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# Cost Studies in European Forestry

## Kostnadsstudier i europeiskt skogsbruk

By a Group of Forest Economists

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# Preface

This work is an account and an analysis of the cost-revenue structure of forestry in different countries in western Europe and to a certain extent in the regional divisions within the countries. The basis for the analysis is statistically compiled material, which has been subjected to processing and systematic evaluation by the countries themselves in order to obtain comparable values. The idea for this work of international co-operation came from a preparatory study made in Sweden as to the costs involved in the production of timber in various conditions and circumstances. As the question of the formulation of method in this connection attracted considerable attention and it was found that there was no general method in international use, there came about the idea of devising such a method through co-operation between international forest economists, and on such a basis later to be able to extend the study to comparisons of costs in the different countries. When it was found that there was a positive interest in this idea the first working contact was made with I.U.F.R.O. Section 31 dealing with Forest Economics, Working Group 3 of which had as its objective "Methods and Problems of Cost Calculation and Accounting in Forestry". These problems were discussed from all approaches at a conference in Copenhagen, and Professor Frits Jörgensen, the Chairman of the Group, drew up the main lines for "Methods and Problems of Cost Accounting in Forestry" which are given in Section 1.3 of this work. According to these general lines as well as a draft presented by the Swedish delegates and based on the preparatory study, the planning of the work was then discussed during a two-day conference in Munich. On the basis of this the Directives were compiled, which—after scrutiny and minor adjustments by the other participating countries—provided the basis for the national accounts presented in Chapters 2-9. Co-operation was achieved and maintained throughout the progress of the work, and Chapter 10 "Comparison of National Levels", which was compiled at the Department of Forest Economics in Stockholm, has been examined and commented upon by the other co-workers, although the responsibility for the chapter is obviously that of the two compilers.

It is my very pleasant duty to offer my warmest thanks to the contributing authors, as well as to all the others who have participated in the materialisation of this book, for their willingness and the great spirit of co-operation they have shown which has made it possible to carry out as extensive a study as the present one. The contacts and discussions with research workers in other

European institutes of forest economics have been very beneficial and stimulating to me, and it is my hope that in this way a contribution has been made to further international co-operation.

My thanks are also due to the Foundation for Forestry Research for the grant which has made it possible to materialise this research project. Special thanks must go to the former Director General, Erik Höjer, who has helped in many ways. In his capacity as Chairman of the Foundation he has ensured that the research project has been granted the necessary financial resources and as Director General of the Swedish Forest Service I have mainly him to thank for placing at the disposal of the Royal College of Forestry the material on which the Swedish survey is based. By participating in the principal discussions on the planning of the work he has also shown his personal interest in the problems dealt with here and has advanced many valuable ideas. My thanks also go to the representatives of other organisations, such as the Association of Swedish Forest Owners and the National Federation of Swedish Forest Owners, for the useful contacts and points of view they have provided, although the original idea also to incorporate cost data from these organisations proved to be impossible to apply in the international comparisons of costs which have been made in this work. To the Dean of the Royal College of Forestry I should like to convey my thanks for the extra grant which has made it possible to publish this work as a part in *Studia Forestalia Suecica.*

EINAR STRIDSBERG,
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*Royal College of Forestry.*

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Sweden.

## *Translator's Foreword*

All the authors contributing to these studies wrote their papers in their native languages with the exception of the Finnish contributor who presented his material in English.

The translation of technical terms was done in consultation with Dr. K. V. Algvere. In certain cases some editing was done in preparing the English translations of the papers, and the final English version was submitted to the respective contributor for approval.

For the translation work involved with all material except the Norwegian I had the valued assistance of Mrs. Eva Marshall. I am most grateful for the kindness of Miss Inger Becker, M.A., as well as the two Norwegian authors, for the practical assistance with the translation from their mother tongue.

Northampton,
St. George's Day, 1967.

P. E. BURKE.

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# Contents

# Chapter 1

# BACKGROUND AND METHODOLOGY OF THE STUDY

# Background and Methodology of the Study

## 1.1 Introductory Remarks

After preliminary contacts with Working Group 3 of Section 31 (Forest Economics) within the International Union of Forest Research Organisations (I.U.F.R.O.) a general discussion took place in Munich on 29 and 30 January 1964. The aim of the investigation was accounted for in the opening speeches as follows:

PROFESSOR E. STRIDSBERG: The purpose of this meeting, at which we are pleased to see so many prominent representatives of European forest economics research, is to contribute to the task of obtaining elucidatory comparisons regarding production conditions in different countries. Bearing in mind the current trend towards a more strongly integrated European market—a trend which can be expected to persist—work of this nature should be of considerable importance to most branches of economy, and not least to forestry. If such an investigation in the sphere of forestry is to be of significance, however, it is necessary to base it on a generally acceptable scientific method.

This investigation shall be carried out by an independent scientific body, entirely free from government guidance, and in open collaboration with other scientific institutions. An important part of our work has been to contact other research institutions to ascertain whether they are willing and able to enter into a close form of co-operation. We have already had the opportunity of discussing with the majority of those present to-day why a comparative cost-revenue analysis of forest production should be made in the countries of western Europe. In our circular we said briefly that the aim of the investigation is to ascertain in detail the yield situation and degree of competition in the different countries, and thereby obtain a better foundation for eventual discussions of commercial policy.

In this connection we first thought of possible association discussions in Brussels, but we also hold the view that this investigation will be able to give a picture of the profitability of forestry practice in the various regions, and that in the light of costs and revenues we shall be able to clarify for the rest of the world the advances which European forestry with its old traditions has been able to make. Simultaneously this would be proof of voluntary co-operation between forest economic institutions to solve common problems in the west European region. Such a task necessitates team-work, and it stands to reason

that all the countries connected with this research shall also be represented in such an international working team.

A difficulty which faces this investigation, however, is that there is no generally accepted and scientifically irreproachable method to use. In this connection we have approached Working Group 3, Section 31, I.U.F.R.O., and obtained very valuable guidance regarding the methods concerned. As the members of this working group are here to-day, I should like to take this opportunity to thank you gentlemen. In particular I should like to thank the chairman of the working group, Professor Jörgensen, who has been put to a lot of trouble in collating this outline. We intend to follow the recommendations obtained from I.U.F.R.O. as far as possible, and aim at the same time to pursue the investigation on the basis of the following methods:

a. Direct cost-revenue comparisons on the basis of actual accounting records.
b. Comparisons of constructed hypothetical models.
c. Moreover, it is intended to utilise aggregate national accounts for the comparisons. In the first instance this will concern forestry's contribution to the Gross National Product and it should further be possible to utilise available total figures as a foundation for a so-called total calculation concerning forest production, which should then reflect the average production conditions for the country in question.

One of the chief tasks at this joint conference should be to discuss the way in which the institutions should collaborate in this research work, and then to try and reach an agreement regarding the practical execution of the work.

It was our hope from the beginning—and from our earlier contacts we were, in fact, given a few promises—that the collection of the material in the various countries would be performed by competent institutions. Therefore, we have endeavoured to find a principal contact for each country, and we hope that these persons will assume the responsibility for co-ordinating this research project in their countries. The question is to what extent you are willing and able to devote yourselves to this question.

In the first place we thought that the adaptation of the material collected in the participating countries could be done centrally at a later date. As the institution in Stockholm has been granted certain funds for this purpose, we would adapt and analyse the material. Later the collation of the manuscript and the publication of the investigation would also be performed by our institution, or, more correctly, the Royal College of Forestry (*Skogshögskolan*) in Sweden would be responsible for the publication of this investigation. The publication would be in English.

The collaborators in this investigation would act as contributing authors, and the chapters written by them about their respective countries would bear their names. In this way the whole thing could be regarded as a product of team-work.

To ensure that all the countries work according to the same principles, and that only such material is collected and adapted as is really necessary for the comparisons with other countries, close contact should be maintained between the participating institutions, or better still, between the people who are responsible for this investigation. We say this so that the research leader or representative of our institution could later on visit the participating countries, when the collection of the material is more or less complete, to discuss and answer on the spot any questions which may have arisen. At the same time we could pass on the finished material regarding Sweden.

I hope that this brief description of the aim and scope of the investigation will serve as a background for the debate.

PROFESSOR J. SPEER: We must be quite certain that the framework of this investigation shall be as broad as possible, and should not concentrate on one country alone to serve as a comparison; the aim should be to acquire something which will allow comparisons over the boundaries within Europe. It is of interest that at the conference which the E.E.C. countries held in Brussels in June 1959 it was said to be a matter of extreme importance to endeavour to commence studies which would permit a cost-revenue comparison of forestry practice between different countries. The reason why we concern ourselves with such things is obvious; it is namely a matter of economic policy, that countries which are dependent on imports are in certain circumstances obliged to sustain their own production by regulating imports in certain ways, while other countries, which are particularly dependent on exports of wood products, are interested in seeing that this trade is as free as possible to European countries. If this question is stripped of its political considerations, which naturally always form part of the picture, and which will always be of significance if the question is viewed from a purely scientific aspect, the only possibility is to answer the following question: what are the conditions of competition in the one country, and how do they compare with those obtaining in the other country? In my opinion, a difficult question is: what is the position of those countries whose markets are based on a free economic system, such as the extolled countries in the West, compared with countries whose trade is centrally controlled and who consequently export through a state monopoly and therefore have utterly uncontrollable competition conditions, and who can thus exercise a purposeful influence on the markets of other countries? But this question can be put to one side. Our problem is to bring about an economic contact in the European region between those countries whose marketing policies are similar, and this also in the sphere of forestry, without one country thereby damaging the conditions for existence of another.

We are gathered here as research workers and the main problem facing us concerns the method to be used; and our chief endeavour is to undertake some sort of scientific analysis. I am convinced that in the spirit of free research and unrestricted thought we should be able to advance our ideas

concerning such things, and also to discuss these questions in an atmosphere which is completely free from political influence. One condition is that the confidence between the research workers in the various countries is not destroyed by any form of political pressure, and that we quite simply consider ourselves responsible for a spiritual problem and nothing else.

## 1.2 Comprehensive Minutes of the Decisions made at the Conference in Munich

### *1.2.1 Principles of Participation*

Those present declared that they were in principle prepared to take part in the investigation.

It was agreed that the disposition of the investigation regarding costs and revenues in forestry production in the various countries should cover the following main points:

a. General information concerning forestry and forest industries.
b. Revenue and costs in the individual forest enterprises based on actual accounting records.
c. Revenue and costs based on constructed hypothetical forestry models.

### *1.2.2 General Description of Conditions in Forestry and Forest Industries*

A general description of conditions in forestry and forest industries (point a) shall form the background of an ensuing analysis of costs and revenue. In this respect the individual countries should decide for themselves which data and information are necessary for the purpose.

The general opinion was that the share of forestry in the Gross National Product should indicate the relative importance of the economic sector in each country and should therefore be given primary consideration. For the most part these estimates should be determined by calculation, and should take into consideration the special conditions obtaining in the country in question. In principle the prices should be calculated free delivery place on roadside. The calculations should include information regarding the transport costs to the mill so that comparative conditions can be worked out.

It was further agreed that each country in the general description should provide data on the following: total roundwood balances, external trade in forest products, the price development of forest products, wage development, and the primary conditions affecting forestry production and forest industries.

### *1.2.3 Comparisons based on Statistical Material*

Comparisons based on statistical material (point b) were discussed in detail. The object of the comparisons is to equate costs and revenue, irrespective of

the accounts in which the costs are given. It was emphasised that Sweden should clearly define the directives for the classification of costs (operational accounts) which each country could then follow. Possible discrepancies should be noted. The following are some of the points on which agreement was reached, namely, that:

the estimates need not take calculated interest on forest capital into consideration;

grants shall be separated and be shown either on the revenue or the cost side;

the calculations take into account the value of services rendered by owner to his forest enterprise, as well as the value of his own wood consumption;

all social charges should be shared between the various groups of costs;

maintenance costs (i.e. maintaining the enterprise in its present condition) shall be separated from the costs for improving and expanding the enterprise (e.g. increased value due to new planting and improvement of soil);

costs for taxes shall be placed together in a special group, as these costs vary in character in the different countries;

the survey shall start from 1958, and that the classifications are made for particular years and continued as far forward in time as possible.

### *1.2.4 Construction of Hypothetical Forestry Models*

The construction of hypothetical forestry models (point c) are intended to contribute to the analysis of the comparisons on the basis of actual accounting records. Discrepancies determined there can be illustrated in a better way with the help of these models by showing how the final result is influenced by factors such as site quality class, tree species and accessibility.

It was agreed that in the first place the models should be constructed for the main commercial tree species in each country. In addition, a theoretical appraisal of costs and revenue is to be made for individual tree species, using statistical data, possibly supplemented by other empirical figures, as a basis. In the first instance the direct costs for the particular tree species, i.e. logging costs and silvicultural costs, should be recorded. As regards managing or common costs, average figures for forest enterprises should be used, as no causal connection between these costs and a specific tree species can be obtained.

The necessary supposition for the models should be general and clearly defined. The division into regions for which hypothetical models can be constructed should be done by each country itself. As models for separate tree species do not always permit satisfactory comparisons to be made, average models for particular regions or countries can be used, in which case data about specific tree species, site quality class and market conditions (accessibility) are weighed together with their relative share. Such a construction, which

represents an average of assumed conditions and which is composed of extremes, should be representative of the region or country in question. It was pointed out that in those countries where the forestry conditions were very dissimilar, the average would even up any particularly pronounced extremes.

The construction of enterprise models by the different countries should follow the same general instructions.

### *1.2.5 Agreed Principles*

After discussions concerning the practical execution of the investigation, agreement was reached on the following points, namely that:

the data for Sweden shall serve as a measuring rod for the work in the other countries, and that standards should therefore be sent by Sweden to the other participating countries showing what basis and which calculations are required for the comparisons;

the analysis of material and summary conclusions shall be done in Sweden;

the Royal College of Forestry in Sweden should be responsible for the publication of the investigation, in which the names of the contributing authors will be mentioned in the customary way. The publication shall be published in English;

the current rates of exchange shall be used for conversion to a common monetary value, and that the Swedish krona (S.kr) shall serve as a basis of comparison, although the other countries may submit their reports with values quoted in their own currencies;

the participating countries collect and adapt their material by the spring of 1965 at the latest, and submit their reports to Stockholm for processing;

Sweden assures the representatives of the various countries participating in the investigation that the work done by Sweden will be carried out in accordance with this agreement;

Sweden shall do everything possible to ensure the participation of France and England in the investigation;

a further meeting of the participants will be necessary at a later date to reach agreement on questions concerning the analysis of material and summary conclusions for the investigation.

## 1.3 Methods and Problems of Cost Accounting in Forestry

by

FRITS JÖRGENSEN

For the Working Group 3, Section 31,
International Union of Forest Research
Organisations (I.U.F.R.O.)

The above working group is concerned with questions of cost, including

problems connected with cost comparisons. The Department of Forest Economics at the Royal College of Forestry of Stockholm has asked the working group to decide the question of procedure for the international comparison of forestry costs. This problem was discussed at the meeting in Copenhagen, 20-22 May 1963, and has also been the subject of correspondence between the members of the group. On the basis of this, the group wishes to make the following announcement:

### *1.3.1 Purpose of Cost Comparisons in Forestry*

Cost comparisons in forestry can serve several purposes. These include:

a. Cost comparisons between enterprises in the same region can form the basis for determining the difference in the level and structure of costs of the enterprises concerned. This can also serve as a basis for eventual rationalisation measures.
b. In addition to the points mentioned under a, cost comparisons between enterprises in different regions or even different countries can help to determine the competitive ability of the various regions or countries.

### *1.3.2 Possible Methods for International Cost Comparisons*

Three of the several possible methods for making international cost comparisons in forestry are outlined below:

a. International cost comparisons can consist of direct comparisons of the average cost per output unit or area unit. This method will ensure that the calculations are representative if they are based on the average of the total figures for large areas or for whole countries.

   However, few countries keep a continuous record of the costs of total forestry production, and as a makeshift the average figures for forests in larger ownership, e.g. State forestry enterprises, can be utilised as a basis of calculation instead. Where such forestry enterprises are concerned, many countries undoubtedly have access to comparatively reliable accounting data, thereby permitting a comparison of similar cost groups. The main disadvantage connected with the use of State forestry accounting figures is that in many cases they are not representative of the country's forestry as a whole. Another considerable disadvantage when making a direct comparison of average costs, is that the various products are not directly comparable. Factors such as composition according to tree species, dimension and quality and, depending on these, the output of sawnwood and pulp, varies most considerably from one region to another.

   Unless the degree in which these factors influence the difference in costs can be ascertained with a reasonable amount of accuracy, the veracity of the direct cost comparisons is considerably reduced. It is theoretically

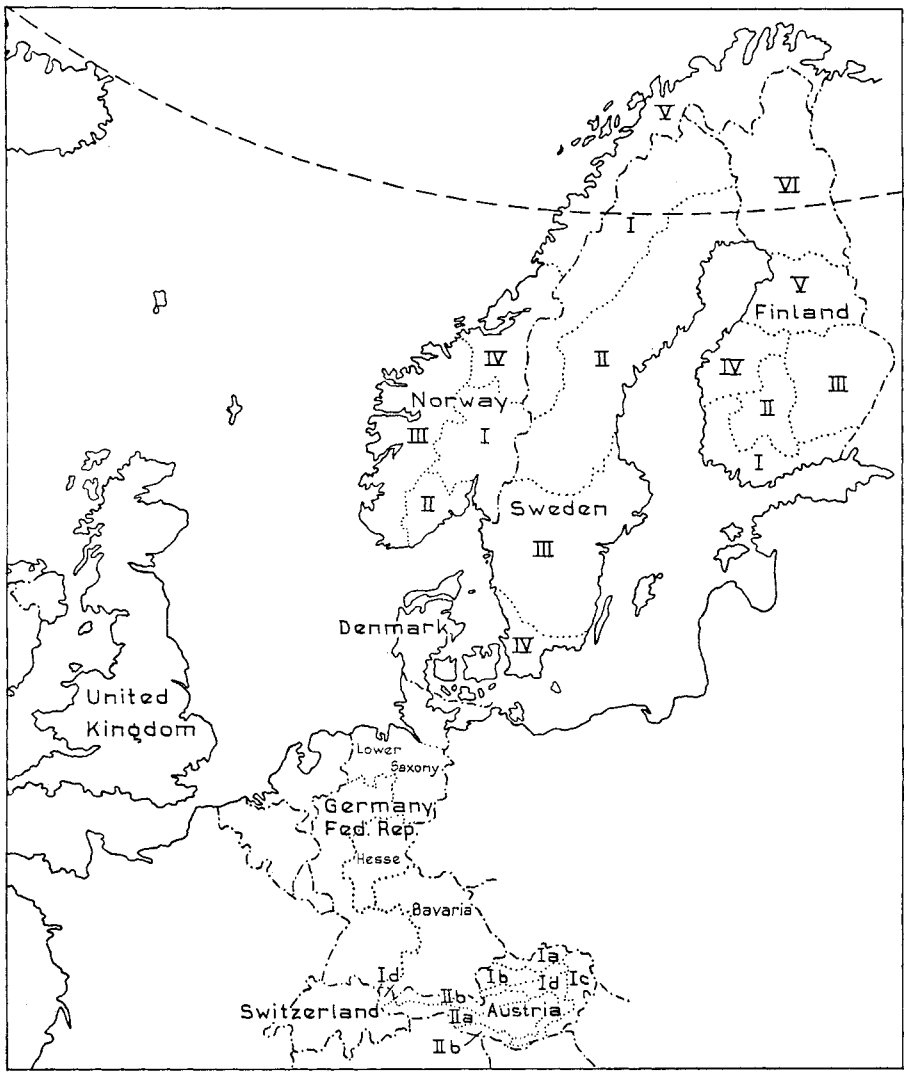


Fig.1-1. Orientation Map

possible to overcome these difficulties by extending the analysis to the end products, such as sawnwood and paper, but in practice it will hardly be possible in the short term to obtain the requisite cost data.

If despite these difficulties direct cost comparisons are made, they should certainly be supplemented with information regarding the products or factors, such as composition by tree species, etc. It would in this way

perhaps be possible at a later stage to make a selection of the sectors which it would be particularly suitable or important to investigate. By analysing these sectors it might be possible to increase the veracity of the overall comparison, without it being necessary to extend the analysis to the end products in each particular case.

b. In countries where the calculation of the national product is divided into sectors it is possible to obtain total figures for forestry revenue and costs. For the most part such figures are arrived at by calculation, and the degree of accuracy presumably varies from one country to another. Further, it is necessary to reckon on there being considerable variations in the demarcation line towards agriculture and forest industry, and in the drawing of a line between costs of investment and of maintenance. Consequently, a considerable amount of analysis would be necessary to determine whether the national accounts are sufficiently uniform in structure to serve as a satisfactory basis for international cost comparisons.

c. A number of the disadvantages which arise when making direct cost comparisons can be overcome by comparing hypothetical models of forest enterprises which are typical of particular regions or countries. The revenue and costs for such model enterprises are obtained by calculation, partly with the help of accounting data, and partly from price lists, working tariffs and the results of possible time studies. The models should be constructed in such a way that a number of important factors such as site quality class, haulage distance and the distribution of dimensions and tree species are variable. In this way it is then possible to analyse the causes of the differences in the unit cost and the operating profit thus established. Furthermore, it is possible to rearrange the models to represent different regions in the different countries. A considerable drawback connected with this method is that it requires an intimate knowledge of forestry conditions in the various countries, and can therefore be used only by highly qualified personnel.

### *1.3.3 Horizontal and Vertical Integration*

None of the methods mentioned here is unexceptionable. Consequently it is impossible to say whether an investigation in this field can provide the grounds on which to draw conclusions regarding the relative competitive ability of forestry in an integrated economic region. It must be emphasised, however, that analyses having this aim must take into consideration the horizontal and vertical integration of forestry with other branches of industry, more particularly agriculture and forest industry. The choice of method also depends on the time and funds available for this sort of investigation. However, we would recommend that, as they are complementary to each other, the investigation be carried out with the help of two or more of the methods simultaneously.

*1.3.4 Problems of Exchange Rates*

The working group has not discussed the problems connected with the circumstance that the official rates of exchange do not faithfully reflect the relative purchasing power of the various currencies. Reference is made in this connection to a publication by Gilbert & Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies* (O.E.E.C., Paris, 1954).

## 1.4 Directives for Comparative Examination of Costs and Revenue in Forest Production

(Compiled on the basis of agreements reached during negotiations in Munich, 29 and 30 January 1964)

*1.4.1 Methodology of the Survey in General*

The main features of the methods have been described by Working Group 3, Section 31, I.U.F.R.O., and according to this agreement the comparative examination is to be carried out with the help of the following methods:

a. Direct comparison of income and expenditure in individual forest enterprises based on actual accounting records (annual reports).
b. Comparison of revenue and costs based on constructed hypothetical models. Furthermore the national accounts, i.e. the contribution of forestry to the national product, be used for comparison purposes.

General information covering forest industries, external trade in forest products and the establishment of total roundwood balances. A description of the structure of the forest-products market is to serve as an introduction to the individual countries. Movements in prices and wages should also be described for comparison purposes.

*1.4.2 Disposition of Survey Material*

Each country should contribute the following information arranged as below:

*A. General information covering forestry and forest industries*

1. The contribution of forestry to the Gross National Product
2. Total forest-products balances and external trade with forest products
3. The structure of the forest-products market and movements in prices
4. The structure of the labour market and movements in wages
5. The main features of roundwood production and processing.

*B. Income (revenue) and expenditure (costs) in individual forest enterprises based on actual accounting records*

1. General description of forest enterprises

2. Annual cut (timber output) and income (gross revenue or sales value at place of delivery)
3. Logging and transport costs (harvesting)
4. Net conversion surplus or stumpage value (price of standing timber sales)
5. Costs of overheads, maintenance and improvement (managing costs)
6. Operating surplus

C. *Revenue and costs based on hypothetical forestry models*
1. Description of assumed conditions
2. Gross revenue (sales value at delivery places at roadside and at mill)
3. Harvesting costs (logging and transport)
4. Net conversion surplus
5. Managing costs (overheads, maintenance and improvement)
6. Operating surplus

### *1.4.3 Appraisal of "Net Production Value" ("Values Added") of Forestry and its Contribution to Gross National Product*

In principle, the aggregate cutting volume and its sales value at the point of delivery (on roadside, railway line, river bank, etc.) should be used as a basis for calculating forestry's "manufacturing value" or "net production value". To determine forestry's net production value, costs connected with the purchase of material and machinery produced in other branches of industry should be subtracted from this sales value. It is only possible to make a very rough estimate of this allowance for production outside forestry, and it depends in the first place on the degree to which forestry work has been mechanised. As a rule, a greater degree of mechanisation means a bigger deduction for the allowance in question.

To calculate the contribution of forestry to the G.N.P., the estimated net production value should be related to the value of the national product. It is important that the latter is calculated according to a standardised method of calculation in all the countries concerned; as there are several ways of calculating the G.N.P., misunderstandings can easily arise. For this reason the basis chosen for the estimates in question is the G.N.P. at market prices according to the definition of the United Nations, details of which are available in international statistics.

The contribution of forestry to the G.N.P. is to be calculated for the five-year-period 1958-1962, both annually and as an average during the period. The calculation should be made in terms of the 1962 currency, and for the conversion the wholesale price indices published in international statistics are to be used.

### *1.4.4 Forest-Products Balances*

To obtain a general impression of the production, consumption, imports and exports of the various forest products in a particular country it is usual to draw up what are known as balances in roundwood equivalents, where the processed forest products are stated in terms of the volume of roundwood which is considered to have been consumed in their manufacture. Such forest-products balances can be found in statistics of the United Nations Food and Agriculture Organisation (F.A.O.: *Yearbook of Forest Products Statistics*), which in turn, however, are based on the statistics of the countries concerned, and should consequently not be prone to major discrepancies. However, in cases where the international statistics do not agree with the statistics of the country in question, the latter should be used. In principle, the F.A.O. conversion factors should be used when converting to roundwood volume.

The forest-products balances for each country are to be drawn up for the 1953-1962 period. The domestic consumption should be calculated as the difference between requirements (annual cut + imports) and exports; consequently it is regarded as a residual, and as such does not reflect the ordinary wood consumption for the various years. Changes in the level of stocks are ignored in the above calculations.

### *1.4.5 Value of Forest Products in External Trade*

The international exchange of roundwood and processed forest products should be regarded as an important criterion when characterising a country's production conditions in the forestry branch. It depends on a country's external trade whether, where forest products are concerned, it is to be classified as a producer and exporting country, producer and importing country or a pure importing country.

The intention is that exporting countries are only to state the value of exports, and importing countries the value of imports of those forest products which have been involved in external trade. The material is to be presented on the basis of the various countries' existing trade statistics and embrace the 1953-1962 period.

### *1.4.6 Structure of the Forest-Products Market and Price Movements*

The relation between the price levels of forest products in different countries is constantly changing due to the influence of fluctuations in the external and internal market requirements. In countries which can be classified as producer and exporting countries, external demand is of decisive importance to the determination of the prices of forest products. The price-formation process in these countries also depends on the derived demand, where the wood-processing industry, as a regulating factor between external requirements of final

forest products and the domestic supply of roundwood, plays a very important part in market policy.

In the group of countries, which have been designated producer and importing countries, other factors predominate in the price determination of forest products. In this case the prices formed in the domestic market are affected to a great extent by foreign supply and price quotations on the assumption that there is a free market economy, and also, but to a lesser extent, on the internal supply of roundwood.

In the pure importing countries, i.e. where domestic production covers but a relatively small part of consumption, external quotations are the chief factors affecting the level of import prices. Furthermore, the formation of prices in individual countries is influenced by a series of factors which can be regarded as specific only as far as that country is concerned. It is important that consideration be paid to just these special factors when describing the market structure, and a special notice should be taken of the way in which they diverge from the so-called free market. This concerns the supply as well as the demand in the various markets for different forest products.

With regard to measuring the dependence of an economy on external trade or, in other words, in order to determine the factors which are responsible for price movements in the international market, the exporting countries are to report on export prices (f.o.b.) and importing countries on import prices (c.i.f., plus customs duties and landing charges) for similar forest products. They are to be the average prices according to the commercial statistics compiled by the respective countries and are to cover the 1953-1962 period. The price development in international trade concerning the following forest products is to be surveyed:

*A. Processed forest products*

1. Coniferous sawnwood (sawn softwood)
2. Chemical and mechanical wood pulp
3. Newsprint

*B. Industrial roundwood*

1. Sawlogs
2. Pulpwood

A comparison between import prices and domestic prices would appear to be particularly valuable to the producer and importing countries. If it is considered necessary, this price movement comparison can also cover broadleaved wood products imported from the tropics.

### *1.4.7 Structure of Labour Market and Movements of Wage Rates*

The wage determination and wage level affecting forest workers depends to a great extent on the general structure of the labour market situation. The supply of and the demand for labour in general should consequently be a great

value. In this context wage negotiations and the wage agreement system should also be discussed in general terms thereby providing a background for the movement in wages in the forestry sector. This discussion should also deal briefly with the principles governing collective agreements for wage fixing where such exist.

The number of people employed in forestry should be stated wherever possible. On the growing use of machines in forestry it would be of advantage if the number of workers could be related to the timber output and that the development of this relationship be drawn up for the 1958-1962 period. The movements in forest workers' wages, hourly or daily payments for fellers, haulers and other adult male workers, should be considered and possibly also compared with wage movements in other sectors of economy, in the first instance in the wood-processing industry and industry in general.

The share of social benefits (overhead charges) in wages or labour costs should be the subject of a more detailed description and analysis. In this connection it is not sufficient to include only the direct social costs which usually constitute a part of the gross wage item (holiday pay, etc.); indirect social expenditure such as pension contributions, which are not proportional to the money wages and are paid by the employer, should also be included.

Data should be obtained on the percentage share of wages representing social benefits and also the social expenditure additional to money wages, which is paid by the employer not to the worker but to the social ministries of the government or to private organisations. With a view to possible comparison with other countries, each country should endeavour to estimate the share of total social charges in labour costs.

### *1.4.8 Main Features of Roundwood Production, Marketing and Processing*

The natural conditions for timber production in each country are to be described briefly. Data concerning the forest area, growing stock, composition of tree species, distribution of age classes, increment and site quality class are to be given.

Furthermore, mention should be made of forest-land ownership, and if possible the above data should also be given for each type of ownership. As far as possible on the basis of available material, special attention should be paid to clarifying the differences in natural site and stand conditions between the various ownership categories.

The accessibility and marketing conditions for roundwood should possibly be defined with the help of the following factors: the location of forests in relation to the larger consumer centres or export seaports, the average distance to local wood-processing plants, the level of industrialisation of the region in general, existing transport facilities and the density of the road network. This description can suitably be made on the basis of the country's division into

forest economic regions, but may also cover the entire country. The division of a country into forest economic regions is to be illustrated by a map.

### *1.4.9 Assessment of Revenue*

Income from timber sales (gross revenue) is determined by the volume of the timber cut and the selling prices for different roundwood products. The volume of timber cut (removals of roundwood) can in this context be equated to the volume of timber sold. Statistics of forestry operations usually only contain data concerning the assortment of wood products for that part of the cutting volume which was felled for delivery sale. Where sales of standing timber are concerned, the distribution of roundwood products should be calculated, or else no attempt should be made to divide the volume of cut into assortments.

The calculation of revenues is to be made on the basis of sales of timber alone, and should not include possible income derived from land rents, hunting and fishing, and the sale of products other than wood. All grants should be quoted separately.

It is practical to calculate the forestry income for the statistical comparisons on the basis of the actual cut, and in principle no attempt should be made to attain adjustments on the basis of "allowable cut" or "normal" cutting volume as is usual when drawing up profit and loss accounts.

Revenue calculated on the average sales value of the "normal" cutting amount are to be used as a basis for the construction of hypothetical models.

Where sales of standing timber are concerned the forest enterprise (the seller) does not record the logging costs, and consequently the income from sales are in such cases not encumbered with logging costs. In general, income from sales of standing timber are to be equated to the net conversion surplus of felled timber (gross revenue less logging costs).

When calculating the net conversion surplus all expenditure connected with logging and transport, including social charges, is to be subtracted from the income from sales of felled timber.

### *1.4.10 Classification of Costs*

The dividing line between primary or biological forest production (timber growing) and the secondary or technical phase of production (harvesting or logging) should in principle be considered when apportioning costs according to function. This demarcation is of particular importance since in a number of countries timber is for the most part sold standing. Any division between harvesting and timber growing must necessarily be arbitrary, as part of the costs refers to both phases of production, e.g. administrative costs, costs for roads and buildings, overhead charges, etc.

Division into the following types of costs would be expedient:

*A. Logging and transport (variable costs)*

*B. Maintenance and improvement (common costs).* These include:

1. Silvicultural costs
2. Administrative costs
3. Maintenance costs
4. Cost of improvement and expansion
5. Taxes

It has been agreed that all social charges (overhead) are to be shared among the above cost groups in both phases of production. The social charges borne by the enterprise include:

a. For workers: Pensions, annuities, the employer's share of national insurance contributions, economic assistance, children's allowances, gratuities, holiday pay, travelling expenses and car allowances, wet weather allowances, camps, etc.

b. For salaried employees: Pensions, employer's insurance benefit contributions, expenditure connected with further education, etc.

The distribution of social charges can only be decided arbitrarily as many of them are common cost items; an allocation according to actual labour expenditure would appear to be possible, however. Social charges can suitably be given as a percentage of money wages.

### *1.4.11 Logging and Transport Costs*

Harvesting, logging or extraction costs include the direct and indirect expenditure which arises in connection with felling and transporting the timber from the stump to the place of delivery (roadside, railway or floating channel).

This includes the following work:

Felling, limbing, marking for cross-cutting into log lengths or standardised products, peeling, skidding and hauling to the landing place where the timber is delivered to the buyer. This landing place can also be at a wood-processing plant. Logging costs consist of wages and the outlay for acquiring machines, appliances and tools.

Difficulties arise when determining the share of the machinery capital expenditure for depreciation charges which is to be regarded as current logging costs. Some of these machines which the forest owner has acquired for logging operations, are also used for other purposes (e.g. the construction of roads and for silvicultural work). Because of the lack of suitable material, a more detailed allocation of depreciation charges is in this context a very complicated matter and hardly feasible. Where the statistical comparisons are concerned it would consequently seem practical, particularly with large enterprises, to refrain from calculating depreciation for machines, appliances and tools, and to regard the average current expenditure as depreciation.

The expenditure for marking, scaling and supervision of felling work, construction and maintenance of logging camps, building of skidding roads (the permanent facilities for timber transport are treated separately), and maintenance of landing places are to be regarded as indirect costs for logging operations.

Furthermore, expenditure connected with holiday pay and travelling expenses, wet weather allowances, and direct outlay for accident and sickness are to be considered as logging costs.

Neither is the expenditure for further transport over long distances (rail, sea and road transport), which is usually defrayed by the buyer and is consequently not included in the gross income from sales of felled timber, to be regarded as logging costs, but should be dealt with separately. In constructed hypothetical models where the sales value is calculated at mill (free factory), however, the expenditure for transport from landing place at roadside to the mill is an element of the logging costs.

### *1.4.12 Silvicultural Costs*

The group embracing silvicultural costs is to include expenses connected with the establishment, improvement and protection of stands, which are necessary for the continuous maintenance of productive capacity in a forest enterprise. New plantings on ground not previously used for forest production or on old cut-over areas are regarded as an extension of the enterprise and are to be treated separately.

In principle a dividing line is to be drawn between the establishment of new plantations and current silvicultural operations. The group covering current operating expenditure includes the following work:

a. Establishing of stands: clearing of clear-cut areas, preparation of ground, seeding and planting, beating up, nursery operations;
b. Improvement of stands: cleaning, weeding, pruning and manuring of ground;
c. Forest protection: combating insects and fungi, protection against game damage (fencing) and natural disasters (forest fires, wind damage).

Social charges connected with expenditure for labour must be regarded as a part of silvicultural costs. Because of incomplete data no attempt at a division between labour and machine costs should be made.

To be able to make a better survey of the establishment of stands it would appear necessary, parallel with the recording of costs, to determine certain basic comparison figures for the cultivated areas. The following comparison indices can be used as a guide for this purpose: cultivated area (seeded and planted) as a percentage of the productive forest area, and the cultivated area in hectares in relation to 1,000 cubic metres timber cut.

Percentage distribution of expenditure for different silvicultural measures,

connected with the establishment, improvement and protection of stands, is of importance for the statistical comparisons. A comparison of the unit costs for different silvicultural operations would also appear to be of value.

### *1.4.13 Administrative Costs*

Expenditure which arises as a result of initiating and maintaining managerial activities, i.e. such expenditure as can be referred to the conducting and supervision of operations, is usually called administrative or overhead costs. Expenditure of a supervisory nature and connected with activities which bear no relation to timber production is not to be considered as administrative costs and is not to be included in the calculations.

Overhead costs of State Forest Administration connected with consulting activities and with the management of privately owned forests are in principle to be referred to as management costs for the latter type of forest ownership.

Where small private forests are concerned, and where the expenditure does not appear in statistical records because the owner himself manages and supervises the operations, only the estimated cost of operations can be utilised in the calculations. For this reason it is necessary partially to make the statistical comparisons with the help of estimated figures.

Administrative costs also include social charges for managerial, technical and clerical staff. Apart from pensions, annuities, financial assistance, accident insurance and the training of technical and clerical staff and workers, this group is also to include the expenditure for rationalisation activities (development and expansion of the enterprise).

There is no need to divide administrative costs into wages and outlay for material, as expenditure appertaining to the building and upkeep of personnel dwellings, marking, maintenance of boundaries, and forest regulation is not regarded as administrative costs. A division into salaries and travelling expenses (allowances, car allowances, etc.) would be useful.

Furthermore, it would appear practical with state forests to differentiate between the cost of central forest administration, regional administrative offices (regional foresters), forest district offices (forest supervisors, forest rangers) and local accounting offices, and to make the statistical comparisons according to this division.

### *1.4.14 Costs for Maintenance of Facilities*

This group includes all expenditure connected with maintenance and referred to in the foregoing groups. It includes the expenditure for maintaining roads, buildings, drainage facilities and machinery, as well as that of maintaining property boundaries, forest mensuration and other measures for the maintenance of forest activities which cannot be referred to administration costs.

Harvesting costs are affected to a considerable extent by existing forest roads and other transport facilities, and expenditure for road construction might also be regarded as indirect logging costs. An extensive road network has the effect of reducing the cost of forest reproduction and the improvement of stands, in combating forest fires and attacks by insects, and in the carrying out of managerial duties.

It is practical to differentiate between new constructions and maintenance, and to regard each cost group separately.

In some regions the forest enterprises own a large number of dwellings for permanent forest workers, houses for technical and clerical staff and also other types of administrative buildings. The expenditure for maintaining these buildings can be quite considerable. However, a certain rent is usually paid to the forest owners for the use of such dwellings, and it would consequently be right to deduct from the expenditure for these dwellings and buildings the amount received in rents.

A division of the total expenditure for maintaining the items in the above cost categories would allow a more specific comparison to be made of the forestry activities in different regions.

### *1.4.15 Costs of Improvement and Expansion*

This group comprises the expenditure connected with the economic growth of forest enterprises. Some of the more important items are:

a. The construction of new roads, buildings and drainage facilities and transport facilities;
b. Initial planting on ground not previously used for forest production (afforestation);
c. Acquisition of new machines, tools and equipment.

Apart from the building up of the road network (motor roads, main haulage roads, bridges, etc.) the costs of improvement and expansion also include expenditure for construction of permanent transport facilities in the mountain areas, water transport facilities, etc. The comparisons need not concern themselves with a detailed specification of artificial establishments and the registration of accomplishments in physical terms (road length, etc.).

### *1.4.16 Taxes*

The annually recurring taxes belong to this cost group. In conjunction with the making of comparisons it would appear to be practical for taxes which are calculated on a different basis to be included separately. In principle the calculations are to include only such taxes which can be regarded as costs. Consequently, income tax for forest owners shall not be considered in this connection. Turnover tax shall be treated as a cost item.

### *1.4.17 Allocation of Overhead Charges*

For the purpose of the investigation full cost accounting seems to be more expedient than the contributory method (direct costing). In the latter case the products only include the variable costs (direct costs such as wages for logging), while the common or fixed costs are considered as a sum total, which makes comparison between the various types of costs complicated or altogether impossible.

Full cost accounting, in which the average costs per cubic metre of the timber cut and per hectare productive forest area are obtained by division, would make anything but a summary comparison impossible. Because of the difficulties connected with allocating the common costs to the different tree species or standardised products, and particularly on account of the incomplete nature of the basic material, this comparative investigation should content itself with rough averages.

It is not difficult to calculate the costs of an entire forest enterprise according to this principle, but a comparative investigation into sections of a forest enterprise is at once more complicated. Certain items of overhead charges (salaries for central office personnel, expenditure for research, pensions and other social expenditure) cannot be allocated to regions according to causal connection. A distribution on the basis of the average timber output would seem to be practical here, as in this way the difference between the natural and economic conditions of the separate regions would stand out more clearly. A differentiation of such common costs, for instance a distribution according to the net conversion surplus or operating profit, as is sometimes customary, would to some extent obscure the real situation.

### *1.4.18 Comparison of Income and Expenditure in Individual Forest Enterprises Based on Actual Accounting Records*

Book-keeping records of actual forestry operations in the countries concerned are to be grouped and adjusted only to such a degree that they can be considered comparable with the results of other countries. Consequently, the statistics of forest enterprises are not to be converted to correspond to normal conditions. In the comparisons, however, income and expenditure which are not attributable to the business proper must be separated.

In general these comparisons are to concern the years 1958-1962 and therefore cover a five-year period. To compute the mean aggregate of the five-year period it is necessary to adjust these data using wholesale price indices. The mean aggregate for the period is to be calculated on the basis of the 1962 value of the currency, i.e. all data concerning income and expenditure for the years 1958-1961 are to be converted to the 1962 value of the currency before they are totalled. Wholesale price indices published in international statistics are to be used for the conversion.

Unit costs per cubic metre solid volume felled timber without bark ($m^3y$) and cost-revenue coefficients[1] are to be used as business indicators or comparison figures for logging costs (proportional costs).

The managing or common costs (differentiated according to the various types) are to be related to the cubic metre ($m^3y$) of the average annual cut and per hectare of productive forest land. They are also to be expressed as cost-revenue coefficients and as a percentage of the net conversion surplus. These figures can be used as business indicators for the purpose of the comparative investigation.

### *1.4.19 Construction of Hypothetical Forestry Models*

The revenue and costs of forestry in different geographical regions and under varying natural and economic conditions can be shown in a reliable manner also with the help of a hypothetical model of a forest enterprise which is organised as a going concern. It is here not only a question of being able to determine the existing cost structure for a certain period; an attempt should also be made with the help of calculations to ascertain costs and revenue which can be regarded as normal for forestry practice on a sustained yield basis.

In other words, it is necessary to make an adjustment of the historical costs of actual forestry operations, which can be of a temporary character, in order to obtain values which are representative of a normal sustained-yield type of forest enterprise. The constructed models are to reproduce the actual production conditions during the observation period and not the ideal or desirable conditions which are aimed at maximum productivity and which will yield the greatest operating profit.

In newly established forest enterprises which are striving to attain normal conditions through increase in the timber capital, i.e. by building up their growing stock, the annual rate of cut is as a rule less than the average annual increment. The cut will include mostly thinning and improvement cuttings. Consequently, the actual financial results in such an expanding (progressive) type of forest enterprise are usually less favourable than would be the case with the normal sustained-yield type under similar natural and economic conditions.

Therefore, in the regions or the whole countries where the actual production conditions greatly deviate from the normal conditions, and especially where there is transition from the expanding type to the normal sustained-yield type of forest management, models for both these types should be constructed.

The revenue calculations are to work on gross sales value, i.e. selling prices for felled timber at delivery place or at mill. The classification of forestry

[1] The cost-revenue coefficient is obtained by dividing the types of costs concerned into the total revenue.

costs shall adhere to the principles already described. Data concerning prices and costs are to reflect the average conditions prevailing during 1958-1962 and be converted to the 1962 value of the currency.

When explaining the assumed conditions and in the actual construction of the models, the following two methods are to be used:

A. The models are to be constructed so that two of the most important cost-determining components—tree species and site quality class—can be varied, while the third main component—accessibility— remains constant under two alternative presumptions. In this way the effects of the variable factors on the result can be read off and compared. Concerning accessibility, it is assumed that the haulage distance from the stump (felling place) to the landing (roadside, railway line, etc.) where the products are delivered to buyers, is alternatively 0.2 and 1.5 kilometres.

The sales prices at such a delivery place, which form the basis for the calculation of revenue, shall concern assortment or products of roundwood. Long distance haulage costs, i.e. from delivery place (roadside) to mill or other place of consumption, are consequently not to be included in the calculations.

In general, a normal sustained-yield type of forest enterprise (normal distribution of age classes) with a steady annual cut is to be presupposed for the various tree species and for each site quality class. The average annual increment (the actual yield of standing timber expressed in "forest" cubic metre solid volume including bark, $m^3f$, per ha productive forest area) and the annual cut (felled timber expressed in "yield" cubic metre solid volume without bark, $m^3y$, per ha) are to be given. The calculation of the annual cut, which is to be noted, should take place after a rotation period which in general is applied to the respective tree species under present conditions.

The direct costs and the common costs are to be calculated so that they can be regarded as relevant to a typical forest enterprise. The distribution of the actual cut according to main standardised products (sawlogs, pulpwood) should be noted.

The construction has been simplified to facilitate comparison, but it should be supplemented by detailed information concerning the silvicultural system and the logging method. The assumed rotation period, the distribution of annual cut between thinnings (intermediate cut) and final removal of forest crop (reproduction cut) and annually cut-over area should be mentioned in this connection.

B. To permit the description of the cost-revenue relationship for total forestry production in a certain region or for a whole country, an average model is to be constructed in which the relative shares of the composition of tree species, site conditions and accessibility are taken into consideration. This model is not only to express the average productive capacity of all

commercial tree species and site quality classes, but also the mean proximity to access roads, and to be representative of all types of forest ownership.

The following assumption should be taken into consideration. The models are to be constructed for an annual roundwood yield of 10,000 cubic metres (felled timber, $m^3y$) and based on the distribution of tree species and the average site quality class; the forest area (rounded off to the nearest 100 hectares) is to be calculated for this felling amount. The growing stock necessary for production of such a quantity in terms of standing timber (total in $m^3f$) and the mean annual increment ($m^3f/ha$, average for all tree species and site classes) are also to be estimated.

Removals are to be divided into the main types of products (assortments) in the respective areas.

The calculation of revenue is to be based on the sales prices of the different assortments at mill or other place of consumption, although the prices at delivery place (roadside, railway line, etc.) should be given, too. Furthermore, mention should also be made of the average distance from delivery place to the wood-processing mill.

Models which concern a whole country can be constructed in the same way as those for forest enterprises. The degree in which these models really represent the national average can be checked to a certain extent with the help of a total estimate of entire forestry production. Such a total calculation can also be used in estimating the contribution of forestry to the Gross National Product.

## 1.5 Notes on the Methodology Debates

*1.5.1 General Views*

From the general views which became apparent during the debate at the Munich conference two main phases of the investigation could be distinguished: firstly, the compilation of national accounts and, secondly, the comparative evaluation of the same. As to the existing basic material the following three possibilities were discussed:

a. To get the figures from selected enterprises.
b. To use average figures from statistical data.
c. To use constructed figures from hypothetical models.

The reasoning behind the first approach was the fact that statistical averages lack weight because they are not completely reliable, while results from enterprises which have been carefully selected as type-patterns would ensure a more accurate accounting. However, the purpose of the survey was to show how the cost-revenue structure has developed in the various countries and the present stage of such. This analysis must be based on the average figures. Type-patterns from selected enterprises would probably not be representative

for the country. Therefore the calculation had to start with the rough average figures in order to arrive at the exact methods; the results had, however, to be revised to some extent and supplemented. In this process selected enterprises could perhaps serve as a kind of measuring rod for the value of the average figures. It seemed to be of the greatest importance to obtain good material for the purpose of comparison. One of the main purposes of the conference was to establish the basis for facilitating such comparisons. One should try to work out a common denominator but this could not be devised in the same way in all countries. The important thing was that the reports of the individual countries should be representative. On the basis of this material showing the cost-revenue structure under the present conditions it should then be tried to construct hypothetical models showing the structure under changed conditions and standardised to certain common values for tree species, accessibility, site quality class, rotation, etc.

An extensive discussion took place as to the requirements the representative material should be expected to meet and how much material of this kind was available in the various countries. It became evident that sufficiently accurate material for the study was available only from State forestry. After discussions which went into detail it was decided to base the comparisons between the countries on material from State forestry and to divide every country into suitable regions. Complementary to the data received, every country should provide a more general description of prevailing conditions as to roundwood balances, external trade, development in prices and wages, and other primary conditions affecting forest production and forest industries. It would be left to the discretion of the compiler in each country to decide to which extent to go into these questions, but certain basic conditions which have bearing on the individual country must be defined more closely as this would probably be of great help in the assessment of comparisons. On the basis of the discussions it was agreed that Sweden should compile a pattern to be followed by the individual countries and that this pattern should indicate the basic information and calculations necessary for the purpose of comparison.

### *1.5.2 Net Production Value of Forestry*

The possibility of using national product calculations was shown by Professor Jörgensen with the following example from Norway (the figures are only approximate values for purpose of examples).

| | | | |
|---|---|---|---|
| Net product from forestry | | 900 million Norwegian kroner | |
| Forest area: | 6 million ha | N.N.P./per ha | = 150 N.kr |
| Timber cut: | 12 million cu.m | N.N.P./per cu.m | = 75 N.kr |
| Labour input: | 25 man-years | N.N.P./per man-year | =35,000 N.kr |

With an annual remuneration per worker estimated at 16,000 N.kr one can designate 20,000 N.kr (36,000-16,000) as return on capital and for the entire

forestry operations this return on capital then amounts to 500 million N.kr for the year (200,000 × 25,000). If the growing stock for cutting 12 million cubic metres is estimated at 360 million cubic metres, one gets 1.40 N.kr per cubic metres for forest capital. Such calculations give the possibility of checking whether the figures derived from hypothetical models are representative or not, but obviously it would be difficult to determine unequivocally the amount for the N.N.P. as 900 million N.kr.

As such a compilation of a total production value of forestry goes beyond the framework which is customary, it was considered that such an extension would be valuable for the survey. However, it was stressed that one must use such figures with caution, because to a great extent they have been obtained by means of assessment; it was agreed that the method to be used should be left to the individual countries.

In the discussion which followed the question was put whether such calculations could be made for the wood-processing industry, too. In reply it was stated that basic data as to costs available for the industry in Germany and Austria would not permit similar calculations. Further causes of difficulty were:

a. Multi-prices in the German industry for German and non-German products. The accounts of prices for roundwood are in no way relevant to the economic position of forestry in Germany.
b. Inaccurate statements of amounts concerning the extent of processing, which in its turn gives rise to standardisation difficulties.
c. Very many manipulated figures in the calculation of the operating results of the industry. However, accounting records of the wood-processing industry are available.

The suggestion to calculate the share of forestry in the G.N.P. from the gross production value of the total wood-consuming industries was met by many objections. It was pointed out that there is a fundamental difference between forestry and the wood-processing industry and that the product value estimates for the industry are totally unreliable. The conclusion was that the figures for the net production value of wood-processing industry are not comparable and that one could not use these figures for the survey. There seems to be no possibility of making a detailed cost comparison in the whole sector of forestry. What could be compared was the share of forestry in the Gross National Product of each country. Therefore it was decided to restrict the survey to forestry and not to go into the problems of industry in the total calculation of the forest economy.

### *1.5.3 Distribution of Costs*

The question of adaptation on the basis of the actual operating records was first discussed from the theoretical point of view, namely, the concept of basis

and the distribution of costs. The main point of the discussion was the set-up of tables in the Swedish outlines. The idea of these tables was to put against the revenue the sum of costs involved in order to attain this revenue regardless of where they appear. One had to start with the figures compiled on the basis of the book-keeping entries, but from these it is necessary to exclude income and expenditure which are not part of the function of management. Part of the statistical material can be obtained only by using calculated values, and for purposes of international comparisons a considerable amount of regrouping of the book-keeping entries must be done in order to make the figures comparable.

By separating logging costs as a special group and by deducting these costs from the revenue, a net conversion surplus or "the purchasing price of standing timber" is obtained; this can be regarded as one of the most important figures for the survey. For the other costs a division into five groups is suggested. Silvicultural costs and administrative costs have to be treated separately, while the costs for improvement and expansions have to form a separate group from maintenance costs in order to show the growth of infrastructure in forestry. Finally, another group should be created for all social charges and taxes. However, the calculated interest on the capital invested in forest land and growing stock should not be included.

During the debate which followed the difficulties involved with a division between the cost groups for maintenance and improvement were mentioned; it was also stated that a comparison between the various countries as to, for instance, net conversion surplus per cubic metre or per hectare could give a false picture because the cubic metre is not a uniform unit of measurement. There are different dimensions, kinds of wood, different amounts of capital per unit of growing stock. These factors must be taken into account. It would be most essential to keep an eye on possible sources of error.

One was aware that serious difficulties could occur in connection with such questions as investments and subsidies, as well as expenditures on functions which are not applicable to commercial forestry, such as the preservation of the countryside and the like. It was agreed that one should try to make a distinction between the costs of social benefits and the costs of forest production in order to maintain the causal connection between the different functions of forestry. It was the general opinion that one must attemp to do this also in the evaluation of the statistics. Such difficulties were particularly prominent for Switzerland and Austria. Various types of costs, such as pensions and torrent drainage, would be included only to a certain degree in the Austrian forestry. Thus, it was obvious that the basic statistical material differed very considerably from country to country, but for the survey efforts should be made to ensure some conformity in this matter. One cannot avoid having to calculate a part of the material. However, such calculations would be different for the various countries.

Provided that a great part of the costs would be based on calculated values, the imputed interest on forest capital should logically also be taken into account. This would perhaps be possible in the hypothetical models, but it seemed very difficult and somewhat dangerous to do it in the statistics. After having discussed this problem further a general agreement was reached that cost assessment in this connection hardly could be made in exactly the same way in all countries. However, it was agreed that the imputed interest has to be excluded in the comparisons of costs and revenues.

### *1.5.4 Discussion about the Main Cost Items*

The greatest difficulty when determining the logging costs was whether certain social payments to forest workers should be included. In the outlines it was suggested that logging costs should include not only the money wage and immediate outlay for the procurement of machinery, equipment and tools but also the social charges connected with the employment of forest workers. These charges include the outlay for provision of accommodation in the forest, paid leave and travelling allowances, compensation for inclement weather, and direct expenditure involved in accidents and injury compensation. However, as conditions in the various countries in regard to social charges are so different, there was also the opinion that these should not be divided into special cost items but should be given as a total figure and constitute a special cost group.

The two alternatives, namely, to add the social charges on direct money outlay for different activities or to deal with them as a certain cost group, turned out to be extremely prominent in the discussions. Mainly this was due to the importance attached to the net conversion surplus, which was regarded as a significant indicator for the state of the forest economy in the various countries. It was suggested that, if the social charges are not to be taken into consideration in the determination of the net conversion surplus, the value of the net conversion surplus would have little relevance or would mean nothing because it would not be free of logging costs. On the other hand, it was said that when the logging costs of the various countries differ very greatly, due to differences in the burden of social charges, then the logging costs are no longer comparable. As a recommendation for the way of dealing with this question and for the compilation of directives, it was stated that an accurate account must be given of the different items included under the heading of social charges.

When discussing the principles concerning the practical division of the other cost groups, questions which had been discussed previously were taken up to a great extent. As to the silvicultural costs, it was agreed that major soil enrichment and afforestation, such as afforestation of drained marshland, should be regarded as improvement and expansion.

The difficulties of differentiating between the costs for maintenance and the costs for improvement were discussed more in detail. For some countries, especially Germany, the difficulties would be hard to surmount, whereas such differentiation was made in forest statistics in other countries, such as Norway and Switzerland. It was suggested that also the outlay for improvement must be regarded as current costs or as normal operational expenditure entailed in production.

The problems about non-productive social charges were discussed further. It was emphasised that the special joint costs which belong in this group must be differentiated for the various countries because this problem cannot be solved completely. It was agreed that the outlay for pensions of salaried employees should be counted as administrative costs, as would be the expenditures of further training, etc. Only taxes should be treated separately, due to the differences in tax legislation.

In the draft it was assumed that administrative costs involved with State responsibilities in extension work, as well as for the care and control of forests which are not owned by the State, shall be ascribed to the administrative costs of the actual forest owners. It was discussed whether such an exhaustive division of the outlay for administration in this survey would be possible, and the general opinion was that it would involve numerous explanations and footnotes. One must see the total picture and has to relinquish aspirations with too perfect assumptions. It was left to the Swedish participants when compiling the directives to define exactly how they regarded this concept; their recommendations should then be followed by the various countries in the best possible way and any deviations should be explained.

It was also discussed whether corrections should be made in the statistical concept regarding changes in the supply of standing timber. However, it was considered too complicated to assess the changes in growing stock. Such clarifications should be brought into the hypothetical models but statistics could record only what has taken place and therefore as few calculated assessments as possible should be used. However, it was questioned whether in this case the terms "Cost and Revenue" should be replaced by "Income and Expenditure". Obviously, it is no longer a matter of revenue when the results of a major disaster or over-cutting are included in the statistical data and shown as revenue. It was agreed that large deviations should not be overlooked. As far as possible, such deviations should be registered and the Swedish compilers should be informed accordingly so that the necessary corrections could be made. If the corrections were made in the individual countries, there was the risk that such calculations would be made in different ways.

*1.5.5 Construction of Hypothetical Forestry Models*

As a rule, in the social sciences, the concept of model is close to what the

scientist means when he uses the term theory. Broadly speaking, the scientist uses the term theory to mean systematic explanation, which is used to describe the workings and interrelations of the various aspects of a phenomenon. The procedure involves the examination of some aspects of reality and the construction of a model; the purpose of the model is to function in the same way as the phenomena being studied.

