finland, 1860-1975



Source: P. Elovirta: Forestry as an Employer in Finland. Silva Fennica 13, 1979 p. 228.

This vulnerability did not pass unnoticed. The Industrialization Committee which was set up in the late 1940s appointed a sub-committee for the study of special problems of small and home industry. This sub-committee dealt especially with development prospects of rural areas. The

report of this sub-committee presented in 1951 stated that there were around 250.000 people in the countryside without stable jobs. The end of the afterwar reconstruction works and the strong cyclical swings in the exports of forest products deteriorated employment prospects there. In addition, rural areas were facing with the rationalization and mechanization of agriculture and forestry (cf The Report of the Committee for the Industrialization of Countryside 1951; Smeds 1951).

A rapid rural depopulation or an increase in emigration would destroy the vitality of the countryside. The established agricultural policy could neither solve rural development problems. The farming based on a continuous increase in public subsidies would not work in the long run. In fact, small enterprise and large enterprise were complementary in the industrialization process. The establishment of small enterprise in rural areas would offer an appropriate solution to development problems of the countryside. The state should offer special credit facilities for this purpose and both production and marketing should be supported by appropriate central and regional agencies.

Turning to forestry, some organizational gaps herited from the interwar period became filled, such as the regularization of the activities of forestry associations and the unionization of workers. The forestry associations transformed from original voluntary associations to indirect agents of the public administration of the forests in Finland, by and by. A shortage of manpower experienced in the logging operations, the growing influence of the Political Left, and the unionization of the workers started to improve the position of the forest and floating worker and to increase interest in the rationalization and mechanization of forest work on the employer side.

Due to the loss of forest area and the parcellisation of forest ownership the demand for the intensification of forestry became pronounced. Ideas about large-scale cutting and mechanization of logging operations expanded among the

forestry experts by and by. The technical means for the realization of these ideas were still lacking.

The heritage of A.K. Cajander was preserved in forest research, especially as concerns the role of forest types as basis for silvicultural operations. A shift from the basic research toward the solution of prevailing practical problems intensified. The main focus of research turned more and more from silvicultural studies toward studies of forest mensuration, economics and technology. Innovative research was missing except for some studies in dynamic economics of sustained-yield. No discussion took place as concerns the specific Finnish model for intensification of forestry.¹³⁾

Table 2.

The Distribution of Forest Ownership in Finland, 1922-1957
(per cent of total)

Ownership	1922	1938	1944	1953	1957
State	39.8	37.0	35.1	30.8	28.0
Communal	0.7	1.5	1.5	1.2	1.3
Parish	0.9	1.0	1.0	0.7	0.6
Company	7.6	7.9	7.9	7.0	7.1
Private	51.0	52.6	54.5	60.3	63.0

Source: M. Ilvessalo: Suomen maan- ja metsänomistussuhteet 1920-1950-luvuilla (Land and forest ownership in Finland from the 1920's to the 1950's) Communicationes Instituti Forestalis Fenniae 51,6.1959 p. 37.

5.2 The Strategic Period, 1953-1958¹⁴⁾

It is possible to differentiate between three main development strategies vis-a-vis the rural development as expressed in committee reports, pamphlets and opinions of experts in the 1950s. First, the representatives of the strategy of capitalist concentration shared the opinion that the out-moded rural production structures should be rationalized and the surplus population shifted from the countryside to more productive occupations. These views were supported by the leading industrialists, economic experts and the Social Democratic Party.¹⁴⁾

Secondly, representatives of the intermediate development strategy stressed that the preservation of a viable economic structure in the countryside was possible only through the creation of side-occupations and new industries there. Especially, the establishment of small industries should be promoted. This view was mainly presented by the Committee for the Industrialization of the Countryside.

Thirdly, the strategy of populist conservation mainly supported by the Peasant Party had the opinion that as large a rural population as possible was worth of preserving. The rural colonization should continuously be expanded to unsettled areas (cf the Report of the National Planning Committee 1954).

The ideologists of the Party justified the policy for the conservation of rural structures, among others, by the superiority of the rural way of life. It was, however, a little inconsistent to require a parity of income level with urban workers and to keep a preference for a distinctive rural way of life. In fact, changes in production technology, the expansion of road network, and the spread of rural electrification and modern mass media started to pose great challenges to the traditional rural way of life in the afterwar world. People living in rural areas in Finland did not seem to possess a special immunity vis-a-vis external

demonstration effects.

Neither the strategy of capitalist concentration nor the strategy of populist conservation seem to offer a viable alternative for the development of the countryside in the long run. Instead, the intermediate strategy would have been more appropriate whereas it was lacking supporters, and economic and technological forces worked for concentration. The Peasant Party which was a powerful political force in the country made its best to accomplish the strategy of populist conservation.

The increase in rural population still in the 1950's made Finland a very peculiar country on the European scene. This development pattern was strikingly different from that prevailing in Scandinavia or Western Europe.

Although there was a lot of discussion about regional development problems and several studies were made about regional differentiation of economic activities, no explicit regional policy was created in Finland. The rural colonization policy, policy of mobilization of peripheral forest resources, agricultural policy, social policy and policy of public works included elements of regional policy but they were carried out by various Ministries and administrative agencies poorly coordinated with each other. In addition, the State directed large-scale capital intensive investments to northern Finland. These investments created a kind of dualistic economic structure there.

The Finnish forestry clearly shifted to the new intensifying sustained yield stage. Peripheral forest resources were mobilized by large-scale mechanized cuttings and mechanization expanded to all aspects of forestry, by and by. The North American model of mechanization was strongly put forward in the discussion about mechanization. Insufficient attention was paid to the development of a Finnish model of mechanization appropriate to small woodland ownership structure.¹⁵⁾

Except the creation of a network of nature and national parks, the focus on commercial use was heavily emphasized in forestry. The rural women and other people active in multiple use of forests were excluded from the formulation of forest policy.¹⁶⁾

As the aims for intensification and mechanization of forestry were largely accepted by the political parties and the main interest groups, such as the forest industries, labour unions and the Central Union of Agricultural Producers, the forestry profession could adopt an "impartial" expert role and concentrate to economic and technical issues without entering to enter politics like A.K. Cajander and Mauno Pekkala had done during the interwar years.

Table 3.

Alternatives for the Mechanization of Logging in the Private Forests

Responsibility and Procurement System	Main Labour Force	Implications for Mechanization
Forest owner; delivery sale	Forest owner	Small-scale together with large-scale (cooperative units)
Machine contractor; sales on the stump	Machine contractor and professional forest worker	Large-scale
Woodland department of a company; sales on the stump	Professional salaried labour force	Large-scale

Since a compensation for the lost territory and resources was looked for in northern Finland many new activities just concentrated there, especially on Lapland. The simultaneous expansion of many activities led to many conflicts. The mobilization of hydropower resources provoked conflicts with floating interests but a compromise was attained by means of the development of new lifting equipment. The establishment of new nature parks and new large national parks provoked conflicts with local people but a compromise was attained by minor amendments of these plans. The ambitious plans to expand the forest industries by the government led to conflicts with forestry experts concerned with the limitations of forest resources. The promotion of rural colonization was opposed by the National Board of Forestry which wanted to preserve the public forests for forestry purposes.¹⁷⁾

The mechanization of forestry heavily leant on imported technology. This was a clear contrast to the prewar situation when most of the technology was domestic. The activities of state-owned companies, and the promotion of research and development by the National Board of Forestry and special commissions, delegations and associations contributed to the creation of a domestic technological capability, by and by.¹⁸⁾

The schizophrenic state between agricultural and forestry studies firmly established already at the beginning of the century made it continuously difficult to understand what was really going on in the Finnish countryside. The mechanization of agriculture and forestry were studied separately in the 1950s. The integration of forestry studies in the activities of the Work Efficiency Association made this organization a potential agency for the promotion of the integrated study of the combined farming and forestry. The resources at its disposal were, however, limited and its main research effort was directed toward the development of machinery and equipment.

The introduction of new social sciences to Finland in principle offered potentialities for new approaches but their

institutionalization took place according to the example of the old industrialized countries. New social scientists who borrowed their ideas from the United States were mainly interested in problems of modern society, such as the behaviour of political parties and labour conflicts in the industry. It was obvious that they were a little perplexed by the existence of an exceptionally large rural population in the country. A general reaction to this "indicator of underdevelopment" was to adopt a role of a missionary for modernization.¹⁹⁾

Although rural sociology was institutionalized in the United States during the interwar period, no rural sociology was transferred to Finland from there. The imports of American ideas were quite selective. Some studies were, however, made about backward Communism in Finland because this well suited to the market of emerging political sociology in the West. Almost no rural sociology was practised in Finland in the 1950's although the share of rural population was the largest in western Europe there! This could be called an alienation of the research from the Finnish conditions.²⁰⁾

The increasing attention paid to human geography in principle offered an opportunity for new approaches as well. In fact, some geographers made penetrating studies on rural development problems. Since they closely followed the example of the agricultural geography developed in the countries where the combination of farming and forestry has not been important since long ago, they could not, however, create fundamentals of an original Finnish agro-forestry geography.

Basic research on natural and socio-economic conditions was poorly practised in forest research in Finland. Typical of the scholars engaged in forest research was the preference for large-scale solutions at the expense of small-scale ones. The opportunities of a creative participation to the international discussion on forest-based development were not used although the Finnish case would have been the most interesting for such purposes.²¹⁾

Summa summarum, the incapability to specify appropriate domestic alternatives of rural development and mechanization of forestry, the lack of consistent political support to these alternatives, together with the lack of versatile domestic engineering industry created favourable chances for the realization of the North American model of mechanization in Finland.

6. The Formation of the Techno-Intensive Forestry System, 1959-1973²²⁾

6.1 The Great Expansion of the Forest Industries, 1959-1965

The period 1959-1965 was characterized by an exceptional importance of the interests associated to the forest sector in the Finnish affairs. In hardly any other period during the history of independent Finland, the forest industries together with farmer-forest owners have played such an important role. The great investment boom in the pulp and paper industry had a decisive impact on the industrialization whereas the Peasant Party gained a political hegemony in the country. The forest industries and the forest owners shared many interests, such as the prevention of the intervention of the state in the wood market and of the establishment of a strong central forest administration.

The excessive investments by the industries and the state resulted in the formation of overcapacity vis-a-vis the available forest resources, overcuttings, the deterioration of forest balance and the rapid rise of stumpage prices. This crisis promoted the rise of the afterwar generation of forestry experts to central positions of forestry technocracy. These experts presented ambitious long-term management plans and plans to increase allowable cut connected with programmes for a strong intensification of forestry. These plans included, among others, the full-scale shift to forest cultivation by means of artificial regeneration. Afterwar developments in the American and Swedish forestry were seen as examples to follow.

The intensification of forestry in the private forests was, however, hampered by a lack of funding. Finally, the organizations of forest owners and the forest industries entered in cooperation in view of finding out a solution to this problem. The Bank of Finland assumed the role of coordinator of the emission of a long-term bonded loan for forestry purposes in 1964.

The intensification and mechanization of agriculture and forestry and the promotion of the vertical integration of production by the cooperatives of farmer-forest owners contributed to the formation of an integrated agro-industrial complex and to the extension of the forest industries complex in Finland. The consolidation of these large-scale units had a great influence on the development of rural structures in the country during the 1960's (cf appendix 1 and 2).

The delocalization of activities connected to farm-forestry proceeded, by and by. The use of imported oil replaced fuelwood use. Foreign machinery and equipment using imported fuel replaced traditional simple tools. Debarking of trees shifted from the forests to the mills. The professionalization of forest workers and the formation of a machine contractor system contributed to the delocalization and to a de-seasonalization of forest work. The new regeneration practices promoted by forestry associations utilized external sources of seed and seedlings. The regional forestry board system responsible for private forestry transformed to bureaucratic administrative machinery which aimed at promoting the intensification of forestry by all means.²³⁾

Although all signs pointed out that the agricultural policy based on a complex system of subsidies was leading toward a serious crisis, the Government continued this policy. Many experts presented technocratic rationalization plans as an alternative. Finnish populism was clearly lacking creative intelligence since few discussion took place concerning viable alternatives in view of the impending danger of rural depopulation. The adoption of a consistent regional

policy was quite late taking into consideration the structural crisis in the countryside.²⁴⁾

The promotion of the income level and working conditions of forest workers by political means together with the rapid rise of stumpage prices increased the pressure for mechanization of forest works. The leading experts in forest technology required the adoption of large-scale mechanization by criticising the inefficient small-scale logging and transportation practices carried out by forest owners by themselves. The adoption of the large-scale mechanization was considered to be consistent with the intensification of silviculture, especially with clear cutting and artificial regeneration.²⁵⁾

Table 4.

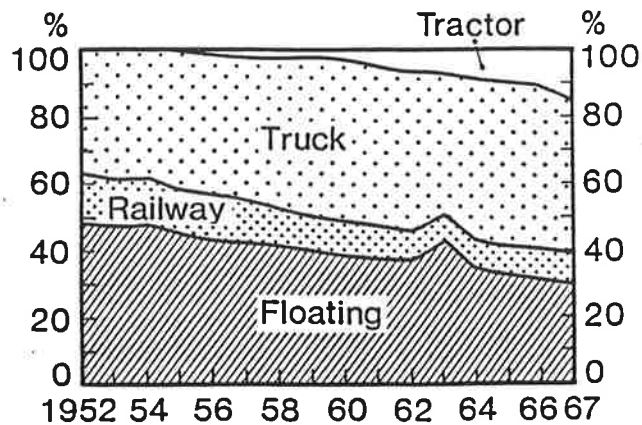
Chain saws by country of manufacture in Finland in 1963

Country	Main trade marks	Percentage
United States	McCulloch, Homelite	56.6
Sweden	Rakett, Partner	18.6
FR Germany	Stiehl, Solo	17.2
Canada		5.3
Finland		1.3
Norway		1.0

Source: S. Sivonen: Machine Costs in Logging With Power Saw in Finland in 1951-1963. Communications Institutii Forestalis Fenniae 59.4, 1965.

Figure 3

The Distribution of Transport Methods for General Movement of Raw Timber in Finland, 1952-1967



Source: P. Yli-Jokipii: Timber Floating: its Importance and Regional development in Finland Since the Second World War. TESG 51, 1970 p. 351.

The mechanized machinery and equipment in forestry mainly stemmed from the United States and Sweden. The domestic engineering industry was absent from the markets of caterpillars and chainsaws whereas the domestic production of tractors, trucks and excavators was limited. The auxiliary equipment was mainly made in Finland. The triumph of the truck in the long-distance transportation was confirmed mainly at the expense of the typically domestic floating system.