It is asserted that the need for theory arises because facts do not always speak for themselves. Facts could possibly indicate relationships. The facts themselves are silent, theory must be invented to describe their workings. Thus, the model which describes the theory should be a simple version of the facts to permit systematic manipulation and analysis. Consequently, in most cases the model represents an oversimplified picture of the real world.

One may also conceive static models to depict a static situation. As this study is concerned with comparisons of costs and revenue in different countries over a certain period of time, the original intention was to construct such models; these must be in close agreement with the facts in order to avoid misrepresentation of the situation which is to be depicted.

In the actual case the models were to be constructed in order to give the picture of a more normalised forestry, where the character of going concern should be developed in such a way that the model should represent a well-balanced activity. Thus, gross revenue, net conversion surplus and operating profit should represent a situation referring to a permanent production apparatus. Therefore, the model should represent a normal forest with even age-class distribution and a certain chosen rotation but refer not to ideal but to actual conditions. One possibility would be to construct models for the most important tree species and for different site quality classes. A second possibility would be to construct one model only for each economic or forest production region which would be an average model for all tree species and site quality classes.

PROFESSOR N. K. HERMANSEN pointed out that the purpose of the hypothetical models should be to contribute to the analysis of the statistical comparison of forest enterprises. In this way the deviations which have been determined there could be analysed in a more satisfactory way. Because of that some general assumptions must be clearly defined for the model and the first requirement must be the distribution of the various tree species. For this reason a theoretical cost-revenue analysis for the individual tree species has to be made with the help of the practical experience obtained from the business statistics. One must first realise clearly the direct costs involved with the tree species—i.e. costs for logging and silviculture—and further the costs which are not dependent on the tree species, such as administrative costs. Since it is impossible to bring the costs for construction of roads in a causal relationship to the tree species, the average costs of improvement and expansion have to be taken. This calculation must be made in the same way for all

countries. In the construction of cost-revenue models it would be more appropriate for each country to select a site quality class and a tree species which are typical of the country, but certain data, for example concerning the size of the enterprise, must be assumed.

PROFESSOR J. SPEER was also of the opinion that just those features which are characteristic of the enterprise should be taken into consideration. In order to get a correct picture a thorough investigation of the statistical data and events is necessary, as it is very difficult to find an ideal enterprise which is representative. The conditions are very different due to the following factors:

a. Site conditions
b. Distribution of tree species
c. Price zones

Thus, three different systems of division are possible. The most important question will be whether hypothetical models shall be constructed according to individual tree species or whether a balanced selection of different tree species shall serve as a basis. Obviously, it is very problematic to compare these models as the extremes determine the average.

DOCENT R. FRAUENDORFER mentioned in his contribution that in the case of Austria the conditions in regard to the basic material would be similar to those cited by Professor Speer for Germany. As to the model, Austrian forest operations concerned purely spruce and beech.

PROFESSOR F. JÖRGENSEN was rather doubtful as to the possibility to construct objectively average models which have to be representative for a country or a region and wondered how it was possible to carry on an objective discussion about average figures. He was of the opinion that it would be more appropriate to analyse in detail the various factors in *one* model by taking a model enterprise which shows the influence of the various factors on the final result. He therefore suggested that a dividing line should be made between the managerial statistics, which register what happens, and the hypothetical models, which are more or less freely constructed. The purpose of a hypothetical model is to explain the reason for the variation of the different factors. The models should be constructed in such a way that important factors such as site quality class, hauling distance and distribution of timber according to tree dimensions and species can be varied. Thus, for this type of model the revenue and costs would be determined by means of calculation from data contained in invoices, price lists, wage rates and time and motion studies. Thus, it would be possible to establish the reasons for differences in unit costs and to analyse economic results. Furthermore, there is the possibility to construct the models in such a way that the various regions within an individual country would be represented. In his opinion the hypothetical models would be important just for those countries where the natural and economic conditions are very different. In such countries the average figures would not be of the slightest significance.

During the following discussions it was established that there was rather a difference as to the factors which are to be thoroughly investigated in the individual countries by using the models. As there were so many possible variations in the proposals presented and discussed as to the construction of models, it was decided that general lines for the construction of models should be established in the Directives.

On the basis of these discussions the section "Construction of Hypothetical Forestry Models" was later on compiled in the Directives (cf. 1.4.19). There an attempt has been made to draw up principles for the construction of similar models which seemed possible to realise for the countries participating in the study with the existing basic material.

Although attempts were made to meet these basic demands in the construction of models it transpired during the course of the study that it was not possible to fulfil such requirements for all the countries in the survey. The question of construction and comparison of models was discussed at a meeting at Bad Godesberg on 18 May 1966. The preliminary compilations which had been made on the basis of the models presented by Austria, Denmark and Norway (and also from other countries, namely, Germany, Finland, Sweden and Switzerland, that with certain reservations had prepared drafts for the construction of models) were not regarded as giving an accurate picture of the differences in the conditions for production. It was therefore decided at the meeting to exclude comparisons by models in the present publication in order to avoid the drawing of wrong conclusions.

It is obvious that the models presented in the reports from Austria, Denmark and Norway represent different types of models. The Austrian model is the one which is coming closest to the instructions to compile a hypothetical forestry model representing the average for all categories of forest ownership. It seems that this has been due to the special investigations which, as far as Austria is concerned, have been made in this field. The Danish and Norwegian models follow in principle the lines drawn up by their representatives (Professors Hermansen and Jörgensen) during the discussions in Munich. It seems as if the construction of models makes a valuable complement for each of the three countries intensifying the understanding of the significance of the cost-revenue structure which is evident from the statistical material. Because of the differences in approach to the problem it seems useless to try to make some kind of comparison between the three models. On account of these facts the analysis of the model will not be continued in this study, apart from the analysis made for each individual country.

### *1.5.6 Conversion to a Common Monetary Value*

One item of the debate was a discussion on the subject how to convert the currencies of the different countries into a common monetary value. In this

connection attention was given to a study by Gilbert and Kravis *An International Comparison of National Products and the Purchasing Power of Currencies* (O.E.E.C., Paris, 1954) in which the authors emphasise "the unsuitability of exchange rates for converting national currencies to a common unit in international comparisons of income levels". As the international purchasing powers of currencies are not an indication of the equilibrium of exchange, the authors propose that in a comparison of the Gross National Product this should be confirmed by "comparative indexes", where price and volume are used as weights in the calculation of the index numbers. However, it could be discussed whether such calculation had any significance for the purpose of the comparisons with regard to the structure of forestry of the suggested investigation. What one had to compare were costs and revenue of a specific sector of the economy and not to measure the Gross National Product and the purchasing power of various currencies. In another study *Social Aspects of European Economic Co-operation,* published by the International Labour Office (Geneva, 1956), it is stated that "the use of exchange rates to express wages in a common currency is of course justified for purposes of analysis of costs of production in different countries" (p. 32). When discussing this question attention should be given to the following three items:

a. Forest products have a world market price, which is determined by competition in a free market.
b. Custom duties, particularly those on roundwood, are not so high in western Europe that they can effect in any way monetary values.
c. Since 1958 there has been free convertibility in all countries. Convertibility ensures constant rates of exchange; these rates change substantially only in exceptional cases, which means that inflation in all countries takes an almost identical course.

During the continued debate it was emphasised that as the economists have still not agreed how a conversion to "comparative indexes" shall be made, it can therefore hardly be our task to find a method which the economic experts throughout the world have not yet been able to devise. Conversion using index numbers is misleading as such index numbers are calculated on a different basis from country to country; also they do not reflect the purchasing power of a currency.

It was agreed to take the official rates of exchange and that it was most suitable to take the Swedish krona as common currency. However, the individual country should present its accounts in its national currency.

# Chapter 2

# SWEDEN

# Sweden

by

E. STRIDSBERG and K. V. ALGVERE

## 2.1 General Information about Forestry in Sweden

### *2.1.1 Contribution of Forestry to the Gross National Product*

*General Concepts*

Sweden occupies an important position in the general supply of forest products. The economic importance of timber can be appraised by estimating the share of the Gross National Product originating from forestry and wood-processing activities. The accepted measure is "value added", which represents the difference between the cost of goods purchased by the forestry and forest industrial enterprises and the value of the products they sell. Consequently, "value added" is the amount available for the payment of salaries and wages, interest, profits and taxes, as well as depreciation and depletion charges.[1]

In this survey the intention is to deal with the share of forestry in the Gross National Product. Here forestry is regarded as the stage of primary or biological production (forest management) and the stage of secondary forest production, i.e. all activities in managing timber (stumpage) and in harvesting and transporting logs and other roundwood products from forests to local points of delivery (roadside, railway, river bank, etc.). Thus the estimated value of timber products concerns delivery to the points mentioned.

Estimates of the value added, attributed to timber, in the next stages of the forest production process—primary and secondary manufacturing, transport and trade—are omitted in these calculations. Thus the aggregate share of forestry and forest industries in the G.N.P. and the importance of timber in the Swedish economy will not be elucidated fully in this connection. However, it should be stated that the total value added by enterprises engaged in the manufacturing of forest products is, in reality, considerably higher than the value added by the primary and secondary stages of forest production.

On account of the different methods of calculation used for assessing the G.N.P. there are certain dangers of misunderstanding and that various data are not fully comparable. As space does not permit a detailed account of method of calculation, it must be emphasised here that as a matter of principle

[1] As stated in various publications: "Value added by manufacture is calculated by subtracting the cost of materials, supplies, and containers, fuel, purchased electric energy, and contract work from the total value of shipments".

efforts have been made to determine the G.N.P. at market prices, according to the definition of the United Nations, in order to be able to make comparisons with the corresponding figures for other countries.[1]

*"Value Added" by Forestry Activities*

In forestry the calculation of the "value added" by manufacture is based on the assumption that the gross value of the total timber cut can be regarded as identical with the market value which is the product of the volume of the cut and the prices which are current for the year in question. From this shall then be deducted the costs of material consumed and contract work placed in other sectors; an amount of 15 per cent is deducted for the purpose. Obviously, this must be regarded as a rough approximation, but it is probably quite comparable with the estimates made by other countries. It should be added that work carried out by outside contractors, such as the construction of roads and dwellings, certain transport, etc., in the main cannot be included in the group for contract work placed in other sectors, which has to be deducted from the market value of the product of forestry. In the actual case an adjustment has been made. In principle, only those costs have been deducted which would have been taken off if the work had been carried out by the forest enterprise itself.

Table 2:1 shows the net production value in forestry (value of product less 15 per cent for intermediate products from other economic sectors) and its share in the G.N.P. during the period 1953-1962. Values in this survey are given both in current prices (in Swedish kronor) and in terms of the 1962

**Table 2:1. Contribution of Forestry Production (Value Added) to the Gross National Product in Sweden, 1953—1962**

| | 1953 | 1954 | 1955 | 1956 | 1957 | Annual average 1953—57 | 1958 | 1959 | 1960 | 1961 | 1962 | Annual average 1958—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gross National Product | | | | | | | | | | | | |
| Current value in millions S.kr. | 39,724 | 41,854 | 45,244 | 48,847 | 52,841 | | 54,779 | 58,044 | 63,086 | 69,270 | 74,755 | |
| Adjusted to 1962 S.kr. | 45,660 | 48,667 | 50,271 | 51,965 | 55,622 | 50,437 | 58,276 | 61,749 | 65,715 | 70,680 | 74,755 | 66,235 |
| Value of Product in Forestry | | | | | | | | | | | | |
| Millions of S.kr in current prices | 2,355 | 2,323 | 2,533 | 2,639 | 2,399 | | 2,112 | 2,266 | 2,551 | 2,930 | 2,855 | |
| Adjusted to 1962 S.kr. | 2,709 | 2,695 | 2,812 | 2,797 | 2,519 | 2,707 | 2,239 | 2,401 | 2,655 | 2,988 | 2,855 | 2,628 |
| Costs for Intermediate Products from other sectors | | | | | | | | | | | | |
| Millions of S.kr in current prices | 353 | 348 | 380 | 396 | 360 | | 316 | 339 | 382 | 439 | 429 | |
| Adjusted to 1962 S.kr. | 407 | 404 | 422 | 420 | 377 | 407 | 335 | 359 | 400 | 447 | 429 | 395 |
| Net Production Value (Value added) in Forestry | | | | | | | | | | | | |
| Millions of S.kr in current prices | 2,002 | 1,975 | 2,153 | 2,243 | 2,039 | | 1,796 | 1,927 | 2,169 | 2,491 | 2,426 | |
| Adjusted to 1962 S.kr. | 2,302 | 2,291 | 2,390 | 2,377 | 2,142 | 2,300 | 1,904 | 2,042 | 2,255 | 2,541 | 2,426 | 2,233 |
| *Percentage* contribution of Forestry to G.N.P. | *5.0* | *4.7* | *4.8* | *4.6* | *3.9* | *4.6* | *3.3* | *3.3* | *3.4* | *3.6* | *3.2* | *3.4* |

[1] In comparison with the G.N.P. at market prices used in the Swedish economic balance and on the basis of the gross value of investments this involves a reduction of the size of eight per cent.

value of the Swedish krona. From this can be seen that the value of product in forestry in terms of current prices during the Sixties has been somewhat higher than during the Fifties and that it was lowest in 1958 and 1959. Primarily the cause of these fluctuations has been the changes in the volume of annual cut, which shows a marked increase from the trough of 1959. The net production value in forestry, which is based on the assumption that costs of material consumed and contract work placed in other sectors have remained unchanged throughout the entire period under survey (15 per cent), shows the same development in terms of current prices as the production value. However, when adjusted to a constant monetary value (the 1962 value of the Swedish krona) the average value added during the period 1958-1962 has been slightly (three per cent) lower than that of the previous five-year period (1953-1957), despite the fact that the average volume of cut for the same periods developed in the opposite direction (i.e. an increase of six per cent, see Table 2:2).

Table 2:1 also shows that there is a marked downward trend in the share of forestry in the G.N.P. during the period under survey. The reduction in this percentage is due to the remarkable increase in the G.N.P. during the same period. Calculated in terms of a constant monetary value the increase in ten years has totalled 64 per cent, or an average of 6.5 per cent a year. The net production value in forestry during the period in question has not been able to show any increase. This contradictory situation between the general expansion of the economy on the one hand, and the standstill of forestry on the other hand, has given rise to special problems for forestry practice. The consequences of this will be determined later in this survey.

### *2.1.2 Forest Products Balances and External Trade*

*Volume of Annual Cut*

In connection with the third national forest taxation assessment which was made in Sweden, the Forest Research Institute compiled a report giving the estimated annual cut in all Swedish forests based on an inventory of standing timber. The beginning of the vegetation period was taken as the dividing line between the different logging seasons. In addition, the National Board of Private Forestry (*Skogsstyrelsen*) has made an estimate of the total volume of annual cut for different logging seasons based on statistics of consumption, changes in stocks, imports and exports. These two estimates on the whole agree very well, but for individual years some differences occur. To some extent these differences seem to be due to discrepancies in time, as the various logging seasons cannot be delimited precisely.

The total volume of annual cut and its distribution by products (assortments) during the period 1953-1962, according to the estimates of the National Board of Private Forestry, can be seen in Table 2:2.

For Crown forests and company-owned forests it has been possible to base

**Table 2:2. Volume of Annual Cut, by Assortments, in Sweden, 1953—1962**
*(million cubic metres solid measure without bark, $m^3y$)*

| Assortment | 1953 | 1954 | 1955 | 1956 | 1957 | Annual average 1953—57 | 1958 | 1959 | 1960 | 1961 | 1962 | Annual average 1958—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sawlogs..... | 14.0 | 17.0 | 15.5 | 14.2 | 14.2 | 15.0 | 15.5 | 13.5 | 17.5 | 16.0 | 15.8 | 15.7 |
| Pulpwood ..... | 12.2 | 16.5 | 18.3 | 20.3 | 20.2 | 17.5 | 18.4 | 16.7 | 20.8 | 23.0 | 24.2 | 20.6 |
| Other roundwood. | 2.0 | 2.0 | 2.0 | 1.8 | 1.9 | 1.9 | 1.8 | 1.7 | 1.7 | 1.4 | 1.2 | 1.6 |
| Fuelwood ..... | 6.5 | 6.0 | 5.8 | 5.6 | 5.4 | 5.9 | 5.2 | 5.0 | 4.8 | 4.6 | 4.4 | 4.8 |
| Total ..... | 34.7 | 41.5 | 41.6 | 41.9 | 41.7 | 40.3 | 40.9 | 36.9 | 44.8 | 45.0 | 45.6 | 42.7 |

*Source:* Statistiska Centralbyrån, *Statistisk årsbok för Sverige*, Stockholm, 1963

these estimates on satisfactory felling statistics, while in the cases of farm forests and estate forests it has been necessary to use the raw material consumption figures for the wood-processing industries, which are published in the Swedish industrial statistics, and from estimated values of the roundwood production. Here certain difficulties arise because of the use of different units of timber measurement in different parts of the country. In the main the conversion factors used for the calculation of timber consumption seem to coincide with those employed by F.A.O., although there are certain deviations. Moreover, for the calculation of the total volume of annual cut for the different logging seasons adjustments must be made with regard to changes in stocks as well as to exports and imports.

As to the data provided in Table 2:2, there may be some uncertainty concerning the estimates for an individual year due to the fact that the given volumes of annual cut for 1953, 1954 and 1962 actually refer to the logging seasons of 1952-1953, 1953-1954 and 1961-1962. The statistics given have been compiled in such a way that the entire volume of cut for the season of operations has been transferred to the last-mentioned half-year; thus for the logging season of 1952-1953 it has been transferred to 1953, for 1953-1954 to 1954, and for 1961-1962 to 1962.

Table 2:2 shows a constantly rising trend in the total volume of timber output; also it is seen how the volume has varied from year to year. The timber output was lowest in 1953 and 1959 mainly because of the reduced demand.

As to the distribution by products (assortments) a marked rise can be noted in the quantities of pulpwood, which almost doubled during the period under survey. However, the increase in quantity has been uneven and has showed marked variations from year to year.

In the case of fuelwood and other timber products there has been an obvious decline in terms of quantity. The last-mentioned group consist mainly of pit-props, poles and stakes as well as timber from deciduous trees, i.e. such

assortments which are not usually considered as industrial roundwood. As there is a constantly increasing demand in the economy for industrial roundwood, i.e. timber which can yield the fibrous raw materials used in the wood-processing industry, this trend in the composition of the assortments in the timber output will characterise the future development to a certain extent.

*Total Forest Products Balances*

Felling statistics have been used as the basis for compiling the total forest products balance for the country. The forest products balance submitted contains data of both production and imports and exports recalculated to roundwood equivalents in cubic metres solid volume without bark ($m^3y$), which is the unit of volume used as a basis also for later calculations in this survey.

**Table 2:3. Total Forest Products Balances in Sweden**

| Year | Production (annual cut) of roundwood | Imports | Total supply | Exports | Domestic consumption | | |
|---|---|---|---|---|---|---|---|
| | | | | | Total | Per capita *cu.m* | |
| | *thousand cubic metres roundwood equivalent* | | | | | annual average | five-year average |
| 1953 | 34,700 | 770 | 35,470 | 21,160 | 14,310 | 2.00 | |
| 1954 | 41,500 | 960 | 42,460 | 22,280 | 20,180 | 2.80 | |
| 1955 | 41,600 | 800 | 42,400 | 24,450 | 17,950 | 2.47 | 2.38 |
| 1956 | 41,900 | 850 | 42,750 | 25,180 | 17,570 | 2.40 | |
| 1957 | 41,700 | 840 | 42,540 | 26,025 | 16,515 | 2.24 | |
| 1958 | 40,900 | 1,020 | 41,920 | 23,575 | 18,345 | 2.47 | |
| 1959 | 36,900 | 975 | 37,875 | 25,870 | 12,005 | 1.61 | |
| 1960 | 44,800 | 1,615 | 46,415 | 27,605 | 18,810 | 2.51 | 2.42 |
| 1961 | 45,000 | 2,125 | 47,125 | 26,130 | 20,995 | 2.79 | |
| 1962 | 45,600 | 1,590 | 47,190 | 26,500 | 20,690 | 2.74 | |

*Sources:* (1) FAO, *Yearbook of Forest Products Statistics*
(2) SOS, Kungl. Skogsstyrelsen, *Skogsstatistisk årsbok*, 1953—1962
(3) Statistiska Centralbyrån, *Statistisk årsbok för Sverige*, Stockholm, 1963

Data about timber imports and exports, in terms of roundwood volume, are based on Swedish trade statistics.[1] In principle the same conversion factors have been used here as for the estimates of fellings. Domestic consumption has been calculated as the difference between supply and exports; thus it can be regarded as a balance. A certain margin of error is generally involved with a recalculation to roundwood volume; even this forest products balance cannot claim to be faultless. However, possible miscalculations are not of any great

[1] Sveriges officiella statistik (S.O.S.), Kommerskollegium (Swedish Board of Trade) *Handel* (Trade).

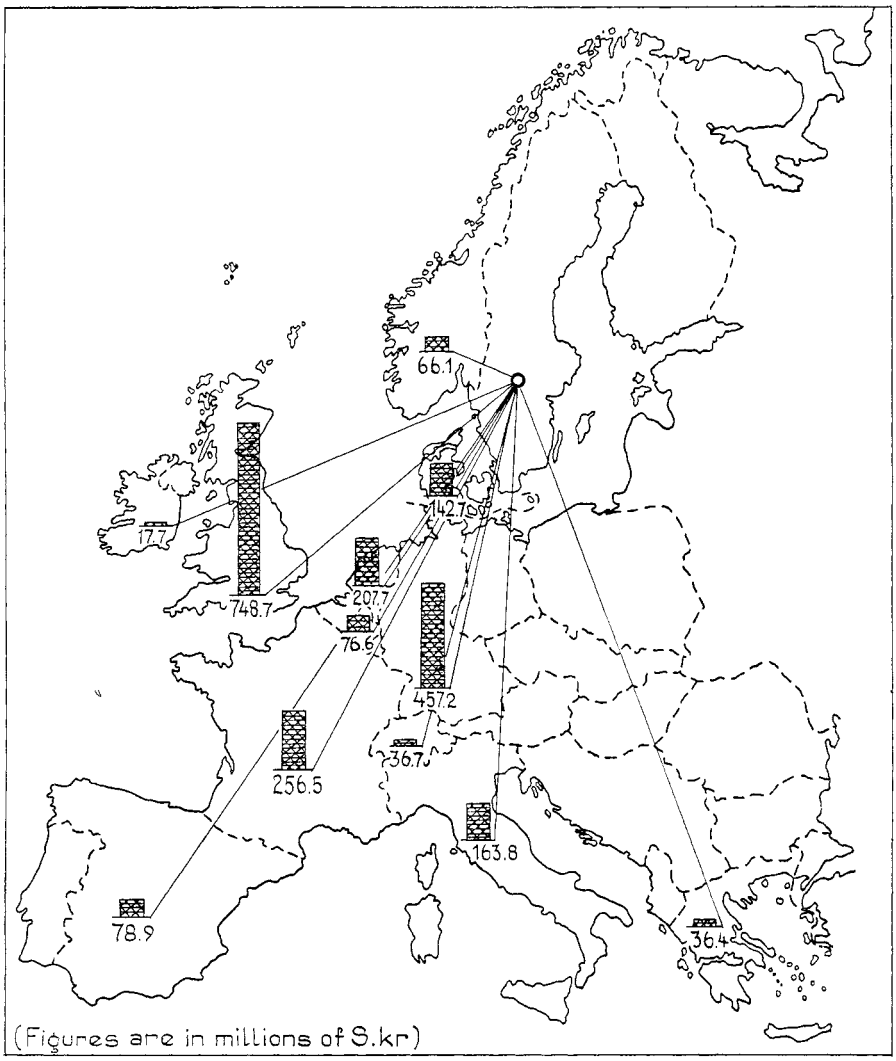


Fig. 2-1. Map Showing the Value of Sweden's Export of Forest Products to Western Europe, 1962
(Source: FAO, Yearbook of Forest Products Statistics, Rome, 1963)

importance, and the figures given in Table 2:3 correspond quite well to the material which the F.A.O. uses for Sweden when compiling its world forest products balances.[1]

[1] F.A.O.: *Yearbook of Forest Products Statistics*, 1952-1963.

Table 2:3 shows that there has been a rising trend in the exports of forest products as a whole with the exception of 1958, when a marked decline in the volume of export took place. During that part of the Fifties under review, the imports of forest products stayed at about the same level, but after that there came a definite increase. The average consumption *per capita* has remained almost unchanged throughout the two five-year periods under survey.

*Share of Forest Products in External Trade*

Sweden is a well-established exporting country for forest products and such products account for a significant share of Sweden's total exports. On the other hand, the import of forest products plays a very insignificant role. Consequently, forest products are of decisive significance for the Swedish balance of payments. Figure 2—1 provides a graphic illustration of the distribution of the exports of Swedish forest products in 1962 to the most prominent importing countries in western Europe. From this it can be seen that the largest consumers of Swedish forest products and also the largest trading partners for Sweden are the United Kingdom and the German Federal Republic.

Table 2:4 indicates the share of forest products in Swedish trade and the percentage distribution of the various products during the period 1953-1962.

**Table 2:4. Value of Forest Products Exports and its Share of Sweden's Total Exports**

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Value of total exports, in million S.kr | 7,657 | 8,196 | 8,933 | 10,070 | 11,060 | 10,799 | 11,424 | 13,273 | 14,198 | 15,129 |
| Index, 1954=100 | 93 | 100 | 109 | 123 | 135 | 132 | 139 | 162 | 173 | 185 |
| Value of forest products exports, in million S.kr | 3,092 | 3,386 | 3,847 | 4,050 | 4,139 | 3,694 | 3,830 | 4,455 | 4,413 | 4,386 |
| Index, 1954=100 | 91 | 100 | 114 | 120 | 122 | 109 | 113 | 131 | 130 | 130 |
| Share of forest products in total export value, % | *40.4* | *41.3* | *43.1* | *40.2* | *37.4* | *34.2* | *33.5* | *33.6* | *31.1* | *29.0* |
| *Percentage* distribution of forest-products exports | % | % | % | % | % | % | % | % | % | % |
| Roundwood | *2.7* | *2.7* | *3.8* | *2.6* | *3.1* | *3.2* | *2.5* | *1.6* | *1.9* | *2.1* |
| Sawnwood | *30.3* | *28.1* | *29.2* | *25.6* | *27.0* | *22.9* | *22.9* | *24.5* | *23.1* | *22.4* |
| Veneers | | | | | | | | | | |
| Plywood | *0.6* | *0.6* | *0.6* | *0.5* | *0.5* | *0.6* | *0.7* | *0.5* | *0.6* | *0.6* |
| Particle board | | | | | | | | | | |
| Fibreboard | *2.0* | *3.0* | *3.2* | *3.4* | *3.7* | *4.1* | *4.5* | *4.1* | *3.9* | *4.0* |
| Wood pulp | *42.3* | *42.9* | *40.7* | *43.5* | *40.7* | *41.6* | *42.7* | *41.5* | *39.4* | *38.4* |
| Paper and paper board | *19.9* | *20.5* | *20.5* | *22.4* | *23.0* | *25.3* | *25.0* | *25.6* | *28.2* | *29.3* |
| Others | *2.2* | *2.2* | *2.0* | *2.0* | *2.0* | *2.3* | *1.9* | *2.2* | *2.9* | *3.2* |
| Total | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* |

*Source:* SOS, Kommerskollegium, *Handel* (Trade) 1953—1962

Here it can be seen that the export value of products, for which wood constituted the raw material, accounted for between 43 and 29 per cent of the total value of exports from Sweden during the period under survey. Sweden thus earned very large amounts of foreign currency from its exports of forest products and in this way obtained the means to import necessities vital for its economy outside the forestry sector.

One can also see from the table that the increase in the value of exports of forest products during the period under survey has been much less than the increase in the value of total exports. The index (1954=100) for total exports had risen to 185 in 1962 while for forest products alone the index had remained at 130. Reckoned in current values of the Swedish krona, the total export value for all forest products showed a marked increase. Despite the fact that the prices of individual forest products have fallen (this will be elucidated in the section which follows) the increase in total value is mainly due to the increase in the volume of products (cf. Table 2:3) and the more intense processing. One can also see from the table that the share of sawnwood, which forms one of the main items in the trade in forest products, had fallen in terms of value (though expressed in current monetary values it had increased), while the share of paper and paperboard, the second main item, has shown a significant upswing with a percentage increase from 19.9 per cent in 1953 to 29.3 per cent in 1962. The third and most important export product —woodpulp—has largely maintained its position during the period under survey. Its share of the total export value of forest products has shown a declining trend in terms of percentage from 42.3 per cent in 1953 to 38.4 per cent in 1962, while in terms of current monetary values it has increased by one-third over the entire period of this survey. Plywood exports have not undergone any great changes, but there has been a clear upward trend in the case of fibreboard. On can see from the table that the exports of roundwood have been small in comparison with those of processed products. In terms of value, the exports of roundwood account for between 1.6 and 3.8 per cent of the total exports of the forestry sector of the economy, but no developing trend can be noted.

### *2.1.3 Structure of Forest Products Market and Movements in Prices*

*Introductory Remarks*

Sweden's economic development has to a large extent been brought about by foreign trade. The large share which the forest products have had in these exports has a considerable influence on the Swedish economy itself.

However, it should be emphasised that the conditions of competition in the epoch of the big industries differ considerably from free competition and that the policy of the large international exporters often has a decisive influence on prices charged. Sweden's share in total world production is only three per cent

while Sweden's share of exports is many times greater, which in its turn provides greater possibilities to exert an influence on the prices charged through trade organisations and in collaboration with other international exporters. However, by and large the state of international trade is decisive for the market development of the Swedish forest industry.

As prices of timber in primary forest production are dependent on what is known as derived demand, any discussion of the roundwood market must be preceded by an analysis of price developments for processed forest products. Seeing that the major part of processed products are exported and not consumed in the domestic market, only the export prices of the final products will be dealt with here, though in the case of roundwood, which is the raw material for the wood-processing industry, both export and import prices will be discussed. A more detailed account of the home-market prices for roundwood will be given.

The tables showing the developments in export prices have been compiled using Swedish official trade statistics, which are based on data obtained from the Customs and Excise Board in connection with the exports of the products concerned. All the necessary data for the trade statistics are obtained in their turn from the declarations of goods made by exporters. However, it has been impossible to check the extent to which the declarations made by exporters deviate from the prices actually paid. The development in prices for roundwood on the domestic market has been based both on price agreements between sellers' and purchasers' organisations and on the official statistics. The prices actually paid for roundwood by the wood-processing industry have not been accessible. The various units of measure, which are commonly applied in timber transactions both in the Swedish home market and with exports, are a source of certain error and in certain cases can increase or decrease the unit prices for roundwood. The reliability is even less where finished products are calculated back into terms of roundwood volume. However, within the framework of this study it is not possible to check the accuracy of the available price statistics and make adjustments.

*Export Prices for Processed Forest Products*

The consumption of sawnwood in those countries, which are large consumers of Swedish timber, has in general not increased at the same rate as the industrial expansion and the increase of consumption in other fields. First and foremost, this has been due to increased competition from other materials, which technically can replace timber and in terms of price can compete with it. Substitutes for wood have gained ground, especially where their prices have not risen in proportion to timber prices, as has been the case in the post-war period.

However, that which is decisive for sales and prices in the international market is the competition coming from other exporting countries. The

U.S.S.R., Finland and Canada are the competitors most able to affect Sweden's export chances in the market of western Europe. Soviet offers, which have been steadily increasing over the last decade, are those which have most affected the Swedish prices for sawnwood. In their efforts to increase their exports, the Soviets in their economic plans have consistently pursued a price policy which has resulted in the sale of all timber offered.

Competition in the European timber market has also hardened as a consequence of the increasing amounts of tropical hardwoods now being offered at prices far more favourable than earlier from the consumers' standpoint.

Table 2:5 shows the development of export prices during the period under survey for four assortments of sawn softwood—pine and spruce. One can see that 1955 is a definite peak, while 1959 appears as an even more marked trough. By 1961 the prices have again risen to the 1954 level. Besides certain specific differences in the price development of individual assortments of sawnwood it is possible to note certain characteristic trends. Thus both in the case of pine and spruce the price difference between grades is becoming less. Obviously, this must be of consequence for the direction of primary forest production both as to dimensions and composition of species, but it seems very difficult to make realistic forecasts in this field.

Sweden's share of the total world pulp exports in 1953 amounted to 36 per cent in terms of volume, while in 1962 it was close to 28 per cent. Thus Sweden's share of this world trade has suffered a decline. Among the European competitors in the export market Finland and Norway play an important role. By co-ordinating the quotation policy for Finland, Norway and Sweden, efforts

**Table 2:5. Average Prices (f.o.b.) for Swedish Exports of Coniferous Sawnwood, by Selected Assortments, 1953—196**
*(current S.kr per standard)*

| Year | Sawn softwood (pine and spruce, all assortments and grades) | Deals (2″×8″ and wider) | | Battens [2″×(6″—8″)] and Scantlings [2″×(6″ and less)] | | Boards [1″×(6″—8″)] | | Small boards [1″×(6″ and less)] | |
|---|---|---|---|---|---|---|---|---|---|
| | | pine | spruce | pine | spruce | pine | spruce | pine | spruce |
| 1953 | 1,000 | 1,102 | 986 | 995 | 958 | 1,117 | 1,000 | 986 | 953 |
| 1954 | 1,042 | 1,191 | 995 | 1,046 | 976 | 1,196 | 1,028 | 1,051 | 976 |
| 1955 | 1,074 | 1,205 | 1,054 | 1,079 | 1,009 | 1,219 | 1,056 | 1,098 | 1,000 |
| 1956 | 1,032 | 1,154 | 1,025 | 1,023 | 990 | 1,173 | 1,023 | 1,060 | 967 |
| 1957 | 1,027 | 1,145 | 1,014 | 1,023 | 981 | 1,187 | 1,018 | 1,032 | 962 |
| 1958 | 1,015 | 1,145 | 990 | 1,009 | 958 | 1,159 | 1,000 | 1,023 | 939 |
| 1959 | 897 | 1,032 | 869 | 911 | 832 | 1,028 | 869 | 916 | 804 |
| 1960 | 1,014 | 1,159 | 967 | 1,028 | 930 | 1,163 | 958 | 1,042 | 911 |
| 1961 | 1,065 | 1,154 | 981 | 1,093 | 976 | 1,159 | 995 | 1,149 | 976 |
| 1962 | 1,009 | 1,066 | 962 | 1,033 | 939 | 1,085 | 957 | 1,091 | 949 |
| 1963 | 1,023 | 1,080 | 966 | 1,045 | 956 | 1,084 | 967 | 1,112 | 987 |
| 1964 | 1,084 | 1,184 | 1,032 | 1,095 | 1,010 | 1,139 | 1,024 | 1,169 | 1,068 |

*Source:* SOS, Kommerskollegium, *Handel* (Trade), 1953—1964

are being made to alleviate the damaging effects of competition. The competition from North America is more difficult to control as exports from this area —although of considerable absolute size—constitute a relatively small share of the production of this area; thus a reduction in price for the surplus quantities can be regarded as realistic in North American eyes.

Table 2:6 shows the development of export prices for pulp grades—dissolving pulp, bleached and unbleached sulphite pulp, bleached and unbleached sulphate pulp, as well as wet and dry mechanical pulp. As in the case of sawnwood, 1959 was a year when the market was depressed, while the boom occurred earlier, namely 1956 (in 1957 for mechanical pulp). Since 1959 the development has been rather uneven. However, in general 1962 and 1963 are at or somewhat above the level of 1953, though in the case of dissolving pulp they are considerably below that level.

**Table 2:6. Average Prices (f.o.b.) for Swedish Exports of Chemical and Mechanical Wood Pulp, by Selected Types, 1953—1964**
*(current S.kr per metric ton)*[a]

| Year | Sulphite pulp | | | Sulphate pulp | | Mechanical pulp | |
|---|---|---|---|---|---|---|---|
| | Dissolving | Other bleached | Unbleached | Bleached | Unbleached | Wet | Dry |
| 1953 | 898 | 688 | 526 | 731 | 480 | 344 | 314 |
| 1954 | 913 | 781 | 596 | 787 | 560 | 342 | 351 |
| 1955 | 936 | 806 | 639 | 805 | 603 | 345 | 384 |
| 1956 | 936 | 806 | 656 | 810 | 616 | 378 | 422 |
| 1957 | 925 | 792 | 627 | 802 | 602 | 384 | 430 |
| 1958 | 884 | 750 | 586 | 758 | 552 | 349 | 322 |
| 1959 | 832 | 695 | 544 | 721 | 503 | 333 | 301 |
| 1960 | 852 | 717 | 568 | 717 | 541 | 331 | 343 |
| 1961 | 860 | 714 | 595 | 713 | 563 | 333 | 327 |
| 1962 | 793 | 644 | 542 | 658 | 502 | 332 | 330 |
| 1963 | 787 | 658 | 549 | 664 | 539 | 331 | 336 |
| 1964 | 859 | 713 | 589 | 717 | 588 | 328 | 350 |

*a.* Metric ton air dry

*Source:* SOS, Kommerskollegium, *Handel* (Trade), 1953—1964

Sweden's share of the consumption of paper and paperboard in western Europe is on average approximately six per cent. For newsprint and kraftpaper the figures are higher, while for other types of paper they are considerably lower. In 1962 Germany took about eight per cent of its demands for paper from Sweden. The United Kingdom bought five per cent of its paper needs from Sweden in that year. Probably to a great extent the sales of processed products with which we are concerned here are dependent on customs policy. However, it seems strange that Sweden's export of paper products to E.F.T.A. countries, despite the accelerated rate of the removal of customs duties, have not shown

any marked rise during the period under review. On the other hand, exports to the countries of the European Common Market, particularly the German Federal Republic, have gone up from year to year. The continued development of the Swedish paper industry thus seems to depend to a large extent on the success in overcoming the trade barriers which—in the form of customs duties or other import restrictions—make Swedish exports to Common Market countries less profitable.

Table 2:7 shows the development of export prices for six types—newsprint, kraftpaper, sulphite wrappings, greaseproof, paperboard and fibreboard. The main trend is the same as that for the pulp assortments, but there is a tendency for the peak to be shifted to 1957, while the minimum figures which occur for 1959 are not as marked as in the above cases. The developments in prices of the highly varied processed forest products, with which we are concerned here, prove to be much less uniform than those mentioned above.

About two-thirds of the Swedish production of fibreboard is exported and this amounts to approximately 45 per cent of the total world export volume. Sweden occupies first place in the world for this product. The United Kingdom has traditionally been the greatest importer. If one excludes the English fibreboard manufacturing industry, then the most dangerous competition for Swedish fibreboard in the English market comes from South Africa. This has been mainly due to the fact that imports from South Africa were duty-free while customs duty was imposed on Swedish products during the period under survey. Table 2:7 shows a downward trend in the prices of fibreboard; this is particularly marked in comparison with other fibre products. This development in prices has probably been brought about mainly by excessive offers and keener competition which this has caused in the world market.

**Table 2:7. Average Prices (f.o.b.) for Swedish Exports of Paper, Paperboard and Fibreboard, by Selected Grades, 1953—1964**
*(current S.kr per metric ton)*

| Year | Newsprint | Kraft paper | Sulphite wrappings | Greaseproof | Paperboard | Fibreboard |
|---|---|---|---|---|---|---|
| 1953 | 637 | 882 | 1,053 | 1,237 | 815 | 498 |
| 1954 | 670 | 880 | 1,115 | 1,292 | 846 | 470 |
| 1955 | 718 | 925 | 1,187 | 1,392 | 867 | 482 |
| 1956 | 772 | 974 | 1,223 | 1,436 | 882 | 460 |
| 1957 | 768 | 997 | 1,183 | 1,481 | 886 | 455 |
| 1958 | 730 | 994 | 1,145 | 1,471 | 841 | 436 |
| 1959 | 685 | 921 | 1,149 | 1,439 | 803 | 431 |
| 1960 | 687 | 928 | 1,137 | 1,413 | 837 | 434 |
| 1961 | 691 | 914 | 1,178 | 1,464 | 876 | 418 |
| 1962 | 687 | 903 | 1,187 | 1,463 | 877 | 418 |
| 1963 | 684 | 908 | 1,181 | 1,484 | 869 | 428 |
| 1964 | 679 | 922 | 1,207 | 1,506 | 890 | 438 |

*Source:* SOS, Kommerskollegium, *Handel* (Trade), 1953—1964

*Foreign Trade in Roundwood*

Sweden's foreign trade in roundwood in comparison with exports of processed forest products has not been very extensive on the whole. However, certain reversals and fluctuations have been a characteristic feature here. Table 2:8 shows the development in roundwood imports and exports in terms of volume during the period 1953-1962. One can easily see that, as a rule, exports were greater than imports during the Fifties, but that the opposite was the case in the early Sixties, though the position has changed again recently. Most noticeable in the development is the constant fall in the exports of pitprops to practically nil during the period under survey. At the same time there has been a rise in the imported quantity of pulpwood.

**Table 2:8. Imports and Exports of Roundwood, by Assortments, in Sweden, 1953—1962**
(*thousand cubic metres solid measure*)

| Year | Sawlogs, veneer logs (coniferous) etc. | | Pulpwood (coniferous) | | Pitprops | | Other roundwood (deciduous and coniferous) | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Imports | Exports | Imports | Exports | Imports | Exports | Imports | Exports | Imports | Exports |
| 1953 | 252 | 61 | 275 | 206 | 4 | 552 | 31 | 106 | 562 | 925 |
| 1954 | 331 | 108 | 293 | 581 | – | 329 | 61 | 90 | 685 | 1,108 |
| 1955 | 204 | 102 | 280 | 1,051 | – | 436 | 47 | 99 | 531 | 1,688 |
| 1956 | 182 | 85 | 348 | 747 | – | 269 | 56 | 76 | 586 | 1,177 |
| 1957 | 131 | 106 | 299 | 890 | – | 457 | 49 | 79 | 479 | 1,532 |
| 1958 | 331 | 146 | 274 | 646 | – | 288 | 55 | 90 | 660 | 1,170 |
| 1959 | 167 | 200 | 315 | 339 | – | 208 | 34 | 135 | 516 | 882 |
| 1960 | 308 | 206 | 603 | 407 | – | 18 | 45 | 145 | 956 | 776 |
| 1961 | 234 | 212 | 1,224 | 528 | 2 | 14 | 33 | 137 | 1,493 | 893 |
| 1962 | 127 | 203 | 894 | 653 | – | 6 | 45 | 168 | 1,066 | 1,030 |

*Source:* SOS, Kungl. Skogsstyrelsen, *Skogsstatistisk årsbok*, 1953—1962

Norway and Finland, which are neighbours of Sweden, account for the bulk of Sweden's imports of roundwood. Norwegian roundwood has normally been imported via the watercourses on the border. At the same time Norway can be considered as the largest buyer of Sweden's export of roundwood. In addition to the ordinary border trade there have been large deliveries of pulpwood from southern and central Sweden. Imports of "other roundwood" consisted mainly of mahogany, teak and other tropical timber.

The major part of roundwood which goes for export comes from the southern part of Sweden. Ports north of Gävle ship the relatively small quantities of roundwood, which mainly depend on the large raw material needs of the industries of northern Sweden. On the other hand, there is a certain surplus of roundwood in the southern parts of Sweden because the expansion of industrial capacity in that part of the country to date has not been able to

keep pace with the increase in the supply of timber there. However, in the immediate future this deficit in the capacity for wood-processing will probably be eliminated by the building of new factory installations, which in their turn will reduce the possibilities of this part of the country to export roundwood in the future. Table 2:9 shows the price series for imported and exported roundwood as to the assortments logs, pulpwood and pitprops. Unit prices per cubic metre (without bark), c.i.f. for imports and f.o.b. for exports, are based on customs statistics and refer to the average for all importers and exporters for the respective years. One can see from the table that the export prices for the assortments in question have been higher than the import prices as a rule. Developments for both import prices and export prices have been largely in the same direction, which can best be seen from the index series presented in Tables 2:11 and 2:12, though certain deviations can be detected. In addition, it can be noted that the price fluctuations become all the more greater the further one goes from the final processed product.

**Table 2:9. Average Prices for Swedish Imports (c.i.f.) and Exports (f.o.b.) of Roundwood, by Assortments, 1953—1964**
*(current S.kr per cubic metre solid measure)*

| Year | Sawlogs and veneer logs (coniferous) | | Pulpwood (coniferous) | | Pitprops | |
|---|---|---|---|---|---|---|
| | Imports | Exports | Imports | Exports | Imports | Exports |
| 1953 | 87 | 122 | 55 | 62 | 42 | 79 |
| 1954 | 95 | 133 | 53 | 70 | — | 61 |
| 1955 | 94 | 143 | 58 | 77 | 60 | 76 |
| 1956 | 86 | 140 | 63 | 78 | — | 78 |
| 1957 | 79 | 146 | 59 | 72 | (100) | 77 |
| 1958 | 79 | 133 | 55 | 69 | — | 74 |
| 1959 | 72 | 104 | 51 | 63 | — | 65 |
| 1960 | 85 | 137 | 57 | 65 | — | 71 |
| 1961 | 89 | 146 | 58 | 70 | 47 | 102 |
| 1962 | 81 | 115 | 59 | 73 | — | 111 |
| 1963 | 82 | 106 | 64 | 69 | — | 81 |
| 1964 | 101 | 113 | 67 | 72 | — | 80 |

*Source:* SOS, Kommerskollegium *Handel* (Trade), 1953—1964

*Prices for Roundwood on the Home Market*

Table 2:10 gives the price series for the "delivered timber" which is supplied from logging operations to the Swedish wood-processing industry. The account refers to fairly well-defined products, namely, both sawlogs (9″ in diameter at the top) and pulpwood, both assortments being divided into the two species pine and spruce.

The prices of industrial roundwood free factory, i.e. for sawlogs at the sawmill and for pulpwood at the pulpmill, become quite varied for the

**Table 2:10. Average Prices for Roundwood, by Selected Assortments, on Internal Market in Northern and Southern Sweden, 1953—1963**
*(current S.kr per cubic metre)*

| Year | Northern Sweden (River Lule, sorted at river mouth) | | | | Southern Sweden (Jönköping district, road side) | | | |
|---|---|---|---|---|---|---|---|---|
| | Sawlogs 9″ top diam. | | Pulpwood | | Sawlogs, 9″ top diam. | | Pulpwood | |
| | pine | spruce | pine (sulphate) | spruce (sulphite) | pine | spruce | pine (sulphate) | spruce (sulphite) |
| | (*S.kr/m³ solid measure*) | | (*S.kr/m³ stacked measure without bark*) | | (*S.kr/m³ solid measure*) | | (*S.kr/m³ stacked measure without bark*) | |
| 1953 | 86 | 83 | 34 | 42 | 73 | 73 | 30 | 40 |
| 1954 | 91 | 86 | 39 | 47 | 87 | 87 | 36 | 47 |
| 1955 | 89 | 81 | 39 | 48 | 86 | 86 | 37 | 48 |
| 1956 | 76 | 70 | 37 | 43 | 76 | 72 | 34 | 44 |
| 1957 | 78 | 72 | 36 | 39 | 87 | 85 | 34 | 40 |
| 1958 | 68 | 58 | 31 | 35 | 66 | 60 | 30 | 35 |
| 1959 | 73 | 61 | 34 | 38 | 82 | 71 | 33 | 39 |
| 1960 | 81 | 67 | 39 | 43 | 96 | 81 | 39 | 47 |
| 1961 | 81 | 67 | 39 | 43 | 95 | 75 | 39 | 47 |
| 1962 | 80 | 65 | 35 | 39 | 85 | 68 | 37 | 42 |
| 1963 | 85 | 70 | 39 | 41 | 85 | 72 | 40 | 45 |

*Source:* (1) SOS, Kungl. Domänstyrelsen, *Domänverket*, 1953—1962
(2) SOS, Kungl. Skogsstyrelsen, *Skogsstatistisk årsbok*, 1963—1964

individual firms because of a general price agreement, involving primarily the distance and method of transport. In northern Sweden, where the delivery price is reckoned free to the final sorting place at the mouth of the river, the total transport costs from the final sorting to "dumping" in the wood yard at the mill amounts according to certain calculations[1] to 15-20 per cent of what can be called the final sorting price (Swedish term: *ådalspris*).

In southern Sweden the costs for further transport to the wood-processing industries usually amount to 20-25 per cent of the delivery prices at roadside. The figures given can be regarded as rough averages and in practice quite large deviations can occur.

In certain cases one must reckon with considerably higher added percentages for further transport as the timber sheds for the individual wood-processing industries are not always rationally distributed, and on account of overlapping of sheds it may be necessary to transport over uneconomic distances. In southern Sweden the average distance to the mill has been

[1] Internal investigations undertaken by the Timber Association of Southern Sweden (*Sydsvenska virkesföreningen*).

estimated at 70 kilometres (about 45 miles), but in extreme cases the distances are very large indeed.

Taking this into consideration the accounts in Table 2:10 have been divided into two geographical areas, namely the River Lule as representing northern Sweden, and where the price refers to "free final sorting", and the Jönköping district as representing southern Sweden, where the price is for delivery to the roadside. One can see that the sawlog prices in southern Sweden are considerably above those of northern Sweden and that the prices for pine are higher than those for spruce and also that this trend, which at the beginning of the period was hardly discernible, later became much more accentuated.

*Some Price Relationships for Forest Products*

The development in the prices for roundwood and its connection with that for processed products is an important question in primary forest production. However, it must be strongly emphasised that such a comparison only provides the possibility of elucidating certain main trends and that as regards details it must of necessity be rather incomplete. In order to facilitate closer comparisons between price series for the various forest products mentioned above, the index series (1954=100) for the period under survey have been set out in Tables 2:11 and 2:12. For the time series in question it should first be noted that the prices for roundwood apply to those of the autumn for the respective year and that consequently the priced processed product appears, as a rule, only in the exports of the following year or even later. One can detect, after making the necessary shift of the index series for roundwood prices on the home market, many of the characteristic features which have been mentioned earlier and it is especially worth noting that there is a great amount of agreement with the export prices for roundwood. Because of the difficulty of correct adjustments for this shift in terms of time and also taking all other complications into consideration, it is obvious that from such comparisons it is only possible to obtain a rather general idea of the relationships involved. One finds that in certain years, e.g. 1958, sawlog prices have declined considerably more than the prices for sawnwood.

A more thorough knowledge of the relationship between the value of the final products and the value of the raw materials used would considerably facilitate the formation of opinions on matters concerning prices. From what has been said before about the complications which arise here it is obvious that there are considerable difficulties involved in obtaining absolutely correct figures for comparison purposes in this connection. On the basis of certain assumptions this relationship has been estimated in Table 2:13, which shows export prices in relationship to the value of the raw material used for certain assortments of sawnwood, pulp and newsprint during the period 1953-1962. The consumption of raw material sawlogs in the case of sawn wood, and pulpwood in the case of pulp and newsprint has been worked out on the basis

of the F.A.O. conversion factors (F.A.O.: *Yearbook of Forest Products Statistics,* 1964). These conversion factors can differ from the actual roundwood consumption in the respective processing areas. However, as there is a lack of reliable studies on roundwood consumption, which would reflect the current situation, it has been necessary in this connection to rely on those factors which can be considered to be the most appropriate for the purpose of this survey.

The trends of development which can be seen in the table are not in the same direction and there is a certain and quite definite difference between the

**Table 2:11. Comparison between Price Indices for Coniferous Sawnwood and Sawlogs, by Selected Assortments, in Sweden, 1953—1964**

*(1954=100)*

| Year | Wholesale price index, all commodities | Sawn softwood (pine and spruce, all assortments and grades) | Sawnwood, exports (f.o.b.) | | | | Sawlogs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Deals | | Battens and scantlings | | Imports (c.i.f.) | Exports (f.o.b.) | Internal market | | | |
| | | | | | | | | | Northern Sweden | | Southern Sweden | |
| | | | pine | spruce | pine | spruce | | | pine | spruce | pine | spruce |
| | | | | | | | average of all dimensions and grades | | all grades, 9" top diameter | | | |
| 1953 | 101 | 96 | 93 | 99 | 95 | 98 | 92 | 92 | 95 | 97 | 84 | 84 |
| 1954 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1955 | 104 | 103 | 101 | 106 | 103 | 103 | 100 | 108 | 98 | 94 | 99 | 99 |
| 1956 | 109 | 99 | 97 | 103 | 98 | 101 | 91 | 105 | 84 | 81 | 87 | 83 |
| 1957 | 111 | 99 | 96 | 102 | 98 | 100 | 82 | 110 | 86 | 84 | 100 | 98 |
| 1958 | 108 | 97 | 96 | 100 | 96 | 98 | 83 | 100 | 75 | 67 | 76 | 69 |
| 1959 | 108 | 86 | 87 | 87 | 87 | 85 | 76 | 78 | 80 | 71 | 94 | 81 |
| 1960 | 111 | 97 | 97 | 97 | 98 | 95 | 89 | 103 | 89 | 78 | 110 | 93 |
| 1961 | 114 | 102 | 97 | 99 | 104 | 100 | 94 | 110 | 89 | 78 | 109 | 86 |
| 1962 | 116 | 97 | 89 | 97 | 99 | 96 | 85 | 86 | 88 | 75 | 98 | 78 |
| 1963 | 119 | 98 | 91 | 97 | 100 | 98 | 86 | 80 | 93 | 81 | 98 | 83 |
| 1964 | 125 | 104 | 99 | 104 | 105 | 103 | 106 | 85 | — | — | — | — |

**Table 2:12. Comparison between Price Indices for Pulp Products and Pulpwood, by Selected Types and Grades, in Sweden, 1953—1964**

*(1954=100)*

| Year | Wholesale price index, all commodities | Woodpulp | | | | | | | Paper | | | | Paperboard | Fibreboard (hardboard) | Pulpwood | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sulphite | | | Sulphate | | Mechanical | | Newsprint | Kraft-paper | Sulphite wrappings | Greaseproof | | | Imports (c.i.f.) | Exports (f.o.b.) | Internal market | | | |
| | | | | | | | | | | | | | | | | | Northern Sweden | | Southern Sweden | |
| | | dissolving | other bleached | unbleached | bleached | unbleached | wet | dry | | | | | | | | | sulphate | sulphite | sulphate | sulphite |
| 1953 | 101 | 98 | 88 | 88 | 93 | 86 | 101 | 89 | 95 | 100 | 94 | 96 | 96 | 106 | 104 | 89 | 86 | 88 | 84 | 86 |
| 1954 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1955 | 104 | 103 | 103 | 107 | 102 | 108 | 101 | 109 | 107 | 105 | 106 | 108 | 102 | 103 | 109 | 110 | 100 | 102 | 103 | 102 |
| 1956 | 109 | 103 | 103 | 110 | 103 | 110 | 111 | 120 | 115 | 111 | 110 | 111 | 104 | 98 | 119 | 111 | 94 | 93 | 94 | 93 |
| 1957 | 111 | 101 | 101 | 105 | 102 | 108 | 112 | 123 | 115 | 113 | 106 | 115 | 105 | 97 | 111 | 103 | 91 | 83 | 94 | 86 |
| 1958 | 108 | 97 | 96 | 98 | 96 | 99 | 102 | 92 | 109 | 113 | 103 | 114 | 99 | 93 | 104 | 99 | 80 | 74 | 84 | 76 |
| 1959 | 108 | 91 | 89 | 91 | 92 | 90 | 97 | 86 | 102 | 105 | 103 | 111 | 95 | 92 | 96 | 90 | 89 | 81 | 90 | 83 |
| 1960 | 111 | 93 | 92 | 95 | 91 | 97 | 97 | 98 | 103 | 105 | 102 | 109 | 99 | 92 | 108 | 93 | 100 | 90 | 109 | 100 |
| 1961 | 114 | 94 | 91 | 100 | 91 | 101 | 97 | 93 | 103 | 104 | 106 | 113 | 104 | 89 | 109 | 100 | 100 | 90 | 109 | 100 |
| 1962 | 116 | 87 | 82 | 91 | 84 | 90 | 97 | 94 | 103 | 103 | 106 | 113 | 104 | 89 | 111 | 104 | 91 | 83 | 103 | 90 |
| 1963 | 119 | 86 | 84 | 92 | 84 | 96 | 97 | 96 | 102 | 103 | 106 | 115 | 103 | 91 | 121 | 99 | 100 | 88 | 113 | 98 |
| 1964 | 125 | 94 | 91 | 99 | 91 | 105 | 96 | 100 | 101 | 105 | 108 | 117 | 105 | 93 | 126 | 103 | | | | |

**Table 2:13. Relationship between Export Prices (f.o.b.) and Value of Roundwood, used in Manufacturing Process, for Selected Products, in Southern Sweden, 1953—1962**

| Year | Sawnwood Boards of pine | | | Wood pulp Bleached sulphate | | | Newsprint | | |
|---|---|---|---|---|---|---|---|---|---|
| | Export price *S.kr/Std* | Value of sawlogs *S.kr/Std* | Value of sawlogs as *percentage* of sawnwood price % | Export price *S.kr/ton* | Value of pulpwood (pine) *S.kr/ton* | Value of pulpwood as *percentage* of pulp price % | Export price *S.kr/ton* | Value of pulpwood (spruce) *S.kr/ton* | Value of pulpwood as *percentage* of newsprint price % |
| 1953 | 1,117 | 569 | *51* | 731 | 206 | *28* | 637 | 160 | *25* |
| 1954 | 1,196 | 679 | *57* | 787 | 247 | *31* | 670 | 188 | *28* |
| 1955 | 1,219 | 671 | *55* | 805 | 254 | *32* | 718 | 192 | *27* |
| 1956 | 1,173 | 593 | *51* | 810 | 233 | *29* | 772 | 176 | *23* |
| 1957 | 1,187 | 679 | *57* | 802 | 233 | *29* | 768 | 160 | *21* |
| 1958 | 1,159 | 515 | *44* | 758 | 206 | *27* | 730 | 140 | *19* |
| 1959 | 1,028 | 640 | *62* | 721 | 226 | *31* | 685 | 156 | *23* |
| 1960 | 1,163 | 749 | *64* | 717 | 268 | *37* | 687 | 188 | *27* |
| 1961 | 1,159 | 741 | *64* | 713 | 268 | *38* | 691 | 188 | *27* |
| 1962 | 1,085 | 663 | *61* | 658 | 254 | *39* | 687 | 168 | *24* |

*Source:* SOS, Kommerskollegium, *Handel*, 1953—1962

Conversion factors to FAO, 1963: 1 cubic metre sawnwood=1.67 cubic metre roundwood (sawlogs); 1 metric ton bleached sulphate=4.8 cubic metres pulpwood of pine; 1 metric ton newsprint=2.8 cubic metres pulpwood of spruce

Prices for 9″ sawlogs and pulpwood in Jönköping district at roadside, see Table 2:10

roundwood consumption of the sawmills and that of the pulpmills. There can be no doubt that the development in prices during the period under survey has been more favourable in the case of pulpwood than in the case of sawlogs seen from the interests of the forest owners. However, the conditions are quite the opposite from the standpoint of wood-using industry.