The leading forest researchers of the afterwar generation adopted the traditional ambition of the Finnish forest researchers to be the guide for the formation of forest policy and the planning of forest use. They were eager to realize the technocratic silvicultural supermyth of the forestry profession aiming at a radical increase in the yield of the forests. They tried now to promote this target by elaborate statistical long-term forecasting methods and plans to increase the allowable cut in connection. In their opinion, the only value of the forests was the industrial mobilization of wood. Technical and economic research was seen as the new key for success.²⁶⁾

The realization of these plans presupposed a shift to a new techno-intensive forestry system. The silvicultural idea of the experts was quite simple: the more inputs will be used the more can be cut. This could be called an idea of the forests as a production automate. The new long-term plans paid few attention to socio-economic factors. They neither took into consideration that no previous experience was available about techno-intensive forestry in the Northern Coniferous Zone and that the Finnish forest research had traditionally hardly focused on special problems of intensive forestry. Basic research was again neglected as almost all the forest research now directed to the study of practical problems of the intensification.²⁷⁾

A lack of environmental and socio-economic impact assessment characterized the intensification and mechanization of forestry. Although the realization of the plans of the forestry technocrats signified the greatest transformation of the Finnish nature since the stabilization of the conditions after the last Ice Age, no critical assessment stemmed from the community of natural scientists!²⁸⁾

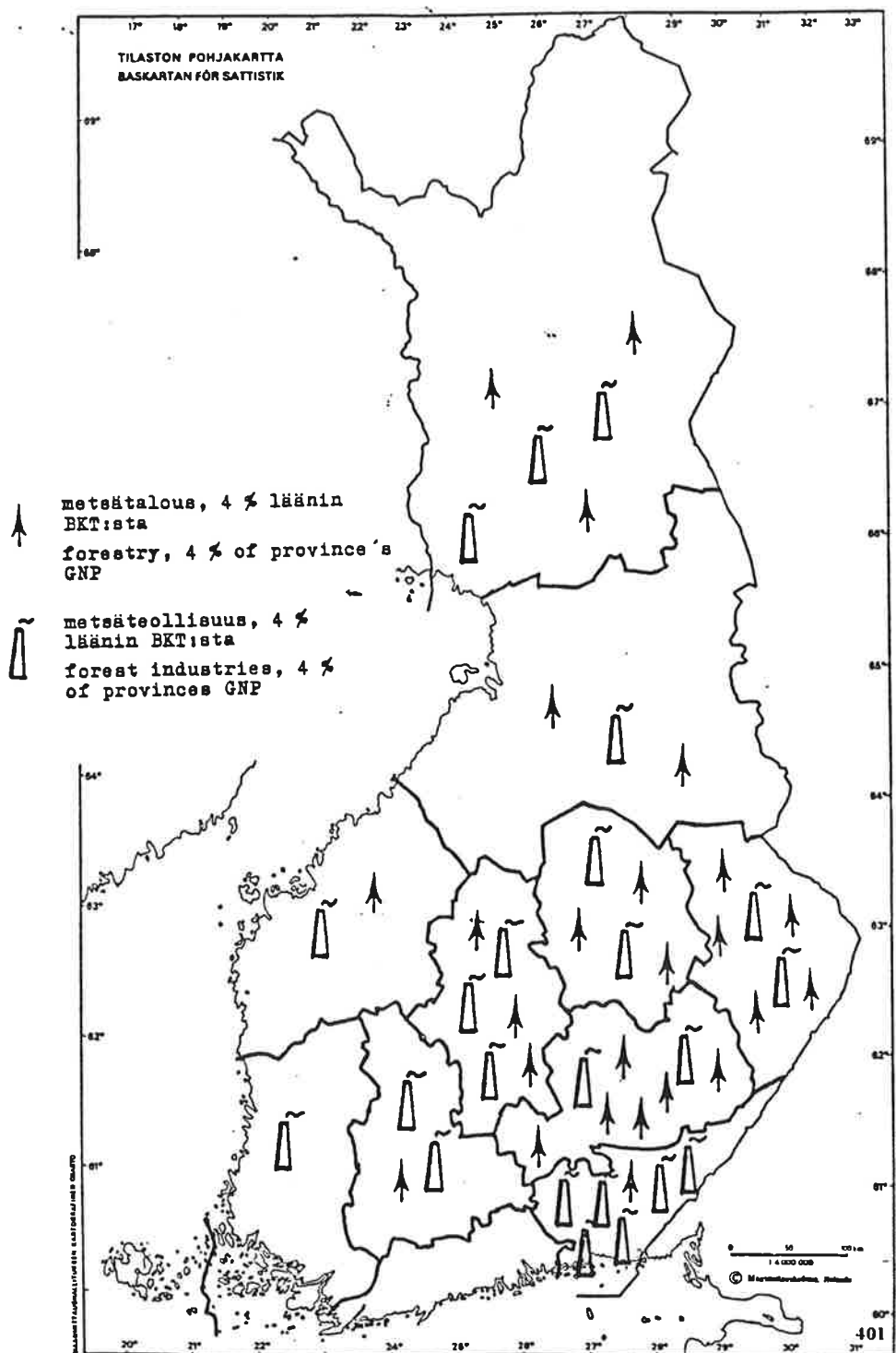
The Conservation Movement started, however, to adopt a critical attitude vis-a-vis certain industrial development projects, such as against the plan to erect a joint Norwegian-Finnish pulp mill on the coast of the Arctic Ocean which would have obtained wood from northernmost Lapland. It was said that this project would lead to a slaughtering of the forests in northernmost Lapland. On the other hand, some conservationists remarked that the intensification programmes did not pay any attention to multiple use of the forests.²⁹⁾

6.2 The Period of Rural Depopulation, 1966-1973

After the Left gained the majority in the parliamentary elections in 1966 and a new Left-Centre government under the leadership of Social Democrats was established in 1966, great changes started in the policy with regard to rural areas in Finland. The Social Democratic Party aimed at fol-

Map 2

The Role of Forestry and Forest Industries in Different Provinces in Finland



Source: H. Seppälä: Metsäsektorin alueellinen merkitys Suomessa (Regional importance of the forest sector in Finland). Folia Forestalia 269, 1976 p. 11.

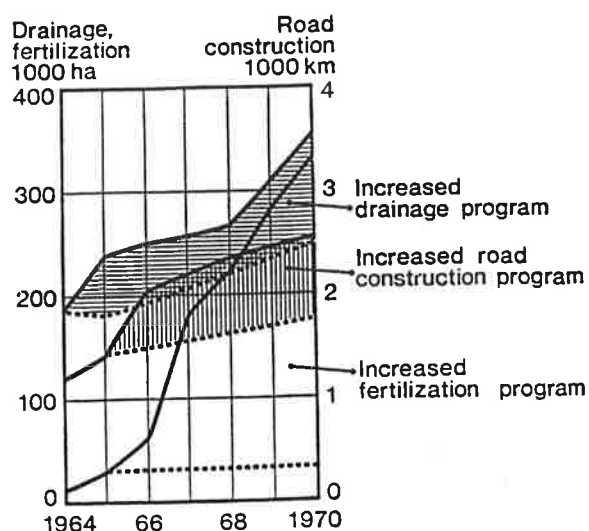
lowing the Swedish development model by introducing the rationalization of agriculture, an active regional policy and the promotion of modernization of the society.

The agricultural policy experienced a radical change. Milk production and the cultivated field area were reduced and the promotion of rural colonization ceased. An active labour market policy was established in view of transferring people from the countryside to urban occupations. A new regional policy promoting the creation of growth centers was introduced according to the dominant ideas in the international discussion of the late 1960's. Public subsidies were now given to the afforestation of fields, among others, and new workers' representatives were installed in the district forestry boards.

After the problems of funding of the intensification of forestry in the private forests had been solved, the mechanization of operations expanded from the state forests and the company forests to the farm forests. The Central Forestry Board Tapio which coordinated the intensification works transformed to a large administrative machinery. Clear cuttings, mechanized site preparation, peatland drainage, fertilization of forest soil, artificial regeneration and the use of herbicides extended overall the country. Because unused capacity was liberated from other uses, such as from land reclamation and drainage, the expansion of forest and peatland drainage was even more rapid than predicted. Forest improvement works served as public works to alleviate unemployment in the peripheral regions. The Finnish engineering industry was active in the development of specific machinery and equipment for forest improvement.

Figure 4.

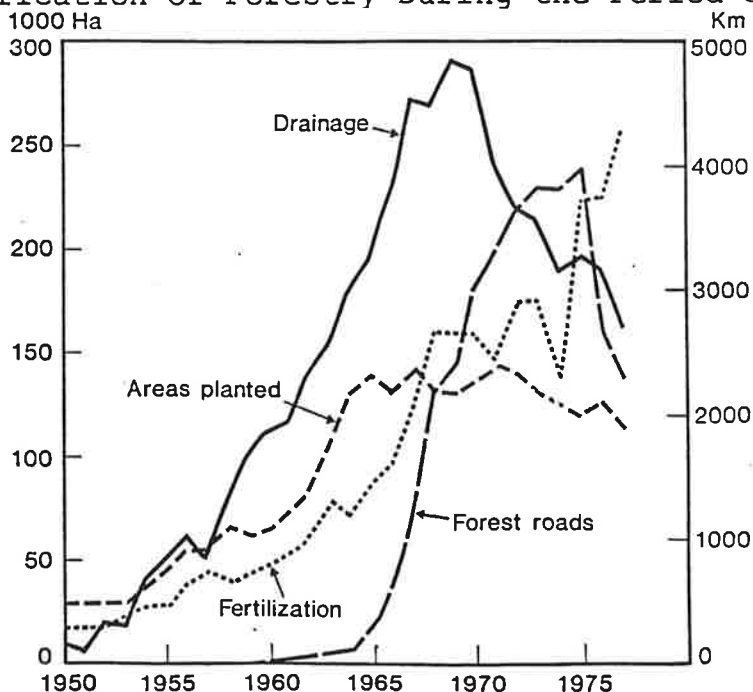
Increase in Drainage, Road Construction and Fertilization in Mera-Programmes in the 1960s



Source: V.J. Palosuo: Mera-ohjelmat Suomen metsätaloudessa (Mera-programme in Finnish forestry). Acta Forestalia Fennica 165, 178 p. 8. (slightly modified).

Figure 5

The Intensification of Forestry During the Period of Mera-programmes



Source: I. Hustich: Suomen maisemat muuttuvat nopeasti (Rapid change of landscapes in Finland) *Terra* 92, 1980 p. 108.

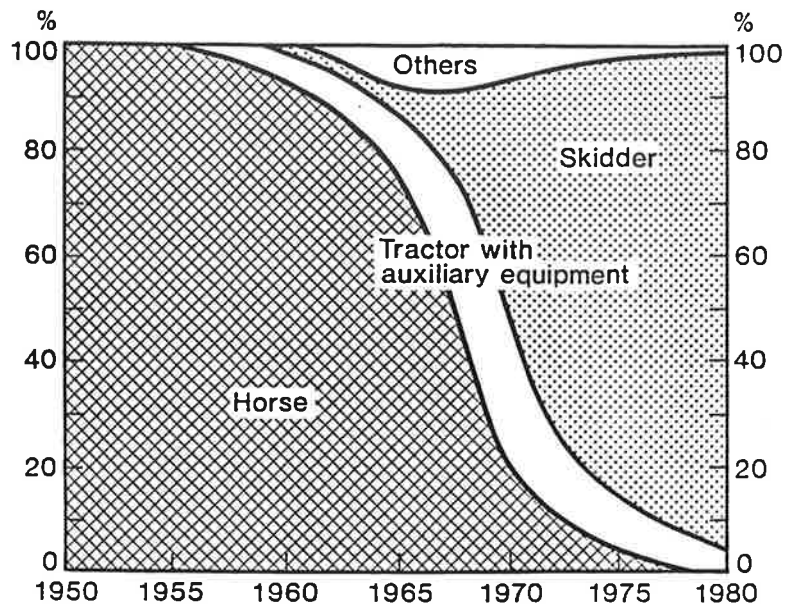
The rise of domestic wood costs and labour costs together with the difficulties experienced by the exports of the forest industries in the international markets speeded up the diffusion of new technics, such as the skidder, to the logging operations. The industry paid special attention to the cutting down of transport and hauling costs. The domestic production capacity of logging machinery and equipment expanded in the late 1960s and, in view of the market situation, it served the needs of large-scale operations, professional forest workers and machine contractors. No specific machinery was developed to serve small-scale farm forestry.

The programmes for the intensification of forestry in the private forests, the so-called MERA-programmes, made from the organizations of private forest owners more and more like sections of the public administration. The leaders of these organizations understood better and better argumentation of the industry. The industry and the experts in forest technology emphasized that the use of tractors in hauling and the small-scale operations on the farm forests raised the procuring costs of wood and consequently diminished stumpage price.³⁰⁾

The direction of the Central Union of Agricultural Producers, which mainly represented the farmers of the South, accepted this argumentation, by and by. It started to prefer sales on the stump to delivery sale in the negotiations with the industry. As a concrete example of this collusion of interests, the director of the Forestry Council of the Central Union of Agricultural Producers became the new director of the Woodland Department of the Central Association of the Forest Industries. In addition, Metsäliitto Ltd, the forest industries cooperative established by the forest owners' organizations supported the activities of the forest technology division of the Central Association of Forest Industries rather than the work of the Work Efficiency Association which suffered from a lack of funding.³¹⁾

Figure 6

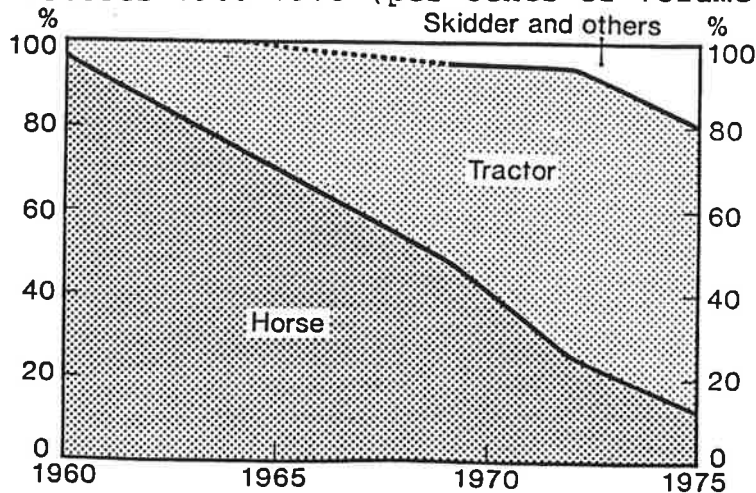
The Development of Hauling Methods in the Logging Operations of the Forest Companies and the National Board of Forestry, 1950-1980



Source: H. Vesikallio: Metsäteollisuusyritysten puunhankinta muuttuvassa yhteiskunnassa (The timber procurement of the forest industries in a changing society). Metsäteho report 371, 1981 p. 38. (Slightly modified).

Figure 7.

The Development of Hauling Methods in Delivery Sale in Private Forests 1960-1975 (per cents of volume)



Source: M. Kantola & J. Mäkelä: Korjuu hankintakaupoissa (Logging in delivery sale) in: Metsä. Tuottava maa 5. (Forest. Productive land 5.) Helsinki 1978 p. 370.

It can be stated that the dreams of the forestry profession about the domestication of the private forest owners were becoming close to reality through the integration of the leaders of their organizations in the forestry technocracy. In addition, many foresters were content to see the disappearance of dwarf and small farms. Typical of the situation was that some foresters even run the risk to talk about the separation of agriculture and forestry from each other.³²⁾

These victories in the South turned out to be, however, relative due to the misfortunes in the North. The intensive forestry met with crisis in Lapland in the late 1960s. The overcapacity of the pulp and paper industry in the province due to political decisions resulted in continuous overcutting. Climate became colder temporarily and the regeneration of forest after large clear cuttings met with difficulties. The rapid change of landscapes and ecosystems through clear cuttings, massive peatland drainage and site preparation by plowing together with problems of forest regeneration invited a strong criticism from the side of the Conservation Movement. Local multiple uses interests, such as reindeer herders, protested as well. The National Board of Forestry tried to answer to the criticism by setting an upper limit of clear cut areas to 20 - 30 ha in Lapland.

For the first time in the history of independent Finland, a clear confrontation took place between the Conservation Movement and the forestry profession in the late 1960s. The Movement was able to expand its social basis and it looked for allies among the expanding touristic interests. It required the creation of new nature parks in northern Finland. Furthermore, the diffusion of radical ecological ideas from North America reached Finland around the year 1970.³³⁾

Because of difficulties in forest regeneration in Lapland and the growing criticism against the intensive forestry, the forestry profession, especially forest researchers, arrived at a little confused state to the 1970s. The leading professors were, however, in the forefront of the forestry

technocracy promoting the continuous intensification of forestry. Their faith was not shaken by the misfortunes in forest management. It was thought that insufficient research was the main cause of the difficulties. Therefore, the problems could be solved by investing more resources in forest research. The internal dissensions among the forestry profession were marginal and active foresters started a struggle against the Conservationists. No question was posed whether the intensification model adopted was appropriate to the natural and socio economic conditions in Finland.³⁴⁾

The automation of sawmills, the limitations of agricultural production together with the speeding up of the mechanization of logging operations, the reform of the business taxation favouring capital intensive production, the construction of good roads as public works to alleviate unemployment in the peripheral regions, the breakthrough of television, and the establishment of an active labour market policy all together provoked a massive rural depopulation in Finland at the end of the 1960s and at the early 1970s. This kind of transformation was unexpected and the Finnish economy and society was unprepared to it. A part of rural migrants left for Sweden where manpower was needed and southern Finland experienced difficult housing problems, among others.