*Concluding Remarks*

Although, as a rule, the market prices for processed wood-products have a decisive influence on the prices for roundwood and the fluctuations in the level of the economy also have a great effect on them, nevertheless the question of how the forces which determine prices actually affect the level of prices constitutes a very complicated problem. However, by way of conclusion certain aspects involved in price formation should be emphasised.

State regulations, which may be enforced from time to time, constitute a strong force on the determination of prices. The great fluctuations in the prices of forest products as a result of the crisis brought about by the Korean War involved considerable problems of adaptation for an exporting country such as Sweden. In order to overcome these difficulties Sweden imposed from the

autumn of 1950 to the spring of 1952 a sort of "export duty" on sawnwood, pulp and paper, and varied it according to the prices in the world market. However, these "export duties" were not paid into the Treasury but were frozen for a certain number of years. The funds involved later went back to the firms or were used for research or certain social purposes with the sector of the economy concerned. However, as an exporting country Sweden has been in principle a supporter of free price formation, particularly for forest products. Only in extraordinary circumstances, such as war, has the State seen fit to introduce measures of price regulation. Thus State price control in Sweden has been applied only during and after the two world wars. After the World War II it was generally desired, and on the part of the State authorities too, to replace the system of regulations with a voluntary organisation in charge of prices and deliveries. One can thus say that from the Fifties there has been free price competition and that the development of prices for forest products has largely followed the general development of prices in the world market.

Consequently, the wood-processing industry in its capacity as a buffer and regulating factor between demand abroad for processed wood-products and the home supply of timber as a raw material will play a very important role in marketing policy. The pricing of forest products, which are sold in the Swedish home market, is considerably less flexible. There seems to be a difference between the situations in the home and the export markets. In the latter it appears that "the competitive conditions resemble the pure competitive model, while the home market . . . is rather characterised by the model of oligopolistic competition"[1] Moreover, because of the long production period, which is characteristic of forestry, exact costs for production of roundwood cannot be easily determined. In this respect forestry differs quite considerably from other raw material producing sectors of the economy where the actual costs of production can be determined or at least estimated with acceptable accuracy.

The pricing of roundwood is therefore greatly dependent on the way in which price negotiations between representatives of the buyers and sellers are conducted. In these negotiations the buying side is represented by more or less firmly organised timber associations of collaborating bodies. One should distinguish between the large industrial organisations such as the pulp industry for Sweden as a whole and the exporting sawmills of the northern half of Sweden, on the one hand, and the organisations of small sawmills, on the other. Since the World War II the large industries have divided Sweden into six timber districts or price zones. In each district price negotiations are conducted independently of the collaborating bodies of the other districts; as to the general price policy the industrial side follows certain common lines. In some cases the small sawmills in the south act on their own, but more often

[1] Nasbeth, L. *Löneökningarnas verkningar inom industrien* (The Effects of Wage Increases in Industry), Stockholm, 1961, p. 281.

via the local sawmill associations or by *AB Sågverksintressenter (A.B.S.I.)*, which has been specially formed by them recently for the purpose of negotiations.

The selling side is represented mainly by the forest owners' association, the position of which as a negotiating party has recently been strengthened in certain areas. As a rule, a skeleton agreement is drawn up for prices and terms of delivery which shall apply for a certain logging season. However, the Swedish Forest Service occupies a special position in this respect. As a rule, roundwood prices are determined in the autumn when normally the timber is still standing. The consequence of such a method of procedure is that the forest owner is completely at liberty to decide not to cut if he is not satisfied with the prices which have been established for the market that season, provided that his finances permit him to let the timber stand for a few more years.

Prices thus apply for the logging season, which does not coincide with the calendar year as a rule. The roundwood buyers, who have their own mills and who sell their processed products both at home and abroad, do not base their offers as a rule only on calculations which are made on current prices but on what the prices are expected to be at the time when the roundwood should be processed and sold as final products. Accordingly, the price of the roundwood will be largely dependent on the expected price in the world market for processed wood-products (sawnwood, pulp, paper, etc.), from which the buyers deduct the processing costs of the industry and the costs of transport involved. Naturally, in the price negotiations the stocks of roundwood held by the buyers play a very important role. Large stocks can cause a decline in the interest to buy and thus reduce prices, despite these not being affected by the general level of the economy and the world market situation. Generally both buyers and sellers try to avoid large fluctuations in prices for roundwood transactions and to follow a policy of even prices. Consequently, volume more often than price is used as a means of competition in the roundwood market.

### *2.1.4 Structure of Labour Market and Movements of Wage Rates*

#### *Employment in Forestry*

Reliable data on the number of persons engaged in forestry work are not available. This applies both to officials and to workers. Census figures, which can be considered to give a fairly surveyable picture of the supply of labour, indicate only the number of people who derive their main source of income from forestry even if they are not exclusively forest workers. According to the 1950 Swedish census, the number of people gainfully employed in forestry totalled approximately 77,200. The Swedish Labour Market Board put the number of forest workers in this category at only about 64,300.[1] According to

[1] Statens Offentliga Utredningar (S.O.U. 1956:36), Socialdepartementet, *Skogsbrukets arbetsmarknad* (Forestry Labour Market), Stockholm, 1956.

**Table 2:14. Estimated Number of Persons Engaged in Forestry Work, by Selected Working Seasons, in Crown and Industrial Forests of Sweden, 1953—1962**

| Year | February | | May | | August | | November | |
|---|---|---|---|---|---|---|---|---|
| | Number of persons | Index (1954=100) | Number of persons | Index (1954=100) | Number of persons | Index (1954=100) | Number of persons | Index (1954=100) |
| 1953 | 71,430 | 99 | 37,221 | 92 | 38,655 | 105 | 48,950 | 98 |
| 1954 | 71,968 | 100 | 40,361 | 100 | 36,888 | 100 | 50,109 | 100 |
| 1955 | 70,686 | 98 | 41,804 | 104 | 38,632 | 105 | 52,314 | 104 |
| 1956 | 68,217 | 95 | 45,998 | 114 | 42,817 | 116 | 56,210 | 112 |
| 1957 | 74,458 | 103 | 42,832 | 106 | 41,840 | 113 | 50,387 | 101 |
| 1958 | 65,273 | 91 | 36,506 | 90 | 36,533 | 99 | 41,995 | 84 |
| 1959 | 54,501 | 76 | 37,539 | 93 | 36,509 | 99 | 45,836 | 92 |
| 1960 | 58,401 | 81 | 38,961 | 97 | 35,471 | 96 | 45,431 | 91 |
| 1961 | 58,733 | 82 | 41,838 | 104 | 36,990 | 100 | 46,164 | 92 |
| 1962 | 56,600 | 79 | 37,223 | 92 | 34,985 | 95 | 40,070 | 80 |

*Source:* SOS, Kungl. Skogsstyrelsen, *Skogsstatistisk årsbok*, 1953—1962

more recent estimates made for the three-year period around 1950, about 74,000 permanently employed workers were engaged in logging operations. By 1960 the corresponding amount of labour was put at 58,000 permanently employed workers.[1] Thus, during the ten-year period under survey there has been a considerable decline in the amount of labour employed, which has been estimated at some 1,600 forest workers a year. It should be noted that at the same time, i.e. during this ten-year period, the volume of annual cut has increased by approximately ten per cent.

The total number of workers in forestry, including hauliers, floaters, etc., in 1950 was estimated at some 150,000[1] and at the beginning of the Sixties at between 110,000 and 120,000.[2] It should be added that the number of physical persons is considerably larger as a great part of the work is seasonal.

More detailed statistics for employment in forestry are compiled for the Forest Service and the larger industrial companies. These statistics include both permanently and temporarily employed forest workers, and give the numbers employed on the second Tuesday in the months of February, May, August and November. Table 2:14 contains statistics for employment in large forests (owned by the Crown and industrial companies) during the period 1953-1962. One can see from this that there has been a continuous decline in the numbers employed in the large forests during the ten-year period under survey, as well as how the number of workers vary at different seasons of the

[1] Statens Offentliga Utredningar (S.O.U. 1963:63), Jordbruksdepartementet, *Utvecklingstendenser i modernt skogsbruk* (Development Trends in Modern Forestry), Stockholm, 1963.

**Table 2:15. Percentage Distribution of Forest Workers, Engaged in Different Forestry Work, by Selected Years and Working Seasons, in Crown and Industrial Forests of Sweden, 1953—1962**

| Year | Month | Logging operations | | Silvicultural work[b] | Maintenance and construction of facilities[c] |
|---|---|---|---|---|---|
| | | Total work[a] | There of hauling | | |
| | | % | | | |
| 1953 | February | 98 | 35 | — | 2 |
| | May | 72 | 12 | 23 | 5 |
| | August | 63 | 7 | 26 | 11 |
| | November | 89 | 18 | 5 | 6 |
| 1956 | February | 98 | 41 | — | 2 |
| | May | 89 | 33 | 8 | 3 |
| | August | 65 | 25 | 26 | 9 |
| | November | 93 | 30 | 2 | 5 |
| 1959 | February | 98 | 35 | — | 2 |
| | May | 65 | 17 | 32 | 3 |
| | August | 63 | 10 | 31 | 6 |
| | November | 92 | 24 | 4 | 4 |
| 1962 | February | 98 | 34 | — | 2 |
| | May | 84 | 21 | 13 | 3 |
| | August | 69 | 10 | 26 | 5 |
| | November | 92 | 23 | 5 | 3 |

*Source:* SOS, Kungl. Skogsstyrelsen, *Skogsstatistisk årsbok*, 1953—1962

*a.* Marking, felling, hauling and floating with own labour

*b.* Clearing of clear-cut areas, preparation of ground, seeding and planting, nursery operations, cleaning, weeding, combating insects and fungi, protection against damage by wildlife and natural disaster

*c.* Maintenance and construction of roads, buildings and drainage facilities and transport facilities

year. The winter season which culminates in February has the highest employment figures, as a rule, while the number of workers employed in the forest is lowest during the summer months. However, the table shows that certain variations can occur in this respect. Especially during the unfavourable period of business activity in 1958-1959, when the volume of annual cut decreased markedly, the decline was reflected by a reduction in the labour force, too.

Table 2:15 illustrates the seasonal variations, which arise because of the more or less seasonal nature of forestry operations. In this table the numbers employed in forestry, divided among logging, silviculture, maintenance and construction work, are given as percentages. From this it can be seen that logging operations have required the major part of the labour force in forestry and that the peak of logging is in February. During this period a large part of the seasonal workers (especially hauliers), who are drawn from agriculture, are employed in the forests. For agricultural workers the possibility of working in forestry during the winter is of great importance as they can then have regular employment throughout the year.

**Table 2:16. Number of Persons Employed in Wood-processing Industries, by Main Sectors, in Sweden, 1953—1962**

| Industrial sector | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Entire woodworking industry ..... | 57,048 | 63,284 | 64,258 | 60,458 | 58,939 | 58,266 | 57,422 | 60,486 | 60,076 | 58,559 |
| of which: | | | | | | | | | | |
| Sawmills and planing works ..... | 25,443 | 28,906 | 29,393 | 27,094 | 26,188 | 25,437 | 23,949 | 25,257 | 24,874 | 23,984 |
| Veneer and plywood factories ..... | 1,125 | 1,232 | 1,427 | 1,417 | 1,320 | 1,373 | 1,249 | 1,348 | 1,378 | 1,138 |
| 2. Entire pulp and paper industry ..... | 45,938 | 47,818 | 49,683 | 50,626 | 50,943 | 50,904 | 52,082 | 54,334 | 55,593 | 54,698 |
| of which: | | | | | | | | | | |
| Mechanical pulpmills | 1,498 | 1,794 | 1,725 | 1,858 | 1,840 | 1,576 | 1,523 | 1,556 | 1,642 | 1,394 |
| Chemical pulpmills.. | 17,197 | 17,443 | 17,995 | 18,398 | 18,341 | 17,801 | 17,911 | 18,422 | 18,910 | 17,836 |
| Papermills and paperboard factories ..... | 19,208 | 19,893 | 20,785 | 21,187 | 21,530 | 22,153 | 23,005 | 24,089 | 24,670 | 25,133 |
| Fibreboard factories | 2,715 | 2,966 | 3,127 | 3,229 | 3,339 | 3,325 | 3,350 | 3,482 | 3,467 | 3,256 |
| Total No. of workers ... | 102,986 | 111,102 | 113,941 | 111,084 | 109,882 | 109,170 | 109,504 | 114,820 | 115,669 | 113,257 |

These statistics refer only to firms employing at least five persons.

*Source:* SOS, Kommerskollegium, *Industri* (Industry), 1953—1962

In farm forests the harvesting and silvicultural work is generally done by the people from the farm itself, though hired labour is often used here. Certain estimates[1] put the number of persons employed in farm forests in November 1961 at about 39,000, a figure which could not be covered by the farms themselves.

In the period 1956-1960 the number employed in timber floating varied between 9,000 and 12,000 persons. Here it may be mentioned that during the winter season the floaters, as a rule, also take part in logging operations, and are therefore probably included in the total labour force employed in forestry.

Fuller information is available concerning the number of persons employed in the wood-processing industry than in the case of forestry itself. Industrial statistics[2] show that the number of workers in the various branches of industry which use timber as a raw material increased during the period 1953-1962, and this development is illustrated in Table 2:16. It can be noted that the total number employed during the Fifties has not undergone any major changes. Workers in the wood-processing industry, which includes the pulp and paper industries, constituted about 16.0 per cent of the total numbers employed in the entire forest industry in 1953, while the corresponding figure was 15.8 per cent in 1962.

On the other hand, certain changes took place in the individual branches of the wood-processing industry during the period under survey. The increase in the number of workers in papermills and paperboard factories is particularly noticeable.

[1] Sveriges Officiella Statistik (S.O.S.), Kungl. Skogsstyrelsen, *Skogsstatistisk arsbok* (Statistical Yearbook of Forestry), Stockholm, 1962, p. 97.

[2] Sveriges Officiella Statistik (S.O.S.), Kommerskollegium, *Industri* (Industry), Stockholm, 1954-1963.

*Mechanisation of Forest Work*

The most outstanding feature of post-war forestry has been the replacement of labour by machines. The Fifties witnessed the rapid advance of the power saw, and to-day such a machine is in the equipment of every logger. According to an investigation carried out by the Forestry Employers' Association (*Föreningen Skogsbrukets Arbetsgivare*) mainly in the large company-owned forests, the number of loggers equipped with power saws in relation to the total number of loggers employed and given in percentages showed the following development:

| Year | | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Sweden | % | 10 | 15 | 25 | 35 | 65 | 70 | — | — | 95 | 98 |
| Southern Sweden | % | 10 | 15 | 25 | 35 | 69 | 77 | 90 | 94 | 95 | 97 |

This development means that practically all felling is now done with motor-driven tools, which in its turn means an enormous increase in productivity in harvesting work. The saws used at the beginning of the period under survey had an average weight of about 17 kg. (37½ lb.) as against 11 kg. (24½ lb.) towards the end of the period. As the power saw has proved to be suitable also for limbing, at least for trees with heavy branches, its field of application has been increased considerably. It should be added that in bucking (cross-cutting into assortments) the power saw is mainly used. Just as the hand saw has been replaced by the power saw, so to a large extent horses have been replaced by tractors. The introduction of tractors in the mechanisation of Swedish agriculture immediately after the World War II resulted in a surplus of capacity, and efforts have been made to utilise tractors for transport in forestry. However, it proved that special tractors made for forest work were more economic than the conventional types of tractors used in agriculture.

Along with the introduction of tractors and lorries in timber harvesting, the heavy loading work was mechanised by various types of cranes and hoists. This has made hauling a one-man job which in its turn has reduced the part of haulage costs taken up by wages by about one-third.

Bark removal in connection with felling has to a large extent been eliminated as this work is now done in various mechanical ways by industry. When the bark removal must be done for one reason or another before the timber is transported to the mills it is carried out by machine at the roadside or the floatway. Single-log machines have been developed continuously during the period of survey. Where they are of mobile design they are combined with cranes for handling the timber.

In Sweden there has been less success with the mechanisation of the silvicultural work. Certain phases of this work, such as ground preparation, have been mechanised to a large extent but planting work in the forests is still largely manual because of the relatively difficult topographical conditions. Machinery is used to a large extent in the construction and maintenance of

roads and buildings and wages in this group now amount to a smaller percentage of the total costs in this field of activity.

The advance of mechanisation which has been outlined here has taken place primarily in the larger enterprises which have relatively good possibilities of concentrating their forestry operations. However, such concentration becomes difficult because in many places there is a diversified ownership and dispersed holding structure; this is especially characteristic for small private holdings which belong to the category of farm forests. Almost half the volume of timber output comes from this latter group, which can be called small-scale forestry and which is integrated with agriculture to a large extent. The amount of mechanisation in small-scale forestry on average is considerably below the level which is common for large-scale forestry although there are a number of exceptional cases. Through various types of collaboration small-scale forestry, too, has the chance of overcoming the negative influence which the dispersed holding structure has on mechanisation and the streamlining of the working operations in the forests.

*Collective Bargaining and Wage Agreements for Forest Workers*

In Sweden centralised bargaining has become the key factor in the wage negotiating machinery. Wages are essentially determined by two major central organisations: on the wage-earners' side—the Swedish Confederation of Trade Unions (*Landsorganisationen* or L.O.) and on the employers' side—the Swedish Employers' Confederation (*Svenska Arbetsgivareföreningen* or S.A.F.). The central "frame" agreements between these major organisations strongly influence the general development of wages also in sectors which are represented in the labour market by separate organisations. In fact, nearly all wage-earners are covered by collective agreements.

Collective bargaining at the local level and for individual branches deals mostly with details of the negotiated increases for wage-earners. Wage contracts are usually of fixed duration, normally for one year. Collective agreements on which wage rates in forestry were based appeared as early as 1918. These were of a local nature, often only concerning individual enterprises in southern and central Sweden. It was not until the mid-Forties that this form of agreement came into use in the northern parts of Sweden. One can now say that collective agreements apply to forests throughout Sweden and primarily apply to large forest enterprises.

Swedish forestry now has the following main groups of collective agreements:

a. Forest agreements (felling, manual bark removal, horse haulage, silvicultural work, etc.)
b. Timber measuring (scaling) agreements
c. Timber floating agreements
d. Sorting agreements (*skiljeställesavtal*)
e. Agreements for timber drive (*flottläggningsavtal*)

The parties to the arrangements vary from area to area. The larger parties on the employers' side are the Swedish Forest Service (*Domänverket*), the Forestry Employers' Association (*Föreningen Skogsbrukets Arbetsgivare*) and the Swedish Employers' Association of Rural Workers (*Svenska Lantarbetsgivareföreningen*). On the wage-earners' side the main organisations are the Swedish Forest Workers' Union (*Svenska Skogsarbetareförbundet*).

It should be pointed out that only to a small extent is the work of hauling by lorries and that of skidding by tractors in forestry regulated by means of collective labour and wage agreements.

As to forest agreements, efforts have been made over a number of years to base the structure of piece-rates in these agreements on time and motion studies, which have been employed on a large scale in forestry since the late Thirties. The results of these studies have not been used, in the main, in the same way as is common throughout industry, namely in order to determine the exact level for piece-rates. Instead they have been used to show the relationship between the rates of work of varying difficulty. The final level of the rates is left for the parties to negotiate. Here to a large extent it is a matter of assessing the degrees of difficulty of the work. For practical reasons this point of the agreement is in most cases left open for subjective evaluation.

The general framework of the collective agreements is also the subject of negotiations between the organisations representing the parties. Since they were first introduced, the principles on which these agreements are based have undergone certain changes; also forest agreements are drawn up somewhat differently in northern Sweden than in the south.

*Earnings of Forest Workers*

One can say that the standard of living of the wage-earners in Sweden has doubled over the past thirty years. For the main part this improvement has been brought about by increased wages. However, other circumstances, such as the social welfare policy of the Swedish State which has supplemented the actual amounts of increase, have contributed towards this greatly improved standard.

The development of earnings in forestry and the wood-processing industry have largely followed the general development of earnings. Prior to World War II the earnings of forest workers were on average lower than those of industrial workers, but since then wages in forestry have risen more rapidly than wages outside this sector of the economy.

Wage statistics concerning the earnings of forest workers are to some extent less reliable than the corresponding data for industrial workers. This has to do with the fact that work in the forests is usually done on piece-rates and that as a rule there is no check on the time worked. Moreover, often a person works for more than one employer during the year, and then seasonal work

and lost time due to inclement weather complicate the matter. Also the earnings of forest workers are very dependent on individual skill and the equipment used (degree of mechanisation) and on a number of other factors which generally cannot be determined and often cannot be explained. For such reasons there can be large variations from the average figure.

Since 1918 statistics concerning forest workers in Sweden have been compiled by the Board of Social Welfare (*Socialstyrelsen*). These statistics are based on the forest supervisors' assessments of a normal day's earnings in forest work in the Swedish Forest Service, but no uniform method of assessment has been applied. It is difficult to give correct data concerning income earned from day work and the corresponding number of hours or exact time of working necessary to attain such an income. In order to make a comparison with industrial workers, the daily earnings of loggers derived from the statistics of the Board of Social Welfare have been divided up on the following hourly basis[1]:

| | | | |
|---|---|---|---|
| 1953-1956 | 48 hour working week | 8.00 hours per day[1] | |
| 1957 | 47 „ | 7.83 | „ |
| 1958 | 46 „ | 7.67 | „ |
| 1959-1962 | 45 „ | 7.50 | „ |

These figures should be regarded as only approximations as the actual working time in the forests varies with the season, the geographical location and with a number of other factors while the working day can be considerably longer or shorter than the stated working hours. The average hourly earnings have later been reduced by the introduction of holidays with pay where the amount of money involved is in proportion to wages (6 per cent during the period under survey) and in effect means a direct increase of hourly earnings in monetary terms. In order to facilitate comparisons with other countries the social charges involved have been kept separate from the actual wage costs. It may be added that, principally, any international comparison of labour costs must be based not on wages alone but on wages and social charges taken together.

Table 2:17 shows the average hourly earnings in forestry, the timber conversion industry, the pulp and paper industry, and industry as a whole during the period 1953-1964. Hourly wage costs are given in the monetary values of the respective years and there is an index series with 1954 as the base year. The hourly earnings in the industry itself are calculated on the basis of the 42-hour and the 46-hour working week excluding extra pay for overtime, shiftwork, work on public holidays, holiday pay and other social benefits.

These figures show that the increases in wages since 1954 have been greater in forestry (this mainly refers to logging) than in the wood-processing industry, as well as in the industry as a whole.

[1] Sveriges Officiella Statistik (S.O.S.), Socialstyrelsen, *Löner* (Wages), 1954-1963.

**Table 2:17. Average Hourly Earnings for Adult Male Workers[a] in Forestry and Forest Industries, 1953—1964**
*(current S.kr, index 1954=100)*

| Year | Forestry (loggers)[b] | | Woodworking industry | | Pulp and paper industry | | Industry as a whole | |
|---|---|---|---|---|---|---|---|---|
| | *S.kr/hour* | *Index* | *S.kr/hour* | *Index* | *S.kr/hour* | *Index* | *S.kr/hour* | *Index* |
| 1953 | 3.54 | 94 | 3.31 | 94 | 3.40 | 94 | 3.72 | 96 |
| 1954 | 3.76 | 100 | 3.53 | 100 | 3.62 | 100 | 3.89 | 100 |
| 1955 | 4.02 | 107 | 3.83 | 108 | 4.02 | 111 | 4.18 | 107 |
| 1956 | 4.20 | 112 | 4.07 | 115 | 4.36 | 120 | 4.53 | 116 |
| 1957 | 4.52 | 120 | 4.32 | 122 | 4.59 | 127 | 4.78 | 123 |
| 1958 | 4.77 | 127 | 4.52 | 128 | 4.78 | 132 | 5.04 | 130 |
| 1959 | 5.03 | 134 | 4.74 | 134 | 4.96 | 137 | 5.26 | 135 |
| 1960 | 5.40 | 144 | 5.11 | 145 | 5.33 | 147 | 5.64 | 145 |
| 1961 | 5.95 | 158 | 5.50 | 156 | 5.59 | 154 | 6.07 | 156 |
| 1962 | 6.53 | 174 | 5.98 | 169 | 5.92 | 164 | 6.53 | 168 |
| 1963 | 7.43 | 198 | 6.45 | 183 | 6.26 | 173 | 6.97 | 179 |
| 1964 | 8.23 | 219 | 6.94 | 197 | 6.67 | 184 | 7.45 | 192 |

*Source:* SOS, Socialstyrelsen, *Löner* (Wages), 1953—1964

*a* Excluding overtime and shift bonus, and holiday pay

*b* For forest workers (loggers) the "normal daily earnings" have in accordance with estimates provided by Forest Service supervisors been divided by 8 for 1953—56, by 7.83 for 1957, by 7.67 for 1958, by 7.50 for 1959—61, and reduced by the value of the holiday (6%) to attain compatibility with industry

In order to illustrate the wage increases in forestry further, Table 2:18 shows the rate of increase in wages provided for under agreements during the period 1953-1962 in northern Sweden. One can see that there is a certain correspondence between the actual increases of wages, according to the statistics (Table 2:17), and the nominal increase in wages provided for time rates alone in the agreements. Piece-work for felling, which in this connection is actually the most suitable for a comparison, deviates considerably from the actual development trend shown by the statistics. Thus the figures presented confirm the known fact that the wages actually paid have a tendency to be higher than the wages provided for under the agreement. This may be due partly to wage drift and partly to a number of other factors, among which the most important is the demand for labour.

As stated above, wages for forest workers have been determined by negotiations between organisations representing the employers and the workers, as a rule, at national level. It cannot be denied that negotiated wage increases in forestry have been greater than the increase in labour productivity. Such excessive wage increases, or wage-push, have been the main reason for the upward movement of costs in forestry production. It may be noted that the industries which pay high wages and where there is increasing labour productivity usually act as the pace-setters when forestry wages are being negoti-

**Table 2:18. Increases of Earnings for Forest Workers According to Wage Agreements, as Percentage and as Price Indices, by Different Kind of Work, in Northern Sweden, 1953—1963**

| Date of wage increase | Time-work | | Piece-work for felling | | Piece-work for hauling | |
|---|---|---|---|---|---|---|
| | Increase in % | Index (1953/54=100) | Increase in % | Index (1953/54=100) | Increase in % | Index (1953/54=100) |
| 1953/54 | — | 100 | — | 100 | — | 100 |
| 1.10.1954 | *11.5* | 112 | *7.0* | 107 | *7.0* | 107 |
| 1.10.1955 | *4.7* | 117 | *3.7* | 111 | *3.7* | 111 |
| 1.10.1956 | *3.5* | 121 | *2.0* | 113 | *2.0* | 113 |
| 1.1.1958 | *1.4* | 123 | *2.0* | 116 | *2.0* | 116 |
| 1.1.1959 | *2.5* | 126 | *0.8* | 116 | *1.5* | 117 |
| 1.1.1960 | *7.0* | 134 | *5.0* | 122 | *7.0* | 125 |
| 1.1.1961 | *7.5* | 145 | *5.3* | 129 | *5.3* | 132 |
| 1.1.1962 | *9.0* | 158 | *7.0* | 138 | *7.0* | 141 |
| 1.1.1963 | *4.3* | 164 | *4.3* | 143 | *4.3* | 147 |

Partly estimates and approximations

*Source:* Kilander, K., "Rationalisering i skogen", *Skogsarbeten*, Report No. 10, 1964

ated and that this results in wage increases which exceed the rise of productivity in forestry. Actually, the general wage negotiations at national level relate not to average wages but to wages in specific industries where the rise in productivity and the level of profits are highest. Needless to say, the high prices and excessive demand for forest products after the Korean War and later in the Fifties have substantially influenced the wage negotiations for forest workers.

### *2.1.5 Forest Resources and Ownership*

*Growing Stock and Dominant Tree Species*

Table 2:19 gives an account of the composition of the growing stock based on assessments made by the National Forest Survey (*Riksskogstaxeringen*). For a total forest area of 22.4 million hectares (according to the assessment of 1961), which constitutes 54 per cent of the total land area, the total growing stock is estimated at 2,100 million cubic metres (94 $m^3f$ per ha). As much as 40 per cent of this is within the 15-25 cm. diameter class. Large timber accounts for 31 per cent and small timber for 29 per cent. The share of spruce in the growing stock is 44 per cent, while pine is somewhat lower at 40 per cent. However, on account of the fact that spruce is the dominant species on better soil its share of the total growth (68.4 million $m^3f$) is as high as 51 per cent as against only 34 per cent for pine. On the other hand, the share of deciduous species of the growing stock and the growth is about the same, namely 16 per cent and 15 per cent respectively. Obviously, it is important to take this into account when making calculations for allowable cut.

**Table 2:19. Standing Timber in Productive Forests, by Species and Diameter Classes, in Sweden**

| Tree species | Growing stock | | | | | | Annual growth | |
|---|---|---|---|---|---|---|---|---|
| | Total volume | | *Percentage* distribution by diameter classes (*cm*) | | | | Total volume | |
| | *Thousands of cubic metres* ($m^3f$)* | % | 0—14.9 | 15—24.9 | 25+ | Total | *Thousands of cubic metres* ($m^3f$)* | % |
| Scots pine .... | 853,749 | *40* | 18 | 41 | 41 | 100 | 23,269 | *34* |
| Norway spruce. | 938,610 | *44* | 31 | 42 | 27 | 100 | 34,833 | *51* |
| Birch ..... | 245,642 | *12* | 54 | 35 | 11 | 100 | 7,476 | *11* |
| Oak and beech | 21,898 | *1* | 20 | 25 | 55 | 100 | 2,832 | *4* |
| Other deciduous species ..... | 55,990 | *3* | 48 | 33 | 19 | 100 | | |
| Total ..... | 2,115,889 | *100* | 29 | 40 | 31 | 100 | 68,410 | *100* |

*$m^3f$="forest cubic metre", solid measure including bark

*Source:* Hagberg, E. and Arman, V., "Skogarna och skogstillståndet vid periodens slut", *Sveriges skogar under 100 år*, Part II, 1959

The average productive capacity or the potential timber output, which could be made annually if the entire forest area were covered with stands of sufficient density and if the age-class distribution were more or less normal, is estimated at approximately 80 million cubic metres (3.6 $m^3f$ per ha)[1], thus an increase in productivity of 12 million cubic metres (i.e. 80 million minus 68 million) would be possible. According to the stump-inventory (*stubbinventering*) made by the National Forest Survey, the annual fellings during the period 1952-1957 for the entire country averaged 47 million cubic metres ($m^3f$), a volume which corresponds to approximately 70 per cent of the annual increment. However, the relationship between the timber growth and drain varies quite considerably in the different parts of the country.

*Forest Ownership*

Table 2:20 shows that the forests in public ownership account for 24 per cent of the total forest area of Sweden, of which the forests under administration of the Swedish Forest Service (*Domänverket*) or Crown forests account for 19 per cent. Of the remaining 76 per cent of the total forest area which is in private hands, company-owned or industrial forests occupy 25 per cent and other private forests 51 per cent. In the category designated as "estate forests", which comprise three per cent of the total forest area, the National Forest Survey differentiates between forests of over 400 hectares in central Sweden

[1] Nilsson, N. E. *Riksskogstaxeringens produktionsöversikter* (Yield Tables from the National Forest Survey), Meddelanden från Statens Skogsforskningsinstitut (Publication of the State Forest Research Institute), Vol. 50, No. 1, 1961.

**Table 2:20. Productive Forest Area and its Distribution in Age Classes, by Ownership Categories, with Site Quality Classes, in Sweden**

| Ownership | Productive forest area *a* | | Percentage distribution of age classes by area | | | | | | | | | | Average Site Quality Class *(cubic metres) per ha)* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total *(thousand ha)* | % | Cut over and openings | I 1—20 | II 21—40 | III 41—60 | IV 61—80 | V 81—100 | VI 101—120 | VII VIII 121—160 | IX+ | Total | |
| Crown forests *b* ... | 4,107 | *19* | 8.6 | 4.5 | 8.8 | 8.7 | 12.9 | 14.3 | 10.6 | 14.8 | 16.8 | 100 | 1.94 |
| Other public forests | 1,218 | *5* | 7.0 | 6.7 | 11.8 | 13.1 | 16.1 | 12.0 | 11.0 | 12.8 | 9.5 | 100 | 2.82 |
| Industrial forests (private companies) | 5,497 | *25* | 6.4 | 5.5 | 10.7 | 13.9 | 20.0 | 18.0 | 12.8 | 9.1 | 3.6 | 100 | 2.57 |
| Farm forests..... | 10,648 | *48* | 6.2 | 5.9 | 15.3 | 18.4 | 20.1 | 15.3 | 9.5 | 6.9 | 2.4 | 100 | 3.19 |
| Other private forests (estates) .. | 788 | *3* | 5.5 | 10.5 | 21.1 | 23.7 | 20.8 | 12.4 | 4.0 | 1.6 | 0.4 | 100 | 4.81 |
| Total ..... | 22,258 | *100* | 6.7 | 5.7 | 13.0 | 15.4 | 18.6 | 15.5 | 10.4 | 9.0 | 5.7 | 100 | (3.60) |

*a.* Including sparsely forest covered areas (hagmark)

*b.* These figures differ slightly from Domänverket's own statistics

*Source:* Hagberg, E., and Arman, V., "Skogarna och skogstillståndet vid periodens slut", *Sveriges skogar under 100 år*, Part II, 1959

(*Svealand*) and 200 hectares in southern Sweden (*Götaland*). The distribution into these ownership categories has remained fairly stable during the present century, although there has been a certain increase in the share of public forests.

The acquisition of forest land by private companies took place chiefly during the period 1870-1906. It was in 1906 that a law was passed prohibiting the acquisition of real estate by industrial companies. Through amalgamations and take-overs the tendency towards large-scale forestry has become all the more marked in the category of industrial forests, the 15 largest timber companies own no less than 80 per cent of the total area of company-owned forests.

As is evident from Table 2:20, there is a considerable variation in the site quality classes for the different ownership categories from the national average figure (3.60 $m^3f/ha$), which is primarily connected with the differencies in the regional distribution of forests. The relatively high site quality class for "estate forests" (4.81 $m^3f/ha$) is natural, because no differentiation for this ownership category is made in northern Sweden (*Norrland*). The relatively low site quality class for the Crown forests (1.94 $m^3f/ha$) is connected with the fact that these forests are concentrated in northern Sweden. The consequences of these differences in the geographical position can also be noted in the age-class distribution. The over-mature stands (age class VII+) and the cut-over areas constitute a high proportion of the Crown forests and a low proportion of "estate forests", while the opposite is the case for the young and middle-aged stands (age class I-IV). A comparison between farm-owned forests and industrial forests shows that the former category contains more younger stands (age class II-III) and less mature stands (age class V+) than the latter category.

*2.1.6 Forest Economic Regions*

From the previous survey it seems evident that a division into regions would be highly desirable in order to give weight to a comparative analysis of the costs and revenue of forestry. However, it is important that the number of these regions be kept to a minimum. The division of Sweden into four Forest Economic Regions which has already been made is shown on the map (Fig. 2—2). From this it can be seen that the prime idea has been to divide the country into a northern area and a southern area. In the case of the northern area it has been considered that it was important to make a division between a more favourable part (the coastal area) and a less favourable part (the highlands). In the case of the southern area it has been considered important to differentiate from the rest a specific region which as to forest land area is comparatively small, but which is characterised by similar growth conditions as the deciduous forests on the Continent.

The division into six increment regions made for the Yield Tables of the National Forest Survey[1] proved to be a suitable basis for the division of Sweden into forest economic regions to meet the above requirements, although certain adjustments had to be made.

On the basis of the area of forest land, growing stock and productive capacity of the soil, these increment regions have been appropriately adjusted in Table 2:21 into what has been called Forest Economic Regions (Fig. 2—2). The Yield Tables of the National Forest Survey have been used as a basic material for the calculations involved in determining these regions.

As can be seen from the table, the average volume of growing stock per area unit within the different Forest Economic Regions does not differ as much as the potential productive capacity or the growth which can be regarded acceptable under normal conditions. The relatively high volume of growing stock per hectare of forest land in Region I and the relatively low volume in Region IV, if compared with the productive capacity of the soil, would seem to be primarily dependent on the age-class composition of the forests. In Region I mature stands ready for cutting are still dominant while in Region IV young and medium-aged stands predominate.

REGION I. The forest land in this region forms the transition between the productive forests and the tundra and mountain area. The coniferous timber line against the tundra in the polar area is at approximately 450 metres above sea level, while the vertical timber line in the mountains run up to 900 metres in the southern part of the Region. In the main the conditions for forest growth and reproduction are unfavourable. In the northernmost parts as well as in the

[1] Nilsson, N. E. *Riksskogstaxeringens produktionsöversikter* (Yield Tables from the National Forest Survey), Meddelanden från Statens Skogsforskningsinstitut (Publication of the State Forest Research Institute). Vol. 50, No. 1, 1961.

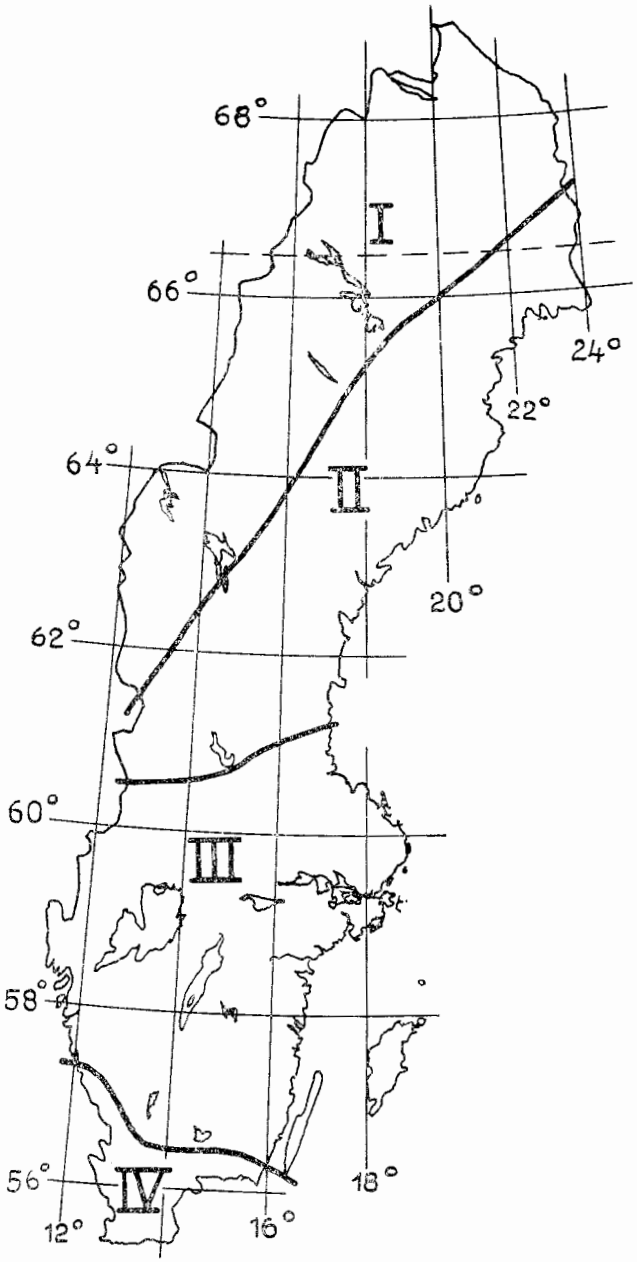


Fig. 2-2. Forest Economic Regions in Sweden

**Table 2:21. Area, Growing Stock and Productive Capacity of Forest Land, by Forest Economic Regions, in Sweden**

| Region | Productive forest area | | Growing stock | | | Productive capacity (*cubic metres per ha*) |
|---|---|---|---|---|---|---|
| | | | Total volume | | *Cubic metres per ha* | |
| | Total (*million ha*) | % | (*million cubic metres*) | % | | |
| I | 4.0 | *18* | 246 | *12* | 61 | 1.70 |
| II | 9.7 | *43* | 789 | *39* | 82 | 2.82 |
| III | 8.0 | *36* | 946 | *46* | 119 | 5.18 |
| IV | 0.7 | *3* | 69 | *3* | 106 | 6.49 |
| All Sweden | 22.4[a] | *100* | 2,050[a] | *100* | 92 | 3.60 |

*a* These figures differ slightly from respective data presented in Tables 2:19 and 2:20, due to differences in primary sources. The latest data must be considered more accurate

*Sources:* (1) Primary Data of the National Forest Surveys
(2) Nilsson, N-E., "Skogsbrukskarta jämte redovisning av skogsmarksarealer, virkesförråd, beräknad avverkning och arbetskraftåtgång m.fl. uppgifter för regioner, län och småområden", *Statens skogsforskningsinstitut*, Report No. 1, 1961

very high mountain areas considerable difficulties are involved with forest reproduction. Because of this almost 0.7 million hectares of the Crown forests in the region are regarded as being above the Reforestation Boundary, where no felling is allowed and where no artificial reproduction measures are taken.

There are no large industries which use timber as a raw material in this region and the major part of the roundwood produced is generally floated to the wood-processing mills in the coastal area. Much of this timber is transported by lorry to the floatways. Only to a very limited extent is road transport used to convey the timber to the industries in the coastal area.

As a rule, transport constitutes the major part of the costs involved in getting timber from the forests to the processing industry. The costs for logging and transport are those which determine the accessibility and thus to a great extent the stumpage value. In this respect the region has the poorest accessibility in Sweden and consequently the lowest value of standing timber. The actual fellings in this marginal area is dependent to a very high degree on market conditions, and the development in recent years shows that there is cause to regard the region in the present circumstances as a "zero area" with certain local exceptions. With improved market conditions and, in the case of certain assortments also in the present conditions, the stumpage value can be satisfactory which in its turn means that forestry operations can be paying. However, this is attainable only in the most extensive form of operations. The establishment of new wood-processing industries in this region could improve the market situation to some extent in the future.

Crown forests and other forests in public ownership account for over half of area of all forests in this region. The average timber volume per hectare probably does not differ very much between the different ownership categories. A comparison between the costs involved with timber harvesting in the different ownership categories[1] shows that the Crown forests have a slightly inferior accessibility than the other public and private forests within the region but, in the main, the natural production conditions are rather similar for all ownership categories.

REGION II. In the coniferous forest belt of northern Sweden the forests near the coast and in the eastern part of the inland area are the most important from the standpoint of timber supply. The conditions for forest growth in this region vary according to the geographical location. Climatic and biological conditions for forest production are less favourable in the northern part of the region than in the south and also they deteriorate the farther one gets away from the coast. As a rule reproduction by natural seeding takes place most easily at the lower altitudes near the coast. Reproduction conditions deteriorate as the altitude increases and some of the productive forest land can be classified as having regeneration difficulties.

Throughout the region the conditions for timber extraction are relatively good. This favourable situation results largely from the abundance of watercourses which for long have been used as floatways; also at the mouth of the rivers wood-processing industries have been established, as a rule. The annual volume of timber floated amounts to-day to almost 12 million cubic metres or about half of the quantity of timber felled in this region, while the other half is transported by land to the wood-consuming industries. The wood-processing mills were built here at a time when floating was practically the only method of transport. Also for convenience of shipping the finished products was the manufacturing done at the mouth of the large rivers. With the introduction of lorries it became possible to transport roundwood from the forest directly to the mills. This has meant that the costs of floating and of land transport have to be weighed against each other, but the cost advantage of the floating is often obvious. However, developments favour land transport at the expense of floating. This fact can be regarded as proof that despite the abundance of floatways the accessibility in this region with present methods of transport cannot be considered as being better than that in other areas which lack such watercourses and where an adequate road network is available. The advantages which this region had in respect of timber transport were obvious in former times but more recent technical development has made the advantages of watercourses less important and often negligible.

[1] Statens Offentliga Utredningar (S.O.U. 1963:14), Finansdepartementet, *Undersökning av taxeringsutfallet* (Investigation of Taxation Yields), Stockholm, 1963.

There are no great differences in the forest production conditions for the various ownership categories in this region. Logging and transport costs in the Crown forests can be considered to be slightly higher than those in the private forests but the general level of managerial costs, including silviculture, is probably similar for all ownership categories.

REGION III. The forests in this region form part of the southern coniferous forest belt. However, the composition of the tree species does not differ very much from that of the previous region, though due to the more favourable climatic conditions the natural growth and reproduction of the forest are better here than in the northern parts of the country. In addition the countryside is dotted with many settlements and these have almost forced out the forests from the larger areas of flat land with the exception of small clusters of trees between the arable land.

The region is well served by highways and railways and in the main the roads are well built. On the other hand with the exception of the north-western part of the region there are no large watercourses which can be used for floating. This constitutes the biggest difference between logging operations in the northern and southern parts of Sweden. Road transport is therefore the main means of getting the timber from the forests of this region to the manufacturing industry.

Various wood-processing factories are spread throughout the region and the marked concentration of industry in the coastal area which is characteristic of the northern part of Sweden is not to be found here.

The successive increase in growing stock which can be noted from the data presented by the National Forest Survey will probably bring about a further expansion of the wood-processing industries.

There are no great differences in the forest production conditions for the various ownership categories. The Crown forests in the main have a larger timber volume per area unit than is found in other forest ownership categories. Logging and transport costs show hardly any differences; consequently, the accessibility factor in the various ownership categories should be regarded as being similar.

REGION IV. The occurrence of beech is a characteristic feature of the forests of the southernmost part of Sweden. The beech stands do not play any prominent role either in timber output or in terms of income. Climatically and biologically the growth and reproduction of the forests here are very similar to those on the Continent, and thus this region should be regarded as a transition zone between the Scandinavian peninsula and the European mainland.

The relatively well-developed wood-processing industry in this region, which is favourably situated for exporting, has certain possibilities for further expan-

sion as its raw material can be easily obtained from the neighbouring region to the north. Lorries are mainly used for the transport of roundwood.

Previously this region had vast non-productive areas covered by heather, which during the first half of the present century were largely converted into productive forest land. The volume of timber stock is still increasing and a considerably larger annual timber output can be expected in the near future. The Crown forests have a far larger timber volume per area unit than the other forests, a condition which has been achieved primarily by intensive silviculture and the restricted cutting policy applied in these forests. The forest production conditions in the main and the accessibility in particular seem to show no great differences for the various ownership categories.

## 2.2 Income and Expenditure in Crown Forests of Sweden

### *2.2.1 State Forest Administration as a Business Enterprise*

There are probably few forestry enterprises whose activity has been registered in the form of an unbroken and almost uniform series of operational statistics from the beginning of this century. The Crown forests under management of the Swedish Forest Service (*Domänverket*) belong to this elite group. The National Board of Crown Forests and Lands (*Domänstyrelsen*), which is responsible for the central administration of such forests, was given a relatively independent position as a State business concern as a result of the 1912 budget reform.

That *Domänstyrelsen* has been given the position of a business enterprise, means in principle that its operations are not dependent on grants from the Swedish Parliament (*Riksdag*); the Board has only to submit a summary Income and Expenditure Account for each year, i.e. a net surplus estimate, which is examined by the State authorities. In the main, the Board can then carry on its activities on its own responsibility, while paying due attention to the general economic situation, and especially to the timber market. However, in many respects the Board is bound by general State regulations in such a way that it cannot always make decisions about its own activities.

The general rule for the administration of the Crown forests is that they "shall be managed in accordance with the principles of sustained yield (and as far as possible of even yield), with the purpose of obtaining the largest possible financial return". This means that there will be an attempt to make forestry profitable when the requirements of sustained yield principles have been satisfied.

In forestry, sustained yield means that the cut must be followed by measures for providing a new forest crop, to maintain the timber production at an appropriate level, and to prevent situations in which the production factor "forest land" is not productive for long periods.

The cost of fulfilling the sustained yield requirements is generally quite burdensome in the case of Crown forestry, because the greater part of the forest is situated in areas of comparatively low productive capacity, where regeneration is difficult. These extreme conditions prevail particularly in Norrland, the northern half of Sweden, near the forest limit, and extend both vertically, as in the mountains, and latitudinally, as in the regions near the tundra in the north; whereas in the southernmost parts of Sweden, the forest growth conditions can be described as optimal. Thus in terms of yield from each unit of area, the Crown forests in Norrland come nowhere near those in southern and central Sweden.

### *2.2.2 Timber Cut and Cutting Policy*

The general objective for the management of the Crown forests, as has already been mentioned, requires that there shall be an even yield, as far as this is possible. Because of this, the annual timber output may not show any marked variations in volume. The supply of roundwood, which the *Domänverket* must put on the market, should be of fairly constant volume, and should not fluctuate too much in response to changing business cycles.

Throughout its century of existence, the Forest Administration has followed a rather conservative cutting policy, the purpose of which has been, first, to ration out the over-mature stands, and secondly, to build up timber capital. However, the actual annual cut has not, on the whole, deviated from the allowable cut determined by the Forest Administration in the working plans.

A characteristic feature of the policy has been the fact that the allowable cut has shown some increase in the course of time; this has been so, despite the fact that the authority in charge of forest regulations has attempted, as a matter of principle, to make its estimates of the allowable cut on a more-or-less scientific basis. Experience gained in forestry practice over the years shows that one cannot claim that there should be some sort of "normal cut" or "absolute allowable cut" laid down objectively, by which it would be possible to gauge overcuts and undercuts. An annual cut of "normal" size, which is not subject to any changes, can be regarded as possible only in the "normal forest". The concept of "normal cut" in large-scale forestry in Sweden, in contrast to certain other countries, is no longer important for control purposes, and for this reason can be excluded from the present argument. Growth is a better criterion for the long-range control of timber removals.

Table 2:22 shows the changes in the timber cut per hectare of productive forest in the Crown forests during the period 1911-1962. The survey refers to the volume of timber actually felled each year, in cubic metres per hectare, both in terms of yield of felled timber, i.e. solid volume without bark ($m^3y$),

**Table 2:22. Total Timber Cut in the Crown Forests of Sweden, Annual Average, 1911—1962**
*(cubic metres per hectare)*

| Period | Average annual cut | |
|---|---|---|
| | *($m^3y/ha$)* | *($m^3f/ha$)* |
| 1911—1915 | 0.81 | 1.03 |
| 1916—1920 | 0.88 | 1.12 |
| 1921—1925 | 0.75 | 0.95 |
| 1926—1930 | 0.99 | 1.25 |
| 1931—1935 | 1.05 | 1.33 |
| 1936—1940 | 1.04 | 1.32 |
| 1941—1945 | 1.27 | 1.61 |
| 1946—1950 | 1.08 | 1.37 |
| 1951—1955 | 1.07 | 1.36 |
| 1956—1960 | 1.26 | 1.59 |
| 1961 | 1.31 | 1.66 |
| 1962 | 1.33 | 1.68 |

*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1912—1963

and as standing timber, i.e. forest cubic metre solid volume including bark ($m^3f$).[1]

It is compiled as a five-year average for the period 1911-1960, and for the years 1961 and 1962. The calculations have been made on the basis of the total forest area, including areas above the Reforestation Boundary. In the total timber removals are included stumpage sales and deliveries of felled timber, whose actual felling may have taken place at some other time, but this difference has probably been levelled out in the average for the period.

Table 2:23 shows the area distribution of the forests and the average annual fellings in the four Regions. The table shows how the timber output per unit-area differs in the various parts of Sweden, and it can be seen that the lowest yield occurs in the northern parts of Sweden. This means in practice that the timber output per unit-area ($m^3f$/ha) in Region IV (southern Sweden) can be obtained in Region I (northern mountains and sub-arctic areas) only from five unit-areas of forest land. In this connection, the natural conditions for timber production are of decisive importance, and the timber growth per hectare can hardly be influenced by human activities during the growing period of the stands, particularly in areas near the natural forest limit. On the other hand, human activities may well upset the production of timber, for instance, by concentrated clear-fellings, which will reduce, at least temporarily, the average growth for the regions affected.

For the Crown forests as a whole, the estimated total volume of the annual growth has shown quite marked variations during the last decades. Despite the

[1] Conversion factor: $m^3f=0.79\ m^3y$.

**Table 2:23. Area Distribution and Timber Cut, by Regions, in the Crown Forests of Sweden**

| Year | | Regions | | | | Average for Crown forests |
|---|---|---|---|---|---|---|
| | | I | II | III | IV | |
| 1958 | Area, *1000 ha*[a] ..... | 1,012 | 1,851 | 513 | 34 | |
| 1953—1957 | Average annual cut, $m^3y/ha$ | 0.80 | 1.06 | 3.63 | 4.46 | 1.40 |
| 1962 | Area, *1000 ha*[a] ..... | 1,012 | 1,826 | 530 | 35 | |
| 1958—1962 | Average annual cut, $m^3y/ha$ | 0.86 | 1.31 | 3.59 | 4.34 | 1.56 |

*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1953—1963
*a* Forest area below the Reforestation Boundary

unreliability of the statistical material, one can perhaps say that remarkable increases in growth have taken place over large areas. This applies especially to southern and central Sweden. Primarily, these increases can be attributed to the fact that the forests in question are in a favourable development phase, i.e. the middle-aged stands are dominant, and secondarily, to the intensive silviculture which has taken place in the southern parts of the country since the turn of the century. The method of cutting has been mainly in the form of thinnings, practised more intensively since the early Thirties, and has had a great effect on the net annual growth.

In areas where the annual growth over a long period has been greater than the actual timber drain, i.e. timber felled plus timber losses through natural causes, the increase in volume of the growing-stock has been quite remarkable (from 67 $m^3f/ha$ in 1953, to 71 $m^3f/ha$ in 1962). Table 2:24 shows the relationship of the annual increment and annual fellings to the growing-stock, with the "cutting percentage" (German term: *Nutzungsprozent*) shown as an average for each of the Regions during the period 1958-1962. To a large extent, the cutting percentage is dependent on the volume of the timber-stock, but the rotation, which is the basis for the calculations of the allowable cut, also plays an important part. As can be seen from the table, the rate at which the existing

**Table 2:24. Growing Stock Compared with Increment and Timber Cut, by Regions, in the Crown Forests of Sweden, Average for the Period 1958—1962**
*(forest area below the Reforestation Boundary)*

| | Regions | | | | Average for Crown forests |
|---|---|---|---|---|---|
| | I | I | III | IV | |
| Growing stock, $m^3f/ha$..... | 51 | 64 | 131 | 151 | 71 |
| Annual growth, $m^3f/ha$..... | 1.1 | 1.5 | 4.4 | 6.0 | 1.9 |
| *Percentage* of growing stock.... | *2.2* | *2.3* | *3.4* | *4.0* | *2.6* |
| Annual cut, $m^3f/ha$ ..... | 1.1 | 1.7 | 4.5 | 5.2 | 2.0 |
| *Percentage* of growing stock.... | *2.2* | *2.7* | *3.4* | *3.4* | *2.8* |

*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1959—1963

**Table 2:25. Percentage Distribution of Productive Forest Land, by Age Classes and by Regions, in the Crown Forests of Sweden, 1962**

| Region | Cutovers and other open areas | Age classes, years | | | | |
|---|---|---|---|---|---|---|
| | | 1—19 | 20—39 | 40—79 | 80—119 | 120 and older |
| I ..... | 17 | 12 | 4 | 13 | 23 | 31 |
| II ..... | 9 | 14 | 9 | 18 | 24 | 26 |
| III .... | 11 | 5 | 11 | 44 | 25 | 4 |
| IV .... | 2 | 17 | 23 | 45 | 12 | 1 |
| Average for Crown forests | 12 | 12 | 8 | 21 | 23 | 24 |

*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1963

supplies of timber are being used is not uniform in the various geographical areas. Because of the slow growth of timber in the north, the cutting percentage there may be said to be less than in the southern parts of the country, where the growth conditions are better.

Table 2:25 sets out the percentage distribution of age classes in the Regions, and Figure 2—3 gives a graphical representation of the age-class distribution.

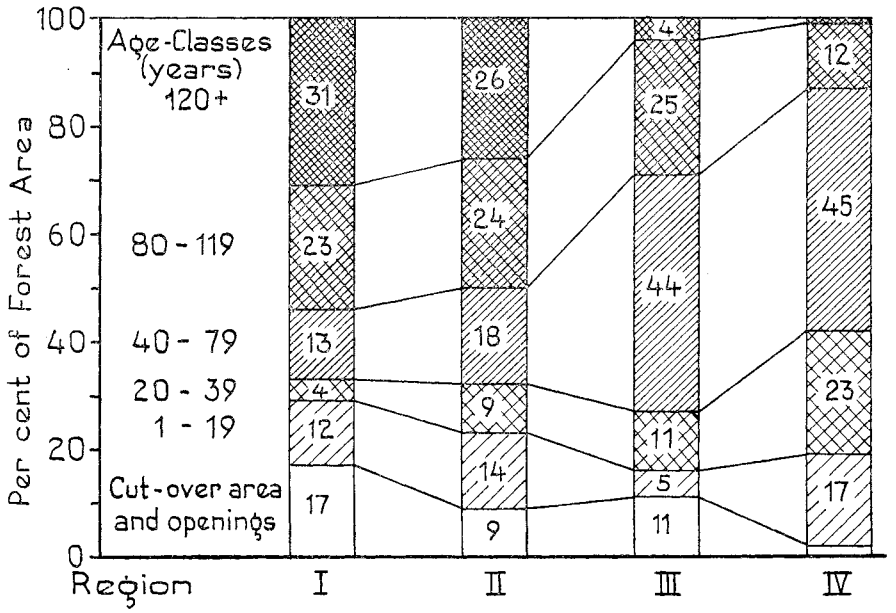


Fig. 2-3. Percentage Distribution of Age Classes, by Regions, in Crown Forests of Sweden, 1962.