Due to the rapid rural depopulation, the speed of urbanization attained one of the highest levels in afterwar Europe. The explosive character of this transformation was a direct consequence of the politically motivated long-term delay of urbanization. The rapid rural depopulation signified a deep crisis of the traditional rural civilization and provoked a sense of rootlessness among the left over and the emigrants. The peripheral regions were filled with embittered old people whose world and world view had been destroyed.

Figure 8.

The Impact of Unused Capacity and Sectoral Shifts in the Regional Construction Industry Complex in Northern Finland in the Late 1960s.

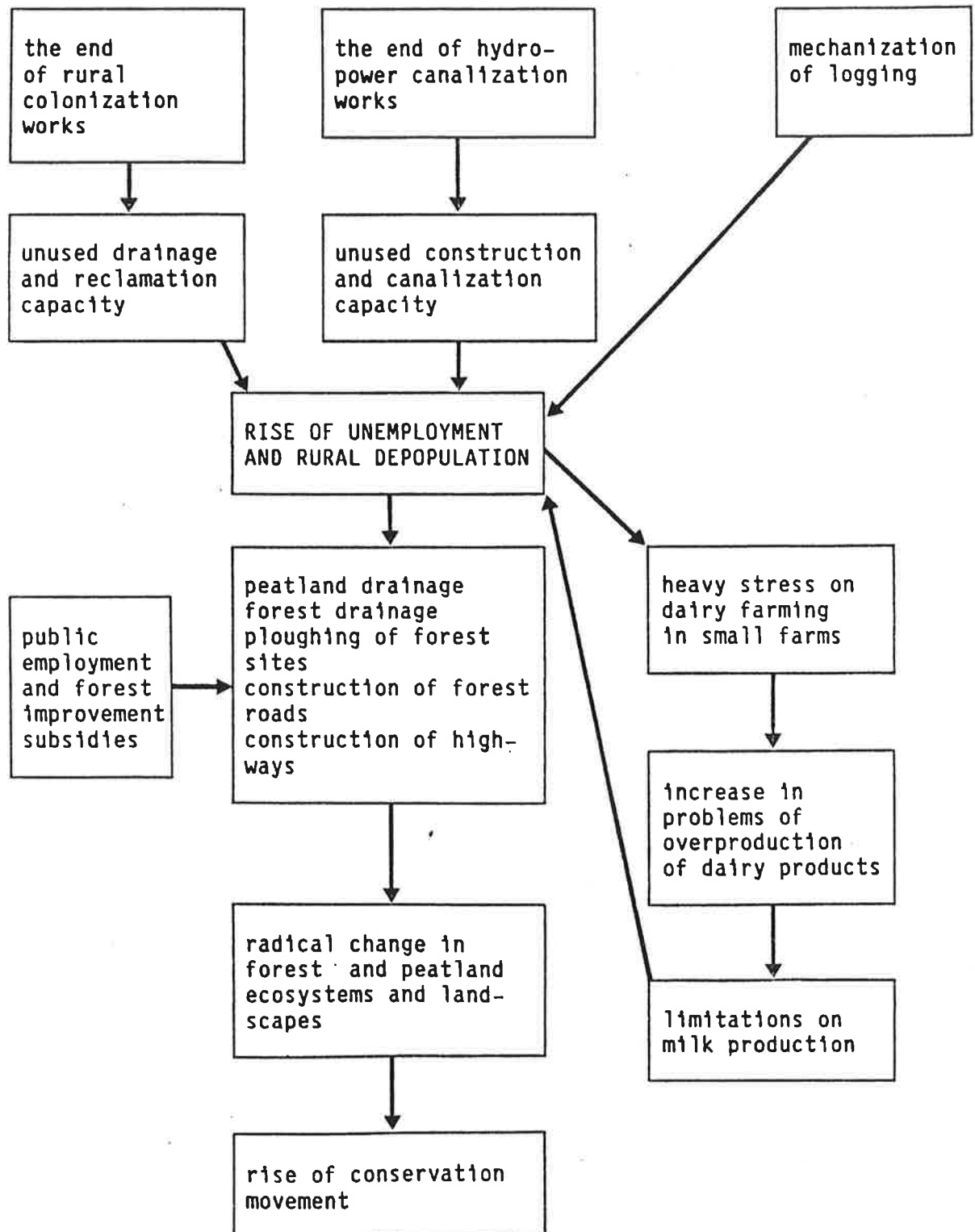
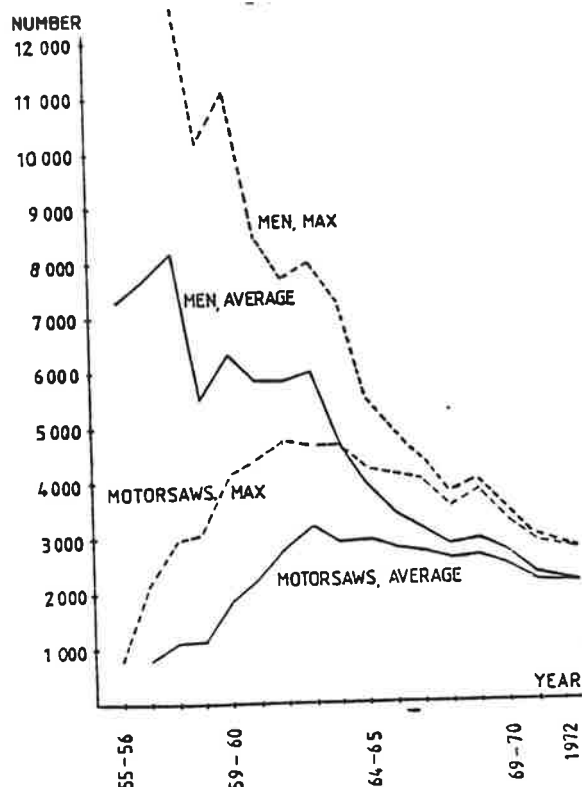


Figure 9.

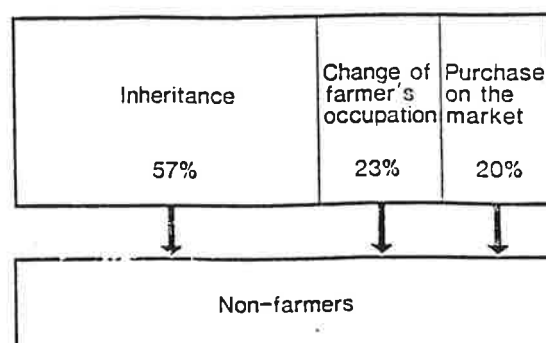
The Number of Men and Chainsaws in Logging Operations of the National Board of Forestry, 1955-1972



Source: U. Silvennoinen: Metsätyön rationalisoimisesta ja sen vaikutuksista työvoimatilanteeseen (The rationalization of logging operations and its impact on employment). Lapin tutkimusseuran vuosikirja 15, 1974 p. 7.

Figure 10.

The Channels of the Increase of Forest Ownership by Non-Farmers in Central Finland, 1945-1970



Source: A. Reunala: Yksityismetsätalouden rakennemuutos (Structural change in private forest ownership in Finland) in: Ihminen ja metsä (Man and forest), Helsinki 1977 p. 78.

The parliamentary elections in 1970 were so-called protest elections in Finland. The Left lost its majority, and the populist Rural Party which was able to canalize popular discontent in the rural peripheral areas gained a considerable victory. The new Christian Party which defended traditional Christian values entered Parliament as well.

It was only at the beginning of the 1970s that studies in rural sociology were initiated in Finland. A destruction of the traditional rural society seemed to be necessary before social scientists started to pay attention to the problems of rural development in the country of their own. The writing of popular novels about rural world started to expand at the early 1970s as well. The tone of this type of novel was quite pessimist and critical vis-a-vis the experience of rural depopulation. It was lacking all the romantic characteristics that had been typical of novels associated to the floating during the interwar years.³⁵⁾

The experience of rural depopulation made the government reform the regional policy to promote the creation of small and medium-size enterprise in rural areas. The proposals of the Committee for the Industrialization of the Countryside from the year 1951 gained suddenly a new actuality twenty years afterwards and after the predicted catastrophe.

The delocalization of farm forestry, however, continued. The contracting role of delivery sale signified a growing entry of professional forest workers and machine contractors to farm forests and an increased use of heavy machinery in logging and hauling. The prevailing inheritance law together with rural depopulation shifted a growing share of farm forests in the hands of absentee dwellers. Consequently, a part of stumpage prices leaked now out of the countryside.

After the Central Forestry Board Tapio centralized nurseries, the seedlings were transported from far away to farmers' forests. The local forestry association told the forest owner how he should regenerate the forest. The freedom of action of the private forest owner diminished all the time.

Table 5.

National Programmes on Intensive Forestry in Finland

<u>Programme</u>	Potential removals (mill. m ³ per year) ¹⁾	
	1980	2000
HKLN in 1961	-	56.4
Teho in 1962	-	63.2
Extended Teho in 1964	-	73.2
MERA III in 1969	65.1	77.1
Economic Council in 1969		
- basic programme	58.9	63.5
- minimum programme	61.3	68.0
- maximum programme	69.0	79.9
Forestry Council		
- timber production programme in 1975	-	
- timber production development programme in 1982	-	67.4
Forest 2000-programme in 1984	-	68.1 ²⁾

1) "Conservation reduction" (1.2 mill. m³ per year) excluded from the figures.

2) A target figure.

Source: The General Report of the Forest 2000-programme, Helsinki 1985 p. 122.

Since most of the professional forest workers and machine contractors stemmed from the countryside and lived in the rural district centres, the delocalization of logging operations was, to a certain degree, relative. In addition, local cooperative and savings banks financed their operations as well as local forestry in general. These banks together with local forestry associations formed local links of the forest industries complex in Finland.

Because the investment in new production capacity was continuous in the pulp and paper industry, the Bank of Finland established together with the Central Association of Forest Industries a system of investment regulation in 1970. New capacity could be created only if there were unused forest resources available for expansion. The situation of the 1960s when the industrial overinvestment had led to problems of raw material supply and a rapid rise of wood costs was considered intolerable. It was thought that the intensification of forestry would allow, however, an increase in plans of allowable cut in the future.³⁶⁾

The stronger position of the Political Left in the public affairs somewhat diminished the interest in allocating public funds for the intensification of private forestry because, in the opinion of the Left, the transfer of public funds to the private forest owners enjoying high stumpage price was hardly justifiable. The interests associated to the continuation of the MERA-programmes started to look for international funding possibilities being able to attract the interest of the World Bank in the promotion of rural forestry in Finland.

The negotiations took place in 1971-1972 and finally the World Bank provided funding for the project giving loans and technical assistance to private forest owners for reforestation, stand improvment, peatland drainage, forest fertilization, and forest road construction. This was the first rural forestry project assisted by the Bank. It was an international paradox that a rich country like Finland who provided only a few development aid received the assistance.

The economists of the Bank were not eager to provide funding for intensive forestry in northern Finland because it was considered poorly economical. In addition, they required an increase in personnel responsible for the private forests in the Ministry of Agriculture and Forestry, officially the highest coordinating agency of private forestry in Finland. Instead, they paid only a limited attention to socio-economic and environmental impact assessment of the project. It was a kind of irony of history that the project started just after the phase of the great rural depopulation and the start of an active public discussion on nature conservation in Finland. A comprehensive evaluation of this pilot project in rural forestry is still lacking.³⁷⁾

After the funding problems of the new intensification programme of forestry were resolved, and in view of the boom in the international markets, the Finnish forest industries started again a strong investment upsurge in 1972-1973. An inflationary overheating of the national economy followed with the result of local shortages of raw material and and the considerable rise of stumpage prices. In spite of high stumpage prices all private forest owners were not willing to sell timber any more. The development of the wood market became more unpredictable than before.

7. The Rise of a Conflict-Ridden Forestry System, 1974 Onwards

The deep recession in the international economy during 1975-1977 hit hard the Finnish forest industries as well. The exports of forest products diminished and the introduction of new technology, and the automatization and rationalization of the production speeded up. During the late 1970s, the Department of Trade and Industry commissioned a report on the problems of the forest industries from the leading consulting engineering company, Jaakko Pöyry Ltd. On the other hand, scholars associated to the Finnish Forest Research Institute developed a dynamic forest sector model for the Finnish sector.

These studies revealed development tendencies which were to make the forest sector a crisis sector in the future. Limits of domestic expansion possibilities were close, the competitiveness was in decline, and the domestic costs were rising. According to the reports, the Finnish pulp and paper industry should shift to quality and high value added products (Jaakko Pöyry 1979; Seppälä & Kuuluvainen & Seppälä 1980).

The new intensification programme of forestry which started at the early 1970s continued up to the middle of the decade. After 1975, investment in forestry declined in the wake of economic recession. New resources at disposal for forest research, better results of regeneration achieved in Lapland, and the funding of forestry by the World Bank raised new confidence among the forestry technocracy. Since a shortage of industrial raw material was in view after the new extensions of the forest industries, studies in whole tree logging and use of stumps and logging residues as industrial raw material started. On the other hand, plans about the extension of cuttings to the protection forests in northernmost Lapland and to the forests on the top of the mountains in northern Finland were presented. The aim was to mobilize the biomass of the Finnish forests more and more intensively in the future.

Due to the considerable rise in oil price, studies on the cultivation of rapidly-growing forests for energy use started and people in the countryside increased again fuelwood use. The planners of regional policy adopted the idea to integrate the promotion of fuelwood use in the tools of the policy for development of the peripheral areas. The results in this field have been, however, limited because of the high cost of domestic fuelwood and continuous changes in the world markets of fossil fuels. On the other hand, the forest industries have not accepted the use of the wood valuable as industrial raw material for fuel.

Thanks to the continuous rise of wood costs the industry made effort to cut down the transportation and logging

costs. The network of forest roads expanded and improved. Following the skidder, new harvesters were introduced in the late 1970s. The domestic production of logging machinery and equipment expanded all the time resulting in the exports of those items as well.

The Labour Union of Rural Workers went on strike for the shift from the traditional piece work contract system to time rate system in 1980. According to the Union, forest work should become similar to the work in the industry to all respects. The employer side kept a hard line in the dispute and, finally, the direction of the Union was obliged to close the strike without achieving positive results. The existence of a large group of independent machine contractors and truck drivers was an important factor in the settlement of the dispute.³⁹⁾

A populist criticism against the heavy mechanization of logging started in northern Finland in the late 1970s. It was said that the use of heavy machinery provoked unemployment and was economically inefficient. Because of this criticism, the National Board of Forestry restricted the introduction of harvesters to the public forests.

Even though the Central Association of Forest Industries and the Central Union of Agricultural Producers established a permanent negotiation system for the regulation of the wood market, the system did not work well. During the upward cycle, local shortages of raw materials resulted in a significant rise of stumpage prices irrespective of agreements. In addition several reasons, such as absentee ownership, the immunity of the forest property vis-a-vis inflation, the growing wealth and discontent with the bureaucratic rule among private forest owners restricted the propensity to sell timber from the private forests.

The realization of the new intensification programme of forestry and intentions to extend the cuttings in Lapland made speed up the efforts of the Conservation Movement to extend the protected area. The Movement which grew

stronger all the time looked for new allies among the members of Parliament. The Centre-Left coalition Government established committees to study the extension of national and nature parks and the protection of peatlands at the early 1970s. After the proposals of the committees were published, the Government took decisions of principle about the extension of the network of national and nature parks and the protection of peatland in 1977-1978. The National Board of Forestry and private landowners were critical to these proposals and decisions.⁴⁰⁾

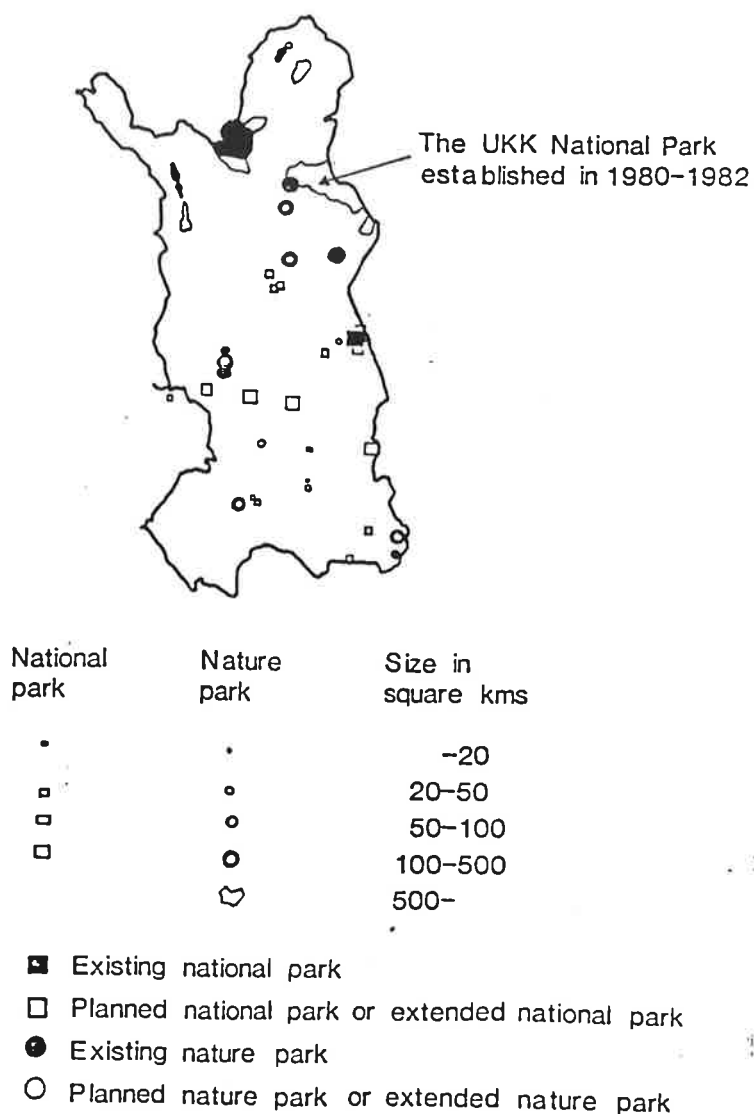
Critical voices against the techno-intensive forestry system were heard even from the side of the forestry profession at the late 1970s. Some students of multiple use and the role of forestry in rural and regional development had doubts about the rationality of the development model which paid almost no attention to multiple use interests and contributed to the decline of rural settlement.

At the same time, a popular movement against spraying of herbicides spread among the people in the peripheral regions. Rural women with great interest in picking berries participated to this movement. Typical of the late 1970s was a general rise of rural activism in Finland. The so called village movement aimed at revitalising the life in the villages all over the country. Human geographers supported this movement by means of participatory research.

It can be stated that the monopoly of knowledge and the authority of the forestry technocracy began to be put seriously into question in the late 1970s. A certain pluralisation of the discussion about forestry took place in Finland. The forestry profession had difficulties in learning a dialogue with people with other views of forests and forestry. Mass media became strongly involved in the forestry discussion, by and by.

Map 3.

The Existing and Planned Nature Parks and National Parks in Northern Finland in 1976



Source: The Proposal of the National Park Committee 1976, 31

The continuous investment, heavy debts, the rise of interests rates, and high domestic costs together with low profitability pushed the Finnish pulp and paper industry in a very difficult situation in the 1980s. A rapid restructuring process led to several mergers among the companies in the middle of the decade. On the other hand, a certain internationalization of production took place.

A strong restructuration of the sawmill industry with severe production cuts and the closing of many sawmills took place as well and the mechanical wood industries in general experienced great difficulties. As the share of the exports of basic metal and engineering industry products has surpassed that of the forest products, the basic tenets of the traditional forest fundamentalism seem to have lost a part of their actuality, by and by.

The faith of the future of the forest sector has not, however, declined. The Economic Council in Finland took the initiative for the preparation of a new long term plan of intensive forestry at the early 1980s. The hard core of forestry technocrats at university, at the Finnish Forest Research Institute, and in the forestry administration supported by the forest industries and the Central Union of Agricultural Producers presented the new Forest 2000 Programme with ambitious targets to increase the cuttings and the growth of the forests in the middle of the decade.

The planning of new programmes of intensive forestry is built in the very logic of the techno-intensive forestry system adopted in the 1960s. The attainment of high targets of forest yield presupposes continuous heavy cuttings, plantations and new inputs to forestry. The preparation of long-term plans is close to the hearts of the leaders of the afterwar generation of the forestry technocracy. The system provides many jobs and the existing structures of forestry administration, forest research, logging, forest improvement, and nurseries closely relate to it. In addition, special industries have developed to supply the system.

The interest coalition for the continuation of the system is therefore strong in the country. The existing organizations made their best to consolidate their positions by legislative means when a reform of forestry law was undertaken recently. For evident reasons of public relations, certain attention was paid to multiple use in the preparation of the Forest 2000 Programme but this did not seriously affect the targets of programming. The severe cuts in the production

capacity of the mechanical wood industries undermined, however, the foundations of the Programme almost immediately after its publication.

On the other hand, the development of the age classes and conditions of the forests due to the intensification programmes have started to pose new challenges to the established logging system, by and by. The need of thinnings is growing all the time but it is not possible to use heavy machinery for this purpose. That is why a lighter machinery has been developed and the participation of farmers is again asked for logging operations.

Because of difficulties in agricultural production and the heavy indebtedness the farmers have also taken a growing interest in participating in logging operations by themselves during the last few years. This together with the cutting of the capacity and the mergers in the forest industries provokes unemployment among professional forest workers. The forest industries and the machine contractors, for their part, have started to require an access to the public forests where, in their opinion, inefficient cutting methods are practised.

At the same time, criticism against intensive forestry practices is mounting in the country. Critical assessment of the past drainage operations is presented, artificial regeneration has continuously met with difficulties in northern Finland, the plantation forests, especially the pine stands, are beset with diseases and producing low quality wood, and the problems of the impact of acid rain are raising growing awareness.

A new dimension in the critical discussion is that even some silvicultural experts have started to demand for forest management alternatives closer to nature. Among others, ideas close to the "Dauerwald"-idea in Germany during the interwar years have been put forward. In general, the scope of forestry discussion has become more multisided than before as international comparisons of the forestry practices

are presented, study of tropical forestry has started, and the number of scientists who have become involved in the forestry discussion is growing.⁴¹⁾

Some private forest owners have challenged the dominant ideas of forest management by requiring the right to use alternative management methods in their lands. This opposition has led to situations where the courts have been obliged to decide how the Private Forestry Law from the year 1928 should be interpreted. An independent organization of private forest owners has been created as well.

A change in the directives for forest management in the private and public forests is taking place. More attention is paid to local conditions, natural regeneration, prescribed burning as a method of site preparation, and the significance of birch in general.

The Conservation Movement, supported by the tourist interests, gained a great victory in Finnish Lapland, as the Government established the vast UKK national park close to the Soviet frontier. The name of the new park stems from the initials of the former President of Republic, Urho Kaleva Kekkonen. The choice of the name was tactically wise but ambivalent, to a certain degree. Urho Kekkonen had been a very active and influential promoter of the mobilization of natural resources in northern Finland with negative implications for conservation in the 1950s and early 1960s.

In general, the realization of the plans for natural conservation established by the Government at the late 1970s was slow because of lack of funds and the opposition to the projects. The Ministry of Environment was created as late as in 1983. For example, the National Board of Forestry, the forest industries in northern Finland and local communes strongly opposed to the creation of the UKK park. A compensation programme for the local communes was included in the decision concerning the establishment of the park whereas the overcapacity of the forest industries vis-a-vis the

regional wood supplies became still greater than before in Finnish Lapland.

New developments at the early 1980s included the rise of the Green Movement to a political factor in Finland. This Movement mainly stemmed from the urban middle class and consisted of different groups, such as ecologists, disillusioned marxists, feminists, and others. The Greens have carried on an active discussion on development alternatives but they have presented few concrete ideas about the organization of natural resources utilization in Finland.

Since the agriculture is arrived at a state of crisis due to problems of overproduction, heavy indebtedness, and the rise of the production costs, new emphasis is given to side-occupations in the policy for the promotion of development of rural areas in the 1980s. Because forestry formed an integral part of the combined farming in Finland traditionally, new attention is paid to the role of forestry in rural development.

Some experts have proposed the creation of special forestry farms which would possess forest properties large enough to guarantee a steady flow of income to the farmer. The return of delivery sale had given new actuality to the traditional ideas of rural self-reliance. Forestry machinery and equipment well suited to the needs of a farm should be developed and the use of large-scale machinery should take place cooperatively.

A weak point in these ideas is that their application in practice does not produce any new employment in the countryside. The question is about a zero-sum game: the more the farmer gains, the more the professional forest worker and the machine contractor loses. The viability of the farms will, of course, improve this way.

The use of small-scale machinery in logging, delivery sale, the use of natural regeneration or locally produced seedlings, the practice of soil preparation without large-scale

machinery, the use of wood as fuel instead of oil all together will lead to a certain relocalization of activities in forest farms.

One can observe certain tendencies similar to the German discussion 1918-1939 in the recent Finnish discussion on forest management. The arguments for "the commercial forest close to nature" are not, of course, as sophisticated as in the German discussion. Since typical of the actual forestry discussion everywhere is a lack of a sense of history, this German discussion is absent.

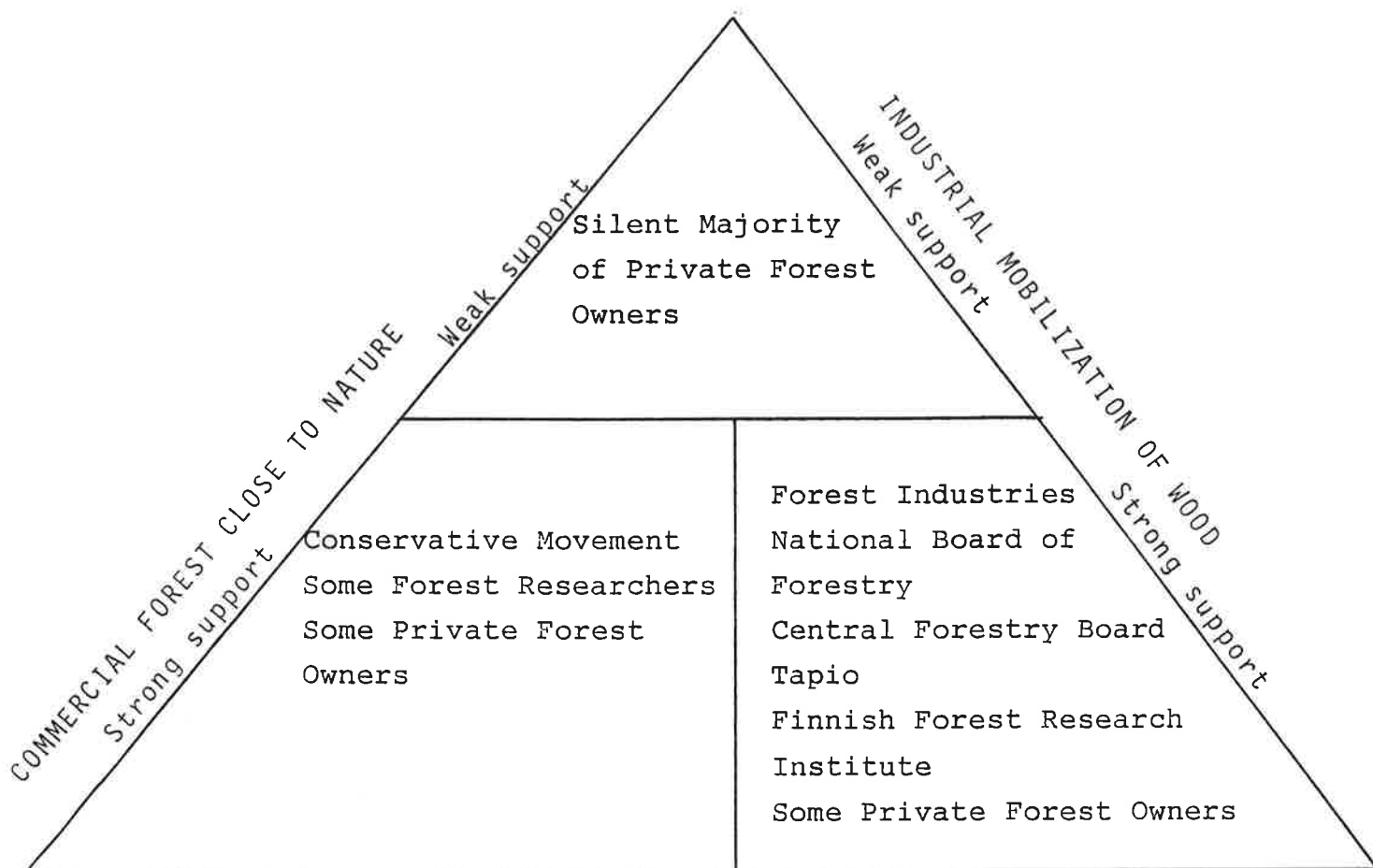
Certain themes similar to those that were dealt with in the discussion in Finland during the 1950s can be observed as well. The attention paid to the alternatives for heavy mechanization of logging or to forest management methods appropriate for forest farms are good examples of that. In principle an appropriate system of mechanization and intensive forestry appropriate for the Finnish natural and socio-economic conditions is looked for.

The large extension of the forest industries, the existence of the strong structures of the techno-intensive forestry together with very high stumpage prices make, however, the search for alternatives in the actual situation much more difficult than in the 1950s. Most of the forest owners who criticize the techno-intensive forestry and the heavy mechanization of logging would like to gain high stumpage prices continuously. The farmers who adopt delivery sale want to gain as high stumpage prices as before although the heavy mechanization or lower stumpage prices were clearly posed as alternatives during the late 1960s. Finland still needs its forest industries whereas the wood costs which are among the highest of the world undermine its viability.

There are no examples available about a deintensification of the forestry on a national level among the industrialized countries. In Finland, the situation is actually perplexed because the silent majority of the private forest owners does not really know where it should stand:

Table 6.