**Table 2:26. Composition by Tree Species and Distribution of Diameter Classes, in the Crown Forests of Sweden, 1962**
*(as percentage of growing stock)*

| Region | Tree species | | | Diameter classes[a] | | |
|---|---|---|---|---|---|---|
| | Pine | Spruce | Deciduous | 0—14 cm | 15—24 cm | 25 cm and over |
| I ..... | 53 | 36 | 11 | 20 | 43 | 37 |
| II ..... | 54 | 31 | 15 | 23 | 44 | 33 |
| III .... | 45 | 45 | 10 | 15 | 40 | 45 |
| IV .... | 21 | 51 | 28 | 16 | 40 | 44 |
| Average for Crown forests | 53 | 35 | 12 | 20 | 43 | 37 |

*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1963
*a.* Conifers only

From these it can be seen that there is a concentration of mature stands in the northern parts of the country. Also conspicuous is the size of the cut-over area in Regions I-III.

The composition by tree species, and the dimension distribution of the growing-stock, are of decisive importance for the value of the timber output in the long run, despite the fact that the annual timber removals can vary considerably, both by species and dimensions.

Table 2:26 sets out the percentage distribution of the tree species, and average tree dimensions, in the growing-stock in the four Regions, according to the 1962 statistical records of the Forest Service. Here it can be seen that the composition by tree species is generally rather uniform throughout the northern parts of the country, but that there is a quite different character in the south, where hardwoods, particularly beech, have their natural range. Such hardwoods are not found in the north. As to the dimension distribution, it is found that the proportion of large timber (over 25 cm. diameter) is greater in the south, whereas small timber (under 14 cm. diameter) is proportionally less there than in the northern parts of Sweden.

Table 2:27 shows the average dimensions of the timber (diameter at breast height) marked out for felling in the four Regions for the period 1956-1962. The D.B.H. of the timber cut is usually slightly higher, on average, in the south than in the north. The smallest average dimensions are found in the coastal area of Norrland (Region II). It may also be noted that the average D.B.H. of the removed timber has successively increased in all areas during the period in question. However, this has been the case only during the last five-year period, previously the tendency was completely the opposite.

The dimensions of the timber removed by fellings depend, to a great extent, on whether it was removed as thinnings, or as a clear-felled final crop. As a

**Table 2:27. Average Diameter of Timber Assigned for Cutting, by Regions, in the Crown Forests of Sweden, 1956—1962**
*(breast-height diameter in cm)*

| Region | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | Average |
|---|---|---|---|---|---|---|---|---|
| I | 17.1 | 17.2 | 18.0 | 18.7 | 18.7 | 18.8 | 19.0 | 18.2 |
| II | 16.3 | 16.5 | 17.2 | 18.0 | 18.0 | 17.9 | 18.0 | 17.4 |
| III | 18.8 | 18.9 | 18.7 | 19.7 | 19.6 | 19.3 | 19.4 | 19.2 |
| IV | 19.9 | 18.9 | 19.6 | 21.0 | 20.9 | 20.6 | 20.5 | 20.2 |

rule, the thinnings have a lower average volume than the timber felled in the final crop. The considerably greater tree dimensions, which were characteristic of the timber output of Norrland in previous decades, depended not only on the fact that the trees were bigger, but also on what is known as selective logging. According to certain investigations[1], the average volume per tree of timber sold by auction from the Crown forests in the northermost parts of Sweden, has decreased from 0.67 cubic metres in 1905, to 0.16 cubic metres in 1958. (This corresponds to a reduction of the diameter at breast height from about 35 cm. to 18 cm.) However, it seems that this reduction is dependent as much on the decline in large timber, as on the increasing sales of small timber, which have been made possible by the expansion of the pulp industry.

The distribution of the cut by assortments or timber products is a matter of great importance for the revenue from timber sales. Details of this assortment composition can be found in the statistics of the Forest Service, but only for that part of the timber output which is felled and delivered through forest administrative personnel. No details are available for stumpage sales. As between 62 and 82 per cent of the timber output in the Crown forests during the period 1953-1962, was delivered from the Forest Service's own logging operations (this will be dealt with in detail in the following section), the assortment of that part—if one excludes certain local deviations—should represent to some degree the average composition by products of the total timber output from the Crown forests.

Table 2:28 shows the percentage distribution of roundwood products in the Forest Service's own logging operations, during the period 1954-1962 (three-year average), for the four Regions. Figure 2—4 shows graphically the percentage distribution of products in the timber felled and delivered on the responsibility of the forest administrative personnel, in northern and southern Sweden from 1936 to 1962. In all areas, a change in the product composition is noticeable. There has been a decline in the proportion of sawlogs while the proportion of pulpwood shows an increase throughout. Pulpwood from

[1] Streyffert, Th., *Utvecklingstendenser beträffande rotvärden och priser pa skogsprodukter* (Price Trends of Stumpage and Forest Products in Sweden), Stockholm, 1960.

**Table 2:28. Percentage Distribution of Felled Timber, by Assortments and Regions, in the Crown Forests of Sweden, Three-Year Average, 1954—1962**

| Region | Year | Logs, sleepers, piles and poles | Coniferous pulpwood and pit-props | Deciduous pulpwood | Other classes of usable timber | Fuelwood |
|---|---|---|---|---|---|---|
| I | 1954—56 | 40.9 | 51.5 | 1.3 | — | 6.3 |
| | 1957—59 | 30.1 | 64.4 | 1.5 | — | 4.0 |
| | 1960—62 | 28.7 | 67.7 | 1.8 | — | 1.8 |
| II | 1954—56 | 43.8 | 45.4 | 4.1 | — | 6.7 |
| | 1957—59 | 34.5 | 54.5 | 6.5 | — | 4.5 |
| | 1960—62 | 34.3 | 54.5 | 8.3 | — | 2.9 |
| III | 1954—56 | 47.5 | 36.6 | 1.6 | 0.5 | 13.8 |
| | 1957—59 | 38.4 | 44.0 | 4.0 | 0.5 | 13.1 |
| | 1960—62 | 38.8 | 44.9 | 8.1 | 0.2 | 8.0 |
| IV | 1954—56 | 34.5 | 30.8 | 1.0 | 7.7 | 26.0 |
| | 1957—59 | 33.8 | 34.6 | 0.8 | 6.6 | 24.2 |
| | 1960—62 | 36.4 | 33.8 | 6.5 | 3.8 | 19.5 |
| Average for Crown forests | 1954—56 | 44.5 | 40.9 | 2.6 | 3.7 | 8.3 |
| | 1957—59 | 32.9 | 52.6 | 4.6 | 2.3 | 7.6 |
| | 1960—62 | 33.5 | 53.3 | 7.2 | 1.4 | 4.6 |

deciduous tree species—one of the latest products of the Swedish forests—is making advances in all areas. At the same time, the proportion of fuelwood is declining. Figure 2—4 shows that during the war years the proportion of fuelwood amounted to 40 per cent in the northern parts of Sweden, and to almost 60 per cent in the southern parts; but since that time, the share of fuelwood in the total timber output has successively decreased. Only in the hardwood forest zone (Region IV) does fuelwood still amount to a significant proportion of the timber output, but even here, this share tends to decrease.

This change in the product composition of the timber output, and in particular the reduction of the amount of fuelwood, affected not only the financial returns, but also the use to which the timber was put. In fact, the increment is not fully utilised everywhere, despite the reduction of the minimum diameter of conifers for pulpwood and the use of deciduous trees in pulp making.

Consequently, the difference between the estimated timber growth, and the actual timber fellings, has somewhat increased, and this in itself has very marked consequences for forestry operations.

### *2.2.3 Gross Revenue*

The volume of the felled timber, its distribution into different assortments,

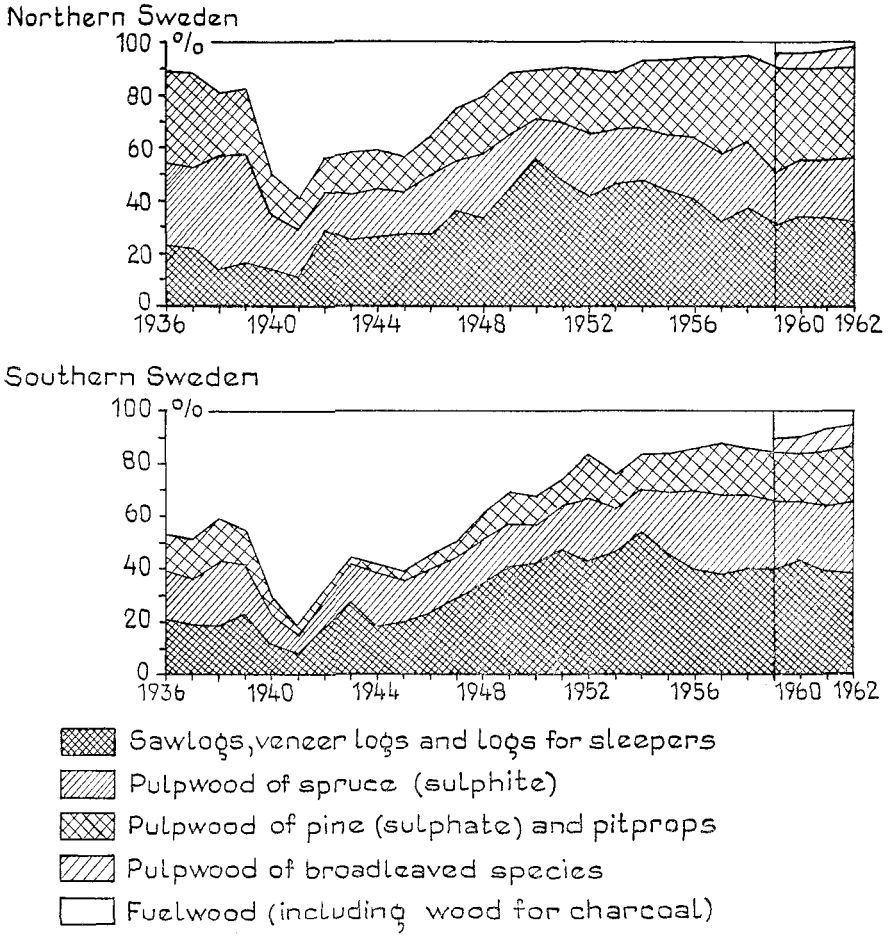


Fig. 2-4. Distribution of Products from State Logging, by Percent of Volume, in Crown Forests of Sweden, 1936 - 1962

and the selling prices of the volume units, are the main factors which determine forestry incomes. This presupposes that the logging operations are under the management of the forest owner, and that felled timber is the product sold.

Before the World War I, logging operations by the Forest Service accounted for about 15 per cent of the total timber output of the Crown forests. In terms of volume, the cut remained relatively unchanged until the mid-Thirties, after which it increased until it accounted for about 50 per cent. To-day, the Forest Service's own logging provides about 80 per cent of the total timber output of the Crown forests.

Table 2:29 shows the share which felled timber had of all the timber sales

**Table 2:29. Felled Timber as Percentage of Total Timber Sales, by Regions, in the Crown Forests of Sweden, 1953—1962**

| Year | Region | | | | Average for Crown forests |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| 1953 | 65 | 68 | 55 | 40 | 62 |
| 1954 | 73 | 73 | 66 | 42 | 69 |
| 1955 | 72 | 72 | 67 | 39 | 69 |
| 1956 | 78 | 80 | 66 | 44 | 73 |
| 1957 | 79 | 76 | 63 | 44 | 71 |
| Average 1953—57 | 74 | 74 | 64 | 42 | 69 |
| 1958 | 88 | 87 | 74 | 48 | 82 |
| 1959 | 78 | 78 | 65 | 40 | 72 |
| 1960 | 78 | 81 | 71 | 42 | 76 |
| 1961 | 85 | 86 | 74 | 48 | 81 |
| 1962 | 84 | 86 | 76 | 52 | 81 |
| Average 1958—62 | 83 | 84 | 72 | 46 | 79 |

*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1954—1963

in each of the Regions, during the period 1953-1962. It can be seen that this percentage of felled timber has increased throughout the Regions during the period, and that it is considerably higher in the north than in the south. To some extent, this is connected with the supplying of industrial roundwood to the State Forest Industries (*AB Statens Skogsindustrier*—generally abbreviated to A.S.S.I.), but there are other factors which have had an influence on the methods of sale. By carrying out its own logging operations, the Forest Service has been able to guarantee its workers employment throughout the year, and in this way has been able to keep a permanent labour force for the different kinds of forestry work. Even the cutting method, which has consisted to a large extent of thinnings for stand improvement purposes, has contributed to the increase in that part of the logging which is carried out by the Service itself. These thinnings usually involve the removal of small trees, for which—as standing timber—buyers are few. Furthermore, one must take into consideration the difficulty of evaluating correctly a standing timber lot, marked for thinning purposes. If the timber is felled, then it is easy for both buyer and seller to put a price on it.

As a rule, timber felled and delivered from the Crown forests is sold by tender or by private treaty, after direct negotiations with the buyer or the purchasing organisation concerned. Usually, the same prices apply also for deliveries of roundwood to A.S.S.I., which is the largest customer of the Forest Service.

Marketing in the Crown forests also includes sales of standing timber, which are conducted mainly by auction. These auctions have some influence on prices for delivery of felled roundwood products, and indicate the general trends in the timber market.

In order to make the assessment of the revenues of Crown forestry operations on a uniform basis, starting from the gross prices and including all forms of timber sales, that part of the timber which has been sold standing has been calculated as though it had been delivered, for the purposes of this survey. This has been done in such a way, that to the revenues from sales of standing timber (for which figures are available), has been added the estimated cost of logging. The gross prices apply to the actual places of delivery in the various parts of Sweden.

In Norrland, the place of delivery is usually on the bank of a large river, and one works with a price which includes free transport to the point of final sorting (*ådalspris*). In southern and central Sweden, the felled timber is usually delivered to the roadside, and to a lesser extent to the railway; the price refers to free delivery for further transport to the timber-yard of the mill.

The average annual revenues from timber sales from the Crown forests expressed as gross unit prices per cubic metre (solid volume without bark), given by Regions for the period 1953-1962, can be seen in Table 2:30. Here the revenues are given in current prices (S.kr), and in terms of the 1962 value of the Swedish krona. The conversion of kronor into constant monetary values has been done by means of the general index for wholesale prices, compiled by the *Kommerskollegium* (the Swedish counterpart of the Board of Trade). This index takes into account the prices of all products.

The calculation of revenues has been done in such a way, that to the receipts from the timber sales, which are accounted for in the statistics of the Forest Service, have been added the calculated logging costs of timber sold standing. These receipts have been related to the total volume of timber sold, both for felled products and for standing timber.

In the main, it can be said that if one eliminates the depreciation in the value of money, there has been a very unfavourable trend in receipts from forestry operations during the period in question. Compared with 1954, which can be regarded as a relatively stable year in the timber trade, the receipts (in terms of the adjusted value of the krona) up to 1962, had fallen for the entire country by about 10 per cent. The same applies when one makes a comparison between the periods 1953-1957 and 1958-1962. As has been mentioned, the fall in receipts resulted from, firstly, the decline in timber prices and, secondly, from changes in the composition of assortments in the timber output, which are set out in Table 2:28. The average receipts per cubic metre for the entire timber output has shown a falling trend, because in the case of the sales of felled timber, the proportion of pulpwood has increased. Where the fall in receipts from timber sold standing is concerned, no comparable change in the assort-

**Table 2:30. Gross Revenue from Timber Sales, by Regions, in the Crown Forests of Sweden, 1953—1962**
*(S.kr per m³y sold and delivered timber)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr |
| 1953 | 60.43 | | 62.17 | | 67.78 | | 61.00 | | 63.80 | |
| 1954 | 61.80 | | 63.59 | | 70.04 | | 66.34 | | 65.99 | |
| 1955 | 65.26 | | 67.29 | | 70.80 | | 73.95 | | 68.61 | |
| 1956 | 63.39 | | 66.41 | | 68.87 | | 66.33 | | 67.21 | |
| 1957 | 59.13 | | 61.14 | | 68.08 | | 67.56 | | 63.58 | |
| Average 1953—57 | | 69.03 | | 70.82 | | 76.66 | | 74.06 | | 72.89 |
| 1958 | 57.00 | | 59.21 | | 63.62 | | 64.62 | | 60.46 | |
| 1959 | 53.17 | | 53.90 | | 61.59 | | 68.00 | | 57.09 | |
| 1960 | 59.24 | | 61.64 | | 66.28 | | 71.21 | | 63.25 | |
| 1961 | 65.29 | | 67.99 | | 71.34 | | 71.86 | | 68.87 | |
| 1962 | 65.57 | | 67.69 | | 69.63 | | 70.81 | | 68.11 | |
| Average 1958—62 | | 62.14 | | 64.50 | | 68.95 | | 71.93 | | 65.93 |

ment composition can be directly demonstrated, owing to the lack of basic data. However, the assessment of stumpage value has probably been made by the timber buyers in respect of the structural changes in the consumption of timber. The deterioration of roundwood prices, or to put it another way, the relative stability of nominal prices despite changes in the purchasing power of money, has been the main cause of the marked fall in real incomes from forestry operations during the period under survey.

### *2.2.4 Logging Costs*

During the Fifties, logging operations were re-organised throughout the country, and manual work was replaced, to a large extent, by highly mechanised working methods in the Forest Service. The main purpose has been to eliminate the heaviest phases of work, and to increase the productivity per worker. Although logging is still mainly carried out during the winter, steady employment throughout the year is a necessary condition for mechanical logging operations, and therefore the aim has been the successive transfer of workers to continuous operations for all seasons of the year.

Table 2:31 shows the average total logging costs to the Forest Service per cubic metre (m³y) of felled timber, in current prices (S.kr), and prices adjusted to the 1962 value of the Swedish krona, for the period 1953-1962 in each Region.

In this connection, the term logging costs means the total expenditures involved in the Forest Service's own logging operations, which do not arise when the timber is sold standing. However, it must be added that for the timber sold standing, the logging costs have been calculated. The method of calculation here has been based on the assumption (which must be regarded as a gross simplification) that the average costs for logging, carried out by the Forest Service, are the same as the costs which are paid by the purchaser of

**Table 2:31. Logging Costs, by Regions, in the Crown Forests of Sweden, 1953—1962**
*(S.kr per m³y sold and delivered timber)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | 42.28 | | 36.38 | | 23.50 | | 18.12 | | 32.26 | |
| 1954 | 42.79 | | 35.13 | | 28.82 | | 23.01 | | 33.51 | |
| 1955 | 44.04 | | 35.82 | | 28.04 | | 25.77 | | 33.63 | |
| 1956 | 48.55 | | 39.51 | | 26.08 | | 23.30 | | 35.15 | |
| 1957 | 45.25 | | 39.27 | | 26.48 | | 24.73 | | 35.07 | |
| Average 1953—57 | | 49.28 | | 41.15 | | 29.68 | | 25.41 | | 37.56 |
| 1958 | 45.91 | | 39.13 | | 27.42 | | 24.72 | | 35.99 | |
| 1959 | 45.22 | | 38.19 | | 26.60 | | 23.73 | | 34.52 | |
| 1960 | 43.76 | | 37.90 | | 26.78 | | 25.22 | | 34.36 | |
| 1961 | 45.11 | | 39.66 | | 28.66 | | 24.82 | | 36.20 | |
| 1962 | 43.53 | | 38.82 | | 31.52 | | 28.59 | | 36.75 | |
| Average 1958—62 | | 46.44 | | 40.16 | | 29.20 | | 26.35 | | 36.87 |

standing timber for the necessary harvesting work. Thus the average costs per cubic metre of felled timber have been made to apply to the logging costs per cubic metre for timber sold standing. One can see from the table that the costs in the various Regions differ quite considerably.

A comparison in terms of the 1962 purchasing power of the Swedish krona shows that in all Crown forests, the average unit costs have decreased slightly. It should be added that the same index figures have been used here, as were used for the adjustment of the revenues in the previous section. In order to make a more detailed analysis of the development of costs, the individual factors which determine the total costs of the timber output must be examined separately. However, this requirement can be met to a limited extent only.

Table 2:32 shows the percentage distribution of the total harvesting costs of the timber output during the period 1958-1962, in the main cost groups, including the indirect or common logging costs as well as further transport, for northern and southern Sweden. Felling and hauling are noted separately in Table 2:33, and these, when taken together with the indirect costs, give the

**Table 2:32. Percentage Distribution of Logging Costs, by Main Geographical Areas, in the Crown Forests of Sweden, Annual Average, 1958—1962**

| | *Northern Sweden* (Six northern Forest Administrative Regions) | | | | | | *Southern Sweden* (Four southern Forest Administrative Regions) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—62 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—62 |
| Felling and hauling | 57 | 52 | 53 | 53 | 55 | 54 | 73 | 72 | 70 | 72 | 70 | 71 |
| Indirect logging costs | 20 | 22 | 22 | 23 | 22 | 22 | 25 | 26 | 28 | 27 | 28 | 27 |
| Costs of further transport | 23 | 26 | 25 | 24 | 23 | 24 | 2 | 2 | 2 | 1 | 2 | 2 |

**Table 2:33. Distribution of Logging Costs, by Different Operations and by Regions, in the Crown Forests of Sweden, 1962**
(*S.kr per m³y*)

| Region | Felling | Hauling | Indirect logging costs | Total logging costs |
|---|---|---|---|---|
| I ..... | 13.90 | 8.90 | 9.90 | 32.70 |
| II ..... | 12.10 | 8.30 | 9.00 | 29.40 |
| III ..... | 12.40 | 10.00 | 8.70 | 31.10 |
| IV ..... | 11.50 | 8.80 | 8.10 | 28.40 |

Costs of "further transport" have not been taken into consideration in this table

average total costs for the four Regions. Table 2:34 gives the distribution of the different cost items in indirect logging costs for the main geographical areas.

It can be seen from these three tables how the costs of timber harvesting, and the composition of such costs, vary over the years and in the different geographical regions of Sweden. From this it can also be concluded that the logging costs—and in present conditions these have become a heterogeneous concept—have a strong influence on the total cost of forestry operations. A brief account of the development of the most important cost items involved in these operations would thus seem to be required.

*Felling*

Felling, largely by means of power saws, has been carried out since the beginning of the Fifties, and to-day the power saw is an essential tool for loggers in the Crown forests. The work of the logger can be divided into three main operations, felling, debarking, and "*brossling*". These operations overlap, and there is often no clear dividing line between them. Felling operations comprise felling, limbing, marking the stems for cross-cutting, bucking and marking. Felling costs usually include all these phases of work, but on the other hand, there is an increasing tendency to cut up the timber with the bark still on, and to deliver it in this state; if debarking is carried out, it is done mechanically later, when the roundwood is stacked by the roadside. In such cases, the payment made to loggers includes no remuneration for debarking. "*Brossling*" means that the worker clears racks, collects the felled timber (usually by hand) and stacks it beside the racks. However, the timber may be manually collected and stacked in places other than beside the racks. Consequently, "*brossling*" can involve considerable differences in manpower and is not a part of the felling operations at all. Because of this, any comparison between the actual felling costs in the different areas is difficult, and so one can use only rough average figures.

**Table 2:34. Distribution of Indirect Logging Costs, by Main Geographical Areas, in the Crown Forests of Sweden, 1960—1962**

| Geographical area | Marking of trees for cutting | Haulage roads and timber dumps | Building and maintenance of cabins | Scaling and supervision | Social costs | | | | Miscellaneous | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Social welfare contribution | Paid holidays | Workers' travel and expense allowances | Total social costs | | |
| | *as percentage of total* | | | | | | | | | |
| Northern Sweden | *7.3* | *19.6* | *12.0* | *17.2* | *15.3* | *14.0* | *2.7* | *32.0* | *11.9* | *100* |
| Southern Sweden | *8.1* | *25.7* | *3.5* | *12.7* | *19.8* | *16.9* | *0.7* | *37.4* | *12.6* | *100* |
| | *S.kr per $m^3y$* | | | | | | | | | |
| Northern Sweden | 0.65 | 1.74 | 1.07 | 1.53 | 1.36 | 1.25 | 0.24 | 2.85 | 1.06 | 8.90 |
| Southern Sweden | 0.67 | 2.13 | 0.29 | 1.06 | 1.64 | 1.40 | 0.06 | 3.10 | 1.05 | 8.30 |

Furthermore, the time, and consequently the cost, of felling work per unit of volume, is dependent on certain fixed factors, such as tree dimensions, topography, snow, cold, etc.

The time required for felling and preparing a certain volume of timber, depends primarily on the tree species, the tree diameter and on the quality of the timber. It is a fact that the output of industrial wood per tree is greater in the forests where the trees are tall, than in those where they are smaller, because in comparison less of the trunk of the tall tree has to be limbed. However, the most important factor is the size of the trees. Table 2:27 shows the average diameter at breast height (D.B.H.) of the trunk; this has a direct influence on the time taken for the felling operations, and in consequence, on the felling costs.

It is possible to check whether the actual expenditures accounted for correspond with those labour costs which, according to the collective labour and wage agreements, should apply to the areas concerned. In practice, the actual expenditures exceed the contracted labour costs. This state of affairs depends not only on subjective evaluations of the degrees of difficulty, and on other adjustments of the contracted prices, but also on the fact that wage agreements for piece-work do not account for all the monetary outlays which make up the felling costs, e.g. various social welfare contributions. As can be seen from Table 2:33, the absolute figure for the felling costs per cubic metre is generally highest in Region I (northern mountains and sub-arctic areas), and lowest in Region IV (southern Sweden). This difference is explained both by the fact that the wages determined by agreements are higher in the north than in the south, and because harvesting conditions are more difficult in the north. The regional variations in felling costs, which are given in percentage form in Table 2:34, show that the percentage variations are greater in southern Sweden than in Norrland; this probably depends on the selection of the places for the delivery of timber.

*Hauling*

Skidding is being carried out by tractors to an ever-increasing extent, especially in the northern parts of the country, where the timber must usually be moved further than in southern Sweden. In the northern districts, with their persistently cold winters, a special technique has been developed for hauling on main winter-roads, thus making it possible for large loads to be moved. Lorry extraction is also being used on considerable numbers of winter-roads.

As there are so many different methods of skidding, it would be extremely complicated to determine the costs for each individual method, on the basis of the available statistics. Therefore, one must be content with rough averages for the extraction methods, from the place of felling to the collecting points on the nearest road, railway or floatway, from which further transport to the industry takes place.

A characteristic development during the Fifties was the building of new forest roads and the expansion of the existing network, which has made for shorter hauling distances. The haulage costs are dependent on the contracted prices, and here it can be seen that labour costs are lower in the south than in the north; furthermore, the costs are affected by topographical conditions, tree dimensions, the dryness of the wood and the subjective determination of the degree of difficulty involved in skidding and transport work.

It can be seen from Table 2:33, that the average of the hauling costs does not show any great variation for the different geographical areas. If one compares the total costs for felling and hauling, which are shown in percentage form in Table 2:32, a slight downward trend can be detected during the period 1958-1962. However, it is not possible to draw any definite conclusions from this for the future. Probably, the reason for this decrease is, firstly, the improved logging technique and, secondly, the gradual adoption of more extensive working-areas (clear-felling instead of thinning).

*Indirect Logging Costs*

As can be seen from Table 2:34, this group of costs is heterogeneous. Here it should be noted that the data are for the logging operations carried out by the Forest Service itself, and for this reason the costs of marking the trees for felling (which, according to the statistical information, apply to the entire timber output, including stumpage sales) have been adjusted in order to make them correspond with the actual volume of timber felled on the authority of the Forest Service. The timber quantity was used as the basis for this adjustment.

In order to adjust the figures to the standard form adopted for this survey, similar changes have been made in the Forest Service statistics for haulage roads, cabins and landings. All social welfare contributions which are associated with logging operations have also been transferred to this group of costs. Table 2:34 shows that the indirect logging costs, taken as a whole per cubic metre ($m^3y$), are higher in Norrland than they are in southern Sweden,

though the opposite applies for some cost items, and in some cases the differences are negligible. The development of social welfare contributions is of particular interest. Within the group "indirect logging costs", the welfare costs amounted, on average, to S.kr 2.85 (32 per cent) per cubic metre for 1960-1962 in northern Sweden, and to S.kr. 3.10 (37 per cent) per cubic metre in southern Sweden. However, it must be added that there is no real reason for the costs to be higher in the southern part of the country, although this may be a consequence of the lower level of mechanisation there. The distribution by regions has been done on the basis of the timber quantity felled under the direct supervision of the Forest Service. Moreover, the proportion of the contributions to the national health insurance and national superannuation pension scheme (A.T.P.), which falls on this operation, has been assessed at 67 per cent of the total contributions. The remainder of this expenditure has been debited to silvicultural costs and the cost of maintaining and improving facilities. It is obvious that complete accuracy cannot be claimed from such a method of distribution but it reflects the actual conditions, in the main.

*Transport*

The further transport of timber from landings, floatways and from the roadside, is done in certain circumstances by the forest administration, and in such cases the appropriate expenditure on transport is accounted for in bookkeeping. This is so mainly in Norrland, or, more exactly, within those price areas where selling prices apply to timber free to the point of final sorting, i.e. at the mouth of a main river, which is the actual unloading place. In practice, the further transport of the logs, in this case by floating, is done by the co-operative floating organisations; even so, the expenditure on floating consame applies to road transport by lorry, within the price areas in question in stitutes a part of the logging costs in the accounts in the Forest Service. The the north.

In the Crown forests in the south, where the bulk of the felled timber is delivered to the buyers at the roadside, the costs of transport are almost negligible (see Table 2:32), i.e. the expenditure is not entered in the accounts of the seller of the timber, but in those of the buyer. Thus the costs involved in the last link of the transport chain, from the point of delivery at the roadside, to the industry, cannot be obtained from the annual reports of the Forest Service.

A characteristic feature of the development during the Fifties was the relative increase of road transport using motor lorries, particularly in areas in which timber-floating is also possible. Primarily, this applies to the coastal and inland districts of Norrland (Region II). The balance between ground transport and floating has become a question of great economic importance. However, further research will be required before any general decision can be made in this matter.

### *2.2.5 Net Conversion Surplus*

After the logging costs have been deducted from the gross revenue, or from the selling price of the felled timber, there remains a balance called the net conversion surplus (contribution margin according to the direct costing method) equivalent to the stumpage value. This net conversion surplus, which represents the average value for the entire timber crop in a particular forest district, is first and foremost an expression of the accessibility and marketing conditions. At the same time, its value determines the maximum limit for the other costs involved in forestry, which are necessary for the maintenance of timber production. The stumpage value of standing timber thus reflects the economic conditions for forestry operations, as well as being an excellent standard for measuring these conditions.

The selling price for standing timber, i.e. stumpage value, should, in principle, be identical with the net conversion surplus for felled timber. However, in reality, there can be some difference between these entities. For this survey, efforts have been made to obtain better comparability, by the adjustment, to some extent, of the revenue from the sales of standing timber. In the main, this has been done by deducting the costs of marking the trees for felling, which, according to the principles followed in this survey, are considered to be a part of the logging costs, but which are in fact included in the selling price of standing timber.

Compiled in Table 2:35 are the net conversion surpluses for the timber output in the Crown forests, during the period 1953-1962, given as five-year averages for the four Regions. Table 2:36 sets out the same data, calculated as annual averages per hectare of forest land.

The prices of standing timber at different periods, and in different geographical areas, can be studied in these tables. The trends in the prices over the years must be viewed in relation to the simultaneous depreciation in the

**Table 2:35. Net Conversion Surplus, by Regions, in the Crown Forests of Sweden, 1953—1962**
*(S.kr per m³y sold and delivered timber)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *Skr.* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | 18.15 | | 25.79 | | 44.28 | | 42.88 | | 31.54 | |
| 1954 | 19.01 | | 28.46 | | 41.22 | | 43.33 | | 32.48 | |
| 1955 | 21.22 | | 31.47 | | 42.76 | | 48.18 | | 34.98 | |
| 1956 | 16.84 | | 26.90 | | 42.79 | | 43.03 | | 32.06 | |
| 1957 | 13.88 | | 21.87 | | 41.60 | | 42.83 | | 28.51 | |
| Average 1953—57 | | 19.75 | | 29.66 | | 46.99 | | 48.66 | | 35.33 |
| 1958 | 11.09 | | 20.08 | | 36.20 | | 39.90 | | 24.47 | |
| 1959 | 7.95 | | 15.71 | | 34.99 | | 44.27 | | 22.57 | |
| 1960 | 15.48 | | 23.74 | | 39.50 | | 45.99 | | 28.89 | |
| 1961 | 20.19 | | 28.33 | | 42.68 | | 47.04 | | 32.67 | |
| 1962 | 22.04 | | 28.87 | | 38.11 | | 42.22 | | 31.36 | |
| Average 1958—62 | | 15.70 | | 24.34 | | 39.75 | | 45.58 | | 29.06 |

**Table 2:36. Net Conversion Surplus, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**
*(S.kr per ha forest land below Reforestation Boundary)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | 13.97 | | 24.72 | | 128.69 | | 181.91 | | 38.76 | |
| 1954 | 16.41 | | 30.77 | | 167.02 | | 189.38 | | 48.60 | |
| 1955 | 16.43 | | 32.85 | | 168.05 | | 198.24 | | 49.98 | |
| 1956 | 12.56 | | 26.47 | | 149.11 | | 194.13 | | 42.48 | |
| 1957 | 11.94 | | 26.97 | | 158.28 | | 206.25 | | 44.06 | |
| Average 1953—57 | | 15.86 | | 31.45 | | 170.81 | | 214.64 | | 49.63 |
| 1958 | 10.44 | | 24.19 | | 117.45 | | 164.28 | | 36.08 | |
| 1959 | 6.40 | | 19.33 | | 127.16 | | 197.37 | | 34.12 | |
| 1960 | 13.51 | | 32.58 | | 153.97 | | 215.69 | | 47.72 | |
| 1961 | 16.59 | | 38.55 | | 154.11 | | 187.89 | | 51.57 | |
| 1962 | 18.96 | | 39.86 | | 136.09 | | 181.87 | | 50.10 | |
| Average 1958—62 | | 13.58 | | 31.89 | | 142.79 | | 196.60 | | 45.43 |

purchasing power of money. Table 2:37 sets out the changes in the net conversion surplus per hectare of productive forest land, in both current and adjusted terms of the krona, in five-year averages for 1936-1960, and for each of the years 1961 and 1962. The information applies to all Crown forests, divided into those in northern Sweden (six forest administrative regions), and those in southern Sweden (four forest administrative regions). The basic material for this table is provided by the official statistics in their original form, i.e. non-adjusted; therefore, the statistical material here does not coincide completely with that in Tables 2:35 and 2:36, which are based on adjusted figures.

It can be seen on closer study of the three tables mentioned above that there are great differences between stumpage value in the various geographical regions. One is struck first of all by the differences in the average stumpage value per hectare, in the mountains and sub-arctice area of northern Sweden (Region I), and that in the hardwood forest zone in the south of Sweden (Region IV), a difference which, during the period 1958-1962, was almost fifteen-fold. When this is calculated on the basis of timber output ($m^3y$) the difference is less, although there is still a three-fold difference in the stumpage values for this period. The dissimilarity between the Regions can best be seen in the diagram reproduced in Figure 2—5. The fluctuations in the stumpage values, which are actually a residual item in consequence of the price changes, are much more obvious in the marginal areas for forestry, than in those which have optimal conditions for forest growth and accessibility. In fact, this means that large parts of the Crown forests are outside the economic limit for continuous forestry operations, in consequence of the unfavourable price and wage trends; to use the technical expression, they have become "zero areas", i.e. areas of forest land where sustained-yield forestry is carried on at a loss.

**Table 2:37. Net Conversion Surplus, by Main Geographical Areas and Periods, in the Crown Forests of Sweden, Annual Average, 1936—1962**
*(S.kr per ha forest land)*

| Period | | 1936—40 | 1941—45 | 1946—50 | 1951—55 | 1956—60 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|
| Average for Crown forests | Current S.kr | 7.07 | 11.42 | 19.75 | 41.90 | 34.97 | 43.90 | 40.94 |
| | 1962 value of S.kr | 20.79 | 20.76 | 32.38 | 48.16 | 37.20 | 44.80 | 40.94 |
| Northern Sweden | Current S.kr | 4.97 | 7.44 | 13.42 | 25.64 | 18.72 | 27.12 | 26.05 |
| | 1962 value of S.kr | 14.62 | 13.53 | 22.00 | 29.47 | 19.91 | 27.67 | 26.05 |
| Southern Sweden | Current S.kr | 24.16 | 42.82 | 66.79 | 162.41 | 144.49 | 164.29 | 147.84 |
| | 1962 value of S.kr | 71.06 | 77.85 | 109.49 | 186.68 | 153.71 | 167.64 | 147.84 |

Adjustment of prices in terms of 1962 value of the S.kr has been done using the general index for wholesale prices compiled by *Kommerskollegium* (Board of Trade), 1953=100
*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1937—1963

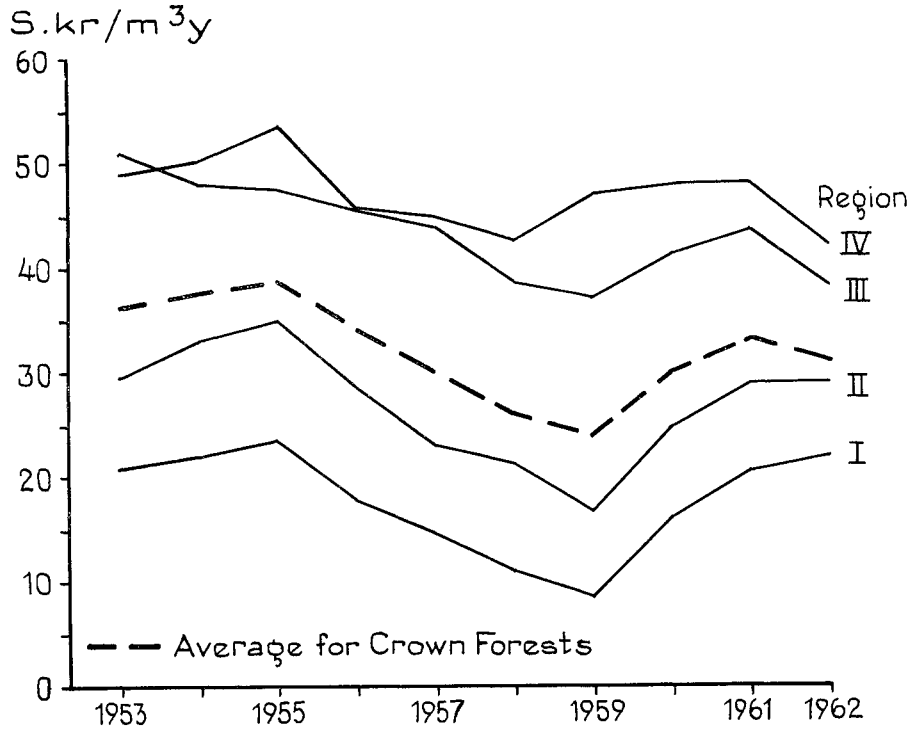


Fig. 2-5. Net Conversion Surplus, Annual Average in 1962 S.kr per Cubic Metre, by Regions, in Crown Forests of Sweden, 1953-1962

The graph in Figure 2—5 shows how the stumpage values have changed in the various regions during the period under survey. It can be seen that there is a downward trend in all regions.

The stumpage prices show the most striking development in Region I, where between 1955 and 1959 inclusive, they fell by almost one-third of their previous value. In recent years, prices have shown an improvement, but in this area it is the very fluctuations that are particularly noticeable. The reason for this is that net conversion surplus is determined, *ceteris paribus,* by the logging costs; consequently, the size of the latter is of great importance for the determination of the intensity of forest management.

### *2.2.6 Costs of Managing Forest Land*

*Silviculture*

Swedish foresters have held different views at different times about the silvicultural systems which should be adopted. The greatest disagreement has been about the methods of cutting—selection felling as opposed to clear-felling —and the differences between the various schools of thought have left deep marks on the past management of the Crown forests.

Between the two world wars, the conflict between the advocates of selection felling and those of clear-felling with replanting, was decided in favour of the methods which were based on natural regeneration. The adoption of these was connected with the serious economic depression of the Thirties, which hit Swedish forestry very hard. Silvicultural systems which involved reduced costs for planting, were in complete accord with the ideas of forest management which were then current.

Cutting methods, such as selective logging and dimension felling, which were not followed by artificial silvicultural measures, had completely dominated forestry in Norrland from the earliest times. Clear-felling with subsequent artificial regeneration, the most common method in southern Sweden, was applied in the north to a limited extent only. Consequently, the change of opinion in the Thirties did not result in a thorough revision of cutting methods in Norrland.

It soon became apparent that stands of mature timber were disintegrated by their being repeatedly cut over, and that natural regeneration from seed did not occur. Simultaneously, the increased mechanisation of forestry operations led to demands for larger and more concentrated logging areas, and so there was a general tendency to change over to clear-felling with subsequent artificial or natural regeneration. The adoption of concentrated clear-felling obviously gives some saving in the costs of logging, but involves also a sudden increase in silvicultural costs, which has proved to be particularly burdensome in areas where the regeneration ability of the site is low.

**Table 2:38. Total Silvicultural Costs in the Crown Forests of Sweden, Annual Average, 1936—1962**
*(in S.kr per ha forest land and as percentage of N.C.S.)*

| Period | 1936—40 | 1941—45 | 1946—50 | 1951—55 | 1956—60 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|
| Current S.kr..... | 0.23 | 0.33 | 1.08 | 3.61 | 5.80 | 6.26 | 7.34 |
| 1962 value of S.kr | 0.68 | 0.60 | 1.77 | 4.15 | 6.17 | 6.39 | 7.34 |
| % of net conversion surplus ... | *3* | *3* | *5* | *9* | *17* | *14* | *18* |

*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1937—1963
Adjustment of prices in terms of 1962 value of the S.kr has been done using the general index for wholesale prices compiled by *Kommerskollegium* (Board of Trade). 1935 = 100

Table 2:38 shows the changes in average annual silvicultural costs in terms both of current prices and the 1962 value of the krona, per hectare of forest land, and as a percentage of the net conversion surplus for the years 1936-1960. For this period it is given as five-year averages, and for each of the years 1961 and 1962, for all Crown forests. From this it can be seen how the expenditure on silviculture has fluctuated over the years in the Crown forests. The main cause of these fluctuations is probably the variation in the ideas of cutting and reproduction methods, and the policies which resulted from this. The adoption, on an enlarged scale, of artificial seeding and planting in the post-war period, is clearly reflected by the sharp percentage increase in expenditure.

Table 2:39 shows the silvicultural costs per hectare of productive forest land for the period 1953-1962 in the four Regions. The cost-revenue coefficients for these costs, and the proportion of the net conversion surplus which they occupy, are given in Table 2:40. These tables show how the outlay on silvicultural measures has varied in the different Regions. The differences in

**Table 2:39. Silvicultural Costs, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**
*(S.kr per ha forest land below Reforestation Boundary)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | 4.51 | | 4.66 | | 7.18 | | 23.98 | | 5.19 | |
| 1954 | 4.64 | | 4.84 | | 6.59 | | 23.34 | | 5.23 | |
| 1955 | 4.56 | | 5.05 | | 8.44 | | 25.36 | | 5.62 | |
| 1956 | 5.37 | | 5.51 | | 10.48 | | 23.10 | | 6.40 | |
| 1957 | 6.02 | | 5.99 | | 11.56 | | 26.02 | | 7.04 | |
| Average 1953—57 | | 5.54 | | 5.75 | | 9.72 | | 26.97 | | 6.50 |
| 1958 | 6.69 | | 6.83 | | 12.72 | | 24.46 | | 7.89 | |
| 1959 | 6.06 | | 6.22 | | 12.49 | | 25.40 | | 7.35 | |
| 1960 | 5.39 | | 6.11 | | 13.44 | | 28.74 | | 7.27 | |
| 1961 | 5.43 | | 6.82 | | 14.69 | | 31.03 | | 7.88 | |
| 1962 | 6.09 | | 8.89 | | 15.48 | | 28.65 | | 9.29 | |
| Average 1958—62 | | 6.16 | | 7.22 | | 14.26 | | 28.66 | | 8.21 |

**Table 2:40. Silvicultural Costs, expressed as Cost-Revenue Coefficients and as a Percentage of the Net Conversion Surplus, by Regions, in the Crown Forests of Sweden, 1953—1962**

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. |
| 1953 | 0.097 | *32.3* | 0.078 | *18.8* | 0.036 | *5.6* | 0.093 | *13.2* | 0.066 | *13.4* |
| 1954 | 0.087 | *28.2* | 0.070 | *15.7* | 0.023 | *4.0* | 0.080 | *12.3* | 0.053 | *10.8* |
| 1955 | 0.090 | *27.8* | 0.072 | *15.4* | 0.030 | *5.0* | 0.083 | *12.8* | 0.057 | *11.2* |
| 1956 | 0.110 | *42.8* | 0.084 | *20.9* | 0.044 | *7.0* | 0.077 | *11.9* | 0.072 | *15.1* |
| 1957 | 0.118 | *50.4* | 0.079 | *22.2* | 0.045 | *7.3* | 0.080 | *12.6* | 0.072 | *16.0* |
| Average 1953—57 | 0.100 | *34.9* | 0.076 | *18.3* | 0.035 | *5.7* | 0.082 | *12.6* | 0.063 | *13.1* |
| 1958 | 0.125 | *64.1* | 0.096 | *28.2* | 0.062 | *10.8* | 0.092 | *14.9* | 0.088 | *21.9* |
| 1959 | 0.142 | *94.7* | 0.094 | *32.2* | 0.056 | *9.8* | 0.084 | *12.9* | 0.085 | *21.5* |
| 1960 | 0.104 | *39.9* | 0.072 | *18.7* | 0.052 | *8.7* | 0.086 | *13.3* | 0.070 | *15.2* |
| 1961 | 0.099 | *31.4* | 0.074 | *17.7* | 0.057 | *9.5* | 0.108 | *16.5* | 0.072 | *15.3* |
| 1962 | 0.108 | *32.2* | 0.095 | *22.3* | 0.062 | *11.4* | 0.094 | *15.8* | 0.085 | *18.5* |
| Average 1958—62 | 0.116 | *45.6* | 0.085 | *22.6* | 0.058 | *10.0* | 0.092 | *14.6* | 0.080 | *18.1* |

the level of costs in the various Regions are seen even more clearly in the graphs in Figures 2—6 and 2—7.

The highest percentage share of the costs in the net conversion surplus and the greatest cost-revenue coefficients have been in Region I. During the period 1953-1957, the silvicultural costs in this region amounted to more than one-third of the net conversion surplus, and to one-tenth of the sales value from felled timber (C/R coefficient 0.100), a situation which can be regarded as unique when compared with conditions in other parts of the country. In central Sweden, silvicultural costs constitute about one-tenth of the stumpage value. The relatively low costs of silviculture in this area (Region III) are attributable to the fact that forest reproduction comes about mostly by natural seeding, due to the relatively high regeneration ability of the site. But there is no doubt that previous traditional practices have something to do with this.

The percentage distribution of the total silvicultural costs in the Crown forests, for various measures during the period 1958-1962, is given in Table 2:41. The data represent the average costs for the Crown forests of Sweden as a whole, but conditions in the individual Regions can deviate considerably from this average. The reason for a relatively large part of the costs being connected with the clearing of cut-over areas, is that such a clearing to a great extent is carried out on sites in which regeneration is easily obtained without further artificial measures being necessary. This applies particularly to northern and central Sweden, where, as has been mentioned, natural seeding

is still the most usual method of regeneration. Artificial seeding, as a regeneration method, on the other hand plays a rather small part in forestry practice in Sweden. Despite planting being almost ten times more expensive than artificial seeding, the planting costs themselves amount to more than one-third of the total silvicultural expenditures.

A relatively large part of the silvicultural expenditures goes in the weeding of plantations and naturally established young stands. On the other hand, the outlay on forest protection, including the expenditure necessary for the extermination of destructive insects, for fencing, etc., constitutes an insignificant part of the whole.

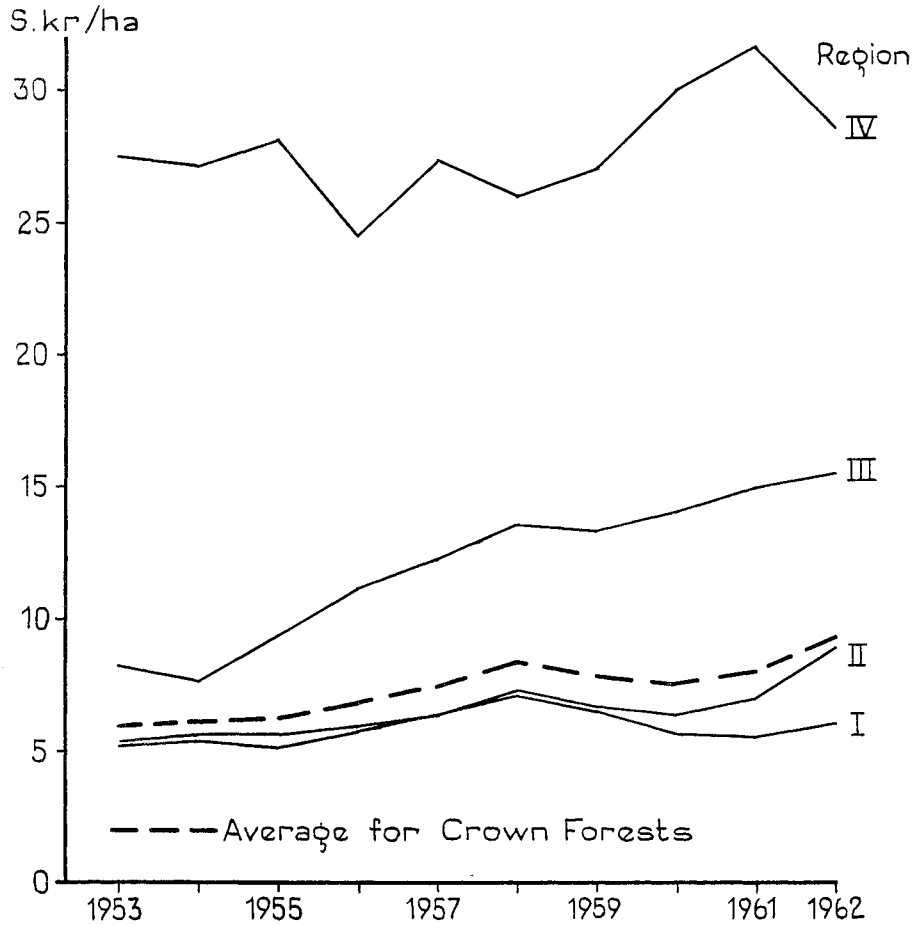


Fig. 2-6. Silvicultural Costs, Annual Average in 1962 S.kr, per Hectare Productive Forest Land, by Regions, in Crown Forests of Sweden, 1953-1962

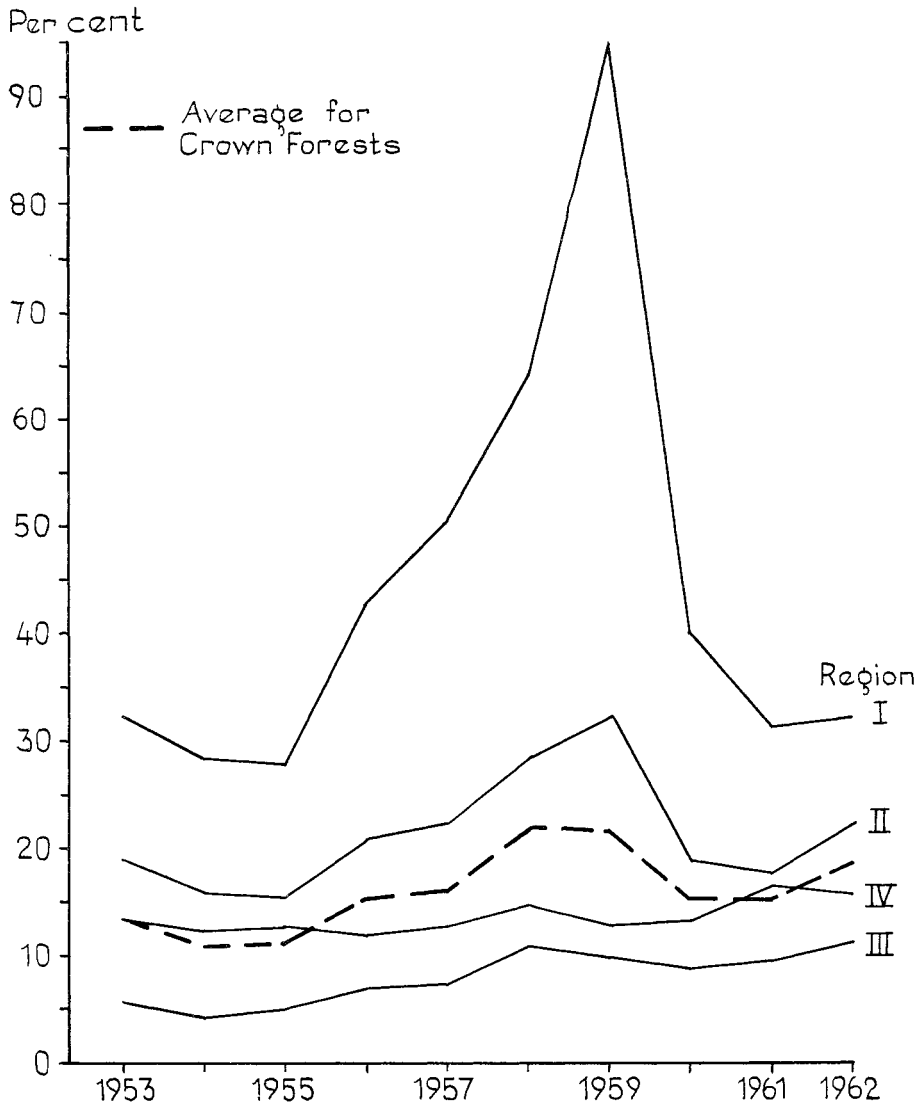


Fig. 2-7. Silvicultural Costs as Percentage of Net Conversion Surplus (Stumpage Value), Annual Average, by Regions, in Crown Forests of Sweden, 1953-1962

**Table 2:41. Percentage Distribution of Silvicultural Costs, by Various Operations, in the Crown Forests of Sweden, Five-Year Average, 1958—1962**

| | % |
|---|---|
| 1. Clearing of cutover areas | *19.0* |
| 2. Ground preparation (scarifying) | *7.5* |
| 3. Broadcast burning | *7.0* |
| 4. Artificial seeding[a] | *4.0* |
| 5. Planting[b] | *34.5* |
| 6. Weeding[c] | *26.0* |
| 7. Forest protection measures[d] | *0.5* |
| 8. Miscellaneous, including seed plantation, experimental work | *1.5* |
| Total | *100.0* |

*a.* Costs of new seeding and supplementary seeding, including costs involved with seed procurement and seed extraction (30 per cent of the total expenditures pertain to seed extraction centres), plus part of the costs for site preparation
*b.* Costs of new planting and supplementary planting, including costs involved with the procurement of transplants and plant cultivation in nurseries (70 per cent of the expenditures pertain to seed extraction centres as well as the central plant nurseries); in cases where planting has been done at the same time as the site preparation, all the costs involved with planting are included in this section
*c.* Including costs of cleaning and limbing of stems
*d.* Refers to costs of fencing, extermination of insects, etc.

Table 2:42 sets out the average unit costs per hectare in the Crown forests for the various silvicultural measures mentioned above, for the period 1958-1962, in terms of the 1962 purchasing power of the krona. These figures are based on unadjusted Forest Service statistics.

These unit costs cannot be regarded as averages for all Regions, as not only do the site conditions differ extremely, but also the results of the particular measures which are applied, are different. This is especially the case with planting costs, where the distance and the age of the transplants—both highly variable—as well as wages, are the most important factors which determine the size of unit costs. It should be added, that the unit costs for planting as given in Table 2:42, do not include the cost of procurement of plants. It is the same with artificial seeding, because here also the cost of obtaining seed is not included.

It is not possible to draw any conclusions about future development, from statistical averages of unit costs over the years, regardless of whether these have shown an increasing or a decreasing trend. All that can be said is that there has been a general tendency towards greater units, in order to reduce costs, during the period in question, despite the fact that the gradual increase in wages has largely prevented the saving, which should have resulted, from actually doing so.

In an analysis of the silvicultural costs within a forest enterprise, the first question to be put is whether sufficient money is being spent to maintain primary forest production at an appropriate level. This question is of special

**Table 2:42. Costs per Area Unit for Various Silvicultural Operations, in the Crown Forests of Sweden, Five-Year Average, 1958—1962**
*(1962 value of S.kr per ha)*

| | S.kr |
|---|---|
| 1. Clearing of cutover areas | 80 |
| 2. Ground preparation | 147 |
| 3. Artificial seeding | 242 |
| 4. New planting | 352 |
| 5. Weeding | 105 |
| 6. Broadcast burning | 145 |

significance for the Forest Service in Sweden, because the regulations stipulate that the requirements of sustained yield shall be adhered to in the Crown forests. The cut-over areas, and the changes which occur in them, constitute a reliable gauge for examining sustained-yield forestry. According to the official statistics of 1 January 1962, compiled on the basis of data from working plans for forests below the Reforestation Boundary, the cut-over areas in which regeneration was inadequate, accounted for an average of 12 per cent of the total productive forest land under working-plan management. Table 2:25 sets out the percentage of cut-over area in each of the four Regions. One may wonder after seeing these figures, whether the silvicultural measures have been adequate, or, to put it another way, whether regeneration has been able to keep up with the fellings in all areas.