Attitudes Toward Forest Management in Finland in the 1980s



It may be so that the forestry system in Finland will develop toward a more pluralistic system in the future. Different methods of forest management will be applied in company forests, public forests and private forests, and in various parts of the country. Similarly, different logging technologies are used. The engineering industry which produces heavy forest improvement and logging machinery will look for new outlets in such countries where this kind of machinery will be still used on a large-scale, such as Sweden, U.S.S.R., Canada and U.S.A.⁴²⁾

8. References

- 1) Section 2.1. Views on Forest and Forest Management in Germany was added to the study according to the comments on the preliminary draft which was presented at the meeting of the WIDER study programme in Helsinki, Finland, August 4-8, 1986.
- 2) Historical processes up to early 1960s are presented in the basic draft for the study written in July 1986 cf Raumolin 1986b.
- 3) I have dealt with these historical issues formerly in a couple of studies cf Raumolin 1982b, 1984a, 1984b, 1984e and 1985e.
- 4) I have dealt with the specific geographical and institutional basis of the Finnish development formerly in several studies cf. eg. Raumolin 1985a, 1985b, 1985c, 1985d. See also Alapuro 1980. As to the common Nordic characteristics see eg. Streyffert 1956.
- 5) I have dealt with the problems of this chapter formerly in a couple of studies eg. in Raumolin 1984a, 1984d, 1985c. As for specific studies on rural development problems cf Harve 1947, Markkanen 1977, Alapuro 1980; logging technology cf Aro 1942, Putkisto 1970, Talve 1977/78; floating cf Seppänen 1937, Purhonen 1962; forest work cf Makkonen 1981; the development of timber sales cf Hakala 1955, Laitakari 1960. It must be stated that no systematic study has been made about the formation of the logging system and floating system before. A.B. Helander has written a historical description of the development of forestry in Finland up to the late 1930s cf Helander 1949.
- 6) I mean by the notion forest fundamentalism the idea that Finland's economic development and success as a nation is totally dependent on forests and forest industries.
- 7) Eg. the Swiss botanist Eduard Rübel published a book on world-wide comparative botany in 1930 cf Rübel 1930; the German forester Franz Heske created the fundamentals of world forestry in 1931 cf Heske 1931a, the German entomologist Karl Friederichs and the British botanist A.J. Tansley defined the notion ecosystem in the 1920s and the 1930s cf Friederichs 1927, 1930 and 1937, Tansley 1935. Concerning the world-wide resource survey through aerial photography see the review article by the German geographer Carl Troll cf Troll 1939.
- 8) Finnish foresters seemed to be immune vis-a-vis the German struggle of different schools of forestry. As the Finnish forestry gained a firm biological basis and as it was based on appropriate national ideas, the German discussion did not seem to be relevant for the Finnish profession.
- 9) Because of the dominance of natural regeneration and the continuous existence of vast areas of mixed forests, there

were no great conflicts between forest aesthetics and commercial forestry at this time. For instance, the botanist Reino Kalliola who was Inspector of Nature Conservation included commercial forests in his vast panorama of beautiful landscapes in Finland cf Kalliola 1942 and 1946.

10) At the beginning of national independence in the 1920s, Finnish officers copied without criticism tactical ideas from Central Europe. A specific Finnish tactical thought which paid attention to the forested and swampy terrain in the country developed only in the 1930s cf Raumolin 1986c. The sociologist Knut Pipping has pointed out parallelisms between the basic military unit during the war and the logging crew of Pipping 1947.

11) The foresters who dealt with the problems of cattle crazing in forests did not mention that the grazing ground forest was a part of women's territory. Grazing seemed to be only a kind of technical problem to them.

12) I have dealt with the problems of this chapter formerly in several studies cf Raumolin 1974/1980, 1980b, 1981a, 1981c, 1982a, 1984c and 1985a. No general "handbook" of the development of forestry, such as A.B. Helander's book about prewar development, exists for the afterwar period. As for specific studies on rural settlement cf Ilvessalo 1959; logging technology cf Putkisto 1970; floating cf Purhonen 1962, Yli-Jokipii 1970; forest work cf Makkonen 1981; forestry and forest research cf Sarvas 1967, Leikola (ed.) 1979; nature conservation cf Mikola 1963, and Lapland cf Massa 1983.

No systematic analysis of the development of forestry, forest research and mechanization from a consistent socio-economic point of view has been made except my former research effort.

13) A large study on Finnish rural labour force was, however initiated by Eino Saari and the Department of Forest Economics at the University of Helsinki at the late 1940s cf Heikinheimo 1950; Saari 1956. Eino Saari was among the first theorists of progressive sustained-yield, see his paper presented at the Third World Forestry Congress in Helsinki in 1949 cf Saari 1950.

14) I have introduced this classification of rural development strategies in my unpublished study in 1980 cf Raumolin 1980b.

15) The new intensifying sustained-yield stage is the third development stage of the Finnish forestry according to the classification introduced in this study of the former stages presented in the chapter 4.

The main representatives of the North American model were professor of forest technology Theodor Wegelius at the University of Helsinki and research associate of the work study section Metsäteho of the Central Association of Forest In-

dustries Kalle Putkisto cf Wegelius 1950, 1955, 1957, 1958; Putkisto 1950, 1956a, 1956b.

The contours of the Finnish model of mechanization were outlined by Director-General of the National Board of Forestry N.A. Osara, Professor of Forest Mensuration at the University of Helsinki Vilho Lihtonen and the leading forestry experts of the Central Union of Agricultural Producers cf Osara 1957, 1958; Lihtonen 1955; Piha 1957. According to Osara, the mechanization should be carried on in the manner which would not jeopardize the basic rural structures in the country. Lihtonen dealt with the specific needs of silviculture and forest work in small forest holdings. Antero Piha stated that the rationalization of timber procurement should be based on the existing organizations of the forest owners.

Compare the Japanese model of mechanization of small-scale agriculture cf Hall 1958.

16) The Committee for the Establishment of New Nature and National Parks organized hearings with the local people. Some voices of the people are included in the Report of the Committee cf The Report... 1953.

17) The National Board of Forestry proposed, among others, the establishment of special forest workers' villages in remote public forests. These proposals have to be seen as an alternative to the continuation of the traditional rural colonisation policy cf Suominen 1955.

18) Such foreign machinery and equipment as Ford trucks, Caterpillar and Allis-Chalmers "caterpillars", Homelite, McCulloch and Partner chainsaws and Waplan debarkers were used in the Finnish forests.

Among the Finnish state-owned companies, Suomen Autoteollisuus Ltd produced trucks, Valmet Ltd tractors and Vammaskosken Tehtaat Ltd excavators. The Delegation for the Mechanization of Forest Drainage was established in 1952 to support the research and development of forest plows appropriate for the Finnish conditions. The Foundation for Forest Drainage continued the work of this Delegation in 1956. The Smallwood Commission supported the research and development of the use of wood as fuel. The association Floating Efficiency supported the promotion of rationalization and mechanization of floating. The National Board of Forestry was active in the research and development of equipment of forest drainage and scarification in view of the intensification of forestry in northern Finland.

Private Finnish engineering industry was associated with this research and development effort and a private machine contractor system developed side by side with the operations of the agencies of public administration in road construction, peatland and forest drainage, and clearing of floatways cf Huikari 1958 and Wegelius 1959.

19) I have dealt with these imitative tendencies in the Finnish social sciences and their alienation from the Finnish conditions in several studies cf Chapter 3. Social Sciences and the Periphery-Country Finland in Raumolin 1980a.

20) An exception of the rule were Finnish rural labour force studies the results of which were published in 1956. In addition to two foresters, the social scientist Toini Ristimäki was engaged to these studies. She stemmed from the traditional Finnish discipline called social policy whose representatives have been interested in social history and rural development problems.

The studies on Finnish rural labour force produced significant information on the conditions of "rural proletariat" and dwarf farms in Finland cf Heikinheimo & Ristimäki & Väänänen 1956.

21) The Third World Forestry Congress held in Helsinki in 1949 was the first really international forestry conference after the War where important issues such as the development projects of forestry and forest industries in underdeveloped countries were dealt with and where the Forestry Division of FAO presented its first development programme cf Proceedings of the Third World Forestry Congress... 1949-1950.

Among the Finnish speakers, N.A. Osara dealt with the role of forestry in rural development and Vilho Lihtonen with the mobilization of peripheral forest resources but they were unable to put these aspects of the Finnish development in an open international perspective cf Osara 1950 and Lihtonen 1950. Finnish economists and geographers were not, for their part, interested in development economics or geography.

22) I have dealt with this period quite intensively in my studies cf Raumolin 1982a, 1982c, 1983, 1984c, 1985a, 1985d. The thinning out of secondary sources is evident the closer one comes to contemporary issues. As for the studies on mechanization of forestry cf Turtiainen 1969, Putkisto 1970, Suomalaista... 1970, Silvennoinen 1972, Häkkilä 1985; intensification programmes cf Holopainen 1965b, 1970, Palosuo 1979; forest worker cf Heikinheimo et al. 1972; regional aspects of forestry cf Hahtola 1970, 1971; Seppälä 1976; Lapland Leikola (ed.) 1979, Massa 1983.

23) The notion of delocalization used here stems from the anthropological literature. It means the shift of control of affairs outside the local community in the context of technological change cf Pelto 1975.

24) Director of the Work Efficiency Association Matti Sipilä proposed the adoption of a new regional policy close to the ideas of the proposals of the Committee of the Industrialization of the Countryside in 1963 but without success cf Sipilä 1963. A major idea of the time was that the workers eliminated from the logging operations through the mechanization should be shifted to silvicultural works cf Heikinheimo

et al. 1963. The first elements of a consistent regional policy were taken only in the middle of the decade.

25) President of Republic Urho Kekkonen who was the former leader of the Peasant Party became actively involved in the promotion of the position of the forest worker. Theodor Wegelius and Kalle Putkisto together with J.E. Arnkil were the leading exponents of mechanization ideas cf Wegelius 1962; Putkisto 1962, 1964, 1965; Arnkil 1957, 1965.

26) Many of the experts of the afterwar generation visited U.S.A.. Among them, the expert in forest mensuration and management Kullervo Kuusela who became Professor of the Finnish Forest Research Institute in 1962 aimed at becoming the leading ideologist of the new generation. He attacked, among others, conservative opinions among the followers of Cajander's ideas. According to his opinion, the nature could and should be transformed cf Kuusela 1955, 1961a, 1961b, 1962, 1965.

27) Concerning the gaps in research cf eg. Mikola & Kangas & Heikurainen 1959, Holopainen 1965a. In general, silvicultural studies which promised great possibilities of increasing yield seemed to gain reputation cf eg. Sirén 1956, 1964, 1965.

The new holistic view based on the notion ecosystem was missing from the Finnish research cf Symposium of Forest Types and Ecosystems 1960.

28) The research on the impact of mechanization mainly dealt with its impact on jobs cf Putkisto 1959.

The idea of forest fundamentalism was well alive in Finland at the beginning of the 1960s, the botanical research leant still heavily on Cajander's theory of forest types and the Office of Nature Conservation was located at the Finnish Forest Research Institute. There was so no break between the official forestry ideas and the botanical research. Even in the symposium about man's role in the changing the face of Finland organized by the Geographical Society of Finland, the intensification of forestry was only marginally dealt with cf Hustich (ed.) 1960.

29) See the discussion in the review Suomen Puutalous in 1960-1961. In this discussion, the leading forest experts and the conservationists struggled together against political aims to promote the development of the North and to create symbols of Nordic cooperation with few respect on the conditions of the forests. Their struggle was, to a certain degree, successful.

The professor of forest biology at the University of Helsinki Peitsa Mikola remarked, among others, that the idea of multiple-use had been the main theme of the Fifth World Forestry Congress held in Seattle, U.S.A. in 1960. Finnish forestry profession seemed to become isolated from new trends of international forestry cf Mikola 1965, 1966.

30) The leading logging technology expert of the National Board of Forestry J.E. Arnkil and Professor of Forest Technology at the University of Helsinki Kalle Putkisto who was close to the industry were again active in this discussion cf Arnkil 1966a, 1967; Putkisto 1966.

31) The direction of the Central Union of Agricultural Producers and Metsäliitto Ltd became full-sized members of the forest industries complex, by and by. Since the co-operative enterprises produced some machinery and equipment, were active in the sales promotion of machinery and equipment, participated to machine contracting, and the Central Forestry Board Tapio became involved in the management of nurseries, their direction had difficulties to see the world from the point of view of a private forest owner. The existence of interlocking directors between the Central Union of Agricultural Producers, Metsäliitto Ltd, and co-operative enterprises facilitated the adoption of the point of view of the industry.

32) J.E. Arnkil stated in 1966 that the National Board of Forestry had adopted the active labour market policy already before the Government. Kullervo Kuusela and Samuel Kaurinkoski required the liberation of forestry from its traditional links with agriculture in 1967 cf Arnkil 1966b; Kuusela & Kaurinkoski 1967.

33) A collection of articles "Luonnon puolesta" (For nature) initiated the radicalization of the Conservation Movement in Finland in 1968. The special issue of the review of the Movement Suomen Luonto on the forestry in Lapland in 1970 was the first strong attack against intensive forestry practices. Young botanists and biologists did not accept the modernized version of forest fundamentalism any more cf E. Kivi & J. Lokki (eds.) 1968; Metsänumero 1970.

34) The desperate mood of forestry experts can be well observed in the special issue of the review Metsä ja Puu about the problems of forestry in Lapland in 1969 cf Onko Lapin metsätalous hätäaputyötä? 1969.

Because the intensification of forestry was the Great National Task for the foresters and created new job opportunities for the profession, critical questions were hardly posed. The existence of only one Faculty of Forestry in Finland, the integration of the professors of the Faculty to the MERA programmes, and the hierarchical attitudes typical of the profession facilitated the elimination of internal dissensions. Only some members of the older generation, such as Professor emeritus Valter Keltikangas took a critical attitude vis-a-vis the new ideas. He dealt, among others, with the beauty of old forests cf Keltikangas 1968.

35) It can be stated that rural sociology attained a status of fashion among the young sociologists in the 1970s. Simultaneously, a neo-rustic fashion in clothing diffused among university students. Since young rural sociologists mainly borrowed their theoretical ideas from Central Euro-

pean marxism, their intellectual tools were perhaps not however, the most appropriate to grasp the specific agro-forestry realities in Finland.

It is interesting to note that the sociologist Matti Mäkelä who just published a study about the theme of rural depopulation in the Finnish literature pays few attention to forestry cf Mäkelä 1986.

The problems of the realization of the ambitious intensification plans of forestry led to certain studies on the behaviour of the forest owner among the forestry profession in the late 1960s. Some scholars, such as Kauko Hahtola and Aarne Reunala arrived at real sociological questions in their studies. It is perhaps no accident that both of them became critics of the official forest policy later on cf Hahtola 1967a, 1967b, 1970, 1971, 1973; Reunala 1974, 1975.

36) The Report of the Forestry Planning Committee stated in 1961 that the availability of capital for investments and good market conditions should be more important guiding principles the industry than a concern for the actual state of the forest balance. This kind of opinion from the part of the Forestry Planning Committee could be called an intellectual capitulation. This attitude characterized the decision-making of the industry and the Government during the Great Investment Boom 1958-1965 leading to continuous improvisations and crisis in the Finnish forestry during the 1960s. Director-General of the Bank of Finland Klaus Waris became critical vis-a-vis the expansion plans of the industry in the middle of the 1960s cf Waris 1966.

37) The limited attention to socio-economic and environmental assessment characterized the project funding of the World Bank in general at that time. The change in the attitudes took place in the late 1970s cf World Bank 1978.

The loan of the World Bank was positively welcomed in Finland except the criticism of the Conservation Movement. The forestry technocracy criticized the Movement about the lack of patriotism and the importation of alien ideas to Finland.

The patriotism is, of course, a relative notion. The construction of a dense forest road network all over Finland implied by the intensification plans was not, for example, very patriotic because it undermined the foundations of the defence tactics utilizing the protection given by the inaccessible forested and swampy terrain.

38) Only some references concerning this period is given. Since the events are very close, no studies are available. Most of the source material is available in pamphlets, reviews, committee reports, and articles published in magazines and in the press. The integration of this kind of ample source material in the study would have exploded the bibliography. I apologize for these omissions.

A couple of my studies deal with the recent issues cf Raumolin 1985a, 1985d, 1985f, 1986a. In addition, I have been a

constant observer and a participant to the discussion during this period. My inputs to practical forestry include the work in the summer residence of our family.

Some tables and figures presented in the former chapters provide information about this period as well.

39) During the 1950s, the representatives of the forest industries and experts in logging technology argued that the forest owners could not create common timber procurement organizations which would be capable of bearing the necessary risks and to guarantee a steady flow of timber to the mills. The creation of new transport cooperatives following the example of the floating cooperatives established at the beginning of the century would result in the formation of a heavy administrative staff. Therefore, the creation of a machine contractor system based on private initiative would be the most appropriate solution.

The organization of timber procurement through the creation of large woodland departments in the companies was neither a good solution because it would lead to accusations about monopolization of timber procurement, a strong unionization of workers and an increase in capital costs and risks inherent in logging operations.

40) Different Centre-Left coalition governments have ruled Finland since 1970. The most influential partners in these governments are the Centre Party, the heir of the Peasant Party, and the Social Democratic Party.

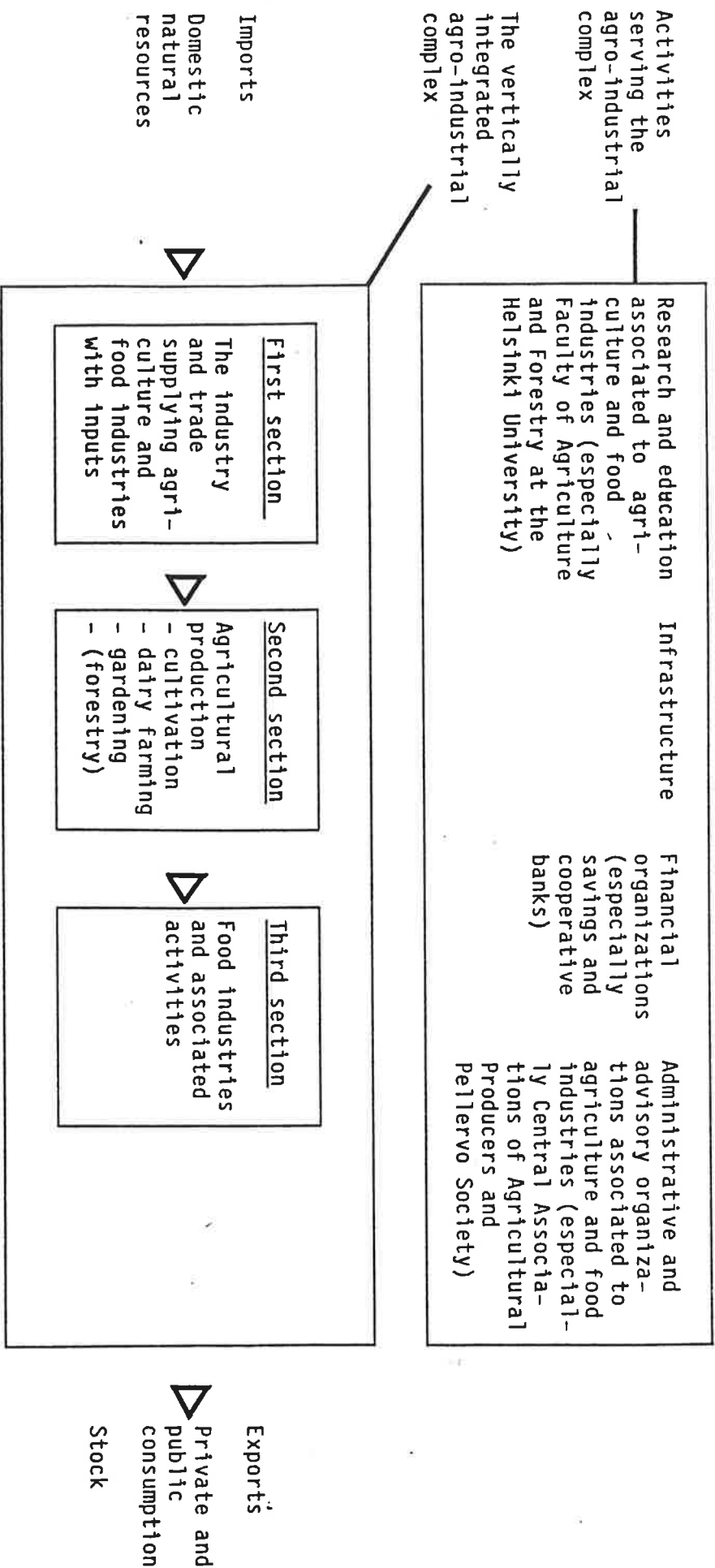
As regards environmental policy, the Centre Party propagated Green ideas but, in practice, it supported the interests of landowners. The Social Democratic Party represented, for its part, urban interests, and together with the Conservative Party in opposition which has become a middle-class party by and by, it supported the extension of the network of protected areas, for example.

41) A symposium "Metsä suomalaisten elämässä" (Forest in everyday life and culture of the Finns) was recently organized in Helsinki under the initiative of Aarne Reunala. Experts from different backgrounds, such as ethnologists, architects, art historians, philosophers, musicologists and others presented various views on forest. This is a good example of the pluralisation of the discussion in Finland. The papers and proceedings of the symposium will be published in Silva Fennica in 1987.

42) In this context, it should not be forgotten that during the late 1950s, the adoption of mechanization seemed to develop toward a pluralistic system both regionally and along with the major groups of forest owners in Finland. The North American Model was adopted in the company forests, this Model associated with delivery sale in the public forests in northern Finland and the Finnish Model in small-scale farm forests in southern Finland.

APPENDIX I

THE AGRO-INDUSTRIAL COMPLEX IN FINLAND



Source: S. Rouninen: Maataloustieteiden kompleksit Suomessa (The agro-industrial complex in Finland) Sosiologia 15, 1978 p. 138 (slightly modified).

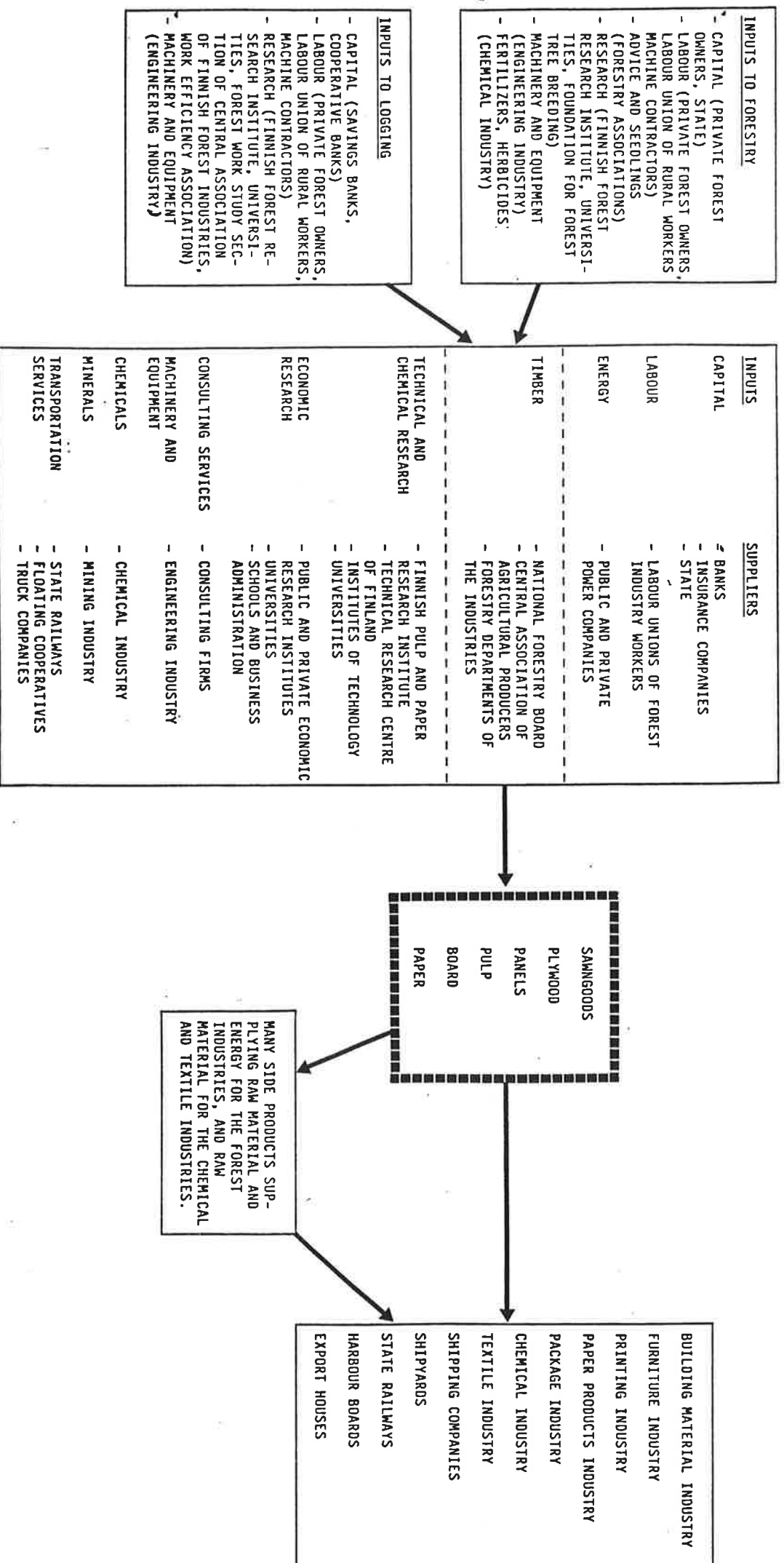
APPENDIX II

THE FOREST INDUSTRIES COMPLEX IN FINLAND

BACKWARD LINKAGES

FOREST INDUSTRIES

FORWARD LINKAGES



SOURCE: J. RAUHOLIN: DEVELOPMENT PROBLEMS IN THE SCANDINAVIAN PERIPHERY. UNPUBL. MSC. VANTAA, MAY 1980 P. 111 (SLIGHTLY MODIFIED).

NOTE: THERE IS A STRONG HORIZONTAL AND VERTICAL INTEGRATION AROUND THE MAIN PULP AND PAPER COMPANIES AS WELL AS COMMON EXPORT CARTELS.

10. Bibliography

Abbreviations used

AFF	Acta Forestalia Fennica
CIFF	Communicationes Institute Forestalis Fenniae
FF	Folia Forestalia
MA	Metsätaloudellinen Aikakauslehti (Finnish Journal of Forestry)
SF	Silva Fennica
SP	Suomen Puutalous (Finnish Timber Economy)

Aho & Soldan (1939). Kuva-Suomi (Finland in pictures). Helsinki.

Alapuro, R. (1980). Finland: An Interface Periphery. Research Reports of the Research Group for Comparative Sociology. University of Helsinki no 25.

L'Arbre en Afrique tropicale. La fonction et le signe (1980). Cahiers O.R.S.T.O.M. Série Sciences Humaines 17, no 3-4.

Arnkil, J.E. (1957). Koneellistamisen nykyvaihe Pohjois-Suomessa (The actual state of mechanization in northern Finland). MA 74, 20-21.

(1965). Traktorikuljetusten soveltaminen uuteen työmaakuvaan (The application of tractor transport in new work units). MA 82, 203.

(1966a). Traktorin käyttöedellytyksistä metsätyössä (The preconditions for tractor use in logging operations). Forest Report of the Work Efficiency Association no 106.

(1966b). Aktiivinen työmarkkinapolitiikka (For an active labour market policy). MA 83, 55-56.

(1967). Suurmetsätalouden menettelytapojen soveltaminen yksityismetsätalouden piirissä (The application of methods typical of large-scale forestry to small scale forestry). MA 84, 19-24.

Aro, P. (1942). Yleisimmät suomalaiset halkosaha- ja kirvesmallit metsätöissä (Bugsaw and axe models used in logging in Finland). MA 59, 129-32.

Berg, C.H.E. v. (1871). Geschichte der deutschen Wälder bis zum Schlusse des Mittelalters. Dresden.

Biolley, H. (1920). L'Aménagement des forets, par la méthode expérimentale et spécialement la méthode du controle. Neuchatel.

Cajander, A.K. (1920). Kansallisen ja sellaisena kotimaisen metsätieteellisen tutkimuksen merkityksestä (On the significance of national research with special reference to forest research). AFF 14:5.

- Cajander, A.K. (1927). Kotimaisen tieteellisen tutkimustyön kehittäminen (Promotion of national scientific research). Terra 39. 41-51.
- (1935a). Metsätalous ja puunjalostusteollisuus (Forestry and forest industries in Finland). Speech given to the members of the Cabinet and Parliament in Imatra. Viipuri.
- (1935b). Die wissenschaftliche Forschungsarbeit. Acta Universitatis Latviensis. Lauksaimniecibas Fakultates Serija II:15, 471-86.
- (1936). Henkisen ja aineellisen kulttuurin kehottaminen (Promotion of culture and economy in Finland). SSF Yearbook 14, 35-45.
- (1949). Aimo Kaarlo Cajander in Memoriam. AFF 56.
- Cernea, M. (1981). Land Tenure Systems and Social Implications of Forestry Development Programs. World Bank Staff Working Paper no 452.
- Cohn, E.J. Jr (1954). Industry in Pacific Northwest and Location Theory. New York.
- Conklin, H.C. (1961). The study of shifting cultivation. Current Anthropology 2, 27-61.
- Dana S.T., (1918). Forestry and Community Development. U.S. Department of Agricultural Bulletin no 638.
- Deffontaines, P. (1933). L'Homme et la foret. Paris.
- Dinsdale, E.M. (1965). Spatial patterns of technological change: the lumber industry of northern New York, Economic Geography 41, 252-74.
- Ebner, A. (1953). Menschliche Fragen als Begrenzung der Weltforstwirtschaft. Zeitschrift für Weltforstwirtschaft 16, 1-15.
- Elovirta, P. (1979). Forestry as an employer in Finland. SF 13, 227-34.
- Endres, M. (1900). Forsten. Handwörterbuch der Staatswissenschaften 3. Jena, 1122-86.
- FAO: (1949). Papers prepared by FAO. Proceedings of the Third World Forestry Congress. Vol 2. Helsinki.
- (1978). Forestry for Local Community Development. FAO Forestry Papers no 7, Rome.
- (1982). Appropriate Technology in Forestry. FAO Forestry Papers no 31. Rome.
- Friederichs, K. (1927). Grundsätzliches über die Lebenseinheiten höherer Ordnung und den ökologischen Einheitsfaktor. Die Naturwissenschaften 15, 153-57, 182-86.

- Friederichs, K. (1930). Die Grundfragen und Gesetzmässigkeiten der land- und forstwirtschaftlichen Zoologie, insbesondere der Entomologie I-II. Berlin.
- (1937). Ökologie als Wissenschaft von der Natur oder biologische Raumforschung. Bios 7. Leipzig.
- Gayer, K. (1886). Der gemischte Wald. Berlin.
- Hahtola, K. (1967a). Hankintahakkuut ja maatilakokonaisuus (Delivery cuts of timber in farm management). AFF 84:1.
- (1967b). Maatilametsätalouden yhteys taloudelliseen ja sosiaaliseen ympäristöön (Farm forestry and its socio-economic environment). AFF 84:2.
- (1970). Yhteiskunnan muutos ja maatilametsätalous (Social change and farm forestry). Forest Reports of the Work Efficiency Association 164.
- (1971). Alueelliset näkökohdat maatilametsätalouden edistämisessä (Regional aspects in the promotion of farm forestry). Finnish Economic Review 67, 109-18.
- (1973). The Rationale of Decision-Making by Forest Owners. AFF 130.
- Hakala, M. (1955). Yksityismetsien myyntitavat 1800-luvun puolivälistä 1. maailmansotaan (Methods employed in timber sales from private forests from the middle of the 19th century to World War I). MA 72, 289-92.
- Hall, R.B. Jr. (1958). Hand-tractors in Japanese paddy fields. Economic Geography 34, 312-20.
- Harve, P. (1947). Puunjalostusteollisuutta ja puutavarakauppaa harjoittavien yhtiöiden maanhankinta Suomessa (Land purchases by forest companies in Finland). AFF 52:1.
- Heikinheimo, L. (1950). Maaseudun työvoimavarojen arvioinnin tarpeellisuus (An assessment of rural manpower is necessary). MA 67, 81-83.
- Heikinheimo, L., T. Ristimäki & S. Väänänen (1956). Maaseudun työvoiman tutkimuksia (Finnish rural labour force studies). AFF 63.
- Heikinheimo, L. et al. (1963). Metsätalouden parannusten työllisyys- ja tulovaikutukset (Effects of forest improvement on employment and income). SF 114.
- (1972). Suomalainen metsätyömiehes (Finnish forest worker). Porvoo-Helsinki.
- Helander, A.B. (1949). Suomen metsätalouden historia (History of forestry in Finland). Porvoo.
- Heske, F. (1931a). Ziele und Wege der Weltforstwirtschaft. Tharandter Forstliches Jahrbuch 82, 1-35.