On the other hand, there is no possibility, within the framework of the net conversion surplus, of increasing the silvicultural costs in certain of the more northerly forest tracts of Sweden, where in the prevailing economic conditions, forestry in its present form is carried on at a loss. This deficit has been covered by the transfer of funds from other areas; from the standpoint of financial equilibrium in business economics, such action is justified for short periods, but in the long run the whole question will have to be reconsidered.

*Administration*

The duty of the staff in the Crown forest administration in earlier times was primarily the supervision of the forests in general. When, as a result of the 1912 budget reform, the Central Forest Administration (*Domänförvaltningen*) was reorganised as a business concern, managerial considerations came more to the fore, while the supervisory tasks took on another significance. However, the organisation of the administrative machinery for the Crown forests has not undergone any great changes. Contributing factors to this are probably firstly, that the expansion of the administrative organisation is decided by the Government and, secondly, that the employment conditions in the Forest Service are the same as those in other Swedish civil service departments. This in its turn means that salaries for the posts are in accordance with civil service scales and cannot be changed without approval from above. However, in the

engagement of staff the Forest Service has a relatively free hand, and only appointments to the higher posts must be approved by the Government.

The Crown forest administration, or the Forest Service, is under the authority of the Ministry of Agriculture (*Kungl. Jordbruksdepartementet*), and is organised on four administrative levels, namely:

a. The National Board of Crown Forests and Lands (*Domänstyrelsen*), as the highest authority.

b. Regional Forest Offices headed by the regional foresters (since 1960 there are 11 such offices, previously there were 10), as the joint body for administration and inspection.

c. Forest Districts headed by forest supervisors (110 in 1961) as the local body for managerial duties and for the direction of forestry operations.

d. Forest Ranger Districts, which are headed by forest rangers who carry out forestry operations in their respective areas (474 in 1961).

In addition, the administrative staff includes a number of specialists, and clerical personnel of various kinds.

As can be seen from Table 2:43, the total number of established staff in the Swedish Forest Service in absolute figures in relation to the total area of productive forest land, and to the timber output per employee, has undergone some changes during the last twenty years. There has been a slight increase in the total number of staff; consequently, there has been a decrease in the area of forest land per employee. This development has come about mainly through the increase in managerial duties in connection with the progress of the welfare state in which social considerations play a constantly increasing part. One must also note the change in the character of forest operations, which became necessary during the Fifties as a result of the mechanisation of forestry work, and the increasing demands for specialisation.

Table 2:44 shows the total administrative costs per hectare of forest land, and as an average percentage of the net conversion surplus for the period 1936-1962 in the Crown forests. One can see that the proportion of administrative costs in the net conversion surplus has been rather variable, depending

**Table 2:43. Established Staff in Relation to Area of Forest Land and Volume of Timber Cut, in the Crown Forests of Sweden, Annual Average for Selected Periods, 1941—1962**

| Years | Annual average no. of staff | Forest land *ha* | Forest land per employee *ha* | Timber cut, annual average $m^3y$ | Timber cut per employee $m^3y$ |
|---|---|---|---|---|---|
| 1941—1945 | 1,360 | 4,016,000 | 2,953 | 5,095,500 | 3,747 |
| 1951—1955 | 1,730 | 4,062,000 | 2,348 | 4,358,500 | 2,519 |
| 1962 | 1,787 | 4,104,000 | 2,297 | 5,439,500 | 3,044 |

**Table 2:44. Total Administrative Costs, including Pensions for Workers and Established Staff, in the Crown Forests of Sweden, Annual Average, 1936—1962**
*(in S.kr per ha forest land and as percentage of N.C.S.)*

| Years | 1936—40 | 1941—45 | 1946—50 | 1951—55 | 1956—60 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|
| Current S.kr..... | 1.95 | 2.72 | 4.51 | 7.77 | 11.53 | 14.60 | 17.08 |
| 1962 value of S.kr | 5.75 | 4.95 | 7.39 | 8.93 | 12.27 | 14.90 | 17.08 |
| *Percentage* of N.C.S. ..... | *28* | *24* | *23* | *19* | *33* | *33* | *42* |

*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1937—1963

*Notes: a.* Adjustment of prices in terms of 1962 value of the S.kr has been done using the general index for wholesale prices compiled by *Kommerskollegium* (Board of Trade), 1935 = 100
*b.* Index-regulated wage costs do not correspond to actual increases in real wages

chiefly on the fluctuations of the net conversion surplus itself. When the stumpage prices are high, there is, as a rule, a fall in the percentage which goes to overheads, under which section the administrative costs should be reckoned. The years 1951-1955 are a typical example of such a situation. The exact opposite took place in 1956-1960, and one can see how the percentage which went to administrative costs, rose in comparison with that in the previous periods.

The total administrative costs per hectare of forest land are shown in Table 2:45 for the period 1953-1962 in the four Regions. Table 2:46 presents the same data, expressed in the form of cost-revenue coefficients and as percentages of the net conversion surplus.

One can see from these tables that the difference in costs between the various geographical areas is greatest where the costs are calculated per unit-area. This can be seen even more clearly from the graph in Figure 2—8.

**Table 2:45. Administrative Costs, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**
*(S.kr per ha forest land below Reforestation Boundary)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | 4.83 | | 6.69 | | 22.05 | | 30.17 | | 8.68 | |
| 1954 | 5.03 | | 6.74 | | 23.11 | | 31.08 | | 8.94 | |
| 1955 | 5.44 | | 7.23 | | 24.60 | | 33.85 | | 9.58 | |
| 1956 | 5.68 | | 7.73 | | 25.84 | | 35.90 | | 10.13 | |
| 1957 | 6.23 | | 8.48 | | 28.22 | | 39.41 | | 11.10 | |
| Average 1953—57 | | 6.01 | | 8.14 | | 27.35 | | 37.62 | | 10.69 |
| 1958 | 6.53 | | 9.03 | | 29.38 | | 40.55 | | 11.79 | |
| 1959 | 6.83 | | 9.37 | | 29.69 | | 41.30 | | 12.11 | |
| 1960 | 7.37 | | 10.15 | | 31.95 | | 44.63 | | 13.08 | |
| 1961 | 8.36 | | 11.64 | | 36.22 | | 49.31 | | 14.88 | |
| 1962 | 9.59 | | 13.15 | | 41.54 | | 58.33 | | 16.98 | |
| Average 1958—62 | | 8.00 | | 11.04 | | 34.92 | | 48.44 | | 14.24 |

**Table 2:46. Administrative Costs, expressed as Cost-Revenue Coefficients and as a Percentage of the Net Conversion Surplus, by Regions, in the Crown Forests of Sweden, 1953—1962**

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. |
| 1953 | 0.104 | *34.5* | 0.112 | *27.1* | 0.112 | *17.1* | 0.117 | *16.6* | 0.111 | *22.4* |
| 1954 | 0.094 | *30.7* | 0.098 | *21.9* | 0.081 | *20.0* | 0.107 | *16.4* | 0.090 | *18.4* |
| 1955 | 0.108 | *33.1* | 0.103 | *22.0* | 0.088 | *14.6* | 0.111 | *17.1* | 0.098 | *19.2* |
| 1956 | 0.116 | *45.2* | 0.118 | *29.2* | 0.108 | *17.3* | 0.120 | *18.5* | 0.114 | *23.8* |
| 1957 | 0.122 | *52.2* | 0.113 | *31.5* | 0.109 | *17.8* | 0.121 | *19.1* | 0.113 | *25.2* |
| Average 1953—57 | 0.109 | *37.9* | 0.109 | *25.9* | 0.098 | *16.0* | 0.115 | *17.5* | 0.104 | *21.5* |
| 1958 | 0.122 | *62.6* | 0.127 | *37.4* | 0.142 | *25.0* | 0.152 | *24.7* | 0.132 | *32.7* |
| 1959 | 0.159 | *106.7* | 0.141 | *48.5* | 0.133 | *23.3* | 0.136 | *20.9* | 0.140 | *35.5* |
| 1960 | 0.142 | *54.5* | 0.120 | *31.2* | 0.124 | *20.8* | 0.134 | *20.7* | 0.125 | *27.4* |
| 1961 | 0.154 | *48.5* | 0.126 | *30.2* | 0.141 | *23.5* | 0.172 | *26.3* | 0.137 | *28.9* |
| 1962 | 0.170 | *50.6* | 0.141 | *33.0* | 0.167 | *30.5* | 0.191 | *32.1* | 0.156 | *33.9* |
| Average 1958—62 | 0.150 | *59.2* | 0.130 | *34.6* | 0.141 | *24.5* | 0.156 | *24.6* | 0.138 | *31.3* |

The distribution of the administrative costs between the local and the central administration, as well as the share of joint costs reckoned per hectare of forest land, for the years 1960-1962, is given in Table 2:47.

The section "overhead charges of common costs" includes a number of cost items of various kinds. These include primarily the "non-operative", more-or-less fixed, social charges (contributions to employees' pensions, life annuities, employers' contributions to national health insurance, etc.), which are determined by authorities outside the enterprise—in this case expenditures to which the Forest Service is legally committed. These are a characteristic feature of the modern welfare state, and may be regarded as taxation in another form.

Furthermore, the following cost items are included in this section: expenditure on rationalisation, on special courses for foremen and workers, training centres, further training of staff, wage negotiations and other joint costs of a heterogeneous nature.

The costs for the central administration have been divided between the regions on the basis of the volume of timber cut. On the other hand, in the official statistics, expenses such as contributions for pensions, contributions to the National Superannuation Pension Scheme (A.T.P.), employers' contributions legally required for national health insurance, rationalisation measures, courses, further training, training centres, postage, wage negotiations and contributions of various kinds, are divided between the forest districts on the

basis of the net conversion surplus. However, this difference in the basis for distribution does not affect the result to any great extent.

Table 2:47 shows also how certain social charges, such as contributions to A.T.P., have increased during recent years. This progressive rise in social contributions is a characteristic feature in all types of labour costs, but it can be more easily noticed in the statistics dealing with administrative costs.

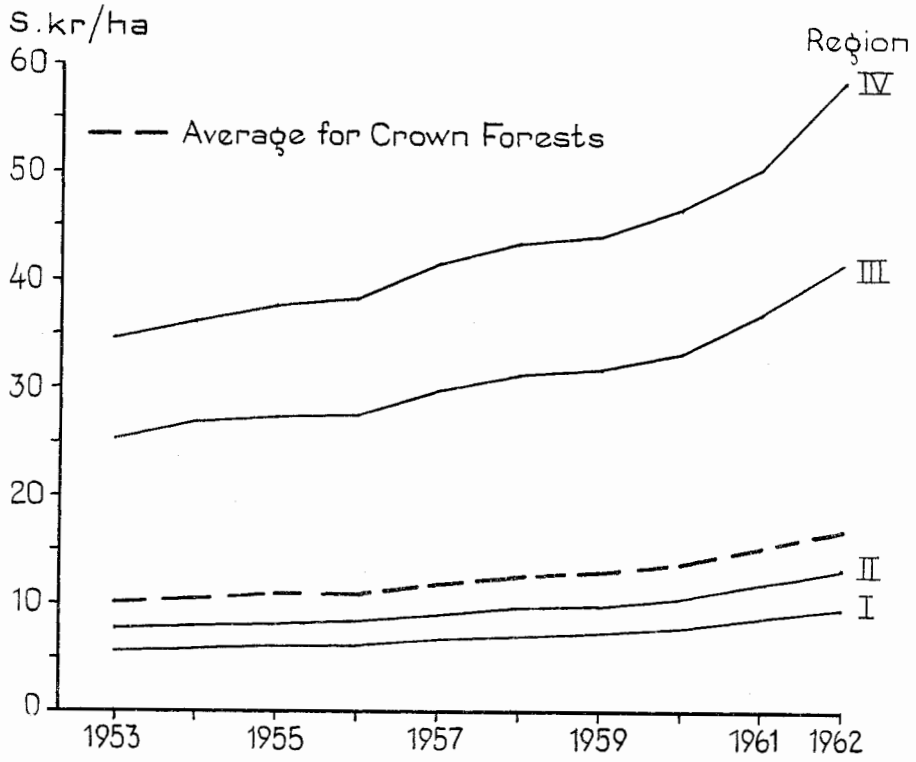


Fig. 2-8. Administrative Costs, Annual Average in 1962 S.kr per Hectare Productive Forest Land, by Regions, in Crown Forests of Sweden, 1953-1962

**Table 2:47. Distribution of Costs between Local and Central Administration for all Crown Forests, Annual Average, 1960 and 1962**
*(in 1962 value of S.kr per ha forest land below Reforestation Boundary)*

| | 1960 | | 1962 | |
|---|---|---|---|---|
| | *S.kr/ha* | *%* | *S.kr/ha* | *%* |
| 1. Local administration (forest districts) | | | | |
| Wages and salaries | 5.06 | *37.1* | 5.87 | *34.5* |
| Travel and expense allowances | 1.40 | *10.3* | 1.47 | *8.7* |
| Office expenditures | | | | |
| Wages and salaries | 0.34 | *2.5* | 0.39 | *2.3* |
| Other expenses | 0.26 | *1.9* | 0.29 | *1.7* |
| Total | 7.06 | *51.8* | 8.02 | *47.2* |
| 2. Central administration (National Board of Crown Forests and Lands, regional foresters, clerical offices) | | | | |
| Wages and salaries | 2.67 | *19.6* | 3.17 | *18.7* |
| Travel and expense allowances | 0.23 | *1.7* | 0.26 | *1.5* |
| Office expenditures | 0.53 | *3.9* | 0.78 | *4.6* |
| Total | 3.43 | *25.2* | 4.21 | *24.8* |
| 3. Overhead charges or common costs | | | | |
| Pensions, ATP* contributions for staff | 2.38 | *17.4* | 2.81 | *16.5* |
| National Health insurance for staff | 0.08 | *0.6* | 0.08 | *0.5* |
| Rationalisation | 0.13 | *1.0* | 0.30 | *1.8* |
| Instruction and further training | 0.20 | *1.5* | 0.73 | *4.3* |
| Other expenses | 0.35 | *2.5* | 0.83 | *4.8* |
| Total | 3.14 | *23.0* | 4.75 | *28.0* |
| Grand total | 13.63 | *100.0* | 16.98 | *100.0* |

*National Superannuation Pension Scheme, which is administered by the Swedish Government as part of the welfare state programme

*Maintenance of Facilities*

This section comprises a number of different cost items which arise in connection with the maintenance of existing facilities in the forest enterprise, but which do not include costs associated with the renewal and growth of the bodies permanently established for the purpose of maintenance.

The maintenance of roads, buildings, drainage systems and machinery comes under this section. Furthermore, it covers forest mensuration, boundary clearing, wildlife management and miscellaneous expenditures on activities which have no direct connection with timber growing and harvesting (e.g. operating expenses of the Forest Service's own power stations, crushing-mills, saw-doctors' shops, etc.). Fundamentally, the maintenance costs appear as

balanced or net amounts, i.e. current income has been deducted from the current expenditure. This applies mainly to the maintenance costs of buildings, which do not correspond to the actual expenditures entered in the books but which represent the differences between the latter and the actual income from rents. In the case of wildlife management, the costs become practically non-existent under this method of procedure, as the total annual receipts from hunting and fishing exceed the total annual expenditure on preservation measures. Although it is standardised, the method gives a result which is not too misleading.

Table 2:48 shows the average annual costs for maintenance of facilities per hectare of forest land for the four Regions.

Table 2:49 shows the percentage distribution of the total maintenance costs for the period 1958-1962 for the Crown forests. The cost items have been entered under the following headings: maintenance of drainage; maintenance of forest roads; maintenance of buildings for forest farm leaseholds (permanent forest workers), employees' housing and other buildings (including rented dwellings for permanent forest workers in built-up areas); maintenance of equipment and machinery; and forest mensuration and the clearing of the boundaries of the forest properties.

The method of cost calculation employed, by which income has been deducted from expenditure, causes the costs of maintenance of existing buildings—which would otherwise constitute the largest item within the section in question—to take second place. Road maintenance costs, therefore, appear as the largest item.

**Table 2:48. Costs for Maintenance of Facilities, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**

*(S.kr per ha forest land below Reforestation Boundary)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | 1.08 | | 1.86 | | 12.02 | | 9.68 | | 3.24 | |
| 1954 | 1.16 | | 1.77 | | 11.83 | | 12.27 | | 3.21 | |
| 1955 | 1.33 | | 1.81 | | 12.11 | | 12.87 | | 3.33 | |
| 1956 | 1.64 | | 2.04 | | 13.13 | | 12.91 | | 3.70 | |
| 1957 | 1.60 | | 2.01 | | 12.95 | | 11.09 | | 3.63 | |
| Average 1953—57 | | 1.50 | | 2.10 | | 13.72 | | 13.02 | | 3.78 |
| 1958 | 1.73 | | 2.23 | | 11.61 | | 9.45 | | 3.61 | |
| 1959 | 1.43 | | 1.75 | | 8.61 | | 7.64 | | 2.78 | |
| 1960 | 1.49 | | 1.81 | | 10.21 | | 8.53 | | 3.09 | |
| 1961 | 1.72 | | 2.37 | | 12.31 | | 12.32 | | 3,82 | |
| 1962 | 2.25 | | 2.65 | | 13.29 | | 12.88 | | 4.30 | |
| Average 1958—62 | | 1.78 | | 2.24 | | 11.60 | | 10.50 | | 3.64 |

**Table 2:49. Percentage Distribution of Costs for Maintenance of Facilities, by Various Operations, in the Crown Forests of Sweden, Annual Average, 1958—1962**

| | % |
|---|---|
| 1. Drainage | *5* |
| 2. Roads | *60* |
| 3. Buildings | *20* |
| 4. Equipment and machinery | *4* |
| 5. Forest mensuration and boundary clearing | *11* |
| Total | *100* |

*Improvement and Expansion*

To-day, the economy is not stationary, but is in a constant state of change. Continuous expansion and increasing capital investment are characteristic of the trend in industry. By new investment in permanent installations, efforts are being made towards the achieving of a balanced expansion in forestry also. The costs of this expansion, which is intended to increase the productivity and renewal of the production apparatus (and which is here called the "improvement and expansion of facilities"), cover expenditure of the following: the construction of new roads, new buildings and new drainage systems; the procurement of new equipment and machinery; and the afforestation of newly acquired areas, which were not previously part of the Crown forest land.

In the main, the development of the forest road network has been made necessary by the increasing mechanisation of forestry operations and particularly by the fact that motor lorries are now used for the transport of timber.

In southern Sweden, the post-war aim of road development has been to provide the forests with as close a network of roads as possible, so that the timber can be brought to the roadside by horse or tractor with minimum costs. By and large, this aim was achieved in the Fifties.[1]

In the northern parts of the country, where one can count on having frozen surfaces for many months of the year, and after the thaw can transport the timber by water from the forest to industry, there are often other ideas about the extension of the forest road network. There is also an attempt in this region to provide roads which are usable throughout the year, so that transport by motor lorries, either to the floatways or directly to the mills, can be guaranteed. However, it cannot be denied that a contributing factor to the building of roads in the Crown forests, has been the wish to provide the forest workers, who are more-or-less isolated, with better facilities for reaching the main roads. The aim has also been to make the forests more easily accessible to labour, so that the work site is within reasonable walking distance of a motor road.

A question which is of great importance in this connection, and one that has been the subject of extensive studies, has been the desirable extent of

[1] Kungl. Domänstyrelsen, *Sveriges skogar under 100 år* (Sweden's Forests during the Past Century), Vol. II, Stockholm 1959.

water transport relative to land transport of roundwood products. In practice, the timber is transported by motor lorry over relatively long distances directly to the wood-processing mills, and these distances are tending to increase. The remaining volume of timber, which is floated, is thus subject to ever-increasing fixed costs. The distance to the mills, over which it pays to transport the timber by motor lorry, is constantly increasing, and therefore the total floating costs are becoming greater. With this situation, one cannot speak of the "low" floating costs in Norrland—except in the case of certain sections of the larger rivers—because, economically, motor transport has proved to be completely competitive with floating.

Another important item in the section of costs concerned with the improvement of facilities, is the cost of construction of new buildings (housing and non-residential buildings). The development of housing in the Crown forests is directly connected with the supply of labour. Efforts are being made to provide more secure living conditions for forest workers, in order to create a labour force which regards forestry as its chosen occupation. The state has undertaken the provision of various kinds of dwelling houses. As a rule, the lease of these goes with an agreement which provides a mutual guarantee of work, i.e. the worker agrees to do forestry work for a certain time during the year, and is guaranteed work for at least the number of days stipulated in his contract of employment. Owing to the continuous depopulation of rural areas in Sweden, and the streamlining of agriculture, the number of leaseholds was considerably reduced during the Fifties; the provision of new housing for permanent forest workers is now mainly in the form of dwelling houses in built-up areas. At the end of 1961, the Forest Service abandoned the system of providing employees' housing, and stopped building new houses; as this constituted a considerable part of the total building costs, this item will disappear completely in the future. In the Fifties, the cost structure of construction of new buildings, which in itself reflects the actual economic conditions of a period of great social and economic change, cannot be regarded as a means of determining the "acceptable" level of costs in this field.

Table 2:50 shows the total costs of improving the facilities of the enterprise (by the construction of new roads, new buildings and drainage systems, as well as by obtaining new equipment and machinery), in current prices, and in terms of the 1962 value of the krona, per hectare of forest land, for 1936-1960 (five-year average) and for each of the years 1961 and 1962. The cost is given also as a percentage of the net conversion surplus for the same years, for northern and southern Sweden. The trend of costs in these areas can be seen even more clearly in the graph in Figure 2—9. From this information it can be seen that the costs have not been uniform at all periods, firstly, owing to the varying nature of the net conversion surplus and, secondly, because of the investment policy of the Forest Service. Usually, these costs arise as a consequence of management decisions, and affect the yield which will result in the

**Table 2:50. Costs of Improvement and Expansion, by Main Geographical Areas, in the Crown Forests of Sweden, Annual Average, 1936—1962**
*(in S.kr per ha forest land and as percentage of N.C.S.)*

| Years | | 1936—40 | 1941—45 | 1946—50 | 1951—55 | 1956—60 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|
| Average for Crown forests | Current S.kr | 0.70 | 1.06 | 2.95 | 7.07 | 6.75 | 6.56 | 6.17 |
| | 1962 value of S.kr | 2.06 | 3.12 | 4.84 | 8.13 | 7.18 | 6.69 | 6.17 |
| | *Percentage* of N.C.S. | *10* | *9* | *15* | *17* | *20* | *15* | *15* |
| Northern Sweden | Current S.kr | 0.35 | 0.45 | 2.10 | 5.04 | 5.16 | 5.04 | 4.80 |
| | 1962 value of S.kr | 1.03 | 0.82 | 3.44 | 5.79 | 5.49 | 5.14 | 4.80 |
| | *Percentage* of N.C.S. | *7* | *6* | *16* | *20* | *28* | *19* | *19* |
| Southern Sweden | Current S.kr | 3.53 | 5.77 | 9.27 | 22.10 | 18.27 | 17.45 | 17.17 |
| | 1962 value of S.kr | 10.38 | 10.49 | 15.20 | 25.40 | 19.44 | 17.81 | 17.17 |
| | *Percentage* of N.C.S. | *15* | *13* | *14* | *14* | *13* | *11* | *12* |

Adjustment of prices in terms of 1962 value of the S.kr has been done using the general index for wholesale prices compiled by *Kommerskollegium* (Board of Trade), 1935=100.
*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1937—1963

future. However, the figures reveal that the administration on the highest level has endeavoured to maintain stability in its investment policy. A characteristic feature here is that the investment costs in southern Sweden have remained at almost the same level, or can be regarded as having decreased over a long period, while in the northern part of the country, there was a marked rise in costs during the Forties and Fifties.

Table 2:51 gives the total cost for the improvement of facilities, per hectare of forest land, during the period 1953-1962 in the four Regions. The investment policy for the Forest Service during the Fifties can be seen quite clearly from these tables. The cost trend, as an average for the Crown forests, shows a quite marked decline between the periods 1953-1957 and 1958-1962.

Table 2:52 shows the percentage distribution of the costs of improving facilities for the period 1958-1962 in all Crown forests. The amounts have been entered under the following headings: construction of new roads and buildings, new drainage systems and the procurement of new equipment and machinery. It can be seen from this table, that the cost of constructing new roads, on average during the five-year period, was 62 per cent of the total cost of improvement and expansion.

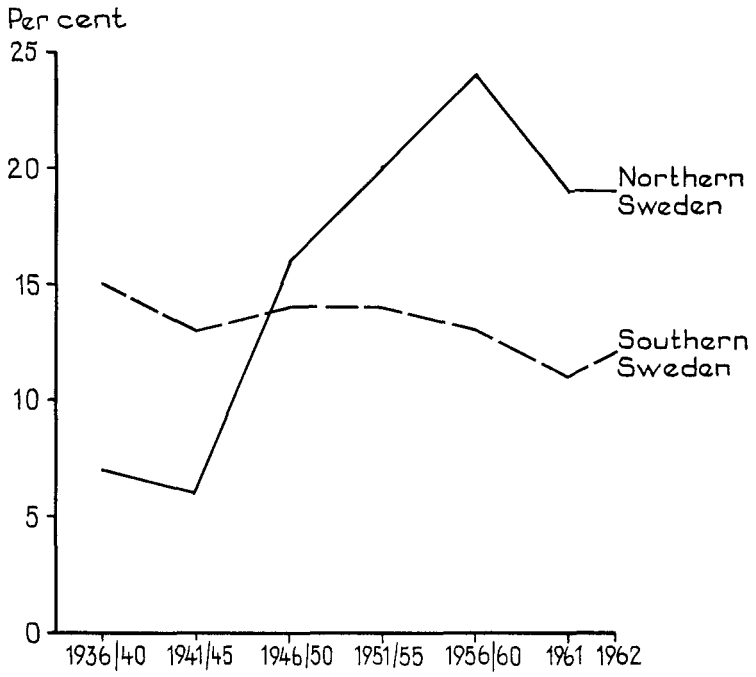


Fig. 2 - 9. Costs of Improvement and Expansion as Percentage of Net Conversion Surplus (Stumpage Value), Annual Average, by Main Geographical Regions, in Crown Forests of Sweden, 1936 - 1962

**Table 2:51. Costs of Improvement and Expansion, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**

(*S.kr per ha forest land below Reforestation Boundary*)

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | 5.11 | | 7.07 | | 23.91 | | 25.63 | | 9.21 | |
| 1954 | 4.92 | | 6.99 | | 24.65 | | 16.83 | | 9.13 | |
| 1955 | 6.04 | | 6.62 | | 21.02 | | 25.14 | | 8.80 | |
| 1956 | 6.10 | | 7.11 | | 22.87 | | 21.81 | | 9.33 | |
| 1957 | 6.26 | | 7.92 | | 23.03 | | 19.81 | | 9.82 | |
| Average 1953—57 | | 6.28 | | 7.90 | | 25.61 | | 24.20 | | 10.25 |
| 1958 | 4.71 | | 7.07 | | 17.92 | | 13.00 | | 8.12 | |
| 1959 | 4.23 | | 6.15 | | 14.86 | | 9.92 | | 6.98 | |
| 1960 | 3.36 | | 5.60 | | 13.80 | | 10.60 | | 6.26 | |
| 1961 | 3.84 | | 7.17 | | 17.37 | | 19.05 | | 7.89 | |
| 1962 | 4.96 | | 6.34 | | 17.48 | | 19.95 | | 7.81 | |
| Average 1958—62 | | 4.38 | | 6.71 | | 16.89 | | 14.96 | | 7.69 |

**Table 2:52. Percentage Distribution of Costs for Improvement and Expansion, by Various Operations, in the Crown Forests of Sweden, Annual Average, 1958—1962**

| | % |
|---|---|
| 1. Construction of drainage facilities | *2.5* |
| 2. Construction of new forest roads | *62.0* |
| 3. Construction of new buildings | *23.0* |
| 4. Procurement of equipment and machinery | *12.5* |
| Total | *100.0* |

### *2.2.7 Costs of Taxes*

Crown forests in Sweden are exempt from national income tax. But as far as other taxation is concerned, the regulations apply to Crown forests as they do to other categories of forest ownership. Only national parks, historic areas and cultural places, to which the public has access, are completely exempt from tax. Primarily, the taxes paid consist of the general communal tax (income tax and "guarantee" tax), payable to the local authorities. The amount which is paid is determined for each rateable property, on the basis of the general tax value of the forest soil and the growing-stock; this is assessed every fifth year according to the General Rules of Valuation of the Communal Tax Law. In order that the local authorities may be assured of a certain minimum revenue from tax, the communal tax is paid even under circumstances where there is no income from the property, which is liable for taxation. In such cases, the sum of tax to be paid is based on what is known as the guaranteed tax amount or "guarantee" tax, which is 2.5 per cent of the assessed value of the property. The Crown forests are hit particularly hard by this regulation, because the greater part of them are located in regions where the site conditions are unfavourable—and where accessibility is poor—areas in which in recent years there has been almost no surplus from forestry operations. Should the taxable income from the property exceed the "guarantee" tax by any amount whatsoever, this will be subject to communal income tax. Furthermore, on Crown forests as well as on private forests, there is a silvicultural levy or forest management fee, as well as other taxes, for instance, purchase tax. However, purchase tax itself has no practical importance here.

Table 2:53 shows the total tax paid by the Forest Service, in current terms (S.kr) and in terms of the 1962 value of the krona, per hectare of forest land, and as a percentage of the net conversion surplus for 1936-1960 (five-year average), and for each of the years 1961 and 1962, in northern and southern Sweden. As can be seen, the tax burden has changed considerably over the years. Up to 1939, taxes accounted for a relatively high proportion of the net conversion surplus, but this proportion has gradually become less because of the deterioration in the value of money and the development of the welfare state.

**Table 2:53. Tax Burden, by Main Geographical Areas, in the Crown Forests of Sweden, Annual Average, 1936—1962**
*(in S.kr per ha forest land and as percentage of N.C.S.)*

| Years | | 1936—40 | 1941—45 | 1946—50 | 1951—55 | 1956—60 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|
| Average for Crown forests | Current S.kr | 1.29 | 1.03 | 1.62 | 3.70 | 3.11 | 4.05 | 4.05 |
| | 1962 value of S.kr | 3.79 | 1.87 | 2.66 | 4.25 | 3.31 | 4.13 | 4.05 |
| | *Percentage* of N.C.S. | *18* | *9* | *8* | *9* | *9* | *9* | *10* |
| Northern Sweden | Current S.kr | 1.16 | 0.71 | 1.25 | 2.48 | 1.29 | 2.49 | 2.67 |
| | 1962 value of S.kr | 3.41 | 1.29 | 2.05 | 2.85 | 1.48 | 2.54 | 2.67 |
| | *Percentage* of N.C.S. | *23* | *10* | *9* | *10* | *7* | *9* | *10* |
| Southern Sweden | Current S.kr | 2.30 | 3.54 | 4.42 | 12.72 | 12.29 | 15.25 | 13.97 |
| | 1962 value of S.kr | 6.76 | 6.44 | 7.25 | 14.62 | 13.07 | 15.56 | 13.97 |
| | *Percentage* of N.C.S. | *10* | *8* | *7* | *8* | *9* | *9* | *9* |

Adjustment of prices in terms of 1962 value of the S.kr has been done using the general index for wholesale prices compiled by *Kommerskollegium* (Board of Trade), 1935=100

Table 2:54 shows the tax burden per hectare forest land, during the years 1953-1962, in the four Regions. Table 2:55 presents these tax amounts expressed in the form of cost-revenue coefficients, and as percentages of the net conversion surplus. It can be seen from these tables that in Regions I, II and III the tax burden for the five-year period 1953-1957, was somewhat greater than that for the five-year period 1958-1962, while for Region IV the trend was in the opposite direction. Expressed in relative figures, and particularly as a percentage of the net conversion surplus, there has been some levelling-out of taxation during the last five-year period, and the differences in the tax burden, which were previously quite marked, have almost disappeared. However, in absolute figures, the tax burden is considerably higher in southern Sweden than in the northern parts of the country.

Table 2:56 provides a further illustration of the tax burden, by giving the percentage distribution of taxes paid (communal taxes, both in the form of income tax and as "guarantee" tax plus the forest management fee) during the years 1960-1962 in the four Regions, and as an average for all Crown forests. One can see from this that in Region I the "guarantee" tax constitutes the major part of the tax burden. However, in the other Regions it is the communal income tax which dominates. It is notable that the forest management fee is relatively higher in Region I than in the other regions, probably because of the proportionally higher assessed values of property in this area.

**Table 2:54. Tax Burden, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**
*(S.kr per ha forest land below Reforestation Boundary)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | 1.98 | | 2.45 | | 7.17 | | 4.89 | | 3.04 | |
| 1954 | 1.15 | | 3.31 | | 12.39 | | 10.97 | | 4.12 | |
| 1955 | 1.08 | | 1.69 | | 15.76 | | 13.65 | | 3.74 | |
| 1956 | 1.04 | | 3.04 | | 16.26 | | 15.45 | | 4.56 | |
| 1957 | 0.47 | | 1.64 | | 11.26 | | 12.85 | | 2.86 | |
| Average 1953—57 | | 1.28 | | 2.70 | | 13.86 | | 12.70 | | 4.06 |
| 1958 | 0.81 | | 1.74 | | 11.53 | | 12.93 | | 3.11 | |
| 1959 | 0.98 | | 1.06 | | 8.53 | | 9.21 | | 2.28 | |
| 1960 | 0.97 | | 1.46 | | 10.97 | | 16.15 | | 2.95 | |
| 1961 | 1.16 | | 3.93 | | 14.45 | | 16.65 | | 4.88 | |
| 1962 | 1.24 | | 4.24 | | 13.33 | | 14.78 | | 4.87 | |
| Average 1958—62 | | 1.07 | | 2.55 | | 12.17 | | 14.43 | | 3.73 |

**Table 2:55. Tax Burden, expressed as Cost-Revenue Coefficients and as a Percentage of the Net Conversion Surplus, b Regions, in the Crown Forests of Sweden, 1953—1962**

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. |
| 1953 | 0.043 | *14.2* | 0.041 | *9.9* | 0.036 | *5.6* | 0.019 | *2.7* | 0.039 | *7.9* |
| 1954 | 0.022 | *7.0* | 0.048 | *10.8* | 0.044 | *7.4* | 0.038 | *5.8* | 0.042 | *8.5* |
| 1955 | 0.021 | *6.6* | 0.024 | *5.1* | 0.057 | *9.4* | 0.045 | *6.9* | 0.038 | *7.5* |
| 1956 | 0.021 | *8.3* | 0.047 | *11.5* | 0.068 | *10.9* | 0.052 | *7.9* | 0.051 | *10.7* |
| 1957 | 0.009 | *4.0* | 0.022 | *6.1* | 0.043 | *7.1* | 0.040 | *6.2* | 0.029 | *6.5* |
| Average 1953—57 | 0.023 | *8.1* | 0.036 | *8.6* | 0.050 | *8.1* | 0.039 | *5.9* | 0.040 | *8.2* |
| 1958 | 0.015 | *7.8* | 0.024 | *7.2* | 0.056 | *9.8* | 0.049 | *7.9* | 0.035 | *8.6* |
| 1959 | 0.023 | *15.3* | 0.016 | *5.5* | 0.038 | *6.7* | 0.030 | *4.7* | 0.026 | *6.7* |
| 1960 | 0.019 | *7.2* | 0.017 | *4.5* | 0.042 | *7.1* | 0.048 | *7.5* | 0.028 | *6.2* |
| 1961 | 0.022 | *7.0* | 0.042 | *10.2* | 0.056 | *9.4* | 0.058 | *8.9* | 0.045 | *9.5* |
| 1962 | 0.022 | *6.5* | 0.045 | *10.6* | 0.054 | *9.8* | 0.048 | *8.1* | 0.045 | *9.7* |
| Average 1958—62 | 0.020 | *8.0* | 0.030 | *8.0* | 0.049 | *8.5* | 0.046 | *7.3* | 0.036 | *8.2* |

**Table 2:56. Percentage Distribution of Taxes, by Main Components and by Regions, in the Crown Forests of Sweden, 1960—1962**

| Region | "Guarantee" tax | Communal income tax | Forest management fee |
|---|---|---|---|
| I | 77.2 | 7.2 | 15.6 |
| II | 32.6 | 60.6 | 6.8 |
| III | 34.9 | 56.4 | 8.7 |
| IV | 34.7 | 56.7 | 8.6 |
| Average for Crown forests | 37.3 | 54.2 | 8.5 |

### *2.2.8 Net Profit*

The difference between revenue from timber sales and total expenditure, as well as the difference between the net conversion surplus (stumpage value) and the total managing costs, is regarded in this connection as the net profit from forestry operations. As the surplus given in the statistics refers to all branches of activity taken together, the figures in this report differ from those in the official statistics. However, the differences are insignificant.

Table 2:57 sets out the net profit, in current prices and in terms of the 1962 value of the krona, per hectare of forest land; also as a percentage of the net conversion surplus, for the period 1936-1960 and for the years 1961 and 1962 in northern and southern Sweden. It can be seen from this that there has been a noticeable decline in the net profit both absolutely and relatively, i.e. in proportion to the net conversion surplus. The characteristic feature in this has been that the percentage figure, which during the period 1936-1945 was largely the same in the different geographical areas, began to show some differences between northern and southern Sweden from about 1950 onwards. Whereas the figure for southern Sweden has remained approximately the same—with the exception of the last two years—there has been a noticeable

**Table 2:57. Net Profit of Forestry Operations, by Main Geographical Areas, in the Crown Forests of Sweden, Annual Average, 1936—1962**
*(in S.kr per ha forest land and as percentage of N.C.S.)*

| Years | | 1936—40 | 1941—45 | 1946—50 | 1951—55 | 1956—60 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|
| Average for Crown forests | Current S.kr | 3.31 | 6.04 | 8.49 | 18.24 | 7.05 | 11.58 | 6.74 |
| | 1962 value of S.kr | 9.74 | 10.98 | 13.92 | 20.97 | 7.50 | 11.82 | 6.74 |
| | *Percentage* of N.C.S. | *47* | *53* | *43* | *44* | *20* | *26* | *16* |
| Northern Sweden | Current S.kr | 2.34 | 3.89 | 5.65 | 9.40 | —0.16 | 5.61 | 3.59 |
| | 1962 value of S.kr | 6.88 | 7.07 | 9.26 | 10.80 | —0.17 | 5.72 | 3.59 |
| | *Percentage* of N.C.S. | *47* | *52* | *42* | *37* | — | *21* | *14* |
| Southern Sweden | Current S.kr | 11.02 | 22.84 | 29.55 | 83.74 | 59.39 | 54.44 | 29.39 |
| | 1962 value of S.kr | 32.41 | 41.53 | 48.44 | 96.25 | 63.18 | 55.55 | 29.39 |
| | *Percentage* of N.C.S. | *46* | *53* | *44* | *52* | *41* | *33* | *20* |

Adjustment of prices in terms of 1962 value of the S.kr has been done using the general index for wholesale prices compiled by *Kommerskollegium* (Board of Trade), 1935=100
*Source:* SOS, Kungl. Domänstyrelsen, *Domänverket*, 1937—1963

decrease in the north. One of the reasons for this is probably the changed management policy of the Forest Service in northern forests; this has resulted in increases in the costs of silviculture, as well as those of improvement and expansion.

Table 2:58 gives the surplus yielded by the Crown forests, both in current prices and in terms of the 1962 value of the krona per cubic metre of timber cut during the period 1953-1962 for the four Regions. Table 2:59 contains the same data, recalculated per hectare of forest land. The difference in the operating profit of the various Regions can be seen clearly from these tables; it is particularly striking when calculated per hectare of forest land. The variation on profitableness in the four Regions during the period 1958-1962, can be seen more clearly in the graph in Figure 2—10. Here, with the monetary surplus—both in kronor per cubic metre of the timber cut and per hectare of productive forest land—is given the annual cutting amount of timber output.

**Table 2:58. Net Profit, for Sold and Delivered Timber, by Regions, in the Crown Forests of Sweden, 1953—1962**
*(S.kr per $m^3y$)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | −4.59 | | 2.08 | | 19.38 | | 20.65 | | 7.64 | |
| 1954 | −0.57 | | 6.58 | | 21.83 | | 21.71 | | 12.02 | |
| 1955 | −2.59 | | 10.01 | | 21.91 | | 21.23 | | 13.24 | |
| 1956 | −9.75 | | 1.03 | | 17.38 | | 18.84 | | 6.32 | |
| 1957 | −10.03 | | 0.75 | | 18.74 | | 20.17 | | 6.23 | |
| Average 1953—57 | | −5.91 | | 4.58 | | 22.16 | | 22.68 | | 10.22 |
| 1958 | −10.68 | | −2.26 | | 10.58 | | 15.51 | | 1.05 | |
| 1959 | −16.31 | | −4.25 | | 14.57 | | 23.31 | | 1.74 | |
| 1960 | −5.81 | | 5.43 | | 18.88 | | 22.82 | | 9.13 | |
| 1961 | −4.78 | | 4.88 | | 16.36 | | 14.90 | | 7.73 | |
| 1962 | −6.04 | | 3.33 | | 9.80 | | 10.98 | | 4.28 | |
| Average 1958—62 | | −9.17 | | 1.63 | | 14.72 | | 18.47 | | 5.04 |

**Table 2:59. Net Profit per Hectare Productive Forest Land, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**
*(S.kr per ha forest land below Reforestation Boundary)*

| Region | I | | II | | III | | IV | | Average for Crown forests | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1953 | −3.54 | | 1.99 | | 56.36 | | 87.56 | | 9.40 | |
| 1954 | −0.49 | | 7.12 | | 88.45 | | 94.89 | | 17.97 | |
| 1955 | −2.02 | | 10.45 | | 86.12 | | 87.37 | | 18.91 | |
| 1956 | −7.27 | | 1.04 | | 60.53 | | 84.96 | | 8.36 | |
| 1957 | −8.64 | | 0.93 | | 71.26 | | 97.07 | | 9.61 | |
| Average 1953—57 | | −4.75 | | 4.86 | | 80.55 | | 100.13 | | 14.35 |
| 1958 | −10.03 | | −2.71 | | 34.29 | | 63.89 | | 1.56 | |
| 1959 | −13.13 | | −5.22 | | 52.98 | | 103.90 | | 2.62 | |
| 1960 | −5.07 | | 7.45 | | 73.60 | | 107.04 | | 15.07 | |
| 1961 | −3.92 | | 6.62 | | 59.07 | | 59.53 | | 12.22 | |
| 1962 | −5.17 | | 4.59 | | 34.97 | | 47.28 | | 6.85 | |
| Average 1958—62 | | −7.81 | | 2.13 | | 52.95 | | 79.61 | | 7.92 |

One can see that Region I is a marked low-yield area, where forestry operations on the basis of sustained yield involve a loss under present conditions. However, even in the regions where growth conditions are better, and accessibility good, there is a declining trend in the net profit, particularly when this is expressed per cubic metre. On the other hand, the net profit per hectare of productive forest land shows a less noticeable decline, on account of the constant increase in the cutting volume. Table 2:60 illustrates the profitableness of forestry operations, expressed as a relationship between total income and total expenditure, i.e. the profit ratio. The development of the profit ratio in the four Regions is shown graphically in Figure 2—11.

The decreasing net profit from forestry operations in the Crown forests during the period under survey, is a direct consequence of the unfavourable trend in the relationship of income to expenditure. However, to some extent it is also a result of the management policy of the Forest Service, which has the intention of maintaining the primary forest production on a sustained yield basis, despite unfavourable conditions, and by means of investments in permanent facilities, of achieving an improvement and expansion of the means of production of forestry.

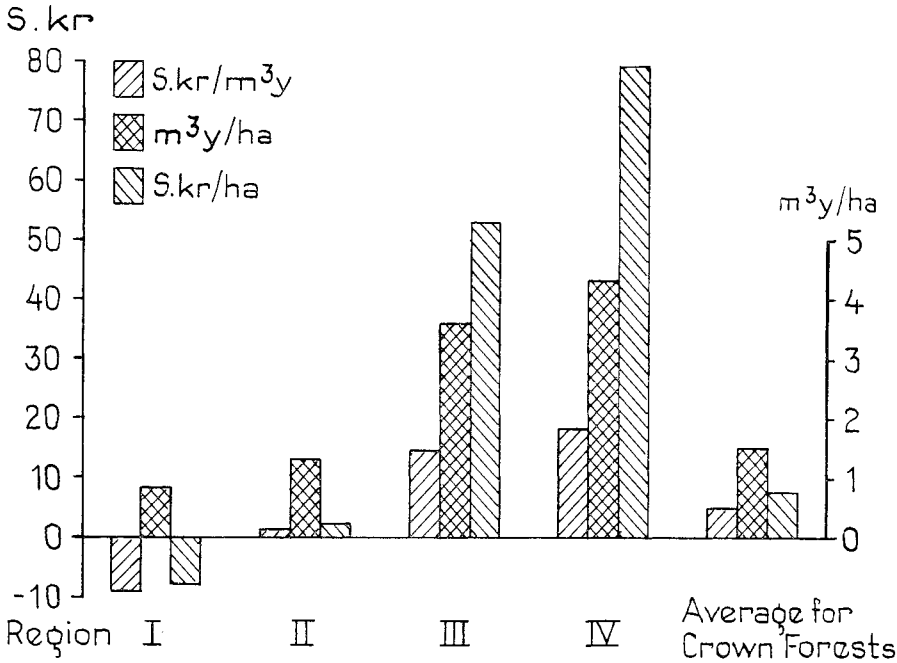


Fig. 2-10. Net Profit, Annual Average in 1962 S.kr per Cubic Metre Timber Cut and per Hectare Productive Forest Land, with the Annual Cut ($m^3y$/ha), in Crown Forests of Sweden, 1958-1962

**Table 2:60. Profitableness of Forestry Operations, by Regions, in the Crown Forests of Sweden, 1953—1962**

*(expressed as profit ratio* $= \frac{\textit{total income}}{\textit{total expenditure}}$*)*

| Region | 1953 | 1954 | 1955 | 1956 | 1957 | Average 1953—57 | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 0.9 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 |
| II | 1.0 | 1.1 | 1.2 | 1.0 | 1.0 | 1.1 | 1.0 | 0.9 | 1.1 | 1.1 | 1.1 | 1.0 |
| III | 1.4 | 1.5 | 1.4 | 1.3 | 1.4 | 1.4 | 1.2 | 1.3 | 1.4 | 1.3 | 1.2 | 1.3 |
| IV | 1.5 | 1.5 | 1.4 | 1.4 | 1.4 | 1.4 | 1.3 | 1.5 | 1.5 | 1.3 | 1.2 | 1.3 |
| Average for Crown forests | 1.1 | 1.2 | 1.2 | 1.1 | 1.1 | 1.2 | 1.0 | 1.0 | 1.2 | 1.1 | 1.1 | 1.1 |

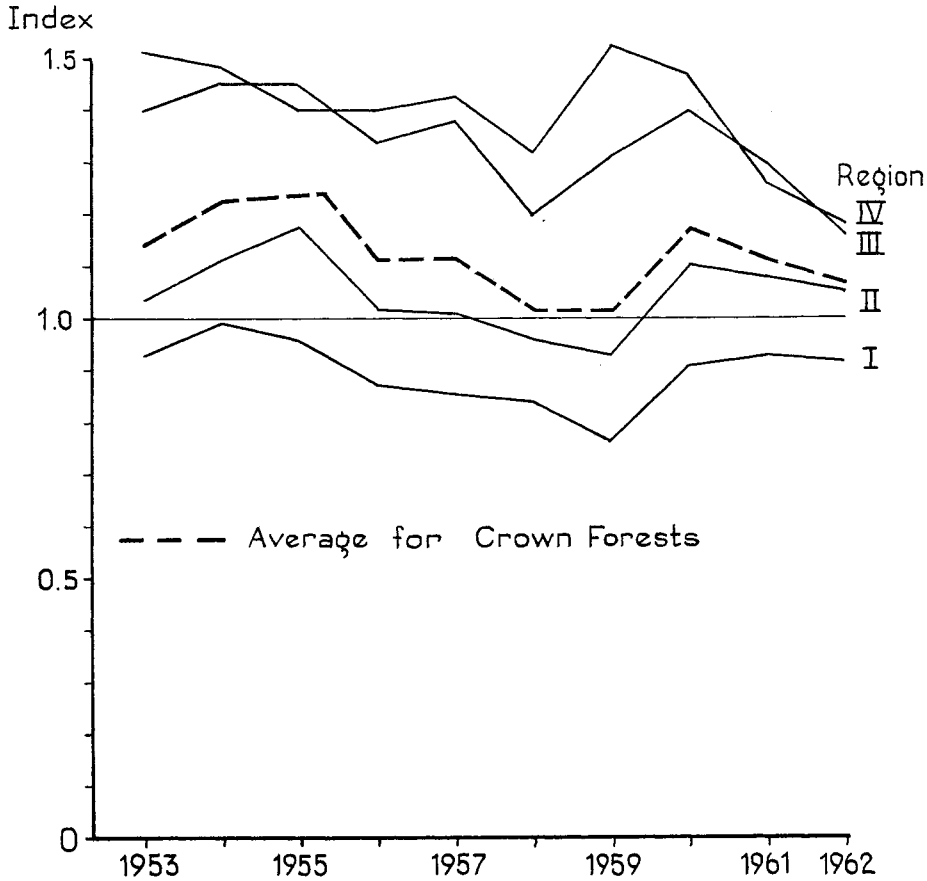


Fig. 2-11. Index of Profitableness (Ratio between Revenue and Costs), by Regions, in Crown Forests of Sweden, 1953-1962

### *2.2.9 Comparison of Income and Expenditure*

The intention behind this study is to compare income and expenditure in the different geographical areas and in different years. In order to demonstrate better what this relationship involves, and how the composition of the cost items varies, figures have been compiled in Table 2:61, giving these data per cubic metre of timber output. Figure 2—12 presents the same data graphically. It can be seen from these comparisons how the surplus, i.e. the difference between income and total expenditure, as a residual item, has come about in the different Regions. At the same time, these comparisons also illustrate the differences in cost structure, which can be considered as being caused by natural growth conditions, by accessibility, and by management policy.

Gross revenue, and total expenditure, in terms of the 1962 value of the krona per hectare of productive forest land, are set out in Table 2:62. Only the absolute figures, and not the relative distribution of costs, differ in the tables presented.

**Table 2:61. Income and Expenditure, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**
*(in 1962 value of S.kr per $m^3y$ sold and delivered timber)*

| Period | 1953—1957 | | | | | 1958—1962 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Region | I | II | III | IV | Total | I | II | III | IV | Total |
| Volume of cut, annual average, *1,000 $m^3y$* | 811 | 1,964 | 1,864 | 152 | 4,791 | 869 | 2,394 | 1,902 | 152 | 5,317 |
| 1. Gross revenue | 69.00 | 70.80 | 76.70 | 74.10 | 72.90 | 62.10 | 64.50 | 69.00 | 71.90 | 65.90 |
| 2. Logging costs | 49.30 | 41.20 | 29.70 | 25.40 | 37.60 | 46.40 | 40.20 | 29.20 | 26.40 | 36.90 |
| 3. Net conversion surplus | 19.70 | 29.60 | 47.00 | 48.70 | 35.30 | 15.70 | 24.30 | 39.80 | 45.50 | 29.00 |
| 4. Silvicultural costs | 6.90 | 5.40 | 2.70 | 6.10 | 4.60 | 7.20 | 5.50 | 4.00 | 6.60 | 5.30 |
| 5. Administrative costs | 7.50 | 7.70 | 7.50 | 8.50 | 7.60 | 9.30 | 8.40 | 9.70 | 11.20 | 9.10 |
| 6. Maintenance costs | 1.90 | 2.00 | 3.80 | 3.00 | 2.70 | 2.10 | 1.70 | 3.20 | 2.40 | 2.30 |
| 7. Costs of improvement and expansion | 7.80 | 7.40 | 7.00 | 5.50 | 7.30 | 5.10 | 5.10 | 4.70 | 3.50 | 4.90 |
| 8. Taxes | 1.60 | 2.60 | 3.80 | 2.90 | 2.90 | 1.20 | 1.90 | 3.40 | 3.30 | 2.40 |
| 9. Total managing costs (4−8) | 25.70 | 25.10 | 24.80 | 26.00 | 25.10 | 24.90 | 22.60 | 25.00 | 27.00 | 24.00 |
| 10. Total costs (2+9) | 75.00 | 66.30 | 54.50 | 51.40 | 62.70 | 71.30 | 62.80 | 54.20 | 53.40 | 60.90 |
| 11. Net profit | −6.00 | 4.50 | 22.20 | 22.70 | 10.20 | −9.20 | 1.70 | 14.80 | 18.50 | 5.00 |

Expenditure, expressed in the form of cost-revenue coefficients, which indicate the part of the income taken up by costs, can be seen in Table 2:63. This table gives a detailed picture of the cost structure of the forestry operations practised by the Forest Service in the various Regions. For the purpose of international cost-revenue comparisons, such a table is probably the most useful, a contention which will be borne out in the concluding part of this paper.

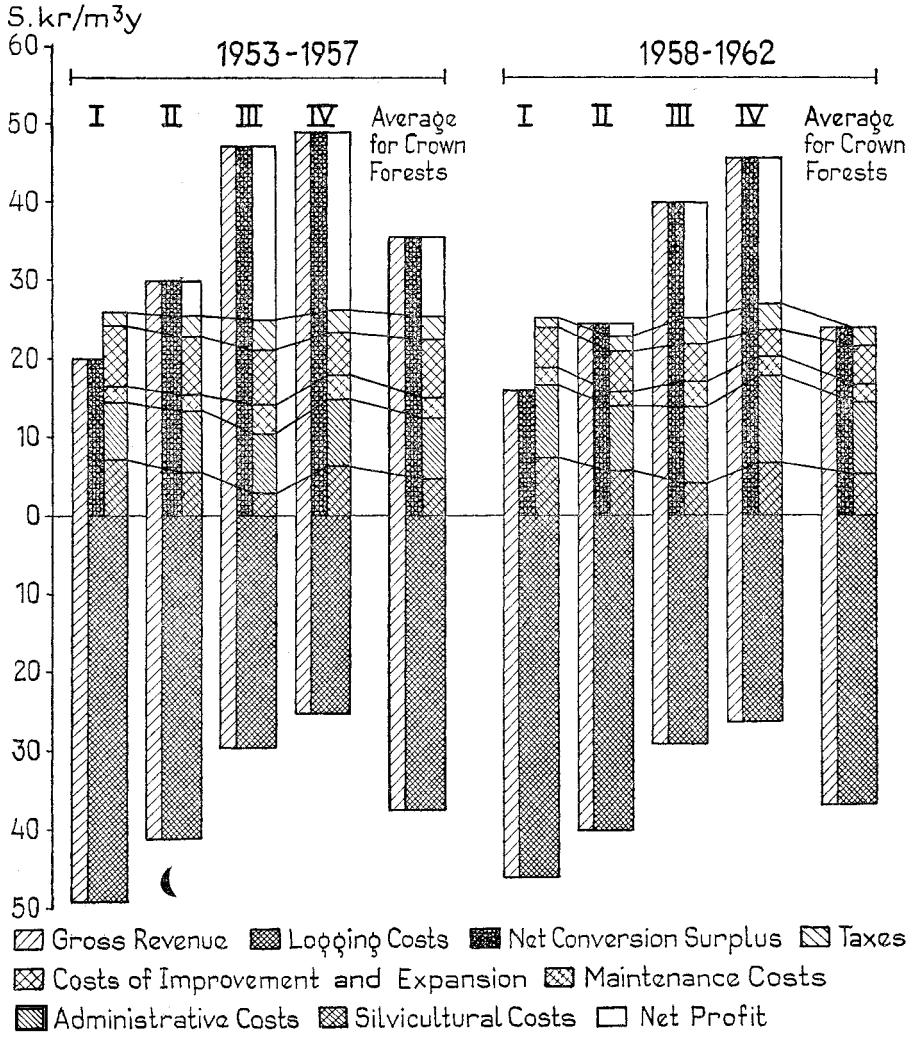


Fig. 2-12. Income, Expenditure and Net Profit, Annual Average in 1962 S.kr per Cubic Metre Timber Cut, by Regions, in Crown Forests of Sweden, for the Periods 1953-1957 and 1958-1962

**Table 2:62. Income and Expenditure, by Regions, in the Crown Forests of Sweden, Annual Average, 1953—1962**
*(in 1962 value of S.kr per ha forest land)*

| Period | 1953—1957 | | | | | 1958—1962 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Region | I | II | III | IV | Total | I | I | III | IV | Total |
| Area: *1,000 ha* ..... | 1,010 | 1,853 | 513 | 34 | 3,410 | 1,010 | 1,827 | 530 | 35 | 3,412 |
| 1. Gross revenue..... | 55.40 | 75.10 | 279.00 | 327.00 | 102.40 | 53.50 | 84.50 | 248.00 | 310.00 | 102.80 |
| 2. Logging costs ..... | 39.60 | 43.60 | 108.00 | 112.00 | 52.80 | 39.90 | 52.60 | 105.00 | 114.00 | 57.50 |
| 3. Net conversion surplus | 15.80 | 31.50 | 171.00 | 215.00 | 49.60 | 13.60 | 31.90 | 143.00 | 196.00 | 45.30 |
| 4. Silvicultural costs ... | 5.50 | 5.80 | 9.70 | 27.00 | 6.50 | 6.20 | 7.20 | 14.30 | 28.70 | 8.20 |
| 5. Administrative costs.. | 6.00 | 8.10 | 27.40 | 37.60 | 10.70 | 8.00 | 11.00 | 34.90 | 48.40 | 14.20 |
| 6. Maintenance costs ... | 1.50 | 2.10 | 13.70 | 13.00 | 3.80 | 1.80 | 2.20 | 11.60 | 10.50 | 3.60 |
| 7. Costs of improvement and expansion ..... | 6.30 | 7.90 | 25.60 | 24.20 | 10.20 | 4.40 | 6.70 | 16.90 | 15.00 | 7.70 |
| 8. Taxes ..... | 1.30 | 2.70 | 13.90 | 12.70 | 4.10 | 1.10 | 2.60 | 12.20 | 14.40 | 3.70 |
| 9. Total managing costs (4−8) ..... | 20.60 | 26.60 | 90.30 | 114.50 | 35.30 | 21.50 | 29.70 | 89.90 | 117.00 | 37.40 |
| 10. Total costs (2+9) .... | 60.20 | 70.20 | 198.30 | 226.50 | 88.10 | 61.40 | 82.30 | 194.90 | 231.00 | 94.90 |
| 11. Net profit ..... | −4.80 | 4.90 | 80.70 | 100.50 | 14.30 | −7.90 | 2.20 | 53.10 | 79.00 | 7.90 |

**Table 2:63. Cost—Revenue Coefficients, by Regions, in the Crown Forests of Sweden, Averages, 1953—1957 and 1958—1962**

| Period | 1953—1957 | | | | | 1958—1962 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Region | I | II | III | IV | Total | I | II | III | IV | Total |
| Gross revenue ..... | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 1. Logging ..... | 0.714 | 0.582 | 0.387 | 0.343 | 0.516 | 0.747 | 0.623 | 0.423 | 0.367 | 0.560 |
| 2. Silviculture ..... | 0.100 | 0.076 | 0.035 | 0.082 | 0.063 | 0.116 | 0.085 | 0.058 | 0.092 | 0.080 |
| 3. Administration ..... | 0.109 | 0.109 | 0.098 | 0.115 | 0.104 | 0.150 | 0.130 | 0.141 | 0.156 | 0.138 |
| 4. Maintenance of facilities ..... | 0.028 | 0.028 | 0.050 | 0.040 | 0.037 | 0.034 | 0.026 | 0.046 | 0.033 | 0.035 |
| 5. Improvement and expansion.... | 0.113 | 0.105 | 0.091 | 0.074 | 0.100 | 0.082 | 0.079 | 0.068 | 0.049 | 0.074 |
| 6. Taxes ..... | 0.023 | 0.037 | 0.050 | 0.039 | 0.040 | 0.019 | 0.029 | 0.049 | 0.046 | 0.036 |
| 7. Total managing expenditures (2−6) ..... | 0.373 | 0.355 | 0.324 | 0.350 | 0.344 | 0.401 | 0.349 | 0.362 | 0.376 | 0.363 |
| 8. Total expenditures for forestry operations ..... | 1.087 | 0.937 | 0.711 | 0.693 | 0.860 | 1.148 | 0.972 | 0.785 | 0.743 | 0.923 |

# Chapter 3

# AUSTRIA

# Austria

by

R. FRAUENDORFER

## 3.1 General Information about Forestry and Timber Industry

Primarily, the following information refers to the forest production, as the writer cannot assume responsibility for any details about the wood-processing industry beyond those based on the official statistics. For this reason the Austrian wood-processing industry will be dealt with only in a general way in this part.