Heske, F. (1931b). Probleme der Forstwirtschaft in unentwickelten Ländern als Lehr- und Forschungsgebiet. Tharandter Forstliches Jahrbuch 82, 737-820.

(1948). Die Forstwissenschaft auf Grundlage weltweiter Erfahrung. Zeitschrift für Weltforstwirtschaft 12, 3-10.

Holopainen, V. (1965a). Tutkimus ja metsänviljelytalous (Forest research and forest cultivation). MA 82, 119-22.

(1965b). 60-luvun metsäpolitiikka (Forest policy for the 1960s). Helsinki.

(1970). Vastuun metsäpolitiikka (For a responsible forest policy). Helsinki.

Huikari, O. (1958). Metsäojituksen koneellistamisesta (The mechanization of forest drainage). CIFF 50:5.

Hustich, I. (1980). Suomen maisemat muuttuvat nopeasti (Rapid change of landscapes in Finland). Terra 92, 106-13.

Hustich, I. (ed.). (1960). Man's Influence on Nature in Finland. A Symposium. Fennia 85.

Häkkilä, M. (1985). On the decline in agriculture in Kainuu, Finland, and its regional effects. Innsbrucker Geographische Studien 13, 43-54.

Hörner, G. (1927). Die Waldvölker. Versuch einer vergleichenden Anthropogeographie. Petermanns Mitteilungen. Ergänzungsheft 192. Gotha.

Ilvessalo, L. & M. Jalava (1931). Maapallon metsävarat (Forest resources of the world). CIFF 16:2.

Ilvessalo, M. (1959). Suomen maan- ja metsänomistussuhteet 1920-1950-luvuilla (Land and forest ownership in Finland from the 1920's to the 1950's). CIFF 51.6

Kalliola, R. (1942). Naturschutz in Finnland unter besonderer Berücksichtigung der Wälder. Intersylva 2, 501-10.

(1946). Suomen kaunis luonto (Finland's beautiful nature). Porvoo.

Kantola, M & J. Mäkelä. (1978). Korjuu hankintakaupoissa (Logging in delivery sale) in: Metsä. Tuottava maa 5. (Forest. Productive land 5.) Helsinki 1978.

Keltikangas, V. (1968). Luonnonsuojelu ja metsäekonominen tutkimus (Nature conservation and forest economics research). Suomen Luonto 27:2-3, 137-39.

Kivi, E. & J. Lokki (eds.). (1968). Luonnon puolesta (For nature). Helsinki.

Kromm, D.E. (1968). Sequences of forest utilization in northern Michigan. Canadian Geographer 12, 144-57.

- Kromm, D.e. (1972). Limitations on the role of forestry in regional economic development. Journal of Forestry 70, 630-33.
- Kuusela, K. (1955). Metsätalouden kokonaisuus (Forestry as a whole). MA 72, 348-50.
- (1961a). Hakkuusuunnitteet ja niiden merkitys puutaloudessa (The significance of allowable cut in timber economy). SP 43, 91-95.
- (1961b). Tehtävien ja työnjaon suunnite metsänhoitajakunnalle (The tasks of foresters in the prevailing situation). SP 43, 245-48.
- (1962). Irti luonnon jalkapuusta (We must get rid of forestry close to nature). MA 79, 494.
- (1965). Puuntuotantoa ja hakkuumahdollisuuksia koskevien käsitysten kehittyminen Suomessa (Development of opinion on the possibilities of timber production and cutting in Finland). MA 82, 4-12.
- Kuusela, K. & S. Kaurinkoski (1967). Metsätalous itsenäisenä elinkeinona (Forestry as independent occupation). MA 84:2, 58-59.
- Laitakari, E. (1960). Metsähallinnon vuosisataistaival 1859-1959 (The National Board of Forestry 1859-1959). Helsinki.
- Lampimäki, T. (1939). Nautakarjan laiduntamisesta metsämailla (Grazing of cattle in the forests). SF 50.
- Larman, J., K. Virtanen & M. Jurvelius (1981). Choice of Technology in Forestry. A Philippine Case Study. ILO, Quezon City.
- Lee, R. (1984). Sustained yield and social order in: H.K. Steen (ed.). History of the Sustained-Yield Forestry. A Symposium in Western Forestry Center, Portland, Oregon Oct 18-19, 1983. Forest History Society. Santa Cruz, Cal., 90-100.
- Leikola, M. (ed.). (1979). Tutkimustoiminta Lapin metsien hoidon ja käytön suuntaajana (The role of forestry research in guiding forest policy and management in Finnish Lapland). SF 13 No 1 A.
- Lemmel, H. (1939). Die Organismusidee in Möllers Dauerwaldgedanken. Berlin.
- Lihtonen, V. (1950). Wirtschaft und Wirtschaftspolitik bei der Verwertung der Wälder im Naturzustand. Proceedings of the Third World Forestry Congress 3., Helsinki, 196-200.

- Lihtonen, V. (1955). Pienmetsätalouden työrytmi (Rhythm of work in small forest holdings). MA 72, 351-53.
- Lorenzi, A. (1918-1919). L'Uomo et le foreste. Rivista geographica italiana 25, 141-64; 213-42 et 26, 47-57.
- Lönnstedt, L. & J. Randers. (eds.) (1979). Wood Resource Dynamics in the Scandinavian Forest Sector. Studia Forestalia Suecica 152.
- Makkonen, O. (1981). Metsätöiden palkkauksen ja työolosuhteiden kehitys Suomessa ennen työsopimuskautta (Development of the payment of wages and work conditions in forest work in Finland prior to the age of agreements on the terms of working). SF 15, 237-55.
- Mantel, K. (1962). Aufgaben und Bedeutung von Wald- und Forstwirtschaften in historisch- und geographisch-vergleichenden Betrachtung von Entwicklungsstufen. Schriftenreihe der Forstlichen Abteilung des Albert Ludwigs Universität, Freiburg. Berichte 1., 51-67.
- Marchak, P. (1983). Green Gold. The Forest Industry in British Columbia. Vancouver.
- Marek, R. (1912). Anthropogeographie des Waldes. Geographische Zeitschrift 18, 1-15.
- Markkanen, E. (1977). Maaseutuväestön varallisuusolosuhteet ja luotto-olot Sisä-Suomessa elinkeinoelämän murroskaudella 1850-1914 (Wealth and credit among rural population in Central Finland during the early phase of industrialization, 1850-1914). Studia Historica Jyväskylänsia 14.
- Massa, I. (1983). Ihminen ja Lapin luonto (Man and nature in Finnish Lapland). Transactions of the Finnish Anthropological Society 12.
- Mayr, H. (1909). Waldbau auf naturgesetzlicher Grundlage. Berlin.
- "Metsänumero" (Special issue on forestry). Suomen Luonto 29, 1970:3.
- Mikola, P. (1963). Neljännevuosisata luonnonsuojelutyötä. Suomen luonnonsuojeluyhdistys 1938-1963 (A quarter of century of nature conservation in Finland). Suomen Luonto 22, 1963:2, 56-83.
- (1965). Metsätalouden tehostamishjelmat metsien moninaiskäytön näkökulmasta (Programmes for intensification of forestry seen from the point of view of multiple use). SF 47, 43-48.
- (1966). Metsien moninaiskäyttö (Multiple use of forests). MA 83, 286-88, 307.
- Mikola, P., E. Kangas & L. Heikurainen (1959). Silvicultural Research in Finland from 1909 to 1950. AFF 70:4.

- Mäkelä, M. (1986). Suuri muutto 1960-70-lukujen suomalaisen proosan kuvaamana (The great rural depopulation interpreted by the Finnish novelists in the 1960s and 1970s). Helsinki.
- Möller, A. (1922). Der Dauerwaldgedanke, sein Sinn und seine Bedeutung. Berlin.
- Onko Lapin metsätalous hätäaputyötä? Keskustelua. (Is the forestry in Lapland a relief work? A discussion) (1969). Metsä ja Puu 1:3, 19-24.
- Osara, N.A. (1950). Relationship of forestry to agriculture in rural economy. Proceedings of the Third World Forestry Congress 3., Helsinki, 243-45.
- (1957). Esikuvat ja olosuhteet (Pattern and circumstances). MA 74, 3.
- (1958). Metsän asema kansamme taloudessa (The role of the forests in the national economy in Finland). Oma maa 4., 227-42.
- Palosuo, V.J. (1979). MERA-ohjelmat Suomen metsätaloudessa (MERA-programmes in Finnish forestry). AFF 165.
- Pekkala, M. (1950). Metsätalouden merkitys kansantaloudessamme (The significance of forestry for Finland's national economy). MA 67, 76-78.
- Pelto, P.J. (1975). Ecology, de-localization and social change in: L. Müller-Wille, P.J. Pelto & R. Darnell (eds.). Consequences of Economic Change in Circumpolar Regions. Edmonton, 29-36.
- Piha, A. (1957). Hankintatoimen kehittäminen (The centralization of timber procurement). MA 74, 91-95.
- Pipping, K. (1947). Kompaniet som samhälle. Iakttagelser i ett finskt frontförband 1941-1944. (Basic military unit as a society. Observations from the frontier 1941-1944). Acta Academiae Aboensis Humaniora 16:1.
- Proceedings of the Third World Forestry Congress 1-4. Helsinki 1949-1950.
- Purhonen, E.J. (1962). Viisi vuosikymmentä uiton hyväksi. Suomen Uittajainyhdistys 1912-1962. (Finnish Floating Association 1912-1962). Helsinki.
- Putkisto, K. (1950). Katsaus koneiden käyttöön metsätaloudessa (Survey on the use of machines in forestry). Metsäteho Report 49.
- (1956a). Koneellisen metsäkuljetuksen kehityksestä (On the development of mechanized hauling). SP 38, 387-91.
- (1956b). Tutkimuksia pyörätraktoreiden käytöstä puutavaran metsäkuljetuksessa (Studies on the use of tractor in hauling). Metsäteho Publications 36.

Putkisto, K. (1959). Puutavaran valmistus, ja metsäkuljetustöiden koneellistumisen vaikutus metsätalouden työvoiman tarpeeseen. Ennuste vuoteen 1972. (Effect of the mechanization of timber preparation and forest transport on the need of labour force in forestry. Prognosis up to 1972). SF 101.

(1962). Puun korjuutyön koneellistuminen ja metsätalouden työvoiman tarve (The mechanization of logging and the need of forest labour). Metsäteho Report 161.

(1964). Puun korjuun ongelmat (Problems of timber procurement). Teknillinen Aikakauslehti 54:6, 15-18.

(1965). Puun korjuumenetelmien ja tieverkon väliset suhteet (Relationship between methods of timber procurement and road network). MA 82, 501-07; 512-14.

(1966). Metsätalous muuttuvassa kansantaloudessa (Forestry in the changing national economy). MA 83, 497-98.

(1970). Sahapuun korjuun ja käsittelyn kehitys viime vuosisadalta nykypäivään (The development of procurement and treatment of logs from the last century nowadays) in: T. Paloposki (ed.). 75 vuotta sahateollisuuden yhteistoimintaa. Suomen Sahanomistajayhdistys 1895-1970 (Finnish Sawmill Owners' Association 1895-1970). Helsinki, 147-49.

Jaakko Pöyry International (1979). Suomen metsäteollisuuden kansainvälisen kilpailukyvyn kehittäminen (Report on the international competitiveness of the Finnish forest industries). Helsinki.

Raumolin, J. (1974/1980). Theory of Social Exchange and Social Sciences in Finland. Mimeo 22 p. Vantaa, August 1974 printed in J. Raumolin: Maailman ymmärtämisen mahdollisuuksista. Kriittisiä kirjoituksia ja tutkielmia 1970-luvulta (On the possibility of understanding the world. Critical essays and studies from the 1970s). Helsinki 1980, 220-30.

(1980a). Maailman ymmärtämisen mahdollisuuksista. Kriittisiä kirjoitelmia ja tutkielmia 1970-luvulta (On the possibility of understanding the world. Critical essays and studies from the 1970s). Helsinki.

(1980b). Development Problems in the Scandinavian Periphery. Unpubl. manuscript 185 p. Vantaa April 1980.

(1981a). Development problems in the Scandinavian periphery. IFDA Dossier no 22, 1981, 3-18.

Raumolin, J. (1981b). Suomen ja Kanadan metsäsektorin yhteiskuntataloudellista tarkastelua (Socio-economic approach in the study of the forest sector in Finland and Canada). Yearbook of the Finnish Society for Economic Research 1981, 78-99.

(1981c). Global scene, natural resources and development problems in the periphery country Finland: some reflections on Ilmari Hustich's world view. Fennia 159:1, 15-23.

(1982a). Metsäteollisuuden kehityksen vaikutuksia asutukseen Pohjois-Suomessa, Pohjois-Ruotsissa ja Quebecissä (The impact of the forest industries on rural settlement in northern Finland, northern Sweden and Quebec) in: S. Aho & L. Heikkola (eds.). Lapin historiaseminaarin raportti. Rovaniemi 8.-9.6.1981. (Papers of the symposium on the history of Lapland). University of Oulu. Publications of the Research Institute of Northern Finland C 42, 90-124.

(1982b). The Relationship of Forest Sector to Rural Development. Some Reflections on the Theory and Practice of Forest-Based Development University of Oulu. Publications of the Research Institute of Northern Finland. Mimeographed Studies 24. Oulu, 64 p.

(1982c). Skogssektorns teknologiska förändringars regionala konsekvenser i Finland (The impact of technological change in the forest sector on regional fortunes in Finland). Paper presented at the NordREFO symposium on the impact of technological change on regional development at Bornholm, Denmark 11-13.10.1982. Mimeo 27 p.

(1983). Conflicts Between Farming Sector and Forest Sector in Finland. Paper presented at the Nordic Research Symposium on Combined Farming and Forestry, Ekenäs Manor, Sweden, December 13.-15.1983.

(1984a). The formation of the sustained-yield forestry system in Finland in: H.K. Steen (ed.). History of Sustained-Yield Forestry. A Symposium. Western Forestry Center, Portland, Oregon, October 18-19, 1983. Forest History Society, Santa Cruz Cal., 155-69.

(1984b). The world economy of forest products and the comparative impact of the forest sector. An exploratory inquiry. Yearbook of the Finnish Society for Economic Research 1983/1984, 188-211.

(1984c). Mihin unohtui kansallinen kehitystie? Uudenaikaisen metsäteknologian tulo Suomen metsiin (Why was the national development path lost? The introduction of modern forestry technology in the Finnish forests) in: A. Reunala (ed.). Näkökulmia maankäyttöpoliitiikkaan (Reflections on land use policy). University of Helsinki. Institute of Land Economics. Publications no 8, 64-81.

Raumolin, J. (1984d). Metsäsektorin vaikutus Suomen taloudelliseen ja yhteiskunnalliseen kehitykseen (The impact of the forest sector on economic and social development in Finland). University of Oulu. Publications of the Research Institute of Northern Finland C 51.

(1984e). L'Homme et la destruction des ressources naturelles: la "Raubwirtschaft" au debut du siecle. Annales E.S.C. 39, 798-819.

(1985a). Conflicts in Forest Utilization in Finnish Lapland. Paper presented at the IUFRO Forest History Group symposium "History of Forest Utilization and Forestry in Mountain Regions" Zürich 3-7 Sept. 1984. Mimeo 13 p. Summary printed in the publications of the symposium, Schweizerische Zeitschrift für Forstwesen. Beiheft 74, 309-11.

(1985b). Introduction to comparative studies between Finland and Canada in: J. Raumolin (ed.). Natural Resources Exploitation and Problems of Staples-Based Industrialization in Finland and Canada. Fennia 163:2, 387-94.

(1985c). The impact of forest sector on economic development in Finland and eastern Canada. ibid, 395-437.

(1985d). Développement régional et politique régionale en Finlande in: Universités et régions marginales. Colloque Franco-Finlandais. Remiremont (Vosges, France), 5 au 7 septembre 1983. INRA. Série Notes et Documents no 71, Montpellier 29-39.

(1985e). The Problem of Forest-Based Development. A Historical Evaluation of Theoretical Discussion, 1850-1965. Unpubl. manuscript. Vantaa, Finland, December 1985, 123 p.

(1985f). Mietteitä Metsä-2000 ohjelmasta (Some thoughts on the Forest 2000-Programme). Finnish Economic Review 81, 346-49.

(1986a). Recent trends in the development of the forest sector in Finland and Eastern Canada. Zeitschrift der Gesellschaft für Kanada Studien 11, 1986, 89-114.

(1986b). The Impact of Technological Change on Rural and Regional Forestry in Finland. Basic Draft. Unpubl. manuscript. Helsinki, July 1986, 220 p.

(1986c). Metsän suojassa. Metsän poliittista antropologiaa ja geopolitiikkaa. (Under the shelter of forests. Reflections on political anthropology and geopolitics of forests). Paper presented in the symposium "Metsä suomalaisten elämässä" (The role of forests in everyday life and culture of the Finns). Helsinki, December 17-18, 1986. Will be printed in the publication based on the papers of the symposium ed. by A. Reunala in 1987.

Reunala, A. (1974). Structural Change in Private Forest Ownership in Finland. CIFF 82:2.

(1975). Metsänomistuksen muutokset ja aluepolitiikka (Forest ownership changes and regional development). SF 9, 259-98.

(1977). Yksityismetsätalouden rakennemuutos (Structural change in private forest ownership in Finland) in: Ihminen ja metsä (Man and forest). Helsinki, 74-79.

Rouhinen, S. (1978). Maatalousteollinen kompleksi Suomessa (Agroindustrial complex in Finland). Sosiologia 15, 137-44.

Rubner, H. (1985). Deutsche Forstgeschichte 1933-1945. Forstwirtschaft, Jagd und Umwelt im NS-Staat. St. Katharinen.

Rübel, E. (1930). Pflanzengesellschaften der Erde. Bern.

Saari, E. (1928). Metsien merkitys maatiloille (The role of forest on Finnish farms). Yhteiskuntataloudellinen Aikakauskirja 24, 28-40.

(1950). The sustained-yield in forestry. Proceedings of the Third World Forestry Congress, 3. Helsinki, 277-79.

(1956). Preface to Heikinheimo, L., T. Ristimäki & S. Väänänen: Maaseudun työvoiman tutkimuksia (Finnish rural labour force studies). AFF 63, iv-viii.

Saari, E. & Y. Ilvessalo (1929). Näkökohtia Suomen metsätalouden tehostamiseksi (Prospects for promoting forestry in Finland). SF 12.

Samset, I. (1966). The implication of mechanization of forest employment on developing countries. Proceedings of the Sixth World Forestry Congress 3., Madrid, 2952-65.

(1972). Forestry Operations in a Dynamic Production Forestry Illustrated by Examples from Norway. The H.R. Macmillan Forestry Lecture. University of British Columbia. Vancouver.

Sarvas, R. (1967). Metsäntutkimuslaitos 1917-1967 (Finnish Forest Research Institute 1917-1967). CIFF 65.

Schlie, T.W. (1976). The transfer of agricultural and forestry technology between regional and national research institutions: in D.B. Thomas et al. Importing Technology in Africa. Foreign Investment and the Supply of Technological Innovations. New York, 102-33.

Schoenichen, W. (1948). Naturschutz, Heimatschutz. Ihre Begründung durch Ernst Rudorff, Hugo Conwentz und ihre Vorläufer. Stuttgart.

Seppälä, H. (1976). Metsäsektorin alueellinen merkitys Suomessa (Regional importance of the forest sector in Finland). FF 269.

- Seppälä, H., J. Kuuluvainen & R. Seppälä (1980). Suomen metsäsektori tienhaarassa (The Finnish forest sector at a crossroad). FF 434.
- Seppänen, O. (1937). Saimaan vesistön uittoväylät ja uittojen organisaatio niissä (The floatways in the Lake Saimaa system of lakes and the organization of floating). AFF 46:1.
- Shepard, P. (1967). Man in the Landscape. A Historic View of the Esthetics of Nature. New York.
- Silvennoinen, U. (1974). Metsätyön rationalisoimisesta ja sen vaikutuksesta työvoimatilanteeseen (The rationalization of logging operations and its impact on employment). Lapin tutkimusseuran vuosikirja 15, 7-15.
- Silversides, C.R. (1965). Developments of Logging Mechanization in Eastern Canada. The H.R. Macmillan Forestry Lecture. University of British Columbia. Vancouver.
- (1966). The rate of diffusion of new harvesting systems and machines in the pulwood logging industry in eastern Canada. Pulp and Paper Canada 67, no 10 WR, 510-38.
- Sipilä, M. (1963). Maatalouden rakenteen ja maaseudun työvoiman kehityksen vaikutuksesta puutavaran hankintaan (The impact of the development of rural structures and rural force on timber procurement). SP 45, 270-78.
- Sirén, G. (1956). Pohjois-Suomen puun tuoton kohottamisesta (The promotion of the increase of forest yield in northern Finland). Paperi ja Puu 38, 213-20.
- (1964). Tavoitteena viljelymetsätalous (Forest cultivation - the new aim of the forestry). MA 81, 211-14.
- (1965). Voidaanko metsiemme primäärituotantoa kohottaa koneellistamisteitse? (It is possible to raise the primary production in our forests by means of mechanization?). SP 47, 370-73.
- Sivonen, S. (1965). Machine Costs in Logging with Power Saw in Finland in 1951-1963. CIFF 59:4.
- Smeds, H. (1951). Är Finlands landsbygd överbefolkad? Några synpunkter på flykten från landsbygden och emigrationen (Is the Finnish countryside overpopulated? Some thoughts on rural depopulation and emigration to Sweden). Ekonomiska Samfundets Tidskrift T.S. 4, 71-108.
- State Committee Reports:
Maaseudun teollistamiskomitean mietintö (Report of the Committee of the Industrialization of the Countryside). Kom. miet. 1951:17, Helsinki.

Uusien luonnon- ja kansallispuistojen perustaminen valtion maille. Luonnon- ja kansallispuistokomitean mietintö (Report of the Committee for the Establishment of New Natural and National Parks) SF 79, 1953.

Valtakunnansuunnittelukomitean mietintö (Report of the National Planning Committee). Kom. miet. 1954:4, Helsinki.

Metsätalouden suunnittelukomitean mietintö (Report of the Forestry Planning Committee). Kom. miet. 1961:1, Helsinki.

Kansallispuistokomitean mietintö (Report of the National Park Committee). Kom.miet. 1976:88, Helsinki.

Metsä 2000-ohjelma (Report of the Forest 2000-Programme). Helsinki 1985.

Streyffert, T. (1956). Northern Europe. The region as a whole in: S. Haden-Guest, J.K. Wright & E.M. Teclaff (eds.). A World Geography of Forest Resources. New York, 231-42.

Suomalaista metsänparannustekniikkaa ja kalustoa (1970/1980). (Finnish forest improvement technics and machinery). First edition 1970. Second edition 1980. Helsinki.

Suominen, O. (1955). Metsätyömieskylät (Forest worker villages). SF 86.

Symposium of Forest Types and Forest Ecosystems (1960). SF 105.

Talve, I. (1977/1978). Skogsavverkningarna i Finland under 1800-talet (Logging operations in Finland during nineteenth century). Budkavlen 56/57, 56-69.

Tansley, A.G. (1935). The use and abuse of vegetational concepts and terms. Ecology 16, 284-307.

Troll, C. (1939). Luftbildplan und ökologische Bodenforschung. Zeitschrift für Gesellschaft der Erdkunde zu Berlin 1939, 241-98.

Turtiainen, K. (1969). Metsäkoneteollisuutemme (The production of logging machinery and equipment in Finland). Metsä ja Puu 1:10, 13-15.

Waris, K. (1966). A banker's view on financing the development of forestry and forest industries. Proceedings of the Sixth World Forestry Congress 1., Madrid, 1166-69.

Wegelius, T. (1950). Havaintoja USA:n ja Kanadan mekanisoidulta metsätyömailta (Observations from the mechanized logging operations in U.S.A. and in Canada). MA 67, 47-49.

(1955). Storindustri vid skiljoväg (Forest industry at the cross-roads) Paperi ja Puu 37, 405-08.

Wegelius, T. (1957). Nollarajaa torjumaan koneiden avulla
(Mechanization is necessary for the mobilization of
peripheral forest resources). MA 74, 95-96.

(1958). Finlands skogsindustri och dess utveckling
(The development of the forest industries in Finland).
Nordisk Tidskrift N.S. 34, 207-18.

(1959). Survey of Forest Technology Research in
Finland. AFF 70:8.

(1962). Tekniska problem inom modernt skogsbruk
(Technical problems in modern forestry). Tekniskt
Forum 83:3, 54-57.

Vesikallio, H. (1981). Metsäteollisuusyrittysten puunhankinta
muuttuvassa yhteiskunnassa (Timber procurement of the
forest industries in the changing society). Metsäteho
Report 371.

Westoby, J.C. (1962). The role of forest industries in the
attack on underdevelopment. Unasylva 16, 168-201.

(1965). World Forest Development. Markets, Men,
and Methods. The H.R. Macmillan Forestry Lecture.
University of British Columbia. Vancouver.

World Bank (1978). Forestry Sector Policy Paper. Washington
D.C.

Yli-Jokipii, P. (1970). Timber floating, its importance and
regional development in Finland since the Second World
War. Tijdschrift voor Econ. en Soc. Geografie 51,
348-57.

ELINKEINOELÄMÄN TUTKIMUSLAITOS (ETLA)
THE RESEARCH INSTITUTE OF THE FINNISH ECONOMY
LÖNNROTINKATU 4 B, SF-00120 HELSINKI

Puh./Tel. (90) 601 322
Int. 358-0-601 322

Telefax (90) 601 753
Int. 358-0-601 753

KESKUSTELUAIHEITA - DISCUSSION PAPERS ISSN 0781-6847

- No 316 PIRKKO KASANEN, Energian säästön määrittely. 06.04.1990. 52 s.
- No 317 PENTTI VARTIA, New Technologies and Structural Changes in a Small Country. 17.04.1990. 15 p.
- No 318 TIMO MYLLYNTAUS, Channels and Mechanisms of Technology Transfer: Societal Aspects from a Recipients Viewpoint. 17.04.1990. 21 p.
- No 319 TOM BERGLUND, Earnings Versus Stock Market Returns; How Betas Computed on These Variables Differ. 24.04.1990. 12 p.
- No 320 VESA KANNIAINEN, Intangible Investments in a Dynamic Theory of a Firm. 27.04.1990. 30 p.
- No 321 ROBERT HAGFORS, Välillisen verotuksen muutosten hyvinvointivaikutukset - Näkökohtia arviointimenetelmistä. 11.05.1990. 23 s.
- No 322 VESA KANNIAINEN, Dividends, Growth and Management Preferences. 23.05.1990. 23 p.
- No 323 PEKKA ILMAKUNNAS, Do Macroeconomic Forecasts Influence Firms' Expectations? 28.05.1990. 26 p.
- No 324 PEKKA ILMAKUNNAS, Forecast Pretesting and Correction. 28.05.1990. 22 p.
- No 325 TOM BERGLUND - EVA LILJEBLOM, Trading Volume and International Trading in Stocks - Their Impact on Stock Price Volatility. 04.06.1990. 23 p.
- No 326 JEAN MALSOT, Rapport du printemps 1990 - Perspectives à moyen terme pour l'économie européenne (Euroopan keskipitkän aikavälin näkymät). 08.06.1990. 31 p.
- No 327 HILKKA TAIMIO, Naisten kotityö ja taloudellinen kasvu Suomessa vuosina 1860-1987, uudelleenarvio. 20.06.1990. 56 s.
- No 328 TOM BERGLUND - STAFFAN RINGBOM - LAURA VAJANNE, Pricing Options on a Constrained Currency Index: Some Simulation Results. 28.06.1990. 43 p.

- No 329 PIRKKO KASANEN, Energian säästö ympäristöhaittojen vähentämiskeinona, päätöksentekokehikko energian ympäristöhaittojen vähentämiskeinojen vertailuun. 01.07.1990. 41 s.
- No 330 TOM BERGLUND - KAJ HEDVALL - EVA LILJEBLOM, Predicting Volatility of Stock Indexes for Option Pricing on a Small Security Market. 01.07.1990. 20 p.
- No 331 GEORGE F. RAY, More on Finnish Patenting Activity. 30.07.1990. 9 p.
- No 332 KARI ALHO, Odotetun EES-ratkaisun ja Suomen linjan taloudelliset perustelut. 01.08.1990. 10 s.
- No 333 TIMO MYLLYNTAUS, The Role of Industry in the Electrification of Finland. 14.08.1990. 35 p.
- No 334 RISTO MURTO, The Term Structure and Interest Rates in the Finnish Money Markets - The First Three Years. 17.08.1990. 27 p.
- No 335 VEIJO KAITALA - MATTI POHJOLA - OLLI TAHVONEN, An Economic Analysis of Transboundary Air Pollution between Finland and the Soviet Union. 01.10.1990. 23 p.
- No 336 TIMO MYLLYNTAUS, Ympäristöhistorian tutkimus Suomessa. 08.10.1990. 35 p.
- No 337 KÅRE P. HAGEN - VESA KANNIAINEN, The R&D Effort and Taxation of Capital Income. 15.10.1990. 34 p.
- No 338 PEKKA YLÄ-ANTTILA - RAIMO LOVIO, Flexible Production, Industrial Networks and Company Structure - Some Scandinavian Evidence. 25.10.1990. 19 p.
- No 339 VESA KANNIAINEN, Destroying the Market for Drugs: An Economic Analysis. 01.11.1990. 32 p.
- No 340 PENTTI PÖYHÖNEN - RISTO SULLSTRÖM, The EES and Trade in Manufactured Goods. 09.11.1990. 14 p.
- No 341 PEKKA SUOMINEN, Ulkomaalaista koskevat investointirajoitukset Länsi-Euroopan maissa. 20.11.1990. 66 s.
- No 342 KARI ALHO, Identification of Barriers in International Trade under Imperfect Competition. 21.11.1990. 27 p.
- No 343 JUSSI RAUMOLIN, The Impact of Technological Change on Rural and Regional Forestry in Finland. 22.11.1990. 84 p.

Elinkeinoelämän Tutkimuslaitoksen julkaisemat "Keskusteluaiheet" ovat raportteja alustavista tutkimustuloksista ja väliraportteja tekeillä olevista tutkimuksista. Tässä sarjassa julkaistuja monisteita on rajoitetusti saatavissa ETLAn kirjastosta tai ao. tutkijalta.
Papers in this series are reports on preliminary research results and on studies in progress; they can be obtained, on request, by the author's permission.

E:\sekal\DPjulk.chp/22.11.1990