### *3.1.1 Share of Forestry in the Gross National Product*

Austria's Gross National Product is compiled by the Austrian Institute for Economic Research (*Das Österreichische Institut für Wirtschaftsforschung*) in accordance with internationally agreed regulations. The publications of this Institute provide the basis for all data given here. It is relatively easy to extract the gross product of forestry from the agricultural sector, while this has proved to be very difficult as far as the net production value of forestry is concerned. For calculating the net production value of forestry, the Austrian Institute for Economic Research makes an officially approved deduction of 20 per cent from the Gross National Product. At present there is no more accurate basis for such a calculation, but it is anticipated that better data will be available in the foreseeable future.

Table 3:1 shows clearly that the gross product value of forestry, disregarding minor variations, has remained about the same (at least if assessed on the 1962 basis), while the Gross National Product is rising sharply owing to the constant and rapid expansion of industry and commerce. Thus, in terms of direct production value, the relative share accounted for by forest production is constantly falling, and forestry is all the time declining in importance within the framework of the economy. The reasons for this trend, which are evident in all industrial countries, are too well known to need detailed discussion here. As can be seen from the other tables, the changing exploitation of timber has had no important effect in any case. Any attempt to bring the share of forest production back to the higher level which it previously enjoyed would automatically result in a material loss of forests. Only by deliberate overcutting could Austrian sustained-yield forestry delay for a time the inevitable downward trend of its product value.

**Table 3:1. Share of Forestry to the Gross National Product of Austria, 1953—1962**

| | 1953 | 1954 | 1955 | 1956 | 1957 | Average 1953—1957 |
|---|---|---|---|---|---|---|
| I. Gross National Product ..... | | | | | | |
| a. million Sch. (current values) ... | 82,969 | 93,244 | 107,617 | 118,013 | 130,823 | 106,530 |
| b. million Sch. (1962 value) ..... | 112,920 | 122,610 | 136,210 | 143,170 | 151,610 | 133,300 |
| II. Gross Production Value of Forestry | | | | | | |
| a. million Sch. (current values) ... | 2,536 | 3,648 | 4,586 | 4,173 | 4,516 | 3,892 |
| III. Net Production Value of Forestry | | | | | | |
| a. million Sch. (current values).... | 2,029 | 2,918 | 3,669 | 3,338 | 3,853 | 3,161 |
| b. million Sch. (1962 value) ..... | 3,518 | 4,061 | 4,113 | 3,703 | 4,113 | 3,902 |
| IV. Share of Forestry to the Gross National Product | | | | | | |
| a. as *percentage* (current values) .. | *2.4* | *3.1* | *3.4* | *2.8* | *2.9* | *3.0* |
| b. as *percentage* (1962 value) ..... | *3.1* | *3.3* | *3.0* | *2.6* | *2.7* | *2.9* |

| | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—1962 |
|---|---|---|---|---|---|---|
| I. Gross National Product ..... | | | | | | |
| a. million Sch. (current values) ... | 136,670 | 143,320 | 161,290 | 177,910 | 186,940 | 161,230 |
| b. million Sch. (1962 value) ..... | 157,850 | 162,260 | 175,770 | 184,130 | 186,940 | 173,390 |
| II. Gross Production Value of Forestry | | | | | | |
| a. million Sch. (current values) ... | 4,117 | 4,120 | 4,102 | 4,878 | 4,502 | 4,340 |
| III. Net Production Value of Forestry.. | | | | | | |
| a. million Sch (current values) .... | 3,294 | 3,296 | 3,282 | 3,902 | 3,602 | 3,475 |
| b. million Sch. (1962 value) ..... | 3,856 | 4,016 | 3,714 | 3,811 | 3,602 | 3,800 |
| IV. Share of Forestry to the Gross National Product..... | | | | | | |
| a. as *percentage* (current values) .. | *2.4* | *2.3* | *2.0* | *2.2* | *1.9* | *2.2* |
| b. as *percentage* (1962 value) ..... | *2.4* | *2.5* | *2.1* | *2.1* | *1.9* | *2.2* |

A more comforting fact is that in recent years the annual cut has diminished and is continuously adapting itself, as far as possible, to the allowable cut on a sustained-yield basis. If because of this the importance of forestry in the Austrian economy has declined, then greater importance will begin to be attached to the non-market benefits of the Austrian forests. Owing to its extremely detached and mountainous nature, its relatively high density of population, and its position at the very centre of the highly industrialised and over-populated countries of Europe, Austria differs very markedly from other timber-exporting countries, such as Sweden, Canada or the U.S.S.R. Consequently, the Austrian forests must not be judged solely from the commercial point of view, but primarily as an indispensible factor for the livelihood of the total population. Welfare considerations, the preservation of the national culture, and the social functions of the forests, are placed increasingly to the fore, in contradistinction to the supplying of raw materials for industry. The safeguarding of the water supply, protection against avalanches, torrents, and soil erosion form an all-important task in forestry in a mountainous country. Without its excellent forests, Austria could fulfil only to a very limited extent its role as a holiday country for a large part of Europe—and this is a matter of prime importance for the economy of the country.

### *3.1.2 Timber Balance and External Trade in Forest Products*

Table 3:2 starts with 1955, when Austria once again became an independent state, as it has not been possible to establish definite figures for the earlier years. The calculations have been made by the Austrian Federal Timber Board, using the conversion factors established by the F.A.O. The increase in the consumption of timber has been so marked in Austria during the last ten years, that the supply of roundwood, and particularly that of pulpwood, could no longer be met to the full. Thus, since 1960, a marked rise in the amounts imported has become an established fact—and the rising trend is continuing. For the most part this timber is imported from Eastern Europe. A slight fall in the amount of timber exported is compensated for by a similarly noticeable rise in domestic consumption. The *per capita* consumption of timber has risen by some 25 per cent during the period in question. This can only be regarded as an adaptation of the economy to that of the highly industrialised western countries, though it lags far behind most of these states. One can certainly expect a further and substantial rise in domestic consumption in Austria.

Austrian exports show a development similar to that of the Gross National Product. Table 3:3 shows only a small increase in the export value of forest products, which in effect means a slight fall in the real value, as against a doubling of the total export value over the past ten years. Up to about 1955, the export of forest products accounted for nearly one-third of the total export value, and was thus the major export item, followed by iron and steel; but then came a rapid decline, and by 1962 the exports of forest products amounted to only 18 per cent of the total export value. However, these percentages are only relative, and have been brought about, in fact, by the great expansion in the export of industrial products. This table does not take into

**Table 3:2. Timber Balance of Austria, 1953—1962**

| Year | Production of roundwood | Imports | Exports | Consumption | |
|---|---|---|---|---|---|
| | | | | Total | Per capita (five-year average) |
| | *thousand cubic metres roundwood equivalent* | | | | *cubic metres* |
| 1955 | 11,893 | 480 | 7,580 | 4,793 | |
| 1956 | 10,586 | 290 | 8,380 | 2,496 | 0.55 |
| 1957 | 11,731 | 330 | 7,940 | 4,121 | |
| 1958 | 10,740 | 330 | 7,815 | 3,255 | |
| 1959 | 12,032 | 440 | 7,450 | 5,022 | |
| 1960 | 12,089 | 790 | 7,600 | 5,279 | 0.69 |
| 1961 | 11,623 | 945 | 6,980 | 5,588 | |
| 1962 | 11,132 | 851 | 7,020 | 4,963 | |

**Table 3:3. Austrian Exports of Forest Products, their Value and Percentage of Total Exports**

| Year | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| I. Value of Total Export of Goods (exclusive services and transfer payments) | | | | | | | | | | |
| a. Million Sch. (current values) | 13,187 | 15,851 | 18,476 | 23,413 | 26,547 | 25,035 | 26,387 | 30,196 | 31,994 | 33,095 |
| b. 1954=100 | 83 | 100 | 117 | 148 | 168 | 158 | 167 | 191 | 202 | 209 |
| II. Value of Exports of Forest Products | | | | | | | | | | |
| a. Million Sch. (current values) | 4,168 | 5,346 | 6,071 | 6,560 | 6,256 | 5,852 | 6,155 | 6,377 | 6,283 | 6,007 |
| b. 1954=100 | 79 | 100 | 115 | 124 | 118 | 110 | 116 | 120 | 119 | 113 |
| c. As *percentage* of total export value | *32* | *34* | *33* | *28* | *24* | *23* | *23* | *21* | *20* | *18* |
| III. Break-down of Exports of Forest Products, % | | | | | | | | | | |
| a. Industrial roundwood and construction timber | *5.9* | *4.7* | *3.4* | *5.1* | *4.0* | *5.1* | *4.9* | *4.1* | *4.2* | *4.0* |
| b. Sawnwood (coniferous and deciduous) | *54.7* | *54.9* | *55.5* | *53.6* | *53.9* | *52.9* | *50.3* | *51.9* | *52.2* | *52.9* |
| c. Veneer | *0.6* | *0.6* | *0.4* | *0.9* | *1.1* | *0.9* | *1.2* | *1.1* | *1.4* | *1.1* |
| d. Plywood | *0.1* | *0.5* | *0.4* | *0.5* | *0.6* | *0.6* | *0.6* | *0.5* | *0.4* | *0.3* |
| e. Particle board and fibreboard | *1.4* | *0.9* | *1.2* | *1.0* | *0.9* | *0.6* | *0.7* | *0.8* | *0.7* | *1.1* |
| f. Wood pulp | *9.2* | *10.0* | *10.5* | *10.4* | *11.1* | *11.4* | *10.8* | *10.5* | *9.8* | *8.3* |
| g. Paper and paperboard | *19.7* | *22.0* | *22.7* | *22.3* | *23.8* | *23.6* | *23.5* | *23.9* | *24.2* | *24.1* |
| h. Other wood and paper products | *8.4* | *6.4* | *5.9* | *6.2* | *4.6* | *4.9* | *8.0* | *7.2* | *7.1* | *8.0* |
| Total | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* |

account the value of services, and especially of tourism, which to-day accounts for more than twice the earnings of Austrian timber exports. Despite this, the forest industry occupies an important position in the export trade of Austria. The composition of the various wood products has changed only very slightly. A relatively great increase in veneers, fibreboard and paper is noticeable, as compared with a slight decline in the overwhelming share of sawnwood.

### *3.1.3 Structure of the Timber Market and Price of Forest Products*

A basic feature of the Austrian timber market is that the greater part of the total production of all wood products is exported, and that there are legal restrictions on the export of unprocessed timber. This means that the prices of roundwood are influenced, on the one hand, by the world market prices of forest products (and especially sawnwood, paper and pulp), which, as a consequence of the ban on the export of roundwood, can be passed on directly and in full to the wood-processing industries. On the other hand, as a consequence of the excess capacity of industry and especially that of the sawmills, a certain amount of competition occurs in the home market, thus preventing the full effect of a buyer's oligopsony.

In Austria there are about 6,600 sawmills, of which only about 2,500 are in commercial operation the year round. The excessive number of sawmills (the capacities of which, at any given time, are too limited to be economic) is a result partly of the mountainous nature of the country with its consequent varied transport conditions, and of the legal regulations which ensure the

supply of domestic timber by prohibiting its export. In consequence of a faulty assessment of the development possibilities, and on the basis of supply, the sawmilling capacity over the last ten years has been increased until it is almost double the quantity of sawlogs annually available in Austria. Of the total quantity of sawnwood, about two-thirds is exported, and one-third used at home; on average, 85 per cent of the exported amount is taken by Italy and Germany; in other words, Austrian timber exports go almost entirely to the European Common Market. About 28,000 persons are employed in Austrian sawmills.

Similarly, the Austrian pulp and paper industry is considerably decentralised; it consists of more than 100 mills, including many very small pulpmills. For the most part, the pulp is produced by the sulphite process. The yearly consumption of this industry amounts to some three million cubic metres of pulpwood, of which an ever-increasing amount is imported, and there is an increasing use of wood-chips and wood residues. About 60 per cent of the paper produced is exported, and in terms of value, approximately 60 per cent of the total pulp and paper exports is taken by the European Common Market, while six per cent goes to E.F.T.A. countries. Table 3:4 gives an account for this branch of industry. In the fibreboard industry, there has been a very rapid development, and this industry is now taking ever-increasing amounts of less valuable wood assortments. About 22,000 persons are employed in the Austrian pulp, paper and fibreboard industry.

From what has been said above, it can be seen that the export prices for coniferous roundwood of all kinds are of no great importance for the Austrian

**Table 3:4. Production and Sales of Austrian Paper and Pulp Industry**
(*metric tons*)

| | Paper | | | | Chemical Pulp | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Production | Imports | Exports | Austrian consumption | Production | Imports | Exports | Industrial consumption |
| 1937 | 232,100 | 2,723 | 117,220 | 97,940 | 267,540 | 40,540 | 145,000 | 106,541 |
| 1946 | 94,805 | not available | 8,864 | 89,556 | 39,804 | not available | 5,755 | 43,503 |
| 1950 | 238,855 | 5,351 | 112,852 | 126,734 | 250,037 | 6,738 | 98,109 | 128,342 |
| 1954 | 365,191 | 3,050 | 210,178 | 158,072 | 371,572 | 12,650 | 133,097 | 207,534 |
| 1958 | 428,276 | 9,373 | 243,845 | 185,808 | 428,416 | 20,131 | 171,444 | 229,794 |
| | Mechanical Pulp | | | | Paperboard | | | |
| Year | Production | Imports | Exports | Industrial consumption | Production | Imports | Exports | Industrial consumption |
| 1937 | 96,765 | — | 18,788 | 77,980 | 64,100 | 1,021 | 32,690 | 31,410 |
| 1946 | 32,255 | not available | 417 | 37,990 | 24,642 | not available | 3,537 | 24,315 |
| 1950 | 93,338 | — | 5,810 | 88,108 | 59,035 | 115 | 12,627 | 46,906 |
| 1954 | 138,403 | 424 | 4,488 | 129,123 | 77,451 | 655 | 26,703 | 53,761 |
| 1958 | 153,173 | — | 6,531 | 144,269 | 91,252 | 3,222 | 24,942 | 61,675 |

**Table 3:5. Export Prices for Forest Products**
*(Schillings per unit free Austrian Frontier)*

| Designation | | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 |
|---|---|---|---|---|---|---|---|---|
| Coniferous roundwood ..... | Sch./cu.m | 508 | 477 | 439 | 441 | 561 | 571 | 564 |
| Telegraph poles and masts... | Sch./cu.m | 752 | 791 | 779 | 788 | 829 | 906 | 924 |
| Pit props ..... | Sch./cu.m | 461 | 568 | 412 | 399 | 454 | 448 | 398 |
| Deciduous roundwood ..... | Sch./cu.m | 454 | 455 | 426 | 441 | 469 | 497 | 517 |
| Coniferous sawnwood ..... | Sch./cu.m | 1,013 | 973 | 937 | 959 | 1,056 | 1,067 | 1,045 |
| Deciduous sawnwood ..... | Sch./cu.m | 1,178 | 1,191 | 1,157 | 1,212 | 1,241 | 1,261 | 1,255 |
| Mechanical pulp..... | Sch./ton | 2,449 | 2,065 | 1,705 | 1,919 | 2,058 | 2,032 | 2,013 |
| Chemical pulp..... | Sch./ton | 3,688 | 3,396 | 3,277 | 3,339 | 3,476 | 3,319 | 3,278 |
| Newsprint ..... | Sch./ton | 3,955 | 3,538 | 3,404 | 3,393 | 3,519 | 3,496 | 3,489 |
| Fibreboard (compressed).... | Sch./ton | | 3,567 | 2,753 | 3,093 | 2,612 | 3,067 | 3,249 |
| Fibreboard (non-compressed) | Sch./ton | | 2,801 | 2,722 | 2,761 | 2,877 | 2,893 | 2,766 |

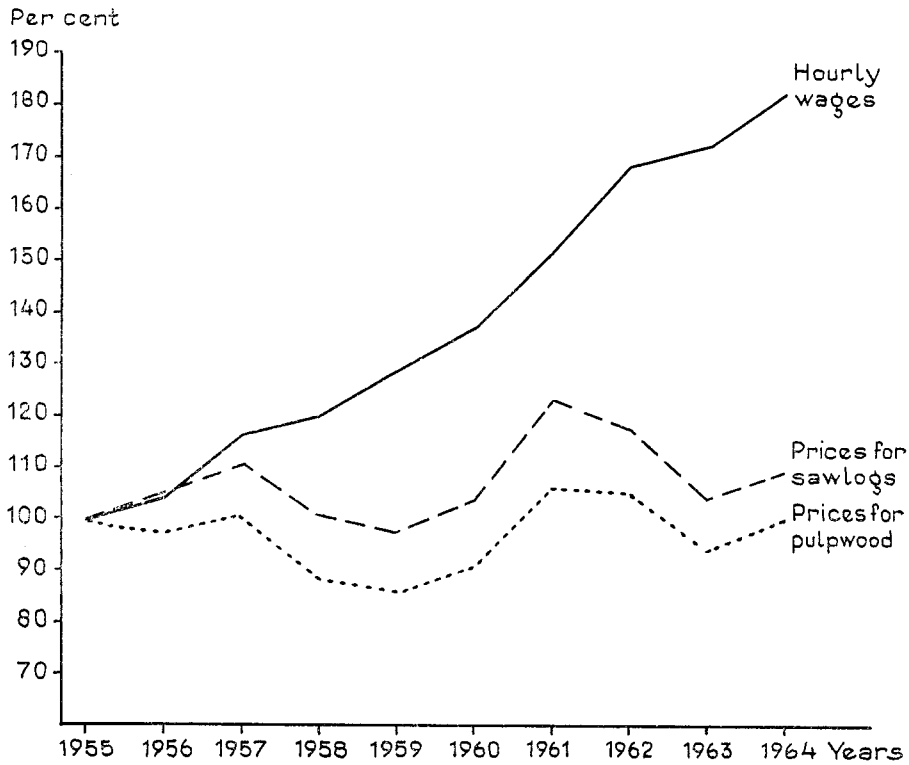


Fig. 3-1. Development of Roundwood Prices and Hourly Labour Costs in Austrian Forestry

forest industry, as the major part of the timber produced must be sold in Austria. The export prices given in Table 3:5 are therefore compared in Figure 3—1 with the trend in home prices (free delivery to roadside) for the two most important types of unprocessed timber (spruce sawlogs, type 2 b, and pulpwood). From this graph it can be seen not only how strongly the world market prices determine the Austrian price via the wood-processing industry but also the even more marked effect on pulpwood of spruce in relation to sawlogs. This is because of the tight cartellisation of the paper industry, which does not allow any competition in the home market.

### *3.1.4 Structure of the Labour Market and Wage Trends*

In Austria there has been no uniform development in the forest workers' profession. While the social status of forest workers was relatively high quite early in those areas traditionally associated with the mining of salt, silver, lead, iron-ore and coal, there were in other regions only day-labourers, who worked in the forests as a sideline. The training of forest workers has been regulated only recently, particularly by the 1954 Vocational Training Act (*Berufsausbildungsgesetz*). Social legislation for forest workers came about much later than that for other vocational groups, and full equality was not attained before 1956. The migration of workers from agriculture and forestry to the centres of industry is still continuing. In recent years there has even been a marked shortage of female labour, which has been particularly noticeable in silvicultural work. The new intake of forest workers is insufficient. Thus of the 5,000 workers in Austrian Federal forests, only 130 are under 20 years of age, 820 in the age group 20 to 30 years, while 950 are over 55 years of age. Consequently, there will be considerably greater difficulties in the labour market in the next few years than there have been up to now. To-day, this development cannot only be said to be a result of the higher wages in industry, but also of the desire to enjoy urban life. People are moving into economically progressive regions, where the standard of living is higher. The number of forest workers (i.e. only those engaged in forest enterprises, omitting farmers working in their own woodland), which averaged some 25,000 persons, decreased by more than 10 per cent during the period in question.

By and large, it has been possible up to now to counteract this loss of labour, by rationalisation and mechanisation measures. Especially important has been the introduction of one-man and two-men working teams in forestry work, compared with the groups of up to ten men which were previously necessary in mountain districts; also, there has been the general introduction of motor saws. However, a more extensive use of large machines for removing bark, skidding, etc., would be greatly limited in Austria, owing to the mountainous nature of the country and the type of forest ownership (250,000 owners

with, on average, only 13 hectares of forest land apiece). In the future, the improvement of the organisation of the work will probably, therefore, be of much greater importance than mechanisation.

The trend in average wages, which can be seen in Table 3:6, has been shown against the timber prices in Figure 3—1. The marked widening of the gap between the prices and costs shown in Figure 3—1 has been absorbed to date by the forest enterprises through a heavy reduction of the profit margin. In most cases, the wages actually paid are considerably higher than the wage costs given in Table 3:6. This is a consequence of the strained labour market, and differs from place to place, depending on the distances from industrial centres.

Because of the very advanced social legislation in Austria, the wages of the forest workers have to provide for a very large contribution to the social welfare programme provided by law. The following table gives an indication of the conditions in 1962 in large privately owned forests. The variations in the amount of the contributions, which can be seen here, can be traced back to various causes. In addition to the increasing age of the forest workers in the individual enterprises, the natural conditions in the various production regions also have a marked effect. In the main, the lowest contribution amounts occur in Production Regions I c and II b, and the highest in Region II a. The table does not take into account direct pension allowances by the management to the workers. The cost of social welfare contributions to industry is constantly increasing. By 1965 this cost might have risen to over 80 per cent of the wages.

**Table 3:6. Earnings of a Forest Worker (married, two children, with 6—15 years of service) in Private Forests**

| Year | Hours worked per year[a] | Basic Wage[b] | | | Fringe Benefits | | | Wage costs *Sch. per hour* |
|---|---|---|---|---|---|---|---|---|
| | | Hourly wage *Sch.* | Piece-work bonus *%* | Basic wage (piece-work) *Sch. per hour* | Accommodation allowance | Christmas bonus | Paid leave | |
| | | | | | *Sch. per year* | | | |
| 1950 | 2,168 | 4.62 | *25* | 5.78 | 120 | 295.68 | — | 6.13 |
| 1951 | 2,168 | 5.32 | *25* | 6.65 | 120 | 340.48 | — | 7.05 |
| 1952 | 2,168 | 5.60 | *25* | 6.65 | 120 | 358.40 | — | 7.21 |
| 1956 | 2,168 | 6.80 | *25* | 7.30 | 120 | 598.40 | — | 8.35 |
| 1957 | 2,168 | 7.15 | *15* | 8.22 | 120 | 743.60 | 343.20 | 9.31 |
| 1958 | 2,168 | 7.50 | *15* | 8.34 | 120 | 780.00 | 390.00 | 9.61 |
| 1959 | 2,012 | 8.00 | *15* | 8.78 | 120 | 856.00 | 392.00 | 10.31 |
| 1960 | 2,012 | 8.50 | *15* | 9.00 | 120 | 1,249.50 | 425.00 | 10.93 |
| 1961 | 2,012 | 9.30 | *15* | 9.80 | 120 | 1,367.10 | 883.50 | 12.13 |
| 1962 | 2,012 | 10.10 | — | 10.60 | 120 | 1,575.60 | 1,414.00 | 13.43 |
| 1963 | 2,012 | 10.10 | — | 10.60 | 120 | 1,929.10 | 1,767.50 | 13.77 |
| 1964 | 2,012 | 10.60 | — | 11.10 | 120 | 2,183.60 | 2,014.00 | 14.60 |

*a.* Actual working time=48-hour week less time not at work, i.e. 13 official holidays with pay.
18 days leave with pay.
10 days leave with pay.

*b.* 60% piece work and 40% shift-work.

Average Social Charges of Forest Enterprises in 1962
(*percentage of wages*)

| | | average | from—to |
|---|---|---|---|
| Extra allowances (paid directly to workers) | = Travelling allowance<br>Hard-living allowance | 3.8 | 2.2— 7.8 |
| Non-wage payments (paid directly to workers) | = Accommodation allowance<br>Official holidays with pay<br>Leave with pay<br>Sick pay | 27.7 | 16.8—35.3 |
| Official social costs paid to the State | = Old age pension<br>National Health Insurance<br>Accident insurance<br>Housing subsidies<br>Children's allowances | 35.7 | 29.8—41.8 |
| Payments in kind (made directly to workers) | = Workmen's dwellings<br>Fuel | 4.2 | 0.5— 7.2 |
| Voluntary social payments (made directly to workers) | | 1.9 | 1.5— 3.2 |
| Total amount as percentage of wages | | 73.3 | 60.8—77.5 |

### *3.1.5 Basis of Timber Production and Timber Cut*

After Finland and Sweden, Austria is the most densely forested country in Europe, with about 40 per cent of its area covered by forests. The percentage of forest land varies between 16 and 54 per cent for different provinces. Table 3:7 shows the distribution of forest land between the different provinces.

The characteristic feature of the structure of forest ownership in Austria (Table 3:8) is the small percentage of State forests as against farmer-owned forests and large privately owned forests. In fact, more than half of Austria's forests are owned by some 250,000 farmers, who in addition by forest rights are entitled to about 16 per cent of the yield of the Austrian Federal forests. This distribution of ownership, together with the mountainous nature of the country and the consequent risks involved, requires special attention by the authorities responsible for forest policy. For a very large part of the Austrian farmers the forest (besides animal husbandry) is the most important, and often the only source of income. In recent decades this has involved the grave risk of excessive felling of the forests, because of the difficulty of adapting mountain farming to modern developments in agriculture.

It can be seen from Table 3:9 that there are in Austria no areas of any importance, besides the High forests, worked by other silvicultural systems, and that about five per cent of the total forest area consists of unproductive stands of mountain pine. The large amount of High forests can be regarded

**Table 3:7. Forest Area by Provinces**

| Province | Forest area *hectares* | Forests as *percentage* of total land area |
|---|---|---|
| Burgenland | 103,342 | *26* |
| Carinthia | 486,326 | *51* |
| Lower Austria | 686,211 | *36* |
| Upper Austria | 411,745 | *34* |
| Salzburg | 283,728 | *40* |
| Steiermark | 876,835 | *54* |
| Tirol | 418,543 | *33* |
| Vorarlberg | 79,238 | *30* |
| Vienna | 5,944 | *16* |
| Austria | 3,351,912 | *40* |

**Table 3:8. Forest Ownership of Austria**

| *Ownership category* | *Hectares* | *%* |
|---|---|---|
| State forests | 514,892 | *15.4* |
| Provincial forests | 43,942 | *1.3* |
| Municipal forests | 205,419 | *6.1* |
| Institutional forests | 15,620 | *0.4* |
| Ecclesiastical forests | 133,438 | *4.0* |
| Co-operative forests | 193,048 | *5.8* |
| Private forests under 50 ha | 1,367,880 | *40.8* |
| Private forests over 50 ha | 877,673 | *26.2* |
| Total | 3,351,912 | *100.0* |

**Table 3:9. a. Forest Area by Silvicultural Systems**
(*hectares*)

| | Productive area | Unproductive area |
|---|---|---|
| High forests | 3,057,324 | 174,261 |
| Coppice-with-standards | 33,967 | — |
| Coppice | 50,782 | — |
| Bottomland forests | 34,878 | 700 |
| | 3,176,951 | 174,961 |

**b. Productive Area of High Forests by Main Functions**

| | *ha* | *%* |
|---|---|---|
| Commercial forests | 2,626,240 | *86.0* |
| Semi-commercial forests | 125,344 | *4.1* |
| Protection forests | 303,740 | *9.9* |
| | 3,057,324 | *100.0* |

**Table 3:10. Percentage Distribution of Age Classes in Productive High Forests**

| Years | 1—20 | 21—40 | 41—60 | 61—80 | 81—100 | 101+ |
|---|---|---|---|---|---|---|
| Altogether | 13 | 17 | 21 | 17 | 14 | 18 |
| State forests | 12 | 12 | 12 | 13 | 13 | 38 |
| Private forests under 50 ha | 13 | 20 | 26 | 19 | 13 | 9 |
| Private forests over 50 ha | 15 | 16 | 20 | 18 | 16 | 15 |

as the most important advantage of Austrian forestry. Of these High forest areas, about 14 per cent can be worked only by taking special precautions. Above all, there is a total ban on clear-cutting in these protection forests.

The age-class distribution of the even-aged forests (Table 3:10) is not unfavourable, on the whole, and conforms with a rotation of approximately 120 years. The actual rotation is between 80 and 180 years, depending on the production region and the species. However, with the individual categories of owners there are large deviations from the average. The proportion of overmature trees is far above the average in the Austrian Federal forests; this can be accounted for partly by the lengthy rotation in these mountain forests, and partly by their unfavourable accessibility. In farm forests (privately owned forests of less than 50 hectares), older stands are lacking to a great extent. Here, the age-class distribution approaches more and more that of the 80-year working group. On the other hand, the large privately owned forests show a very even age composition, which can be regarded as a result of a purposeful and responsible management.

It is the composition by tree species of the forests (Table 3:11) which is the important consideration in forestry within the framework of the Austrian economy; this is particularly important when it comes to exports. Conifers cover five-sixths of the forested area, and thus form the basis for forest utilisation which could be regarded profitable to-day. The importance of the deciduous species is markedly declining, and the operation of forest enterprises, where deciduous species are predominant, cannot be regarded as a profitable undertaking under prevailing conditions. In the near future, and especially in the neighbourhood of the larger settled areas, there will be a far-reaching revision of management objectives to the favour of welfare and recreational forests. It will be an important task for forest policy, and for the economic policy as a whole, to bring about this revision without causing hardship to the forest owners.

**Table 3:11. Composition of Tree Species in Austria**
*(as percentage of total forested area)*

| Species | % | |
|---|---|---|
| Spruce | *55.8* | |
| Silver fir | *4.6* | |
| Larch | *8.0* | |
| White pine | *13.9* | *84.1* |
| Austrian pine | *1.2* | |
| Stone pine (*Pinus cembra*) | *0.6* | |
| Beech | *9.2* | |
| Oak | *1.2* | *15.9* |
| Other deciduous trees | *5.5* | |
| Total | *100.0* | |

Table 3:12 contains the main data concerning growing-stock and increment for the most important groups of the Austrian forests. The extent of the allowable cut is also shown in this table; these figures can be taken as a guide for forest policy, and are derived from very conservative assessments. Therefore the timber actually cut, which is given in Table 3:13 for comparison purposes, must not be regarded as over-exploitation. Despite this, one can mention with satisfaction that the unfavourable economic trend in agriculture in recent years has not led to a general rise of the excessive fellings, indeed, there has been a slight reduction in actual removals.

According to all assumptions, the Austrian forestry will be run on a sustained-yield basis, and will not allow itself to be carried away with experiments. It is hoped that this most welcome trend will be given increasing support by appropriate promotional measures by the State.

**Table 3:12. Basic Sources of Production in Forests**
(*cubic metres standing timber, $m^3f$*)

| | Growing stock $m^3f$ | | Mean increment (HDZ) $m^3f$ | | Allowable cut $m^3f$ | |
|---|---|---|---|---|---|---|
| | Total | per *ha* | Total | per *ha* | Total | per *ha* |
| a. All Forests | | | | | | |
| *Silvicultural systems* | | | | | | |
| High forests | 471,185,690 | 154 | 8,424,498 | 2.9 | 8,119,380 | 2.7 |
| Coppice-with-standards | 2,520,790 | 74 | 84,602 | 2.5 | 120,640 | 3.6 |
| Coppice | 2,030,170 | 40 | 120,053 | 2.4 | 120,720 | 2.4 |
| Bottomland forests | 2,861,660 | 82 | 165,487 | 4.7 | 162,980 | 4.7 |
| Total | 478,598,310 | 151 | 8,794,640 | 2.9 | 8,523,720 | 2.7 |
| b. High Forests only | | | | | | |
| *Ownership* | | | | | | |
| State forests | 95,287,800 | 202 | 1,291,320 | 3.4 | 1,522,460 | 3.2 |
| Municipal and co-operative forests | 48,923,850 | 159 | 722,141 | 2.4 | 3,400,110 | 2.7 |
| Private forests over 50 ha | 153,644,030 | 158 | 2,898,148 | 3.1 | | |
| Private forests under 50 ha | 173,330,010 | 133 | 3,512,889 | 2.7 | 3,196,810 | 2.5 |
| *Main functions (objectives)* | | | | | | |
| Commercial forests | 420,121,270 | 160 | 7,943,707 | 3.0 | 7,771,630 | 3.0 |
| Semi-commercial forests | 10,029,630 | 80 | 178,512 | 1.4 | 81,980 | 0.7 |
| Protection forests | 41,034,790 | 135 | 302,279 | 1.7 | 265,770 | 0.9 |
| Total | 471,185,690 | 154 | 8,424,498 | 2.9 | 8,119,380 | 2.7 |

**Table 3:13. Actual Annual Cut in Austria**
(*cubic metres felled timber, $m^3y$*)

| Year | Industrial roundwood | | | Fuelwood | | | Felled amount | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coniferous | Deciduous | Total | Coniferous | Deciduous | Total | Coniferous | Deciduous | Total Cut |
| 1958 | 7,003,188 | 517,859 | 7,521,047 | 1,629,857 | 1,089,245 | 2,719,102 | 8,633,045 | 1,607,104 | 10,240,149 |
| 1959 | 7,711,722 | 574,478 | 8,286,200 | 1,616,683 | 1,089,852 | 2,706,535 | 9,328,405 | 1,664,330 | 10,992,735 |
| 1960 | 6,977,980 | 585,893 | 7,563,873 | 1,437,606 | 1,014,446 | 2,452,052 | 8,415,586 | 1,600,339 | 10,015,925 |
| 1961 | 7,047,364 | 635,763 | 7,683,127 | 1,334,304 | 1,052,963 | 2,387,267 | 8,381,668 | 1,688,726 | 10,070,394 |
| 1962 | 6,804,556 | 567,988 | 7,372,544 | 1,247,395 | 1,247,395 | 2,265,518 | 8,051,951 | 1,586,111 | 9,638,062 |

*3.1.6 Forest Production Regions of Austria*

Up to now there have not been available any findings from detailed investigations of how Austria should be divided up into forest production regions with regard to the factors essentially affecting costs. It is true that the forest areas have already been thoroughly surveyed on the basis of tree species, and Austria has been divided up into price zones as a basis for the uniform assessment of forest property. It is only to some extent that reference can be made to these two divisions for the purpose of drawing up production regions. The same applies to the extant regional division of Austria into agricultural production regions. The method used here for dividing Austria into production regions is based primarily on a combination of the forest areas, which has a considerable effect on productivity, and on the transport conditions, which to a considerable extent determine the variable costs of forestry operations.

The Austrian forest inventory for 1952-1955 provides usable data about the forest conditions in these production regions.

| Production Region | Productive forest area 1,000 ha | Growing stock $m^3f/ha$ | Average growth $m^3y^*/ha$ | Allowable cut $m^3y^*/ha$ |
|---|---|---|---|---|
| I a | 291 | 160 | 3.4 | 3.2 |
| b | 142 | 176 | 4.5 | 3.9 |
| c | 246 | 123 | 2.9 | 2.5 |
| d | 766 | 157 | 3.0 | 2.7 |
| II a | 809 | 146 | 2.4 | 2.3 |
| b | 803 | 163 | 2.6 | 2.6 |
| All Austria | 3,057 | 154 | 2.84 | 2.66 |

*without bark

The data concerning growing stock and growth, as well as the determination of the allowable cut, have been derived from the forest assessment on a stand basis.

The conversion from cubic metres of standing timber ($m^3f$) to cubic metres of felled timber without bark ($m^3y$) has been carried out on the basis of the varied composition of tree species, with a subsequent percentage reduction for bark, logging residues, etc.

| Production Region | Per cent |
|---|---|
| I a | 15 |
| b | 10 |
| c | 15 |
| d | 15 |
| II a | 20 |
| b | 25 |

PRODUCTION REGION I—Geographical Extent:

a. The hill and mountain country north of the River Danube. Primary rock. Predominantly spruce with strong local admixture of Scots pine, fir and beech.
b. The foothills of the Alps. Plains and hill country. Alluvial and diluvial base. Spruce, Scots pine, various deciduous trees in different admixture.
c. Eastern Austria with its warm summers. Plains and hill country. Vineyards are characteristic of this area. Scots pine and deciduous trees predominate. Some areas with coppice and coppice-with-standards.
d. The northern and eastern slopes of the Alps. Sub-alpine nature. Sandstone, greywacke, etc. Spruce, fir, beech in mixed stands. Partly also pure deciduous forests, "Vienna Woods" (*Wienerwald*).

PRODUCTION REGION II—Geographical Extent:

a. The central Alps. Primary rock. Area of spruce forests and mixed forests of spruce and larch. Locally also stone-pine forests.
b. The northern and southern limestone Alps. Area of mixed forests of spruce, fir, larch, beech with spruce predominating.

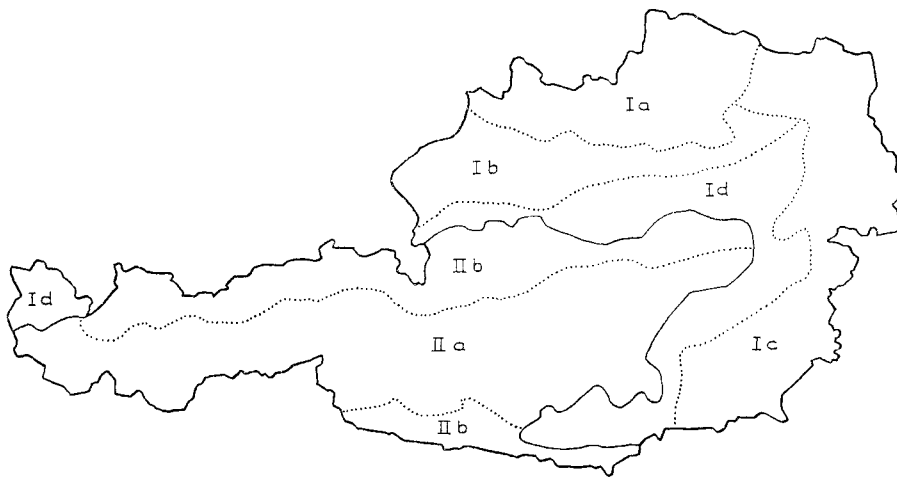


Fig. 3-2. Forest Production Regions in Austria

### *3.1.7 Forest Price Zones of Austria*

The price zones give the revenues, in western and eastern Austria, which are determined by the export position (mainly going to the west and south) and the pure costs of transport (railway rates). On the other hand, the location of the Austrian sawmills and pulpmills create local price differences at the most, but there is no definite formation of zones. The price differences are considerable. One can expect that the price for coniferous sawlogs will drop

by about a quarter (approx. 130 Sch. on average) from the Tirol in the west to Burgenland in the extreme east of Austria. The situation is intensified by the fact that there has been no export of timber for the last twenty years to Hungary, which was a natural timber market for Austria. Price conditions cannot be used as a basis for dividing up the production regions, because the price zones run more or less north-south, while the production regions run east-west.

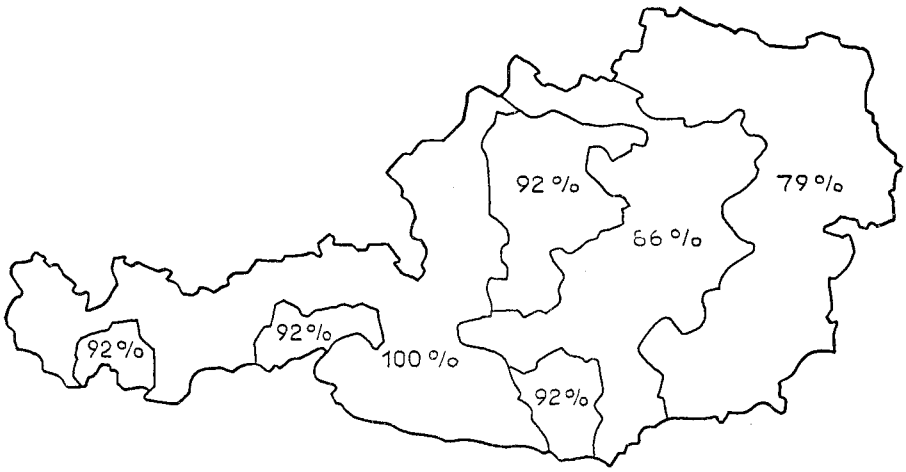


Fig. 3-3. Price Regions in Austrian Forestry

### 3.2 Costs and Revenue in Forest Enterprises on the Basis of Annual Reports

Federal forests in Austria play a relatively limited part in the total forest economy, as can be seen from Table 3:8. But despite this, they come very much to the fore in this survey because it was possible to obtain detailed results only in the case of Federal forests, and to make comparisons on the basis of the financial year. Although the important privately owned forests were referred to, the total of 50 or so comparison units proved to be insufficient to give a representative result for the separate financial years. These units are not distributed evenly throughout the separate production regions and price zones, and only in the case of a very few was it possible to follow the results for all five years. Despite this, it was actually the book-keeping records of these large privately owned forests which were used to construct the model appearing in Section 3.3, as they gave a more accurate picture of the working conditions of the Austrian forest economy than the Federal forests themselves. No definite accounting records are available for the small privately owned forests (farm forests) which account for almost half of the forests of Austria. These were taken into account on a purely arbitrary basis when constructing the model.

### *3.2.1 Federal Forests*

Regarding the Austrian public forests, the following general data should be kept in mind:

During the period under survey, the Austrian Federal forests covered on average 482,000 hectares of forest land, of which almost 22 per cent consisted of protection forests. This latter figure is markedly different from the 10 per cent for the overall protection forest area in Austria. Consequently, the Federal forests are producing under conditions which are on average unfavourable when compared with the rest of the Austrian forest economy. Accordingly, the gross revenue per cubic metre of roundwood removals is less than the Austrian average. It was not possible to determine the share of the cut in the protection forests in the total removals; in any case it was considerably less than that which would correspond to the area of this type of forest. The total allowable cut varied in the different financial years between 1.55 and 1.62 million cubic metres, and averaged 1.58 million. There is a rising trend in the amount of allowable cut, especially as a result of the increasingly improving accessibility and the more effective methods of inventory and forest management. More than 15 per cent of the total cutting volume can be attributed to the timber exploitation rights of the farming population. This amount of timber is freely disposed of on the stump. Furthermore, there is the heavy burden resulting from the rights to use litter and forests as a pasture. Regard has been paid to this unique feature of the Austrian Federal forests as the results of the activity are not only compiled according to the actual accounting records but also takes into account the effect of the obligations on the forest properties and the allowable cut.

**Table 3:14. Income and Expenditure in Austrian Federal Forests, 1958—1962**
*(in 1962 value of Sch. per m³y timber cut, without bark)*
Based on actual accounting records

| Financial year | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—1962 |
|---|---|---|---|---|---|---|
| 1. Gross revenue | 423 | 267 | 380 | 375 | 396 | 364 |
| 2. Logging costs | 152 | 123 | 141 | 131 | 140 | 136 |
| 3. Net conversion surplus | 271 | 144 | 239 | 244 | 256 | 228 |
| 4. Silvicultural costs | 18 | 13 | 14 | 15 | 15 | 15 |
| 5. Administrative costs | 73 | 54 | 66 | 66 | 72 | 66 |
| 6. Maintenance costs | 36 | 21 | 31 | 31 | 35 | 30 |
| 7. Costs for improvement and expansion | 32 | 24 | 35 | 27 | 50 | 34 |
| 8. Taxes | 34 | 26 | 25 | 24 | 29 | 27 |
| 9. Total managing (fixed) costs (4—8) | 193 | 138 | 171 | 163 | 201 | 172 |
| 10. Total costs (2+9) | 345 | 261 | 312 | 294 | 341 | 308 |
| 11. Net profit (1—10) | 78 | 6 | 68 | 81 | 55 | 56 |

The total cut (including obligations on the forest properties) averaged per financial year 1.67 million cubic metres, and thus exceeded the allowable cut by something more than five per cent. Primarily, this can be attributed to the exceedingly high amount of damage caused by snow and storms in 1958-1959, which has not yet been made up to the full. These undesirable large fellings also cause marked distortions of the operational results for 1958, and especially 1959. For this reason, too, some adjustment to the calculated operational results seemed to be necessary. At the end of the year, the average timber stock ready for sale, amounted to some 40 per cent of the annual cutting volume.

**Table 3:15. Income and Expenditure in Austrian Federal Forests, 1958—1962**
*(in 1962 value of Sch. per ha productive forest land)*
Based on actual accounting records

| Financial year | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—1962 |
|---|---|---|---|---|---|---|
| 1. Gross revenue | 1,106 | 932 | 1,116 | 1,098 | 1,130 | 1,081 |
| 2. Logging costs | 397 | 430 | 414 | 384 | 400 | 406 |
| 3. Net conversion surplus | 709 | 502 | 702 | 714 | 730 | 675 |
| 4. Silvicultural costs | 49 | 44 | 41 | 43 | 44 | 44 |
| 5. Administrative costs | 192 | 187 | 195 | 193 | 204 | 195 |
| 6. Maintenance costs | 94 | 75 | 92 | 89 | 99 | 90 |
| 7. Costs for improvement and expansion | 85 | 84 | 102 | 81 | 143 | 100 |
| 8. Taxes | 89 | 90 | 73 | 69 | 82 | 81 |
| 9. Total managing costs (4—8) | 509 | 480 | 503 | 475 | 572 | 510 |
| 10. Total costs (2+9) | 906 | 910 | 917 | 859 | 972 | 916 |
| 11. Net profit (1−10) | 200 | 22 | 199 | 139 | 158 | 165 |

Management of Austrian Federal forests is closely tied up with the national budget, and, therefore, the costs involved in State forestry operations are not the same as the average in the Austrian forestry. The uniform transfer of budgetary means to an enterprise leads automatically to a constant limitation of all unavoidable costs. The ratios for the years 1958-1962 show almost complete agreement for the fixed operational expenditure for the years concerned, while the condition of the forests required a considerable increase of expenditures for silvicultural measures, maintenance and improvement of facilities. One can note a general, strongly rising trend in these cost groups in the case of private forest enterprises, on the other hand. The direct costs for timber harvesting can be influenced only indirectly by budgetary policy. Although the increases in wage costs for the Federal forests were running completely parallel to those in private forest enterprises, such increases could be absorbed to a great extent in both cases. A large part of the increase in wage costs was compensated by rationalisation and mechanisation. This applied particularly to the private forest enterprises, where the degree of investment was considerably higher.

**Percentage Distribution of Costs according to Object Accounts**

| Object Account | Salaries (staff) | Social charges (staff) | Travelling expenses | Material expenses | Investment for replacement purposes | Wages (workers) | Social charges (workers) |
|---|---|---|---|---|---|---|---|
| Central administration | 78.3 | 11.0 | 1.7 | 9.0 | | | |
| Forest management | 48.1 | 6.6 | | 26.8 | | 9.8 | 8.7 |
| Forest administration | 57.9 | 34.5 | | 6.7 | 0.9 | | |
| Silviculture | | | | 8.7 | | 48.6 | 42.7 |
| Maintenance of facilities | | | | 27.1 | 26.5 | 24.4 | 22.0 |
| Taxes | | | | | | | |
| Obligations on forest properties | | | | 43.5 | | 29.7 | 26.8 |
| Improvement and expansion | | | | | | | |
| Logging costs | | | | 14.6 | 0.2 | 44.6 | 40.6 |

The cost items which form the cost group "Improvement and expansion" can be distributed as follows (%):

| | |
|---|---|
| Road construction ..... | 60.1 |
| Buildings ..... | 9.8 |
| Afforestation (new planting) | 0.4 |
| Land acquisition ..... | 29.7 |
| | 100.0 |

In classifying the costs appearing in the Annual Reports of the Austrian Federal forests, the system agreed upon at Munich has been adhered to in this survey as closely as possible, although it has been necessary to make considerable adaptations in parts. Accordingly, the logging costs include the total costs from the felling of the timber, right up to skidding to a motor road, and a small part of the transport costs to the nearest railway station. Precise details of the amounts of felled and hauled timber are not available. Here, as with all other cost groups, no depreciation was taken into account, but all newly acquired installations were entered in the accounts for the years as costs. Accordingly, all the non-wage payments and social charges were brought together with the total wage amounts in the individual cost groups. As to silvicultural costs, the costs of afforestation of former agricultural land could not be separated from the current silvicultural costs, but in any case it was only a matter of small afforestation areas. Similarly, it was not possible in the time available to divide the silvicultural costs according to the establishment, care and protection of the stands. The administrative costs include both the cost of individual forest districts, and that of the central administration in Vienna. The costs of planning forest management (forest regulation) were taken from those of the general administration and included in the maintenance costs. The costs of improvement and expansion include a part of the expenditure for road construction, and the erection of new buildings, as well as the procurement of new machinery; this meant that it was not always possible to distinguish between new investments, and reinvestments necessary for replacement purposes. Moreover, here are also included the expenditures for the

**Table 3:16. Cost-Revenue Coefficients in Austrian Federal Forests**
Based on actual accounting records

| Financial year | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—1962 |
|---|---|---|---|---|---|---|
| Gross revenue | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 1. Logging | 0.359 | 0.460 | 0.370 | 0.349 | 0.354 | 0.375 |
| 2. Silviculture | 0.043 | 0.049 | 0.037 | 0.040 | 0.038 | 0.041 |
| 3. Administration | 0.172 | 0.202 | 0.174 | 0.176 | 0.182 | 0.181 |
| 4. Maintenance of facilities | 0.085 | 0.079 | 0.082 | 0.083 | 0.088 | 0.082 |
| 5. Improvement and expansion | 0.076 | 0.090 | 0.092 | 0.072 | 0.126 | 0.094 |
| 6. Taxes | 0.080 | 0.098 | 0.066 | 0.064 | 0.073 | 0.074 |
| 7. Total managing expenditures (2—6) | 0.456 | 0.518 | 0.451 | 0.435 | 0.507 | 0.472 |
| 8. Total expenditure for forestry operations (1+7) | 0.816 | 0.978 | 0.821 | 0.784 | 0.861 | 0.847 |

**Table 3:17. Managing Expenditures (fixed) as Percentage of Net Conversion Surplus in Austrian Federal Forests, 1958—1962**
Based on actual accounting records

| Financial year | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—1962 |
|---|---|---|---|---|---|---|
| 1. Net conversion surplus | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2. Silviculture | 6.8 | 8.8 | 6.0 | 6.1 | 6.1 | 6.6 |
| 3. Administration | 27.0 | 37.4 | 27.8 | 26.9 | 28.0 | 28.8 |
| 4. Maintenance of facilities | 13.2 | 14.9 | 13.0 | 12.5 | 13.5 | 13.5 |
| 5. Improvement and expansion | 12.0 | 16.6 | 14.6 | 11.3 | 19.6 | 14.8 |
| 6. Taxes | 12.6 | 18.0 | 10.3 | 9.7 | 11.2 | 12.0 |
| 7. Total managing expenditure | 71.6 | 95.7 | 71.7 | 66.5 | 78.4 | 75.7 |

purchase of forests, which were substantial only in 1962. In the matter of taxation, only turnover tax, land tax and other official dues were taken into account. The following survey gives a picture of how the total costs are divided, according to object accounts, and of the origin of costs, on average for the five financial years.

*Explanation of Tables 3:18 and 3:19*

The corrected results given in these tables make it possible to get a better impression of the cost structure. Here all the fixed costs have been related to allowable cutting amount, but the costs associated with logging have been derived from the actual annual records. Furthermore, obligations on forest properties (servitute) are calculated in the following way: where these fellings are composed of less valuable species and assortments than the total cut in average, they were assessed at 70 per cent of the average sales price. For logging costs the same rates were applied as for timber used by the enterprise itself. Where the annual amount of obligations on forest properties varied between 200,000 and 400,000 cubic metres during the five years under review, an average of 245,000 cubic metres was used as the basis of calculation for all the years.

The adjusted cost-revenue coefficient as an average for all expenditure is 0.83 which, however, should not be taken as a reason for regarding the Austrian forestry in too favourable a light. An increase of expenditures for silviculture, maintenance, improvement and expansion to the necessary extent would directly absorb this net surplus. In this case, the assessment of the full resources of the enterprise must be made, as well as that of the productive forest capital, and capital invested in the form of roads, buildings, etc. In addition to this, should it be desirable to prepare Federal forests for a further development in the wage and price sector, and consequently to make even greater efforts in the way of investment activities, a net surplus would no longer appear in the profit and loss account of that time.

**Table 3:18. Revenue and Costs, adjusted to "Normal" Annual Cut in Austrian Federal Forests, 1958—1962**

*(in 1962 value of Sch. per m³y without bark)*

Based on calculations

| Financial year | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—1962 |
|---|---|---|---|---|---|---|
| 1. Gross revenue | 403 | 254 | 362 | 358 | 378 | 352 |
| 2. Logging costs | 151 | 123 | 141 | 131 | 140 | 137 |
| 3. Net conversion surplus | 252 | 131 | 221 | 227 | 238 | 216 |
| 4. Silvicultural costs | 15 | 14 | 13 | 13 | 13 | 14 |
| 5. Administrative costs | 60 | 58 | 60 | 58 | 61 | 60 |
| 6. Maintenance costs | 29 | 23 | 28 | 27 | 29 | 27 |
| 7. Costs for improvement and expansion | 26 | 26 | 32 | 24 | 43 | 30 |
| 8. Taxes | 28 | 28 | 22 | 21 | 24 | 25 |
| 9. Total managing costs (4—8) | 158 | 149 | 155 | 143 | 170 | 156 |
| 10. Total costs (2+9) | 309 | 272 | 296 | 274 | 310 | 293 |
| 11. Net profit (1−10) | 94 | −18 | 66 | 84 | 68 | 59 |

**Table 3:19. Revenue and Costs, adjusted to "Normal" Annual Cut in Austrian Federal Forests, 1958—1962**

*(in 1962 value of Sch. per ha productive forest land)*

Based on calculations

| Financial year | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—1962 |
|---|---|---|---|---|---|---|
| 1. Gross revenue | 1,288 | 824 | 1,182 | 1,188 | 1,270 | 1,157 |
| 2. Logging costs | 485 | 398 | 460 | 436 | 471 | 451 |
| 3. Net conversion surplus | 803 | 426 | 722 | 752 | 799 | 706 |
| 4. Silvicultural costs | 49 | 44 | 41 | 43 | 44 | 44 |
| 5. Administrative costs | 192 | 187 | 195 | 193 | 204 | 195 |
| 6. Maintenance costs | 94 | 75 | 92 | 89 | 99 | 90 |
| 7. Costs for improvement and expansion | 85 | 84 | 102 | 81 | 143 | 100 |
| 8. Taxes | 89 | 90 | 73 | 69 | 82 | 81 |
| 9. Total managing (fixed) costs (4—8) | 509 | 480 | 503 | 475 | 572 | 510 |
| 10. Total costs (2+9) | 994 | 878 | 963 | 911 | 1,043 | 961 |
| 11. Net profit (1−10) | 294 | −54 | 219 | 277 | 227 | 196 |

*3.2.2 Large Private Forests*

In investigations of the large privately owned forests it was possible to establish, on the one hand, the effects of the position of these forests in certain production regions and price zones, while on the other hand, the high degree of adaptation of forest management to the natural site and economic conditions, as well as the demands of the individual forest owners were demonstrated. As opposed to the Federal forests, there is here a very clear indication of the will to increase investments even if the profitableness of these prevailing production conditions is already very much in doubt, as is the case in the high alpine region. Depending on the conditions, the cost-revenue coefficient for forestry operations varies between 0.50 and 1.14. It is the intention to continue, and constantly expand during the coming years, the cost-revenue analyses started for the purposes of this investigation, in order to be able to follow exactly the developments in the revenue position of the Austrian forest economy. In this respect the support of the forest owners is not lacking. However, the very marked divergencies in the book-keeping methods used by the individual forest enterprises involve great difficulties.

## 3.3 Costs and Revenue of Austrian Forestry on the Basis of Hypothetical Models of Forest Enterprises

*3.3.1 Introductory Remarks*

The construction of these models is based on the fact that the management of forests in Austria is carried out, in the main, on a practical sustained-yield basis. The amount of over-cutting shown by statistics, as opposed to the allowable cut based on the forest inventory, has declined greatly in the course of recent years, and is now approaching the limit of error to be expected in determining the cutting volume. In effect, the only questionable phenomenon is that this over-cutting takes place almost entirely in farm forests where the timber stock is insufficient. The cost structure used in the model is therefore not only to be regarded as that of an ideal method of management, but also as the one currently used throughout Austria.

The actual accounting records of the individual forest enterprises and of the Austrian Federal forests have been used as the basis for the construction of the hypothetical models. In the constructed models for individual tree species the conditions in farm forests have been disregarded in order to facilitate a comparison with other countries. On the other hand, in the average model, the conditions in the farm woodlands, corresponding to the share of this category of ownership in the Austrian forest economy were carefully approved and taken into account. All the revenues indicated are given at the sales price of the timber delivered to the roadside. As the transport costs to the mill or to the railway were not taken into account, the total cost-revenue pattern refers

to the place of delivery, i.e. the motor road. Although it is true that the said transport costs, in the case of certain individual enterprises, can be determined fairly easily, no definite average value could be established. The average costs of railway transport to the frontier—a very important price-determining factor in Austria—have been arrived at by dividing the country up into price zones. Consequently, the average price zone was determined for Production Regions I and II and the extent of the fluctuations was also given. It proved that, on average, Production Region I is in a less favourable price zone than Production Region II. In both cases equally wide ranges were fixed (± 40 Sch. per $m^3y$).

All prices and costs quoted correspond to the average for the years 1958-1962, and have been adjusted to the 1962 value of the currency. In the light of production costs, which in accordance with the generally determinable development trend, are rapidly rising, and prices which are constant, or in the case of many assortments even falling, the actual results of Austrian forestry (1965) must be regarded as definitely unfavourable.

### *3.3.2 Hypothetical Models for Ideal Operation: Classes of Individual Tree Species*

Such models were constructed for spruce, which is the main commercial species, and for both Production Regions. A model also shows the profitableness of beech as an example of low-yielding deciduous species.

*Explanation of Tables 3:20 and 3:21*

In Production Region I a rotation of 100 years would correspond to present conditions and to recognised forestry practice. A slow reduction of this rotation to an average of 90 years is expected in the next decades. The site quality class of spruce in this region is generally between 5 and 13 (in $m^3f$ DGZ 100). Chosen from these were site quality class 10, which is well above average, and class 6, which is somewhat below average.

In both the flat and the mountainous areas of this region, the costs of harvesting can be graduated very easily according to the hauling distances to the motor road. Three different distances, ranging from the most favourable to the least favourable accessibility, were taken. For the calculation of the revenue, the following percentages of assortments and average sale prices have been used as a basis:

| *Site Quality Class 10* | | *Site Quality Class 6* | |
|---|---|---|---|
| 70% sawlogs | @ 530 Sch. | 60% sawlogs | @ 500 Sch. |
| 10% special assortments | @ 450 Sch. | 20% special assortments | @ 450 Sch. |
| 10% pulpwood | @ 330 Sch. | 10% pulpwood | @ 330 Sch. |
| 10% fuelwood | @ 120 Sch. | 10% fuelwood | @ 120 Sch. |

**Table 3:20. Revenue and Costs in a Hypothetical Forestry Model for Spruce, Site Quality Class 10**
Production Region I. Rotation 100 years

| | | | |
|---|---|---|---|
| 1. Species | | Spruce | |
| 2. Site quality class in $m^3f$ per ha DGZ 100 | | 10 | |
| 3. Hauling distance to motor road, *km* | 0.2 | 0.8 | 1.5 |
| 4. Annual cut, $m^3y/ha$ | 8.2 | 8.0 | 7.8 |
| 5. Gross revenue, according to price zone | | *Sch*/$m^3y$ 450±40 | |
| 6. Logging costs | 107 | 135 | 155 |
| of which felling | 77 | 80 | 85 |
| skidding | 30 | 55 | 70 |
| 7. Net conversion surplus | 343 | 315 | 295 |
| according to price zone | | ±40 | |
| 8. Silvicultural costs | 32 | 35 | 38 |
| 9. Administrative costs | 68 | 75 | 78 |
| 10. Maintenance costs | 75 | 47 | 32 |
| of which for roads | 60 | 30 | 15 |
| buildings, etc. | 15 | 17 | 17 |
| 11. Taxes and dues | 47 | 43 | 39 |
| 12. Total managing (fixed) costs | 222 | 200 | 187 |
| 13. Total costs excluding investments | 329 | 335 | 342 |
| 14. Operating profit ±40 | 121 | 115 | 108 |
| 15. Necessary investments, *Sch*/$m^3y$ | up to 10 | —to 40 | —to 60 |
| 16. Net profit with complete investments, *Sch*/$m^3y$ | 71—151 | 35—115 | 8—88 |
| 17. Actual determined investments, *Sch*/$m^3y$ | 1 up to 112, average 38 | | |
| 18. Size of model in ha for 10,000 $m^3y$ calculated annual cut | 1,220 | 1,250 | 1,282 |

**Table 3:21. Revenue and Costs in a Hypothetical Forestry Model for Spruce, Site Quality Class 6**
Production Region I. Rotation 100 years

| | | | |
|---|---|---|---|
| 1. Species | | Spruce | |
| 2. Site quality class in $m^3f$ per ha DGZ 100 | | 6 | |
| 3. Hauling distance to motor road, *km* | 0.2 | 0.8 | 1.5 |
| 4. Annual cut, $m^3y/ha$ | 4.86 | 4.74 | 4.62 |
| 5. Gross revenue, according to price zone | | *Sch*/$m^3y$ 420±40 | |
| 6. Logging costs | 125 | 156 | 179 |
| of which felling | 92 | 96 | 102 |
| skidding | 33 | 60 | 77 |
| 7. Net conversion surplus | 295 | 264 | 241 |
| according to price zone | | ±40 | |
| 8. Silvicultural costs | 50 | 53 | 57 |
| 9. Administrative costs | 86 | 95 | 105 |
| 10. Maintenance costs | 85 | 62 | 42 |
| of which for roads | 70 | 45 | 25 |
| buildings, etc. | 15 | 17 | 17 |
| 11. Taxes and dues | 36 | 32 | 22 |
| 12. Total managing costs | 257 | 242 | 226 |
| 13. Total costs excluding investments | 382 | 398 | 405 |
| 14. Operating profit ±40 | 38 | 22 | 15 |
| 15. Necessary investments, *Sch*/$m^3y$ | up to 10 | to 40 | to 60 |
| 16. Net profit with complete investments, *Sch*/$m^3y$ | −12 to 68 | −35 to −5 | |
| 17. Actual determined investments, *Sch*/$m^3y$ | 4 to 54, average 16 | | |
| 18. Size of model in ha for 10,000 $m^3y$ calculated annual cut | 2,058 | 2,100 | 2,164 |

Logging waste and residues were put at 18, 20 and 22 per cent, and the longer the hauling distance to the motor road, the greater the amounts of poor-quality timber for which it is difficult to find buyers.

In all the models the costs do not even include that proportion of the costs for the improvement and expansion of facilities, as all investments are of a very variable magnitude, and this is shown in our special study. However, the investments which are regarded as necessary, as well as the investments actually determined, have been brought into the cost accounting after the outturn of the enterprises have been stated. In this way a fairly clear concept is obtained of the actual profitableness as well as an indication of the prospective development.

One can state in summing up that a positive operating profit can be expected for all hauling distances in site quality class 10, even after all the necessary investments have been made. In any case, the high investments involved with the present unfavourable accessibility would pay. The situation is somewhat different as regards the poor site quality class, where there is an income for the forest owner, only in the more favourable price zones, and in the more favourable conditions of accessibility, after all the necessary investments have been made. In many cases the conditions for production could be so improved by the investment of additional capital to-day that a successful forestry practice is still conceivable in the long run.

*Explanations of Tables 3:22 and 3:23*

In Production Region II the actual rotation varies, depending on the altitude, between the very wide limits of 90 and 200 years. The rotation of 120 years, which has been taken as the basis for the present calculation, must only be regarded as representative because the relatively large areas of protection forests in this region are not being taken into consideration in this study. The deduction for the logging waste and residues is between 23 and 31 per cent; this is due primarily to the greater losses in logging operations, and to a lesser extent to the very great amount of residues in the mountains. Unlike Production Region I, higher extraction losses must be expected even to-day in Production Region II, owing to the methods of transport which have to be used in the mountains.

One thus has to take into account that there are very different methods of skidding, which are used in the most varied combinations in the mountains; and so in order to simplify the model, only two classes were taken into consideration. Regarded as "favourable" in this connection are transport conditions where, on average, the logs can be moved, by using the force of gravity, over distances of approximately 500 metres, as well as skidding of the timber of a further 500 metres over plain country. We use the term "unfavourable" for lengthy transport by means of timber slides, hoists or

**Table 3:22. Revenue and Costs in a Hypothetical Forestry Model for Spruce, Site Quality Class 10**
Production Region II. Rotation 120 years

| | | |
|---|---|---|
| 1. Species | Spruce | |
| 2. Site quality class, in m³f per ha DGZ | 10 | |
| 3. Hauling distance to motor road | "Favourable" | "Unfavourable" |
| 4. Annual cut, *m³y/ha* | 7.48 | 6.80 |
| | *Sch/m³y* | |
| 5. Gross revenue, according to price zone | 445±40 | 410±40 |
| 6. Logging costs | 140 | 190 |
| of which felling | 85 | 90 |
| skidding | 55 | 100 |
| 7. Net conversion surplus | 305 | 220 |
| according to price zone | ±40 | |
| 8. Silvicultural costs | 25 | 20 |
| 9. Administrative costs | 75 | 82 |
| 10. Maintenance costs | 54 | 36 |
| of which for roads | 35 | 15 |
| buildings, etc. | 19 | 21 |
| 11. Taxes and dues | 27 | 19 |
| 12. Total managing costs | 181 | 157 |
| 13. Total costs excluding investments | 321 | 347 |
| 14. Operating profit ±40 | 124 | 63 |
| 15. Necessary investments, *Sch/m³y* | up to 40 | up to 100 |
| 16. Net profit with complete investments, *Sch/m³y* | 44 to 124 | −77 to +3 |
| 17. Actual determined investments, *Sch/m³y* | 20 to 70 | 90 to 150 |
| 18. Size of model in ha for 10,000 m³y timber cut | 1,336 | 1,470 |

**Table 3:23. Revenue and Costs in a Hypothetical Forestry Model for Spruce, Site Quality Class 6**
Production Region II. Rotation 120 years

| | | |
|---|---|---|
| 1. Species | Spruce | |
| 2. Site quality class in m³f | 6 | |
| 3. Hauling distance to motor road | "Favourable" | "Unfavourable" |
| 4. Annual cut, *m³y/ha* | 4.61 | 4.18 |
| | *Sch/m³y* | |
| 5. Gross revenue according to price zone | 415±40 | 385±40 |
| 6. Logging costs | 165 | 215 |
| of which felling | 100 | 105 |
| skidding | 65 | 110 |
| 7. Net conversion surplus | 250 | 170 |
| according to price zone | ±40 | |
| 8. Silvicultural costs | 30 | 20 |
| 9. Administrative costs | 122 | 125 |
| 10. Maintenance costs | 47 | 20 |
| of which for roads | 30 | 5 |
| buildings | 17 | 15 |
| 11. Taxes and dues | 20 | 10 |
| 12. Total managing costs | 219 | 175 |
| 13. Total costs excluding investments | 384 | 390 |
| 14. Operating profit ±40 | 31 | −5 |
| 15. Necessary investments, *Sch/m³y* | up to 40 | up to 100 |
| 16. Net profit with complete investments, *Sch/m³y* | −49 to 31 | −145 to −65 |
| 17. Actual determined investments *Sch/m³y* | 20 to 70 | ? |
| 18. Size of model in ha for 10,000 m³y timber cut | 2,169 | 2,392 |

costly cable conveyors. The results of the cost analyses for corresponding forest enterprises provide important data.

As the models show, with a very good site quality class and favourable transport conditions, there can be obtained results which are hardly inferior to those obtained in Production Region I. Even with unfavourable transport conditions it is still possible to obtain such results in good price zones by making all necessary investments. Here, too, it appears to be worthwhile to bring about an improvement in the accessibility conditions, and the investments which are actually decided upon would seem to underline this. In the case of the poor site quality class, the necessary investment funds can be raised only in the best price zones, and where there are already favourable conditions of access. One cannot count on successful outturn of activity in any of the other cases. Here it would seem to be very questionable whether the investment of further capital would be worthwhile where there are unfavourable conditions for production.

*Explanation of Table 3:24*

Only in the case of the Austrian Federal forests could data be obtained concerning the yield conditions in areas of pure deciduous forests. Such data concerned ten forest districts of what is known as the "Vienna Woods"

**Table 3:24. Revenue and Costs in a Hypothetical Forestry Model for Beech**

| | |
|---|---|
| 1. Species | Beech |
| 2. Site quality class in m³f per ha DGZ 100 | 5 |
| 3. Hauling distance to motor road, *km* | 0.5 |
| 4. Annual cut, *m³y/ha* | 4.47 |
| | *Sch/m³y* |
| 5. Gross revenue according to price zone | 250 |
| 6. Logging costs | 135 |
| of which felling | 85 |
| skidding | 50 |
| 7. Net conversion surplus according to price zone | 115 |
| 8. Silvicultural costs | 12 |
| 9. Administrative costs | 48 |
| 10. Maintenance costs | 38 |
| of which for roads | 28 |
| buildings, etc. | 10 |
| 11. Taxes and dues | 11 |
| 12. Total managing (fixed) costs | 109 |
| 13. Total costs excluding investments | 244 |
| 14. Operating profit | 6 |
| 15. Necessary investments, *Sch/m³y* | 20 |
| 16. Net profit with complete investments, *Sch/m³y* | −14 |
| 17. Actual investments, *Sch/m³y* | 10 |
| 18. Size of model in ha for 10,000 m³y timber cut | 2,237 |

(*Wienerwald*), a medium-altitude area covered mainly with beech and other deciduous species. To a large extent, the model corresponds to the actual management of these forests; consequently it does not involve any costs which would automatically arise with a large-scale conversion of these stands into mixed stands containing different coniferous species. Moreover, as there is very little economic activity in this low-yielding forest area, perhaps the model does not give an accurate picture of the actual and very difficult position of the management of deciduous forests. Where there is no large-scale conversion of the stands through the investment of further money capital in these forest enterprises, then in many cases, even in the very near future, they will be excluded from the productive forest economy. Even to-day the importance of their protective and recreational functions far exceeds their function in timber production.

### *3.3.3 Hypothetical Models for the Production Regions and for the Total Results of the Austrian Forestry*

The models presented in Tables 3:25 and 3:26 are intended to give a picture of the Austrian forestry as an average for the years under review, and are based on all available information. The assumptions as to the forested areas, the growing stock, the average site quality class and the average increment, the actual annual cut and the composition of the species, as well as the proportion of the assortments in the roundwood output, which have been used as a basis for the models, have been derived from various official statistics. As far as prices and costs are concerned, efforts were made to take into consideration, as objectively as possible, the differences between the three large ownership categories, i.e. the Austrian Federal forests, the large privately owned forests and the farm woodlands.

The total result for the Austrian forestry, as an average for the period 1959-1962 and in terms of the 1962 value of the Schilling, will then be as follows:

| | | | |
|---|---|---|---|
| Total forest area | 3,057,000 hectares | | |
| Actual annual cut | 11,505,360 cubic metres ($m^3y$) | | |
| | *Altogether* | | |
| | *Sch.* | *Sch./ha* | *Sch./$m^3y$* |
| Revenue | 4,466,000,000 | 1,461 | 388 |
| Costs | 3,854,000,000 | 1,261 | 335 |
| Balance | 612,000,000 | 200 | 53 |

Although the results of the calculations for these models are not in complete agreement with those of the G.N.P. (see Table 3:1), no further changes are made. It may be questioned whether the G.N.P. actually gives the true result. From the operating surplus of the Austrian forestry as a whole, which has been put at 612 million Sch. here, and which is shared between 240,000 forest owners, there must still be deducted property tax, inheritance tax, and the various other personal payments which have to be made, plus income tax, in order to arrive at the income which the forest owners have at their disposal for their private purpose. It is not possible to assess this amount at present.

**Table 3:25 (1). Hypothetical Model of Forest Enterprise, Constructed Average for Production Region I**
*(for 10,000 m³y annual cut)*

Assumed Conditions:

| | | | |
|---|---|---|---|
| Productive forest area | =2,451 ha | Total growing stock ..... | 377,454 m³f |
| | | Growing stock per ha ..... | 154 m³f |
| Site quality class DGZ 100 | =5.9 m³f/ha | Total annual cut ..... | 12,000 m³f (10,000 m³y) |
| Average actual increment | =3.9 m³f/ha | Average annual cut ..... | 4.08 m³f/ha |
| | | Exploitation *percentage* ..... | *2.65* |

Average hauling distance to motor road=800 metres
Skidding is done partly with tractors and partly with horses

| | | |
|---|---|---|
| *Percentage* of main tree species in forested areas: | Spruce+fir ..... | *50* |
| | Larch ..... | *3* |
| | Scots pine ..... | *25* |
| | Deciduous ..... | *22* |
| | | *100* |
| *Percentage* of assortments in timber cut: | | |
| Industrial roundwood: | Coniferous ..... | *65* |
| | Deciduous ..... | *13* |
| Fuelwood: | Coniferous ..... | *10* |
| | Deciduous ..... | *12* |
| | | *100* |

Revenue (all prices are for timber delivered to road side):

| Assortments | | % | m³y | Price, Sch/m³y | Revenue, Sch. |
|---|---|---|---|---|---|
| Sawlogs | Deciduous | *6* | 600 | 500 | 300,000 |
| | Spruce | *28* | 2,800 | 530 | 1,484,000 |
| | Scots pine | *15* | 1,500 | 450 | 675,000 |
| Pulpwood | Coniferous | *6* | 600 | 330 | 198,000 |
| | Deciduous | *7* | 700 | 220 | 154,000 |
| Pitprops | Coniferous | *5* | 500 | 270 | 135,000 |
| Special types | Coniferous | *11* | 1,100 | 500 | 550,000 |
| Fuelwood | Coniferous | *10* | 1,000 | 120 | 120,000 |
| | Deciduous | *12* | 1,200 | 160 | 192,000 |
| | | *100* | 10,000 | 380 | 3,808,000 |

**Table 3:25 (2). Revenue and Costs in the Model**
*(10,000 m³y annual cut, 2,451 ha area)*

| | Total *Sch.* | *Sch/ha* | *Sch/m³y* |
|---|---|---|---|
| Revenue | 3,808,000 | 1,553.65 | 380.80 |
| Felling costs | 792,300 | 323.25 | 79.23 |
| Skidding costs | 600,000 | 244.79 | 60.00 |
| Logging costs | 1,392,300 | 568.04 | 139.23 |
| Net conversion surplus | 2,415,700 | 985.61 | 241.57 |
| Silvicultural costs | 310,000 | 126.48 | 31.00 |
| Administrative costs | 548,000 | 223.58 | 54.80 |
| Maintenance costs | 360,000 | 146.87 | 36.00 |
| Costs of improvement and expansion | 250,000 | 101.99 | 25.00 |
| Taxes and dues | 290,000 | 118.32 | 29.00 |
| Total managing (fixed) costs | 1,758,000 | 717.24 | 175.80 |
| Total costs | 3,150,300 | 1,285.28 | 315.03 |
| Net profit | 657,700 | 268.37 | 65.77 |

| | | |
|---|---|---|
| Applied to the entire Production Region I: | Forest area, *ha* | 1,445,000 |
| | Revenue, *Sch.* | 2,245,000,000 |
| | Costs, *Sch.* | 1,857,000,000 |
| | Net profit, *Sch.* | 388,000,000 |

**Table 3:26 (1). Hypothetical Model of Forest Enterprise, Constructed Average for Production Region II**
*(for 10,000 m³y annual cut)*

Assumed Conditions:

| | | | |
|---|---|---|---|
| Productive forest area | =2,873 ha | Total growing stock | 442,528 m³f |
| | | Growing stock per ha | 154 m³f |
| Site quality class | =5.8 m³f/ha | Total annual cut | 12,500 m³f (10,000 m³y) |
| Average annual increment | =3.1 m³f/ha | Average annual cut | 3.48 m³y/ha |
| | | Exploitation *percentage* | *2.26* |

Skidding by means of gravity 500 metres, further hauling to motor road 500 metres and, to some extent, direct delivery to road side by cable, conveyors and hoists

| | | |
|---|---|---|
| *Percentage* of main tree species in forested areas: | Spruce+fir | *75* |
| | Larch | *15* |
| | Scots pine | *5* |
| | Deciduous | *5* |
| | | *100* |
| *Percentage* of assortments in timber cut: | | |
| Industrial roundwood: | Coniferous | *79* |
| | Deciduous | *1* |
| Fuelwood: | Coniferous | *15* |
| | Deciduous | *5* |
| | | *100* |

Revenue (all prices are for timber delivered to road side):

| Assortments | | % | $m^3y$ | Price, *Sch/$m^3y$* | Revenue, *Sch.* |
|---|---|---|---|---|---|
| Sawlogs | Deciduous | *55* | 5,500 | 500 | 2,750,000 |
| Special types | Coniferous | *8* | 800 | 500 | 400,000 |
| Pulpwood | Coniferous | *16* | 1,600 | 330 | 528,000 |
| | Deciduous | *1* | 100 | 220 | 22,000 |
| Fuelwood | Coniferous | *15* | 1,500 | 120 | 180,000 |
| | Deciduous | *5* | 500 | 160 | 80,000 |
| | | *100* | 10,000 | 396 | 3,960,000 |

**Table 3:26 (2). Revenue and Costs in the Model**
*(10,000 $m^3y$ annual cut, 2,873 ha area)*

| | Total *Sch.* | *Sch/ha* | *Sch/$m^3y$* |
|---|---|---|---|
| Revenue | 3,960,000 | 1,378.08 | 396 |
| Felling costs | 1,020,000 | 354.96 | 102 |
| Skidding costs | 950,000 | 330.60 | 95 |
| Logging costs | 1,970,000 | 685.56 | 197 |
| Net conversion surplus | 1,990,000 | 692.52 | 199 |
| Silvicultural costs | 200,000 | 69.60 | 20 |
| Administrative costs | 650,000 | 226.20 | 65 |
| Maintenance costs | 220,000 | 76.56 | 22 |
| Costs of improvement and expansion | 370,000 | 128.76 | 37 |
| Taxes and dues | 150,000 | 52.20 | 15 |
| Total managing (fixed) costs | 1,590,000 | 553.32 | 159 |
| Total costs | 3,560,000 | 1,238.88 | 356 |
| Net profit | 400,000 | 139.20 | 40 |

| | | |
|---|---|---|
| Applied to the entire Production Region II: | Forest area, *ha* | 1,612,000 |
| | Revenue, *Sch.* | 2,221,000,000 |
| | Costs, *Sch.* | 1,997,000,000 |
| | Net profit, *Sch.* | 224,000,000 |

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All available statistics published by the Austrian Central Bureau of Statistics (*Das Österreichische Statistische Zentralamt*), the Austrian Federal Timber Industry Council (*Der Österreichische Bundesholzwirtschaftsrat*), the Austrian Forest Survey (*Die Österreichische Waldstandsaufnahme*), the Austrian Institute of Economic Research (*Das Österreichische Institut für Wirtschaftsforschung*), the Society of Accounting (*Die Landesbuchführungsgesellschaft*), the United Nations' Food and Agriculture Organisation (F.A.O.), and also basic agreements, collective agreements and similar material have been consulted and used primarily for the purpose of constructing the models.

# Chapter 4

# DENMARK

# Denmark

by

NIELS K. HERMANSEN

## 4.1 General Information about Forestry and Timber Industry

### *4.1.1 Share of Forestry in the Gross National Product*

Denmark had a forest area of 437,600 hectares in 1950, according to the latest official statistics. Preliminary results from statistical material now being processed indicate that the forest area in July 1965 was 473,000 hectares, which corresponds to about 11 per cent of the total area of the country.

Denmark can be regarded as a sparsely wooded country when compared with most of the other countries of Europe. As can be seen from Table 4:1, forestry makes only a very modest contribution to the Gross National Product. However, it should be added that the figures given in the table concern only the amounts of timber extracted from the forests. They do not

**Table 4:1. Value of Timber Production and Share of Forestry in the Gross National Product of Denmark**

| | 1957—58 | 1958—59 | 1959—60 | 1960—61 | 1961—62 |
|---|---|---|---|---|---|
| | *Million D.kr* | | | | |
| Value of annual cut: | | | | | |
| Beech | 46 | 46 | 46 | 39 | 35 |
| Oak | 8 | 9 | 9 | 8 | 8 |
| Other deciduous | 8 | 8 | 9 | 9 | 9 |
| Conifers | 68 | 66 | 66 | 67 | 82 |
| Total | 130 | 129 | 130 | 123 | 134 |
| Changes in the value of standing timber | 56 | 53 | 50 | 70 | 63 |
| Total revenue | 186 | 182 | 180 | 193 | 197 |
| Procurement of materials, machinery, etc. | 13 | 13 | 13 | 13 | 13 |
| Share in the G.N.P. (current value) | 173 | 169 | 167 | 180 | 184 |
| Share in the G.N.P. (1962 value) | 184 | 184 | 184 | 184 | 184 |
| G.N.P. (1962 value) | 35,447 | 39,626 | 42,758 | 46,221 | 50,974 |
| Share of Forestry in the G.N.P. as *percentage* | *0.52* | *0.46* | *0.43* | *0.40* | *0.36* |

take into account the rather large subsidiary revenues from the sales of decorative branches and Christmas trees, as well as from hunting and fishing.

As to the contents of the table, the following comments can be made:

Instead of making direct use of the figures of the Gross National Product calculated by the statistical authorities, a special assessment of the share of forestry has been used for the purposes of the present survey. This assessment consists firstly of an estimate of the value of the annual cut; this estimate is made by multiplying the removals of the different tree species by the average selling price for the species in question. These average prices have been assessed as an average figure (weighted according to cut) of the average prices obtained by the State forest enterprises appearing in the statistical accounts for the respective categories of forest owners. Table 4:2 gives the results of the assessments of the average prices. For example, in the column for 1961-1962 is shown how large a part of the total cut is represented by the average price calculations for the cut.

**Table 4:2. Average Prices for Assessment of the Share of Forestry in the Gross National Product of Denmark**

| | 1957—58 | 1958—59 | 1959—60 | 1960—61 | 1961—62 | *Percentage* of total cut represented by average price calculations 1961—62 |
|---|---|---|---|---|---|---|
| | | | *D.kr/m*³ | | | |
| Beech ..... | 70.0 | 68.9 | 66.8 | 66.4 | 62.6 | *52* |
| Oak ..... | 82.4 | 93.8 | 90.0 | 94.5 | 92.0 | *61* |
| Other deciduous | 56.3 | 57.0 | 58.9 | 60.0 | 65.0 | *48* |
| Conifers ..... | 72.7 | 71.5 | 71.4 | 75.2 | 81.9 | *50* |

The figures of the annual cut which have been used are given in Table 4:1.

Then to the value of the cut has been added the change in the value of the standing timber. This has been assessed by using the figures of growth contained in Table 4:14, in that the growth has been assumed to be constant over the years. The difference between the growth and the cut for the individual species of trees has been multiplied by the average prices given in Table 4:2; this in its turn has given the figures for "Changes in the value of standing timber" shown in Table 4:1. In other words, it is the realisation value of the timber which has been used as the basis for the assessment. Certain objections may be raised against this particular method. The results of the assessment should therefore be regarded only as an indication of the order of magnitude.

Finally from the total revenue there has been deducted the value of materials, machinery, etc., which have been procured from other sectors of the economy. Lacking usable statistics for this purpose an estimate has been made by specialists concerning the procurement on the basis of statistics of

cultivated areas, length of forest roads built, as well as data on the procurement of machinery, etc. No attempts have been made to arrive at an individual assessment for the individual years.

Furthermore, a corresponding assessment has been made only on the basis of the average prices for 1962. It is obvious that by using this method of assessment the results will be constant from year to year as long as one works on the basis of the same rate of growth and the same amount spent on procurement from other sectors. Even if the share of the Gross National Product (given as a percentage in the last line of the table) will hardly be decisive, when using the method of assessment indicated, with regard to the variations from year to year, there can hardly be any doubt that the trend it shows is correct in that the long time of production in forestry, despite the increase in the forested areas of Denmark, means that the contribution of forestry to the G.N.P. cannot keep pace with the marked rise particularly in the value of industrial production.

### *4.1.2 Timber Balance*

Denmark's timber balance for the years 1958-1962 is shown in Table 4:3. The following remarks can be made about the assessments:

The figures given for production are those compiled by the statistical authorities for the total cut of the individual years. The import and export figures

**Table 4:3. Timber Balance of Denmark, 1958—1962**
(*thousand cubic metres with bark*)

| | | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|
| Production: | Deciduous | 899 | 907 | 925 | 821 | 779 |
| | Conifers | 924 | 913 | 927 | 892 | 1,005 |
| | Total | 1,823 | 1,820 | 1,852 | 1,713 | 1,784 |
| Imports: | Deciduous | 281 | 288 | 429 | 383 | 369 |
| | Conifers | 2,374 | 2,659 | 3,244 | 3,198 | 3,467 |
| | Total | 2,655 | 2,947 | 3,673 | 3,581 | 3,836 |
| Total supply: | Deciduous | 1,180 | 1,195 | 1,354 | 1,204 | 1,148 |
| | Conifers | 3,298 | 3,572 | 4,171 | 4,090 | 4,472 |
| | Total | 4,478 | 4,767 | 5,525 | 5,294 | 5,620 |
| Exports: | Deciduous | 185 | 205 | 230 | 220 | 286 |
| | Conifers | 361 | 282 | 332 | 384 | 400 |
| | Total | 546 | 487 | 562 | 604 | 686 |
| "Apparent consumption" | Deciduous | 995 | 990 | 1,124 | 984 | 862 |
| | Conifers | 2,937 | 3,290 | 3,839 | 3,706 | 4,072 |
| | Total | 3,932 | 4,280 | 4,963 | 4,690 | 4,934 |

have been calculated on the basis of the official import and export statistics, in which the individual items have been recalculated into cubic metres with bark using Danish conversion factors. Calculations of this kind are done as a matter of routine each year by the Forestry Department (*Skovbrugsafdelingen*) of Royal Veterinary and Agricultural College of Denmark (*Landbohøjskolens skovbrugsafdeling*). The amount of home "consumption" in the last lines of the table has been calculated simply as production plus imports minus exports. In other words, no adjustments have been made for changes in the stocks of timber kept, which explains to some extent the marked variations in the "apparent consumption". However, this does not invalidate the fact that there has been a rise in consumption during the period.

The consumption on average for this five-year period has been 4,560,000 cubic metres, which corresponds to approximately 1.0 cubic metres *per capita.*

Furthermore, it can be seen from Table 4:3 that in the case of timber from deciduous forests home production and consumption almost balance each other. The imports of timber from overseas are mainly for furniture manufacture. Timber from Danish deciduous forests is exported mainly in the form of furniture, blocks for parquet floors and semi-finished products of beech. For coniferous timber, home production accounts for, on average, approximately 26 per cent of Danish consumption.

Table 4:4 contains a comparison of the values of the exports and imports of roundwood and processed forest products against the values of Denmark's

**Table 4:4. Values of Imports and Exports of Timber and Processed Forest Products Compared with the Values of Denmark's Total Imports and Exports**

| | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|
| | *Million D.kr* | | | | |
| Value of total imports ..... | 9,435 | 11,058 | 12,469 | 12,968 | 14,730 |
| Relative values (1958=100)..... | 100 | 117 | 132 | 137 | 156 |
| Value of timber imports ..... | 632 | 722 | 914 | 935 | 1,035 |
| Relative values (1958=100) ..... | 100 | 114 | 145 | 148 | 164 |
| Timber imports as *percentage* of total imports, % ..... | *6.7* | *6.5* | *7.3* | *7.2* | *7.0* |
| Value of total exports..... | 8,906 | 9,643 | 10,275 | 10,573 | 11,460 |
| Relative values (1958=100) ..... | 100 | 108 | 115 | 119 | 129 |
| Value of timber exports ..... | 243 | 277 | 341 | 363 | 404 |
| Relative values (1958=100) ..... | 100 | 114 | 140 | 149 | 166 |
| Timber exports as *percentage* of total exports, % ..... | *2.7* | *2.9* | *3.3* | *3.4* | *3.5* |

total exports and imports, which further illustrates the trend in Denmark's foreign trade in forest products.

As can be seen, Denmark's total imports increased by 56 per cent while the imports of roundwood and processed forest products increased by 64 per cent in the period under survey. For exports the corresponding increases were approximately 29 per cent and 66 per cent respectively. These figures show the increasing relative importance to Denmark's foreign trade of the timber sector of the economy and particularly the export of forest products. In terms of export values, it is the marked rise in furniture exports which accounts for a great part of the increase in the value of timber exports from Denmark.

To illustrate the development of the relationship of the various product groups, Table 4:5 shows the percentage of the value of timber imports and exports accounted for by deciduous and coniferous timber. Within the coniferous group a further distinction is made between timber where the structure of the wood has been retained, i.e. products of sawnwood or manufactured wooden products, and timber where the structure has been broken down, i.e. pulp or products of pulp (paper). For imports it can be seen that the deciduous share of the value of imports has risen; this can be attributed to the expansion of furniture production. Within the coniferous group there has been a relative shift in value in favour of timber where the structure of

**Table 4:5. Percentage Distribution of the Value of Imports and Exports of Timber and Products thereof**

| | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|
| Value of timber imports: | | | | | |
| Coniferous, where structure of wood retained | 27.7 | 30.9 | 30.1 | 30.6 | 30.2 |
| Coniferous, where structure of wood broken down | 58.4 | 55.3 | 52.0 | 53.3 | 52.9 |
| Total coniferous | 86.1 | 86.2 | 82.1 | 83.9 | 83.1 |
| Total deciduous | 13.9 | 13.8 | 17.9 | 16.1 | 16.9 |
| Grand total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Value of timber exports: | | | | | |
| Coniferous, where structure of wood retained | 11.9 | 7.6 | 6.2 | 7.2 | 6.7 |
| Coniferous, where structure of wood broken down | 28.0 | 25.6 | 26.1 | 28.9 | 28.7 |
| Total coniferous | 39.9 | 33.2 | 32.3 | 36.1 | 35.4 |
| Total deciduous | 60.1 | 66.8 | 67.7 | 63.9 | 64.6 |
| Grand total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

the wood has been retained; this can be explained both by the increase in building activity and by the greater home production of wood-based panels, pulp and paper, but also by a shift in price relationships.

*4.1.3 Structure of the Timber Market and Price Developments*

As was pointed out in Section 4.1.2, there is in the case of *deciduous* products a very close balance between imports and exports. However, imports consist mainly of those species which are not produced in Denmark and in particular tropical species, because Denmark has a surplus of timber from local deciduous forests, mainly beech, for export. The possibilities of exporting and the prices in consuming countries, especially England, for semi-finished products of beech have also a certain influence on price developments in Denmark. However, home demand is probably the most decisive factor.

In the *coniferous* field home production covers between one-quarter and one-third of consumption. Consequently, the prices of imported timber have a rather definite influence on the prices of coniferous timber in Denmark. However, the effect of import prices is somewhat lessened by the Danish sawmills to a large extent having the facilities to saw logs according to the specifications of consumers. Furthermore, it is worth noting that the effect has been more noticeable on the islands of Denmark than on the peninsula of Jutland, because the islands are closer to countries which export timber (Sweden and Finland), and also because there is a certain export to Germany from the coniferous forests of Jutland. This has meant that over the years it can be noted that the Great Belt can be regarded as a price line with higher coniferous prices to the west of the line.

In the home timber market practically all trade is with felled timber. Thus the seller fells the timber and there is no sales on the stump. Moreover, free-hand sales are the most common method of selling timber in Denmark. Auctions are held only in exceptional cases, and then only for fuelwood. Likewise, sales by tender are seldom made and only for special assortments, for example, timber for piling.

One must make a distinction between sales by the State forests and sales by private forest owners with regard to the development of prices for domestic timber.

The Directorate of the Danish State Forests circulates annually lists of minimum prices to the individual State Forest Districts. These prices are determined by the Directorate after noting the market trends and normally the prices are determined without previous negotiations with the purchasing organisations.

One can talk—at least to some extent—about price leadership in the timber market with the State as the price leader, because the sales from the State forests account for approximately 30 per cent of the sales of coniferous timber and about 20 per cent of deciduous sales.

Each year the private forests receive details of *recommended prices* from the commercial organisation for privately owned forests. These recommended prices are arrived at after negotiations with the central organisation for the timber industry (sawmills), and have to be approved by the State Monopolies Commission. Even if it is only a question of recommended prices which are not binding for the individual forest owner, these prices have a decisive influence on the actual fixing of prices. Where there are any deviations these are generally higher than the recommended prices; thus to a certain degree the recommended prices can be regarded as minimum prices. It is during the above-mentioned negotiations between the organisation of private forest owners and the organisation for the timber industry that the minimum prices for the State forests play a definite role in price leadership.

**Table 4:6. Average Import Value per Unit for various Product Groups, 1953—1962**

| Year | Coniferous sawnwood *D.kr/m³* | Chemical sulphite pulp *D.kr/hkg dry* | Mechanical woodpulp *D.kr/hkg dry* | Newsprint *D.kr/hkg* | Fibreboard, soft *D.kr/hkg* | Fibreboard, hard *D.kr/hkg* |
|---|---|---|---|---|---|---|
| 1953 | 284 | 81 | 54 | 86 | 58 | 60 |
| 1954 | 293 | 92 | 54 | 86 | 64 | 58 |
| 1955 | 312 | 96 | 58 | 92 | 73 | 65 |
| 1956 | 310 | 98 | 61 | 95 | 75 | 59 |
| 1957 | 295 | 95 | 58 | 97 | 77 | 59 |
| 1958 | 281 | 88 | 51 | 96 | 71 | 59 |
| 1959 | 261 | 83 | 45 | 90 | 68 | 58 |
| 1960 | 288 | 84 | 48 | 89 | 68 | 60 |
| 1961 | 309 | 87 | 49 | 91 | 69 | 63 |
| 1962 | 300 | 82 | 48 | 92 | 66 | 59 |

The price fluctuations during the period 1953-1962 are given in Table 4:6, which sets out the average import value per unit for the various product groups calculated as the total import value divided by the quantity imported.

The possibilities of comparing the import values given in the table are hampered by the fact that the composition of the qualities and dimensions of the products imported vary from year to year.

The price details given in Table 4:7 further illustrate the relationship between the fluctuations of the import prices and the prices of domestic timber.

As can be seen from the table, the course of prices for sawnwood of domestic spruce runs completely parallel with the course of the prices of imported pine. The fact that the prices of imported pine are somewhat higher than the prices of domestic spruce is because pine is more appreciated in the main than the quickly growing Danish spruce.

**Table 4:7. Prices of Danish and Imported Sawnwood at Place of Consumption and of Danish Sawlogs, 1954—1962**

| Year | Sawnwood | | | Danish coniferous (spruce) logs with bark at roadside in forest 18—20 cm middle diam. *D.kr/m³ (s)* | Danish coniferous (spruce) logs with bark at roadside in forest 21—24 cm middle diam. *D.kr/m³ (s)* | Beech logs >40 cm top with bark at roadside in forest *D.kr/m³ (s)* | Beech logs 30—39 cm 1st class with bark at roadside in forest *D.kr/m³* |
|---|---|---|---|---|---|---|---|
| | Danish spruce | | Imported pine | | | | |
| | $3\frac{1}{2}'' \times 6''$ sawn *D.kr/f³* | $1\frac{1}{2}'' \times 2\frac{1}{4}''$ edged *D.kr/f³* | $1'' \times 7''$ V'ta *D.kr/f³* | | | | |
| 1954 | 7.27 | 9.53 | 12.25 | 71.0 | 76.0 | 130 | 135 |
| 1955 | 8.16 | 10.50 | 12.86 | 80.0 | 86.0 | 140 | 135 |
| 1956 | 8.17 | 10.77 | 12.90 | 80.0 | 86.0 | 140 | 135 |
| 1957 | 8.14 | 10.66 | 12.76 | 77.5 | 83.5 | 145 | 135 |
| 1958 | 8.23 | 10.36 | 12.46 | 77.5 | 83.5 | 150 | 150 |
| 1959 | 8.06 | 10.28 | 11.61 | 77.5 | 83.5 | 145 | 150 |
| 1960 | 8.68 | 10.79 | 12.97 | 77.5 | 83.5 | 150 | 150 |
| 1961 | 9.77 | 12.10 | 14.12 | 85.5 | 92.5 | 140 | 150 |
| 1962 | 10.61 | 12.13 | 14.00 | 98.5 | 105.5 | 145 | 160 |

Furthermore, the table shows that the prices for sawlogs of spruce follow rather closely the prices for sawnwood in that the influence of the import prices on the formation of prices goes right back to the formation of prices in the forests in that prices for sawlogs as a whole show a lesser tendency to fluctuate than the prices for sawnwood paid by the consumers. This tendency towards price stability can be considered as one of the effects of the above-mentioned price negotiations on the formation of prices. The fact that the prices of sawnwood as a whole have risen more than sawlog prices over the period may possibly be a consequence of the lack of rational procedure in the sawmilling industry; the industry has not been streamlined to deal with rising labour costs, instead there has been restraint in allowing the price of sawlogs to rise.

As has been mentioned before, the development of deciduous prices has been determined to a high degree by domestic demand and the general level of prices. Nevertheless, the possibilities of exporting also play an important role, especially for beech.

### *4.1.4 Structure of the Labour Market and Wage Trends*

Demands for labour in Danish forestry have decreased considerably in recent years, especially because of greater mechanisation. The data presented in Table 4:8 for the number of man-hours per hectare of forest land in the State forests and the privately owned forests can serve as an illustration.

The decline in the demand for labour is further illustrated in Table 4:9 which shows the number of man-hours per cubic metre felled timber in the State forests.

**Table 4:8. Man-hours Worked per Hectare of Forest Land**
*(total per year)*

| Year | State forests | | Private forests | |
|---|---|---|---|---|
| | Old forests | Plantations on heaths | Properties with preponderance of deciduous trees | Properties with preponderance of conifers |
| 1954 | 46 | 32 | — | — |
| 1955 | 43 | 29 | 50 | 43 |
| 1956 | 43 | 31 | 46 | 42 |
| 1957 | 40 | 32 | 54 | 46 |
| 1958 | 45 | 33 | 50 | 35 |
| 1959 | 44 | 33 | 45 | 37 |
| 1960 | 40 | 30 | 42 | 33 |
| 1961 | 37 | 26 | 39 | 34 |
| 1962 | 35 | 23 | 33 | 31 |

**Table 4:9. Man-hours Worked and Timber Cut in Danish State Forests**

| Year | Total timber cut *cubic metres* | Man-hours worked on timber harvesting | Man-hours per *cubic metre* |
|---|---|---|---|
| 1958 | 372,524 | 798,320 | 2.1 |
| 1959 | 388,754 | 686,894 | 1.8 |
| 1960 | 402,759 | 655,565 | 1.6 |
| 1961 | 420,533 | 617,539 | 1.5 |
| 1962 | 381,528 | 576,561 | 1.5 |

Supplies of labour for forestry have also declined in recent years. However, a shortage of labour has been felt only in limited areas, but inadequate numbers of young workers are going in for forestry. This can be seen from Table 4:10, which gives both the average age and the distribution of labour in age groups for forestry and other occupations in 1950.

Wages in forestry are determined by negotiations between the trade unions and the forest owners' associations. Special wage negotiations take place for workers in the State forests. Table 4:11 shows wage rates in forestry compared with wages in other occupations.

The table shows that the wages of forestry workers are fully comparable with those paid in industry. In recent years forestry wages have even been higher than those in industry; this is attributed to the increasing use of motor saws and the adoption of piece rates in more and more fields of work. It should be emphasised that the hourly rates given in the table do not include holidays with pay and other social benefits. In addition, it should be mentioned that motor saw costs are borne by the workers themselves.

**Table 4:10. Average Age and Age Group Distribution of Labour in Forestry and Other Occupations, 1950**

| | Average age | *Percentage* distribution | | |
|---|---|---|---|---|
| | *years* | *25 years* | *25—55 years* | *55 years* |
| Forestry workers ..... | 43.8 | *6.3* | *71.8* | *22.9* |
| Agricultural workers ..... | 39.9 | *14.5* | *67.5* | *18.0* |
| Workers in wood-processing industries ..... | 35.3 | *26.4* | *63.8* | *10.3* |
| All occupations ..... | 34.7 | *31.4* | *57.4* | *11.2* |

**Table 4:11. Hourly Wage Rates in Danish State Forests and other Occupations**
(*D.kr per hour*)

| Year | Earnings in State forests | | | | | Woodworking industry, provincial rates for machine operators | All industries, average rates for workers |
|---|---|---|---|---|---|---|---|
| | Time rates | Piece rates (Logging) | | Average for all work | | | |
| | | Skilled workers | All workers | Skilled workers | All workers | | |
| 1956 | 3.76 | 4.49 | 4.49 | 4.49 | 4.27 | 3.92 | — |
| 1957 | 4.02 | 5.13 | 4.55 | 4.69 | 4.32 | 4.12 | 4.79 |
| 1958 | 4.05 | 5.58 | 5.23 | 4.95 | 4.61 | 4.24 | 4.97 |
| 1959 | 4.28 | 6.43 | 6.07 | 5.42 | 5.06 | 4.62 | 5.38 |
| 1960 | 4.55 | 7.01 | 6.80 | 5.88 | 5.46 | 4.94 | 5.73 |
| 1961 | 5.42 | 8.29 | 7.91 | 6.86 | 6.41 | 5.53 | 6.53 |
| 1962 | 5.87 | 8.76 | 8.54 | 7.33 | 6.98 | 6.11 | 7.10 |

### *4.1.5 Basis of Timber Production, Marketing and Further Processing*

Denmark has a forest area of approximately 473,000 hectares to-day. As the latest statistics have not yet been fully processed, the following details are based on the forest statistics for 1951, according to which the forest land area totalled 437,600 hectares. Of this the actually forested area occupied 370,670 hectares, while the rest consisted of roads and tracks, lakes, meadows, bogs, land placed at the disposal of employees, and other areas coming under the Forest Administration.

Table 4:12 shows the distribution of tree species in the forests.

Of the forested areas of Denmark as a whole the areas of coniferous forest are the greatest; this can be attributed particularly to the planting of conifers on the heaths and sand dunes of Jutland. The table also shows the characteristic difference between the forestry practice on the Danish islands and that of Jutland. The forests on the islands are old forests where the deciduous trees are still in the majority, while new forests with a majority of conifers are a characteristic feature of Jutland. However, in the eastern part of Jutland there are also old forests where deciduous trees predominate.

**Table 4:12. Distribution of Tree Species in Danish Forests**
*(hectares)*

| | Jutland | Danish Islands | Total |
|---|---|---|---|
| Beech | 27,500 | 56,123 | 83,623 |
| Oak | 6,515 | 14,371 | 20,886 |
| Other deciduous | 13,770 | 14,440 | 28,210 |
| Conifers | 195,501 | 42,450 | 237,951 |
| Total forested area | 243,286 | 127,384 | 370,670 |

In the following account of the cost-revenue conditions a differentiation has been made between these two regions: the "Old forests" of the Danish islands and eastern Jutland and the "New forests" of northern and western Jutland. The distribution into age classes and site quality classes in these two regions, set out in Table 4:13, can serve to illustrate this difference. The assessment has been made on the basis of the 1951 statistics and does not take into account forest property of less than 50 hectares.

The site quality classes correspond to Professor C. M. Møller's height/age site classes, which for beech range from 1 to 5, and for spruce from 1 to 6. For beech the average growth in class 1 is ten cubic metres per hectare, while for class 5 it is three cubic metres per hectare; for spruce the average growth in class 1 is twenty cubic metres per hectare, while for class 6 it is three cubic metres per hectare.

**Table 4:13. Distribution into Age Classes and Site Quality Classes in Danish Forests over 50 Hectares**

| Species | Age class *years* | Old forest region | | New forest region | |
|---|---|---|---|---|---|
| | | Area *ha* | Site quality class | Area *ha* | Site quality class |
| Beech | 0—30 | 10,135 | 2.1 | 1,140 | 3.7 |
| | 30—60 | 15,012 | 2.1 | 987 | 3.6 |
| | 60—90 | 18,154 | 2.1 | 1,093 | 3.6 |
| | 90—120 | 10,785 | 2.4 | 937 | 3.9 |
| | 120 | 9,805 | 2.5 | 1,530 | 4.4 |
| | Total | 63,891 | 2.2 | 5,687 | 3.9 |
| Spruce | 0—30 | 27,329 | 2.6 | 23,121 | 4.7 |
| | 30—60 | 15,740 | 3.3 | 16,650 | 4.8 |
| | 60—90 | 4,869 | 3.7 | 6,274 | 5.1 |
| | 90 | 155 | — | 262 | 5.2 |
| | Total | 48,093 | 3.0 | 46,307 | 4.8 |

It can be seen from the table that in the case of both beech and spruce the site quality classes and thus also the growth conditions are much better in the Old forests than in the New.

Furthermore, the table illustrates the considerable predominance of conifers in forests of the younger age classes, which brings about the previously stated conditions, namely, that coniferous growth is much greater than the felling. Table 4:14 shows the assessment of growth in Danish forests compared with the average annual cut for the period 1958-1963.

Also the table illustrates the difference between growth conditions on the Danish islands and in Jutland.

The distribution of forest area between the State forests, municipally owned forests and privately owned forests can be seen in Table 4:15. It should be emphasised that the private forests are generally owned by individuals, while companies and similar bodies own only a small part of the forest area and almost only new plantations in Jutland. Also the table gives a rough idea of the distribution of the forest area for large and small forest properties.

**Table 4:14. Growth Compared with Fellings a, in Danish Forests, 1958—1963**

| | Danish Islands | | Jutland | | Denmark as a whole | | |
|---|---|---|---|---|---|---|---|
| | Growth | | Growth | | Growth | | Fellings[a] 1958—1963 |
| | $m^3/ha$ | total *1,000 $m^3$* | $m^3/ha$ | total *1,000 $m^3$* | $m^3/ha$ | total *1,000 $m^3$* | total *1,000 $m^3$* |
| Beech ..... | 8.6 | 482 | 6.1 | 159 | 7.7 | 641 | 622 |
| Oak ..... | 5.8 | 84 | 4.2 | 27 | 5.3 | 111 | 89 |
| Other deciduous | 4.5 | 65 | 4.0 | 55 | 4.3 | 120 | 141 |
| Conifers ..... | 11.4 | 483 | 6.0 | 1,191 | 7.1 | 1,674 | 918 |
| Total ..... | 8.7 | 1,114 | 5.9 | 1,432 | 6.9 | 2,456 | 1,770 |

*a.* over 5 cm with bark

**Table 4:15. Distribution of Forest Area According to Owner Categories and Size**

| | Forest properties >50 ha | | Forest properties <50 ha | | All forest properties | | |
|---|---|---|---|---|---|---|---|
| | No. | Area *1,000 ha* | No. | Area *1,000 ha* | No. | Area *1,000 ha* | % |
| State forests ... | 86 | 121 | 43 | 1 | 129 | 122 | *28* |
| Municipal forests | 78 | 13 | 188 | 3 | 266 | 16 | *3* |
| Private forests .. | 734 | 201 | 32,038 | 99 | 32,772 | 300 | *69* |
| Total ..... | 898 | 335 | 32,269 | 103 | 33,167 | 438 | *100* |

It appears therefore that the special characteristic of Danish forestry is that municipally owned forests occur only to a limited extent and that small forest properties, which are predominantly private farm woodlands, account for approximately one-quarter of the forest area of the country.

As to the distribution of tree species, site quality classes, growth, volume of timber and other growth factors, there is no important difference between the State forests and the large privately owned forest properties. However, an exception must be made for the plantings on the sand dunes along the west coast of Jutland, which are owned by the Danish State, and where the average growth conditions are much poorer than in the other forests which are classified as New forests. As far as the smaller forests are concerned, the natural productive conditions do not differ very much from the conditions in the other owner categories, but for well-known reasons the actual production of these forests is generally less. This is illustrated by Table 4:16 which gives the total fellings per hectare and the percentage of industrial roundwood in forests of different sizes.

It can be clearly seen from the table that both the amount of industrial roundwood and the composition of the sales according to the various qualities are definitely dependent on the size of the property.

**Table 4:16. Total Fellings and Percentage of Industrial Roundwood in Forests of Different Size, 1959—1963**

| Species | Forests <50 *ha* | | Forests 50—250 ha | | Forests >250 ha | |
|---|---|---|---|---|---|---|
| | Fellings $m^3/ha$ | Industrial roundwood % | Fellings $m^3/ha$ | Industrial roundwood % | Fellings $m^3/ha$ | Industrial roundwood % |
| Beech ..... | 4.5 | *43* | 6.3 | *65* | 8.5 | *72* |
| Oak ..... | 3.0 | *61* | 4.6 | *78* | 4.4 | *79* |
| Other deciduous | 2.7 | *30* | 4.4 | *54* | 6.5 | *58* |
| Conifers ..... | 2.2 | *73* | 3.4 | *87* | 4.8 | *90* |
| All species ..... | 2.8 | *59* | 4.2 | *78* | 5.8 | *81* |

* * *

Denmark is a relatively small country and this means that usually there are only small distances between most of the forests and the centres of consumption, industries and export ports. Furthermore, the topographical nature of the country does not involve any great problem with land transport, which is mostly done by means of lorries.

One cannot say that there are any noticeable regional differences in marketing conditions, because wood-processing industries in sufficient numbers are to be found in all parts of Denmark to-day. Thus a more detailed account of transport and marketing conditions would hardly be of interest in this survey.

## 4.2 Costs and Revenue in Forestry in Different Regions and Owner Categories

### *4.2.1 General Description of Forest Enterprises Surveyed in this Study*

Cost-revenue conditions are given for the following ownership categories:

A. Old forest region:
   (a) Privately owned forests
   (b) State forests
B. New forest region of Jutland:
   (a) Privately owned forests
   (b) State forests

The State Forests involve the forest districts managed by the Directorate of the Danish State Forests, and the material used here has been taken from the annual reports *De danske statsskoves udbytte af ved og penge* (The Danish State Forests: Timber Yield and Revenue), supplemented by special examinations of the basic accounts. For the period under survey (1958-1962) the Danish State Forests totalled on average 63,600 hectares of forest area, namely 36,000 hectares in the Old forest region and 27,600 hectares in the New forest region. Table 4:17 sets out other general data about the State forests.

The privately owned forests mean here those forest properties which submit their accounts to the Danish Forestry Association (*Dansk Skovforening*) for processing. When this material has been processed by the Association it appears in the annual publication *Regnskabsoversigter for dansk privatskovbrug* (Survey of Accounts for the Danish Privately Owned Forests), from which the information used here has been culled. On average for the period 1958-1962 accounts were received from altogether 110 properties comprising

**Table 4:17. General Data on Forest Area Covered in this Survey**
*(Averages for the period 1958—1962)*

| | State forests | | Private forests | |
|---|---|---|---|---|
| | Old forests | New forests | Old forests | New forests |
| Forest area, ha | 36,000 | 27,600 | 62,500 | 8,400 |
| No. of Forest Districts/properties, 1962 | 22 | 8 | 90 | 24 |
| Distribution of species in %: | | | | |
| Beech | *37* | *3* | *43* | — |
| Oak | *10* | *3* | *12* | *5* |
| Other deciduous | *9* | *3* | *9* | — |
| Conifers | *44* | *91* | *36* | *95* |
| Annual reforestation as % of forested area | *1.57* | *1.86* | *1.51* | *2.14* |
| Growth, $m^3$/ha per year | 8.7 | 3.9 | 8.7 | 4.0 |
| Fellings, $m^3$/ha per year | 8.2 | 3.3 | 8.1 | 3.4 |

a forest area totalling 70,900 hectares, namely 62,500 hectares in the Old forest region and 8,400 hectares in the New forest region. Table 4:17 sets out other general data about the forest properties from which statistics have been obtained.

As can be seen from the table, there is a great similarity between the State forests and private forests in the statistics for each of the two regions as far as the basic conditions of production are concerned.

### *4.2.2 Cost-Revenue Data*

Tables 4:18 to 4:22 contain the processed results of the accounts submitted for the years 1958 to 1962 for the above-mentioned ownership categories and regions. All the sums of money involved have been adjusted to the 1962 value of the Danish krone using the official index for wholesale prices (1950=100), which for the individual years under survey was as follows:

1958: 102
1959: 102
1960: 102
1961: 104
1962: 106

Table 4:22 shows the average results for the period 1958-1962.

As has been pointed out earlier, the figures given represent actual results which have been taken from the survey of the accounts for forest properties and State forest districts. One has had to adapt to a certain extent this material in order to get it into the form required for the present survey. However, this adaptation has been restricted to the transfer of certain cost entries. This means that the gross revenue from sales as well as the net surplus have been taken directly from the accounts without alteration.

As far as the individual items in the tables are concerned the following should be noted:

As no sales of standing timber have been made on properties and in districts included in the statistics, the total gross revenue represents the receipts from the sale of felled timber. Allowance has been made for changes in the stocks of felled timber which have taken place during the course of the financial year in such a way that felling, revenue from sales, as well as logging costs and transport costs correspond to each other in the statistics given.

Logging and transport costs include all the costs from felling up to the time when the various assortments are ready for sale at the logging site or at the roadside by the forest, or occasionally when delivered to the buyer's yard. Social charges are included both in these costs and the following cost groups. Here it has been necessary to distribute the social costs; in most cases this has been done objectively as holidays with pay and workers' insurance are in relation to earnings and the number of hours worked, respectively. For

**Table 4:18. Costs and Revenue for Privately Owned Properties in the Old Forest Region, 1958—1962**
*(adjusted to 1962 value of the Danish krone)*

| Year | 1958 | 1959 | 1960 | 1961 | 1962 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Forested area, 1000 ha | 61 | 62 | 64 | 63 | 64 | 61 | 62 | 64 | 63 | 64 |
| Total annual cut, 1000 $m^3$ | 478 | 496 | 499 | 536 | 523 | 478 | 496 | 499 | 536 | 523 |
| Annual cut, $m^3$/ha | 7.9 | 8.1 | 7.8 | 8.6 | 8.2 | 7.9 | 8.1 | 7.8 | 8.6 | 8.2 |
| Reforestation area, ha | 883 | 873 | 1090 | 930 | 939 | 883 | 873 | 1090 | 930 | 939 |
| | | | *D.kr/ha* | | | | | *D.kr/$m^3$* | | |
| Gross revenue | 618 | 630 | 623 | 688 | 634 | 78.3 | 77.8 | 79.8 | 80.0 | 76.3 |
| Logging and transport costs | 140 | 141 | 140 | 161 | 165 | 17.6 | 17.4 | 18.0 | 18.8 | 20.0 |
| Net conversion surplus (stumpage value) | 478 | 489 | 483 | 527 | 469 | 60.7 | 60.4 | 61.8 | 61.2 | 56.3 |
| Silvicultural costs | 94 | 94 | 100 | 96 | 102 | 11.8 | 11.6 | 12.8 | 11.2 | 12.5 |
| Administrative costs | 102 | 105 | 105 | 114 | 119 | 12.9 | 13.1 | 13.6 | 13.2 | 14.5 |
| Maintenance costs | 54 | 55 | 52 | 55 | 50 | 6.8 | 6.7 | 6.7 | 6.4 | 6.1 |
| Costs for improvement and expansion | — | — | — | — | — | — | — | — | — | — |
| Taxes | 58 | 60 | 59 | 56 | 56 | 7.5 | 7.4 | 7.6 | 6.5 | 6.8 |
| Total managing costs | 308 | 314 | 316 | 321 | 327 | 39.0 | 38.8 | 40.7 | 37.3 | 39.9 |
| Total costs | 448 | 455 | 456 | 482 | 492 | 56.6 | 56.2 | 58.7 | 56.1 | 59.9 |
| Net profit | 170 | 175 | 167 | 206 | 142 | 21.7 | 21.6 | 21.1 | 23.9 | 16.4 |

**Table 4:19. Costs and Revenue for State Forests in the Old Forest Region, 1958—1962**
*(adjusted to 1962 value of the Danish krone)*

| Year | 1958 | 1959 | 1960 | 1961 | 1962 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Forested area, 1000 ha | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Total annual cut, 1000 $m^3$ | 279 | 294 | 302 | 310 | 282 | 279 | 294 | 302 | 310 | 282 |
| Annual cut, $m^3$/ha | 7.8 | 8.2 | 8.4 | 8.6 | 7.8 | 7.8 | 8.2 | 8.4 | 8.6 | 7.8 |
| Reforestation area, ha | 555 | 518 | 603 | 606 | 538 | 555 | 518 | 603 | 606 | 538 |
| | | | *D.kr/ha* | | | | | *D.kr/$m^3$* | | |
| Gross revenue | 629 | 616 | 647 | 694 | 610 | 80.7 | 75.1 | 77.1 | 80.7 | 78.2 |
| Logging and transport costs | 146 | 142 | 150 | 161 | 158 | 18.8 | 17.2 | 17.9 | 18.5 | 20.4 |
| Net conversion surplus (stumpage value) | 483 | 474 | 497 | 533 | 452 | 61.9 | 57.9 | 59.2 | 62.2 | 57.8 |
| Silvicultural costs | 104 | 107 | 115 | 115 | 113 | 13.5 | 13.1 | 13.6 | 13.3 | 14.5 |
| Administrative costs | 89 | 92 | 93 | 108 | 107 | 11.4 | 11.3 | 11.1 | 12.5 | 13.7 |
| Maintenance costs | 53 | 50 | 50 | 64 | 61 | 6.5 | 6.2 | 5.9 | 7.4 | 7.9 |
| Costs for improvement and expansion | 12 | 15 | 17 | 23 | 15 | 1.5 | 2.0 | 2.0 | 2.5 | 1.9 |
| Taxes | 51 | 51 | 54 | 50 | 51 | 6.7 | 6.2 | 6.3 | 5.7 | 6.6 |
| Total managing costs | 309 | 315 | 329 | 360 | 347 | 39.6 | 38.8 | 38.9 | 41.4 | 44.6 |
| Total costs | 455 | 457 | 479 | 521 | 505 | 58.9 | 56.0 | 56.8 | 59.9 | 65.0 |
| Net profit | 174 | 159 | 168 | 173 | 105 | 22.3 | 19.1 | 20.3 | 20.8 | 13.2 |

**Table 4:20. Costs and Revenue for Privately Owned Properties in the New Forest Region (Plantations on Heaths), 1958—1962**
*(adjusted to 1962 value of the Danish krone)*

| Year | 1958 | 1959 | 1960 | 1961 | 1962 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Forested area, 1000 ha | 8 | 8 | 8 | 9 | 9 | 8 | 8 | 8 | 9 | 9 |
| Total annual cut, 1000 $m^3$ | 27 | 29 | 27 | 33 | 29 | 27 | 29 | 27 | 33 | 29 |
| Annual cut, $m^3$/ha | 3.3 | 3.4 | 3.3 | 3.7 | 3.2 | 3.3 | 3.4 | 3.3 | 3.7 | 3.2 |
| Reforestation area, ha | 234 | 212 | 194 | 122 | 142 | 234 | 212 | 194 | 122 | 142 |
| | | | *D.kr/ha* | | | | | *D.kr/$m^3$* | | |
| Gross revenue | 207 | 218 | 217 | 256 | 215 | 62.6 | 64.2 | 65.7 | 69.3 | 67.1 |
| Logging and transport costs | 63 | 60 | 64 | 72 | 72 | 19.0 | 17.6 | 19.2 | 19.5 | 22.7 |
| Net conversion surplus (stumpage value) | 144 | 158 | 153 | 184 | 143 | 43.6 | 46.6 | 46.5 | 49.8 | 44.4 |
| Silvicultural costs | 63 | 56 | 60 | 54 | 51 | 19.0 | 16.4 | 18.3 | 14.5 | 15.8 |
| Administrative costs | 41 | 45 | 47 | 44 | 45 | 12.4 | 13.3 | 14.3 | 12.0 | 14.3 |
| Maintenance costs | 22 | 23 | 15 | 16 | 11 | 6.6 | 7.0 | 4.6 | 4.4 | 3.2 |
| Costs for improvement and expansion | — | — | — | — | — | — | — | — | — | — |
| Taxes | 19 | 20 | 19 | 15 | 14 | 5.8 | 5.9 | 5.8 | 4.1 | 4.4 |
| Total managing costs | 145 | 144 | 141 | 129 | 121 | 43.8 | 42.6 | 43.0 | 35.0 | 37.7 |
| Total costs | 208 | 204 | 205 | 201 | 193 | 62.8 | 60.2 | 62.2 | 54.5 | 60.4 |
| Net profit | −1 | 14 | 12 | 55 | 22 | −0.2 | 4.0 | 3.5 | 14.8 | 6.7 |

**Table 4:21. Costs and Revenue for State Forests in the New Forest Region, 1958—1962**
*(adjusted to 1962 value of the Danish krone)*

| Year | 1958 | 1959 | 1960 | 1961 | 1962 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Forested area, 1000 ha | 28 | 27 | 27 | 28 | 28 | 28 | 27 | 27 | 28 | 28 |
| Total annual cut, 1000 $m^3$ | 84 | 85 | 91 | 102 | 90 | 84 | 85 | 91 | 102 | 90 |
| Annual cut, $m^3$/ha | 3.0 | 3.1 | 3.3 | 3.7 | 3.2 | 3.0 | 3.1 | 3.3 | 3.7 | 3.2 |
| Reforestation area, ha | 535 | 552 | 570 | 480 | 431 | 535 | 552 | 570 | 480 | 431 |
| | | | *D.kr/ha* | | | | | *D.kr/$m^3$* | | |
| Gross revenue | 193 | 204 | 231 | 271 | 222 | 64.4 | 65.8 | 69.9 | 73.3 | 69.3 |
| Logging and transport costs | 69 | 72 | 81 | 93 | 94 | 22.9 | 22.9 | 24.0 | 25.0 | 29.0 |
| Net conversion surplus (stumpage value) | 124 | 132 | 150 | 178 | 128 | 41.5 | 42.9 | 45.9 | 48.3 | 40.3 |
| Silvicultural costs | 54 | 61 | 62 | 61 | 62 | 18.2 | 19.1 | 18.7 | 16.4 | 19.1 |
| Administrative costs | 42 | 44 | 46 | 51 | 53 | 13.8 | 14.2 | 13.6 | 13.9 | 16.7 |
| Maintenance costs | 17 | 17 | 19 | 22 | 20 | 5.3 | 5.4 | 5.7 | 6.3 | 6.3 |
| Costs for improvement and expansion | 5 | 5 | 6 | 5 | 8 | 2.0 | 1.7 | 1.9 | 1.3 | 2.5 |
| Taxes | 15 | 14 | 15 | 15 | 12 | 4.9 | 4.5 | 4.7 | 4.1 | 3.8 |
| Total managing costs | 133 | 141 | 148 | 154 | 155 | 44.2 | 44.9 | 44.6 | 42.0 | 48.4 |
| Total costs | 202 | 213 | 229 | 247 | 249 | 67.1 | 67.8 | 68.6 | 67.0 | 77.3 |
| Net profit | −9 | −9 | 2 | 24 | −27 | −2.7 | −2.0 | 1.3 | 6.3 | −8.0 |

**Table 4:22. Average Costs and Revenue per Year for the Period 1958—1962 for Privately Owned Properties and State Forests in both Old and New Forest Region**
*(adjusted to 1962 value of the Danish krone)*

| | Old forest region | | New forest region | | Old forest region | | New forest region | |
|---|---|---|---|---|---|---|---|---|
| | Private | State | Private | State | Private | State | Private | State |
| Forested area, 1000 ha | 64 | 36 | 8 | 28 | 64 | 36 | 8 | 28 |
| Total annual cut, 1000 $m^3$ | 520 | 294 | 29 | 90 | 520 | 294 | 29 | 90 |
| Annual cut, $m^3$/ha | 8.1 | 8.2 | 3.4 | 3.3 | 8.1 | 8.2 | 3.4 | 3.3 |
| Reforestation area, ha | 1.51 | 1.57 | 2.14 | 1.86 | 1.51 | 1.57 | 2.14 | 1.86 |
| | | | *D.kr/ha* | | | | *D.kr/$m^3$* | |
| Gross revenue | 637 | 640 | 222 | 223 | 78.4 | 78.4 | 65.8 | 68.5 |
| Logging and transport costs | 148 | 151 | 67 | 82 | 18.4 | 18.5 | 19.6 | 24.8 |
| Net conversion surplus (stumpage value) | 489 | 489 | 155 | 141 | 60.0 | 59.9 | 46.2 | 43.7 |
| Silvicultural costs | 96 | 111 | 56 | 60 | 11.8 | 13.6 | 16.7 | 18.3 |
| Administrative costs | 110 | 98 | 44 | 47 | 13.5 | 12.0 | 13.1 | 14.4 |
| Maintenance costs | 54 | 56 | 17 | 19 | 6.5 | 6.7 | 5.2 | 5.8 |
| Costs for improvement and expansion | — | 16 | — | 6 | — | 2.0 | — | 1.9 |
| Taxes | 58 | 51 | 17 | 14 | 7.2 | 6.3 | 5.0 | 4.4 |
| Total managing costs | 318 | 332 | 134 | 146 | 39.0 | 40.6 | 40.0 | 44.8 |
| Total costs | 466 | 483 | 201 | 228 | 57.4 | 59.1 | 59.6 | 69.6 |
| Net profit | 171 | 157 | 21 | −5 | 21.0 | 19.3 | 6.2 | −1.1 |

certain other social costs such as sick pay and accommodation allowances the distribution is more arbitrary and has been made on a percentage basis. However, in the main these involve only small amounts, and in all events it can only be a matter of errors of insignificant importance.

Silvicultural costs include the costs of establishment and maintenance of plantations as well as the later care and protection of the stands and the soil. It has not been possible to separate the costs for planting areas not previously cultivated. In the Old forests this involves only very small sums for the individual years. Considerable planting is still being done in the New forests, though probably this applies only to a limited extent for the properties included in the statistics, and in the case of certain properties the planting of new areas has been completely omitted from the accounts submitted. All in all, the problem would seem to be of small importance.

Administrative costs involve wages and salaries, living accommodation, pensions, etc. for the administrative staff (forest supervisors and forest rangers), as well as office costs, travelling allowances, etc. In the State forests there has also been included the costs of the central administration, the central auditing and the planning department. It should be noted that the administrative costs of the accounting statistics have been included in their entirety. Consequently, no attempt has been made to separate certain of the administrative costs as being involved in other activities than timber production, such as the production and sale of planting stock, decorative branches and Christmas trees, leasing of fishing and hunting rights, etc. In assessing the administrative costs it should be noted accordingly that in the case of many forest properties the revenue from such other sources can be considerable and can often amount to between 50 and 100 Danish kroner per hectare of the total forest area on a property.

The group maintenance costs includes the maintenance of roads, drainage, fences, fire-breaks, building and machinery. Where privately owned forests are concerned it has not been possible to distinguish between the building of new roads and the maintenance of roads, etc. However, it should be emphasised here that there is only a very limited new building of such facilities in the Danish forests, which on the whole are well provided with roads, ditches and fences.

The group improvement and expansion costs, for the above reason, has been included only for the State forests and covers new road building, drainage and fences, as well as the procurement of larger items of machinery. On the other hand, as has been mentioned before, it has not been possible to separate the costs for planting areas not previously cultivated.

Under the heading taxes have been included only those taxes which fall on the forest areas and the buildings and installations appertaining thereto. Forest properties are not burdened with other taxes, which can be regarded as costs in this connection.

### *4.2.3 Comparison of Revenue and Costs in the Different Regions and Ownership Categories*

As can be seen from the average annual revenue and costs for the period 1958-1962 (Table 4:22), there is very little difference between the results shown in the accounts of the privately owned forests and of the State forests. This applies both to the Old and New forest regions. However, on the whole the net surplus is somewhat lower for the State forests, which is chiefly due to the special costs involved with "improvement and expansion" for the Old forests. To some extent this can be explained by the fact that in the State forests a number of new roads as well as paths for ramblers are being made for the convenience of the general public, and also by the fact that the State forests are obliged to maintain and improve a number of dwellings for keepers, etc., as a consequence of the general public having access to the State forests.

The same applies for the New forests. However, here it must be added that the logging and transport costs are higher for the State forests than for the private forests. Most likely this can be attributed to the higher piece rates paid by the State and the somewhat less favourable position of the State forests in matters of costs where the hire of labour is involved.

The marked difference in the results for the Old and the New forests can be attributed primarily to the difference in the conditions of growth. However, in addition there is the fact that the New forests have not yet attained full production, neither in terms of growth nor in terms of cut, because here there is still a marked preponderance of young trees and stands. Also it may be worth mentioning that in the New forests a revenue, which is by no means negligible, is obtained from the sale of decorative branches and Christmas trees. Consequently, the results given here, which take only timber production into account, do not give a complete picture of the economic position of the forests in question.

## 4.3 Hypothetical Models for the Danish Forest Economy

### *4.3.1 Hypothetical Models*

In order to elucidate and explain the results for the individual regions with their various compositions of tree species and quality site classes, accounted for in Section 4.2, Tables 4:23—4:25 have been compiled to show the assessment of the contribution margin for the species of Norway spruce of site quality classes 1 and 4 as well as beech of site quality class 2 in "normal forest" conditions in Denmark. The assessments refer to both species and site quality class and they have been made for two rotation periods, namely, rotations of 50 and 60 years for the best Norway spruce site

**Table 4:23. Assessment of Contribution Margin for Normal Forest of Norway Spruce of Site Quality Class 1**
*(1962 price level)*

| | 50-year rotation | 60-year rotation |
|---|---|---|
| 1. Average annual cut, $m^3$/ha | 19.9 | 20.0 |
| 2. Gross revenue, D.kr/$m^3$ | 85 | 88 |
| 3. Assortment costs, D.kr/$m^3$ | 17 | 16 |
| 4. Net conversion surplus (stumpage value), D.kr/$m^3$ (2−3) | 68 | 72 |
| 5. Net conversion surplus (stumpage value), D.kr/ha (1×4) | 1,353 | 1,438 |
| 6. Silvicultural costs, D.kr/ha | 88 | 72 |
| 7. Overhead costs dependent on volume, D.kr/ha | 60 | 60 |
| 8. Overhead costs dependent on species, D.kr/ha | 92 | 109 |
| 9. Specific costs dependent on species, D.kr/ha sum (6+7+8) | 240 | 241 |
| 10. Contribution margin for species, D.kr/ha (5−9) | 1,113 | 1,197 |
| 11. Contribution margin for species, D.kr/$m^3$ (10÷1) | 56 | 60 |

quality class, of 60 and 70 years for the less favourable site quality class for the same species, and 100 and 120 years for beech. It should be noted that the rotation periods in question represent the limits within which such rotation is carried out normally in Denmark.

Norway spruce has been assessed for two site quality classes, whereas only one site quality class has been taken for beech. The reason for this is that, as has been mentioned before, beech is particularly prevalent in the Old forests, where site quality class 2 can be regarded as the typical class (see Table 4:12), while Norway spruce is grown both in the Old and in the New forests. Consequently, site quality class 1 can be regarded as an optimum for Norway spruce in the Old forests and site quality class 4 as an average in the New forests.

As to the concept "contribution margin for species" it should be emphasised that this term includes gross income from sales less all costs directly attributable to the species, such as logging and transport costs, silvicultural costs, as well as the overhead costs involved with volume and species. On the other hand, other overhead costs, particularly part of the administrative costs, have not been deducted when making the assessment of the contribution margin for species, because these costs are not dependent on the selection of the species, or in any case only to a very limited degree. However, to a marked extent they are dependent on the nature of the property, particularly its size, its geographical position and structure, its integration with other economic activities (especially in the timber industry or in agriculture), and a number of other circumstances which are specific for the individual property. When constructing economic models for the individual species it it most logical to disregard such costs which have no relation to the species. For this reason alone the assessed contribution margin cannot be compared

**Table 4:24. Assessment of Contribution Margin for Normal Forest of Norway Spruce of Site Quality Class 4**
*(1962 price level)*

| | 50-year rotation | 60-year rotation |
|---|---|---|
| 1. Average annual cut, $m^3$/ha | 9.3 | 9.8 |
| 2. Gross revenue, D.kr/$m^3$ | 74 | 80 |
| 3. Assortment costs, D.kr/$m^3$ | 23 | 21 |
| 4. Net conversion surplus (stumpage value), D.kr/$m^3$ (2−3) | 51 | 59 |
| 5. Net conversion surplus (stumpage value), D.kr/ha (1×4) | 474 | 578 |
| 6. Silvicultural costs, D.kr/ha | 67 | 57 |
| 7. Overhead costs dependent on volume, D.kr/ha | 28 | 29 |
| 8. Overhead costs dependent on species, D.kr/ha | 31 | 35 |
| 9. Specific costs dependent on species, D.kr/ha, sum (6+7+8) | 126 | 121 |
| 10. Contribution margin for species, D.kr/ha (5−9) | 348 | 457 |
| 11. Contribution margin for species, D.kr/$m^3$ (10÷1) | 37 | 47 |

directly with the results presented in Section 4.2. Moreover, such a direct comparison cannot be of importance, because the purpose of the hypothetical forestry models is to illustrate only the relationship between the different species and site quality classes. One may wish to make a comparison for determining the discrepancy between the hypothetical models and the actual results; in such a case there must also be deducted from the contribution margins the sum of the overhead costs, which can vary between 50 and 200 Danish kroner according to the conditions mentioned (see also Section 4.2).

As to the details in the tables the following should be noted:

(1) The average annual cut per hectare in a "normal forest" has been compiled on the basis of Professor C. M. Møller's surveys of growth according to site quality classes. These surveys, which to a large degree are based on production studies carried out in test areas, indicate the production in stands with optimum development and growth for the different site quality classes. One has to calculate in actual practice with a lower saleable timber cut, owing to incomplete cover in the stands, effect of boundaries, attacks by pests and diseases, larger losses in felling, etc. The difference between the actual timber cut and the data in the production tables varies between 5 and 25 per cent. In the construction of the hypothetical forestry models no reduction has been made for the amounts in the production tables. Here again the reason for this is, firstly, that the reduction varies irrespective of the variations in site quality classes and species, and, secondly, that the fitness of the hypothetical models as a basis for the explanation sought for the economic effect brought about by the variations in site quality classes and species in the various regions does not depend on the absolute results represented by the models (see also Section 4.2).

**Table 4:25. Assessment of Contribution Margin for Normal Forest of Beech of Site Quality Class 2**
*(1962 price level)*

| | 50-year rotation | 60-year rotation |
|---|---|---|
| 1. Average annual cut, $m^3$/ha | 8.8 | 8.7 |
| 2. Gross revenue, D.kr/$m^3$ | 58 | 61 |
| 3. Assortment costs, D.kr/$m^3$ | 22 | 21 |
| 4. Net conversion surplus (stumpage value), D.kr/$m^3$ (2−3) | 36 | 40 |
| 5. Net conversion surplus (stumpage value), D.kr/ha (1×4) | 317 | 348 |
| 6. Silvicultural costs, D.kr/ha | 92 | 76 |
| 7. Overhead costs dependent on volume, D.kr/ha | 27 | 26 |
| 8. Overhead costs dependent on species, D.kr/ha | 45 | 51 |
| 9. Specific costs dependent on species, D.kr/ha, sum (6+7+8) | 164 | 153 |
| 10. Contribution margin for species, D.kr/ha (5−9) | 153 | 195 |
| 11. Contribution margin for species, D.kr/$m^3$ (10 ÷ 1) | 17 | 22 |

(2) The gross revenue per cubic metre is calculated on the basis of the 1962 selling prices corresponding to the guiding prices agreed between the private forest enterprises and the timber industry. These selling prices for assortments are combined with an assortment ratio, which for beech was determined by the 1954 investigation undertaken by the Danish Forestry Association (*Dansk Skovforening*). The assortment ratio for Norway spruce is based on the findings of a special study involving a number of State forest districts on the basis of the details of the timber cut in recent years.

(3) The assortment costs include the costs of felling, sorting, measuring, selling, transport and other costs which can be attributed to the individual assortments. The costs have been calculated on the basis of the piece-rate agreements as well as standard rates and supplementary charges. After the cost calculations have been made for each assortment, the average assortment cost per cubic metre was calculated by using the above-mentioned assortment ratios. Details of these calculations are not given in this survey.

(4) The net conversion surplus or revenue for timber on the stump (stumpage value) is given as the difference between the gross revenue per cubic metre and the assortment costs per cubic metre.

(5) The net conversion surplus per hectare is given as the product of the timber cut per hectare and the net conversion surplus per cubic metre.

(6) The silvicultural costs per hectare include the costs involved with establishing the stand and with its later care and protection. These costs are calculated using models for the technical side of the establishment of the stands combined with the rates for labour and the prices for the planting stock.

(7) The overhead costs dependent on volume include that part of the common costs which varies according to the production (timber felled and sold). This involves especially the main part of the costs of maintenance of roads and other transport facilities, plus some of the variable costs of administration (office costs, transport allowance for personnel, certain expenses involved with measuring and selling, etc.). No detailed study has been made into the size of these costs. One can estimate the overhead costs dependent on volume at 3 D.kr. per cubic metre after examining a number of forestry accounts. Although this amount may not be completely accurate, there can be no doubt that it indicates the correct magnitude, and this is sufficient to show the influence of the varying conditions of site quality classes and species on the overhead costs with varying production.

(8) A part of the overhead costs is directly dependent on the composition of tree species in the forests. In the first instance this involves property taxes, and in addition there are certain fees and contributions which have to be made to associations, and such are calculated on the same basis as the property taxes. Property taxation is determined on the basis of the value of the property assessed according to species and taking site quality class and age class distribution into account. Consequently, this taxation is directly determined by the species and the site quality class as well as the rotation period. For the purposes of the present survey an estimate has been made on a theoretical basis of the property value of a "normal forest" of Norway spruce and beech for different rotation periods and site quality classes. The estimate has been made on the basis of the official 1960 valuation lists. The costs mentioned have then been put at 2.5 per cent of the value of the property; this corresponds to the average percentage for taxation plus the above-mentioned fees and contributions to associations.

(9) The specific costs dependent on species now appear as the sum of the silvicultural costs and the overhead costs dependent on volume and species. (It should be noted that the assortment costs are also dependent on species, but as can be seen they have been taken into account at an earlier time.)

(10) The contribution margin per hectare for the species is calculated as the difference between the net revenue per hectare for timber on the stump and the specific costs dependent on the costs per hectare.

(11) The contribution margin per cubic metre for the species is calculated as the contribution margin per hectare divided by the volume of timber cut per hectare.

The calculation of the contribution margins for a "normal forest" is a result of a cost-revenue analysis according to age classes. For example, the details for Norway spruce of site quality class 1 in a 60-year rotation are reproduced in Table 4:26. While details of the derivation of the various

**Table 4:26. Example of Assessment of Contribution Margins for Age Classes and Normal Forest of Norway Spruce of Site Quality Class 1 and 60-year Rotation**
*(1962 price level)*

| | Age and Age Class | | | | | | | | Normal forest | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4 | 5—9 | 10—19 | 20—29 | 30—39 | 40—49 | 50—59 | 60 | Total | per ha | per $m^3$ |
| 1. Timber cut, $m^3$ | — | — | 48 | 142 | 164 | 146 | 186 | 436 | 1,122 | 20 | — |
| 2. Average diameter of trees cut, cm | — | — | 8 | 12 | 18 | 26 | 34 | 42 | — | — | — |
| 3. Average gross price, D.kr/$m^3$ | — | — | 66 | 67 | 75 | 89 | 97 | 98 | — | — | 88 |
| 4. Gross revenue of age class | — | — | 3,168 | 9,514 | 12,300 | 12,994 | 18,042 | 42,728 | 98,746 | 1,763 | — |
| 5. Assortment costs, D.kr/$m^3$ | — | — | 40 | 29 | 17 | 13 | 12 | 12 | — | — | 16 |
| 6. Assortment costs of age class | — | — | 1,920 | 4,118 | 2,788 | 1,898 | 2,232 | 5,232 | 18,188 | 325 | — |
| 7. Net conversion surplus of age class | — | — | 1,248 | 5,396 | 9,512 | 11,096 | 15,810 | 37,496 | 80,558 | 1,438 | 72 |
| 8. Silvicultural costs | 2,457 | 1,385 | 213 | — | — | — | — | — | 4,055 | 72 | — |
| 9. Overhead costs dependent on volume | — | — | 144 | 426 | 492 | 438 | 558 | 1,308 | 3,366 | 60 | — |
| 10. Overhead costs dependent on age | 18 | 141 | 531 | 844 | 1,188 | 1,525 | 1,844 | — | 6,091 | 109 | — |
| 11. Total specific costs dependent on age and species | 2,475 | 1,526 | 888 | 1,270 | 1,680 | 1,963 | 2,402 | 1,308 | 13,512 | 241 | — |
| 12. Contribution margins for age classes and normal forests | −2,475 | −1,526 | 360 | 4,126 | 7,832 | 9,133 | 13,408 | 36,188 | 67,046 | 1,197 | 60 |

data are given above, the following should be mentioned concerning the analysis of the age classes:

The gross revenues and assortment costs for the timber cut have been compiled on the basis of the prices and costs according to assortments, as well as on the above-mentioned assortment ratio, which has been established for the varying diameters of the timber cut. The calculations of the contribution margins for a "normal forest" set out in Tables 4:23—4:25 appear as the sum of the cut of the individual age classes, revenues, costs and contribution margins.

### *4.3.2 Comparison of the Hypothetical Models and Actual Results*

For a number of reasons there is, as has been mentioned before, a considerable difference between the contribution margin of the hypothetical forestry models and the cited operational results obtained in actual practice. One important cause of this is the previously mentioned fact that the models are constructed on the basis of surveys of growth, which in their turn are based on the optimum growth conditions without regard to actual conditions which reduce production below the optimum. Another cause is that in the models no deduction is made for other overhead costs than those which can be attributed to the respective species. Moreover, the models are constructed for single species, while most forest properties are made up of trees of several species. One must keep in mind also the fact that the models are based on the assumption of "normal forest" conditions, an assumption which never or rarely is fulfilled in actual practice.

In order to illustrate the relationship between the hypothetical models and actual practice a cost-revenue model has been constructed on the basis of the hypothetical forestry models. The cost-revenue model is for a forest property of 1,000 hectares located in the Old forests. This model has been adapted to the conditions in actual practice which means that corrections have been made to the hypothetical models for all the above-mentioned conditions with the exception of the "normal forest" assumption.

The forest property consists of 600 hectares of beech and 400 hectares of conifers, which are grown with rotation periods of approximately 120 years and 60 years, respectively. The beech is of site quality class 2, and for the conifers (Norway spruce) it is presumed that the site quality class is also 2. It is true that in the survey up to now no hypothetical model has been given for Norway spruce of site quality class 2. However, the model, which will be used from now on, is constructed in the same manner as the ones already described.

**Table 4:27. Cost-Revenue Model for a Property in the Old Forest Region of Denmark**
*(1962 price level)*
SITE QUALITY CLASSES: BEECH 2.0, NORWAY SPRUCE 2.0
TOTAL AREA: 1,000 HA, OF WHICH 600 HA OF BEECH AND 400 HA OF NORWAY SPRUCE
*Rotation: 120 years for beech, 60 years for Norway spruce*

| | Results per unit for beech area | | Results per unit for Norway spruce area | | Results per unit on average for the entire property | |
|---|---|---|---|---|---|---|
| | Hypothetical model | Practical model | Hypothetical model | Practical model | (for the practical model)* | |
| 1. Timber cut, m³/ha | 8.7 | 8.0 | 16.0 | 12.8 | 9.9 | (8.1) |
| 2. Gross revenue, D.kr/m³ | 61 | 61 | 82 | 82 | 72 | (78) |
| 3. Assortment costs, D.kr/m³ | 21 | 21 | 18 | 18 | 19 | (18) |
| 4. Net conversion surplus, D.kr/m³ | 40 | 40 | 64 | 64 | 53 | (60) |
| 5. Net conversion surplus, D.kr/ha | 348 | 320 | 1,024 | 819 | 525 | (489) |
| 6. Silvicultural costs, D.kr/ha | 76 | 76 | 70 | 70 | 74 | (96) |
| 7. Overhead costs dependent on volume, D.kr/ha | 26 | 24 | 48 | 38 | 30 | — |
| 8. Overhead costs dependent on species, D.kr/ha | 51 | 51 | 75 | 75 | 61 | — |
| 9. Total specific costs dependent on species, D.kr/ha | 153 | 151 | 193 | 183 | 165 | — |
| 10. Contribution margins for species, D.kr/ha | 195 | 149 | 831 | 636 | 360 | — |
| 11. Other overhead costs, D.kr/ha | — | — | — | — | 140 | (222) |
| 12. Net surplus of property, D.kr/ha | — | — | — | — | 220 | (171) |

*Figures in parenthesis refer to the results obtained from the accounts of privately owned properties in the Old Forest region, according to the survey in Section II

Table 4:27 shows the results of the assessment.

If the model in the right-hand column of Table 4:27 is compared with the cited results obtained from the accounts of privately owned properties in the Old forests (see the figures in parenthesis in Table 4:27), it can be noted that the model gives somewhat more favourable figures than the surveys of accounts. This is especially due to the fact that in actual practice the age class distribution (particularly in the case of conifers) is not normal, as there is a predominance of young stands. Furthermore, a very striking feature is that the model gives considerably lower silvicultural costs than the accounts. This is due to the fact that only Norway spruce and beech are taken into consideration in the model while the silvicultural costs in the accounts also include stands of more valuable species, such as various species for the production of decorative branches and Christmas trees. Also the silvicultural costs in the model are still based on model stands, which from the technical standpoint and the economic point of view are probably more of an optimum nature than can be expected in actual practice.

# Chapter 5

# FINLAND

# Finland

by

PAIVIO RIIHINEN

## 5.1 General Information Covering Forestry and the Forest Industries

### *5.1.1 Contribution of Forestry to the Gross National Product*

The contribution of forestry to the Finnish economy is more conspicuous than in most other countries, because apart from agriculture it is the main primary industry of the nation. During the first half of the Fifties it comprised 8-10 per cent of the Gross National Product. Since then this proportion has been on the decrease, while other industries—secondary and tertiary—have increased. There is comparatively large variation in this percentage, due mainly to changes in the amounts of timber cut and in stumpage prices. Thus, in 1959, forestry comprised 6.6 per cent of the G.N.P. while in 1961 it accounted for over eight per cent. These trends can be seen from the statistical data in Table 5:1.

### *5.1.2 Total Forest-Products Balances and External Trade in Forest Products*

Exports of forest products gained in importance following the expansion of the Finnish forest industries in the late Fifties. The expansion continued through the early Sixties, although the export figures for 1962 were somewhat depressed by a slump. Table 5:2 gives the total balances of forest products in 1953-1962 in roundwood equivalents. The annual consumption figures are based on the national censuses of wood consumption. They consist of the

**Table 5:1. Contribution of Forestry Production to the Gross National Product in Finland, 1953—1962**

| | 1953 | 1954 | 1955 | 1956 | 1957 | Average for 1953—57 | 1958 | 1959 | 1960 | 1961 | 1962 | Average for 1958—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gross Domestic Product at market prices | | | | | | | | | | | | |
| Current value, million Fmk | 7,530.2 | 8,233.8 | 9,113.0 | 10,304.2 | 11,119.6 | | 11,862.7 | 12,575.9 | 14,310.2 | 15,923.7 | 17,070.4 | |
| Adjusted to 1962 Fmk.... | 9,729.0 | 10,654.5 | 11,910.7 | 12,880.3 | 12,698.6 | 11,574.6 | 12,527.0 | 13,380.8 | 14,653.6 | 16,051.1 | 17,070.4 | 14,736.6 |
| Index, 1954=100..... | 91 | 100 | 112 | 121 | 119 | | 118 | 126 | 138 | 151 | 160 | |
| Net Product Value of Forestry | | | | | | | | | | | | |
| Current value, million Fmk | 629.4 | 790.0 | 924.8 | 828.1 | 807.1 | | 849.5 | 833.6 | 1,084.7 | 1,296.3 | 1,323.8 | |
| Adjusted to 1962 Fmk.... | 813.2 | 1,022.3 | 1,208.7 | 1,035.1 | 921.7 | 1,000.2 | 897.1 | 887.0 | 1,110.7 | 1,306.7 | 1,323.8 | 1,105.1 |
| Index, 1954=100..... | 80 | 100 | 118 | 101 | 90 | | 88 | 87 | 109 | 128 | 129 | |
| Gross Domestic Product, %... | *8.4* | *9.6* | *10.1* | *8.0* | *7.3* | *8.7* | *7.2* | *6.6* | *7.6* | *8.1* | *7.8* | *7.5* |

*Source:* SVT, *Statistical Yearbook*, 1953—1962

**Table 5:2. Total Forest Products Balances in Finland, 1953—1962**

| Year | Production (annual cut) | Imports | Total supply | Exports | Domestic consumption | |
|---|---|---|---|---|---|---|
| | | | | | Total | Per capita 5-year average, $m^3(s)$ |
| | *thousand cubic metres roundwood equivalent* | | | | | |
| 1953 | 35,060 | 15 | 35,075 | 15,400 | 19,675 | |
| 1954 | 40,160 | 20 | 40,180 | 18,380 | 21,800 | 4.87 |
| 1955 | 43,310 | 100 | 43,310 | 21,630 | 21,780 | |
| 1956 | 40,000 | 160 | 40,160 | 19,890 | 20,270 | |
| 1957 | 40,420 | 150 | 40,570 | 20,780 | 19,790 | |
| 1958 | 41,350 | 120 | 41,470 | 21,130 | 20,340 | |
| 1959 | 42,310 | 210 | 42,520 | 23,640 | 18,880 | |
| 1960 | 48,090 | 190 | 48,280 | 26,600 | 21,680 | 4.72 |
| 1961 | 50,670 | 300 | 50,970 | 28,470 | 22,500 | |
| 1962 | 47,090 | 460 | 47,550 | 26,420 | 21,130 | |

industrial wood used and the fuel plus other wood used by rural population. Logging waste is excluded from these figures.

Earlier appreciable quantities of Finnish roundwood were exported. As late as in 1961 the roundwood exports totalled almost six million cubic metres without bark. Since 1964 there has been no export surplus. During the last two years a slight surplus of roundwood imports can be noted.

Since 1957 over a half of wood consumption comprised exports of forest products. This is all the more important an item because it all consists of industrial wood. Domestic consumption, instead, includes at the present some 10 million cubic metres of fuel wood (waste wood excluded).

As in most other countries with a comparable level of income, the consumption of wood *per capita* decreased slightly during the decade 1953-1962. Thus, the average *per capita* consumption for the first half of this decade was 4.87 cubic metres without bark, and for the second half 4.72 cubic metres.

### *5.1.3 Structure of the Forest-Products Market and Movement of Prices*

Table 5:3 gives a synopsis of trends in the value of exports of forest products and their share of the value of total exports. It is conceivable that the proportion of forest-products exports of total exports decreases as the other exports increase. At present this proportion is about 70 per cent. Similarly, it is evident that the products involving a higher degree of manufacture, especially paper and board, are increasing their importance among the forest products exported.

Geographically the markets for the Finnish forest products cover the entire world. However, the great bulk of exports goes to Europe. Thus, in 1965, the proportion of the Finnish exports of forest products going to Europe was about 83 per cent.

**Table 5:3. Value of Exports of Forest Products and their Share of Total Exports of Finland, 1953—1962**
(*In current Finnish marks*)

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Value of total exports, 1000 Fmk | 1,315,552 | 1,566,181 | 1,812,593 | 1,779,865 | 2,123,854 | 2, 479,344 | 2,673,219 | 3,164,735 | 3,374,050 | 3,533,100 |
| Index, 1954=100 ..... | *84* | *100* | *116* | *114* | *136* | *158* | *171* | *202* | *215* | *226* |
| Value of forest products' exports 1,000 Fmk ..... | 1,018,703.3 | 1,250,296.4 | 1,470,426.4 | 1,395,427.0 | 1,630,735.8 | 1,923,785.7 | 1,969,736.1 | 2,381,966.6 | 2,676,500.0 | 2,550,292.0 |
| Index, 1954=100 ..... | *81* | *100* | *118* | *112* | *130* | *154* | *158* | *191* | *214* | *204* |
| Forest products as *percentage* of total export value, % ..... | *77.4* | *79.8* | *81.1* | *78.4* | *76.8* | *77.6* | *73.7* | *75.3* | *79.3* | *72.2* |
| Proportions of forest products specified | | | | | | | | | | |
| Roundwood .....1,000 Fmk | 96,617.9 | 129,149.9 | 190,920.3 | 170,863.7 | 168,115.2 | 187,381.1 | 160,019.0 | 205,241.3 | 294,799.0 | 188,214.0 |
| % | *9.5* | *10.3* | *13.0* | *12.2* | *10.3* | *9.7* | *8.1* | *8.6* | *11.0* | *7.4* |
| Sawnwood .....1,000 Fmk | 303,118.4 | 335,826.0 | 371,196.4 | 292,950.0 | 358,567.6 | 432,151.0 | 471,516.5 | 636,082.8 | 640,101.0 | 560,954.0 |
| % | *29.8* | *26.9* | *25.2* | *21.0* | *22.0* | *22.5* | *23.9* | *26.7* | *23.9* | *22.0* |
| Veneer .....1,000 Fmk | 481.2 | 258.2 | 443.3 | 493.6 | 1,188.6 | 1,452.2 | 933.3 | 1,350.9 | 2,309.0 | 1,672.0 |
| % | — | — | — | — | *0.1* | *0.1* | — | *0.1* | *0.1* | *0.1* |
| Plywood .....1,000 Fmk | 57,725.1 | 93,708.8 | 106,972.3 | 70,352.2 | 83,389.1 | 97,958.4 | 113,135.0 | 142,643.0 | 133,115.0 | 142,353.0 |
| % | *5.7* | *7.5* | *7.3* | *5.0* | *5.1* | *5.1* | *5.7* | *6.0* | *5.0* | *5.6* |
| Particle board ....1,000 Fmk | — | — | — | — | — | — | — | — | 9,396.0 | 9,330.0 |
| % | — | — | — | — | — | — | — | — | *0.4* | *0.4* |
| Fibre-board .....1,000 Fmk | 11,313.7 | 11,203.5 | 13,082.3 | 10,613.4 | 14.449.2 | 23,269.0 | 28,461.6 | 34,109.9 | 36,463.0 | 38,338.0 |
| % | *1.1* | *0.9* | *0.9* | *0.8* | *0.9* | *1.2* | *1.5* | *1.4* | *1.4* | *1.5* |
| Pulp .....1,000 Fmk | 222,555.7 | 298,795.7 | 367,779.8 | 380,161.9 | 423,043.4 | 491,560.2 | 482,664.9 | 542,676.6 | 578,650.0 | 582,290.0 |
| % | *21.8* | *23.9* | *25.0* | *27.3* | *25.9* | *25.6* | *24.5* | *22.8* | *21.6* | *22.8* |
| Paper and paper board ..... 1,000 Fmk | 248,889.4 | 304,724.0 | 376,034.8 | 418,401.1 | 524,588.4 | 634,346.4 | 654,474.8 | 755,201.4 | 908,492.0 | 965,805.0 |
| % | *24.1* | *24.4* | *25.6* | *30.0* | *32.2* | *32.9* | *33.3* | *31.7* | *33.9* | *37.8* |
| Others .....1,000 Fmk | 78,001.9 | 76,630.3 | 44,024.2 | 51,591.1 | 57,194.3 | 55,667.4 | 58,531.0 | 64,660.2 | 73,175.0 | 61,336.0 |
| % | *7.7* | *6.1* | *3.0* | *3.7* | *3.5* | *2.9* | *3.0* | *2.7* | *2.7* | *2.4* |
| Total .....% | *100.0* | *100.0* | *100.0* | *100.0* | *100.0* | *100.0* | *100.0* | *100.0* | *100.0* | *100.0* |

**Table 5:4. Average Export Prices (f.o.b.) for Newsprint, 1953—1962**
*(current Fmk and S.kr per metric ton)*

| Year | Metric tons | Value, *1,000 Fmk* | *Fmk/ton* | *S.kr/ton* | Index |
|---|---|---|---|---|---|
| 1953 | 402,181 | 11,173,960 | 27,780 | 624 | 91.5 |
| 1954 | 391,750 | 11,335,235 | 28,930 | 650 | 95.3 |
| 1955 | 470,070 | 14,150,677 | 30,100 | 677 | 99.3 |
| 1956 | 536,868 | 16,782,227 | 31,260 | 699 | 102.5 |
| 1957 | 550,591 | 19,260,075 | 34,980 | 708 | 103.8 |
| 1958 | 584,514 | 24,695,267 | 42,250 | 682 | 100.0 |
| 1959 | 575,876 | 23,657,457 | 41,080 | 664 | 97.4 |
| 1960 | 691,115 | 28,140,888 | 41,720 | 673 | 98.7 |
| 1961 | 846,240 | 33,999,973 | 40,180 | 646 | 94.7 |
| 1962 | 869,726 | 34,783,995 | 39,990 | 643 | 94.3 |

*Source: Foreign Trade Statistics*, 1953—1962

The value of exports depends to a large extent on the prices of forest products. Table 5:4 gives the average prices for newsprint exported from Finland in 1953-1962. There is hardly any trend visible in these prices. Changes in the newsprint prices in Europe are usually associated with those in North America, but we shall not go into this problem here.

### *5.1.4 Structure of the Labour Market and Movements in Wages*

Traditionally Finnish agriculture and forestry used the same labour force, with the exception of supervisory staff. The seasonal variations in these two sectors have largely counterbalanced each other. As a result, the number of people participating in forest and floating work each year has been large; in 1959 it was estimated at 450,000 men; with an average annual labour input of 84 days. By 1961 the average labour input per year had increased to 104 days. An expert estimate puts the number of forest and floating workers in 1965 as 300,000 men and a forecast for 1975 indicates that it will be in the order of 200,000. The development trend is towards increasing specialisation among forest workers and their detachment from agriculture. This trend seems to be associated with the diminishing number of small agricultural holders, whose age class distribution lends itself to shift them away from forest work. In the ten-year period 1950-1960 the number of holders of less than five hectares of land, participating in forest work, had decreased by one-half. The trend towards specialisation is speeded up by mechanisation and the shifting of certain phases of forest work to the mills. In general it can be said that the change in forest labour is one aspect of a larger social change mainly caused by industrialisation.

The remuneration of forest workers in Finland comes under the appropriate law of 1964 which provides a minimum wage legislation. The employers are

obliged to maintain a wage level not lower than that indicated in the collective agreement between the employers' organisations and the trade unions. The collective agreement fixes the wage level in forest and floating work as to provide average earnings comparable to those of the male workers in the wood-processing industries.

Most of the work in Finnish forests is done on a piece-work basis. Standard wages (wage norms) are fixed in the negotiations between the employers' organisations and trade unions. The piece rates are determined from the standard daily wages (Table 5:5) on the basis of time and motion studies and detailed statistics of actual work output (Table 5:6). There was very little variation in the real value of daily wages and piece rates in 1958-1962. A slight increase is, of course, conceivable as a result of the general endeavour to share the gains from increased productivity.

**Table 5:5. Daily Wage Norms for Forest Workers Working under Contract**

| Year | Southern Finland District 8 or 6* | | | Northern Finland Districts 1—7* | | | Northern Finland District 2* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *S.kr* at 1962 value | Old Fmk | | *S.kr* at 1962 value | Old Fmk | | *S.kr* at 1962 value | Old Fmk | |
| | | current value | at 1962 value | | current value | at 1962 value | | current value | at 1962 value |
| 1958 | 19.43 | 1,140 | 1,204 | 22.24 | 1,305 | 1,378 | 23.01 | 1,350 | 1,426 |
| 1959 | 21.16 | 1,230 | 1,309 | 24.35 | 1,415 | 1,506 | 24.95 | 1,450 | 1,543 |
| 1960 | 21.16 | 1,280 | 1,311 | 23.55 | 1,425 | 1,459 | 24.79 | 1,500 | 1,536 |
| 1961 | 21.88 | 1,340 | 1,361 | 24.50 | 1,500 | 1,524 | 25.48 | 1,560 | 1,585 |
| 1962 | 22.35 | 1,390 | 1,390 | 24.92 | 1,550 | 1,550 | 25.88 | 1,610 | 1,610 |

*These districts are the Finnish wage norm districts, not the districts of the study

**Table 5:6. Wages for Felling and Primary Conversion of Sawlogs**
(*Brought to the sleigh; mean volume* 10 *cu. ft; old Fmk per cu. ft*)

| Year | Southern Finland Districts 8 or 6* | | | Northern Finland Districts 1—7* | | | Northern Finland District 2* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *S.kr* at 1962 value | Old Fmk | | *S.kr* at 1962 value | Old Fmk | | *S.kr* at 1962 value | Old Fmk | |
| | | current value | at 1962 value | | current value | at 1962 value | | current value | at 1962 value |
| 1958 | 0.16 | 9.31 | 9.83 | 0.18 | 10.67 | 11.27 | 0.25 | 14.74 | 15.57 |
| 1959 | 0.20 | 11.45 | 12.18 | 0.25 | 14.66 | 15.60 | 0.25 | 14.66 | 15.60 |
| 1960 | 0.20 | 11.92 | 12.21 | 0.23 | 14.15 | 14.49 | 0.23 | 13.97 | 14.31 |
| 1961 | 0.20 | 12.50 | 12.70 | 0.24 | 14.53 | 14.76 | 0.26 | 15.75 | 16.00 |
| 1962 | 0.21 | 12.95 | 12.95 | 0.25 | 15.66 | 15.66 | 0.26 | 16.35 | 16.35 |

*These districts are the Finnish wage norm districts, not the districts of the study

**Table 5:7. Average Hourly Earnings, by Selected Industries, in Finland, 1953—1962**

| Year | Forest work (logging)[a] | | Woodworking industry[b] | | Pulp and paper industry[b] | | Industry as a whole[b] | |
|---|---|---|---|---|---|---|---|---|
| | *Old Fmk* per hour | 1954=100 | *Old Fmk* per hour | 1954=100 | *Old Fmk* per hour | 1954=100 | *Old Fmk* per hour | 1954=100 |
| 1953..... | 127 | 91 | 153 | 99 | 167 | 95 | 164 | 96 |
| 1954..... | 139 | 100 | 155 | 100 | 175 | 100 | 170 | 100 |
| 1955..... | 158 | 114 | 158 | 102 | 185 | 106 | 179 | 105 |
| 1956..... | 175 | 126 | 178 | 115 | 205 | 117 | 202 | 119 |
| 1957..... | 181 | 130 | 188 | 121 | 213 | 122 | 209 | 123 |
| 1958..... | 187 | 135 | 202 | 130 | 225 | 129 | 221 | 130 |
| 1959..... | 197 | 142 | 211 | 136 | 240 | 137 | 232 | 136 |
| 1960..... | 220 | 158 | 225 | 145 | 258 | 147 | 249 | 146 |
| 1961..... | 265 | 191 | 246 | 159 | 271 | 154 | 265 | 159 |
| 1962..... | 272 | 196 | 259 | 167 | 282 | 161 | 278 | 164 |

*a.* State Board of Forestry Employers
*b.* Fourth quarter of the year
*Sources:* (1) SVT, *Statistical Yearbook*, 1953—1962. (2) *Sosiaalinen Aikakauskirja*, 1954—1957

Table 5:7 gives a summary of average hourly earnings in forest work and certain other industries. The effect of public efforts to improve wages in logging can be seen towards the end of the period under review.

*5.1.5 Main Features of Roundwood Production and Processing*

According to the fourth national forest inventory (1960-1963), the total forest area in Finland was 21,741,000 hectares, i.e. 71.2 per cent of the total land area. Of this area 16.9 million hectares are classified as productive and 4.8 million hectares as unproductive. Table 5:8 gives a distribution of productive and unproductive forest area by region. The regions are based on Forestry Board districts and can be identified from Figure 5—1. The average growing stock in the southern half of the country (Regions I-IV) was 88 cubic metres with bark per hectare, and the mean annual growth 3.1 cubic metres per hectare. The corresponding figures for the northern half (Regions V-VI) of the country were 51 cubic metres and 1.0 cubic metres. These estimates cover all species and forest land as a whole. Table 5:9 provides a synopsis of the average growing stock and mean annual growth per hectare by region.

All forests in Finland are classified as "forests in use". There are no inaccessible forests because the forest industries have expanded and the productivity in forest work has increased during the last decade or so. There are, of course, regional differences in accessibility for certain timber assortments of a given species. Thus birch may not yet be accessible for pulpwood in certain parts of Eastern and Southern Finland, its market outlets are found within a certain economic radius around the mills using birch for pulping. As imported fuels are preferred by an increasing number of even rural house-

holds, birch constitutes a silvicultural and economic problem in certain regions, notably in parts of the Regions II and III.

The forest ownership pattern is one of the most important factors determining the objective and means of forest policy. This pattern has changed in Finland considerably since the early Twenties. Characteristic of this development is the increasing proportion of private ownership through land settlement and partition of land holdings. Table 5:10 illustrates the trends in the forest ownership pattern since 1922.

**Table 5:8. Distribution of Forest Land Area into Productive and Poorly Productive Forest Land, by Regions**

| Forest Economic Region | Inventory | Productive forest land | Poorly productive forest land | Total |
|---|---|---|---|---|
| | | *thousand hectares* | | |
| I | 1960—1961 | 2,324 | 362 | 2,686 |
| II | 1960—1961 | 2,372 | 284 | 2,656 |
| III | 1960—1961 | 3,596 | 424 | 4,020 |
| IV | 1960—1961 | 1,529 | 553 | 2,082 |
| I—IV | 1960—1961 | 9,821 | 1,623 | 11,444 |
| V | 1962—1963 | 2,519 | 903 | 3,422 |
| VI | 1962—1963 | 4,569 | 2,306 | 6,875 |
| V—VI | 1962—1963 | 7,088 | 3,209 | 10,297 |
| Total | | 16,909 | 4,832 | 21,741 |

**Table 5:9. Growing Stock and Mean Annual Growth**
(*cubic metres per hectare, including bark*)

| Forest Economic Region | Inventory | Growing stock[a] | Mean annual growth |
|---|---|---|---|
| I | 1960—1961 | 95 | 3.3 |
| II | 1960—1961 | 94 | 3.2 |
| III | 1960—1961 | 91 | 3.1 |
| IV | 1960—1961 | 63 | 2.4 |
| I—IV | 1960—1961 | 88 | 3.1 |
| V | 1962—1963 | 58 | 1.5 |
| VI | 1962—1963 | 46 | 0.8 |
| V—VI | 1962—1963 | 51 | 1.0 |

*a.* Average for all species and total forest land

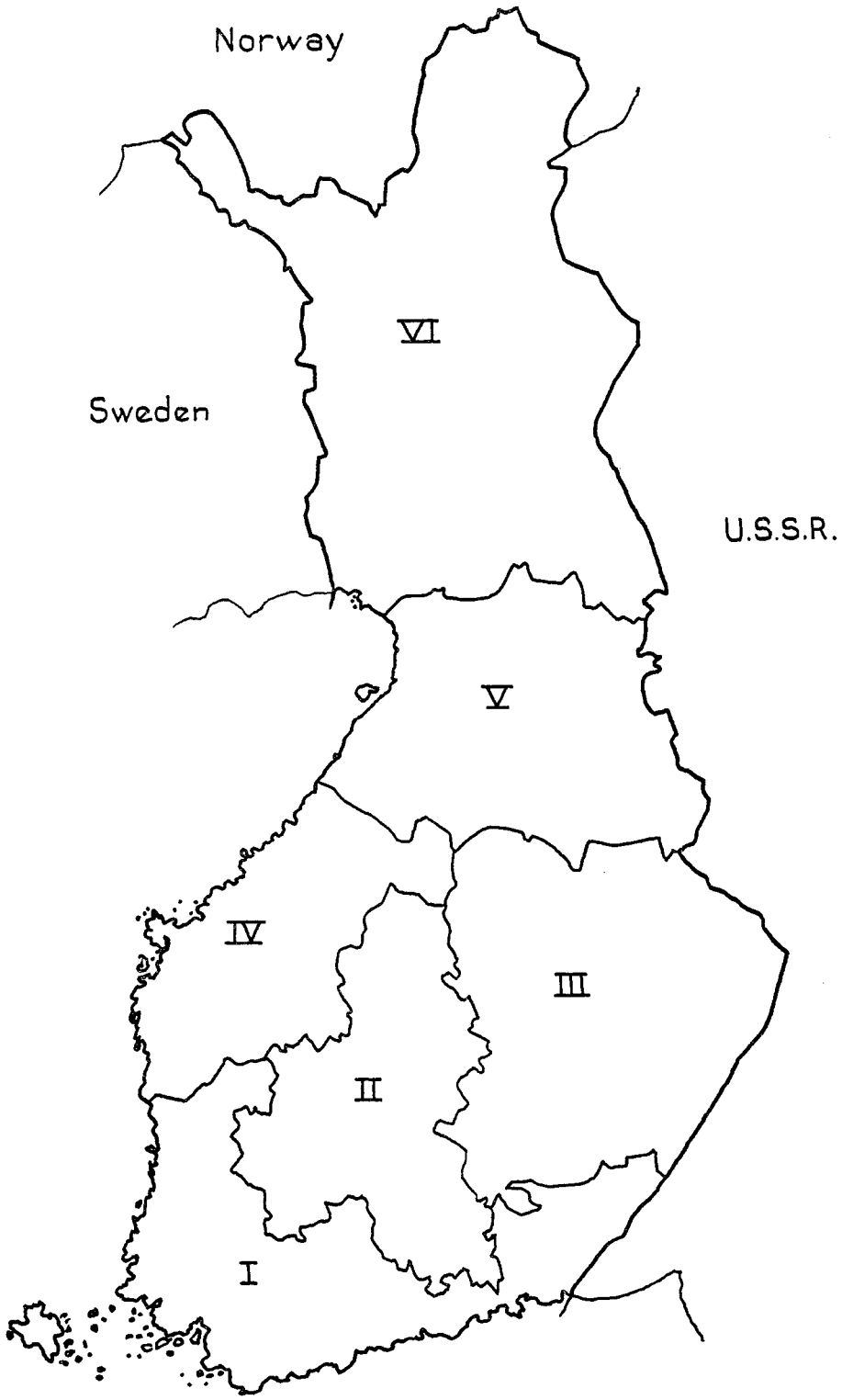


Fig. 5-1. Forest Economic Regions in Finland

**Table 5:10. Distribution of Forest Area, by Ownership Categories, in Finland, Selected Years, 1922—1957**

| Ownership category | 1922 | 1938 | 1944 | 1953 | 1957 |
|---|---|---|---|---|---|
| State, 1,000 ha | 10,050 | 9,204 | 7,600 | 6,740 | 5,963 |
| % | *39.8* | *37.0* | *35.1* | *30.8* | *28.0* |
| Communes, 1,000 ha | 178 | 365 | 330 | 270 | 288 |
| % | *0.7* | *1.5* | *1.5* | *1.2* | *1.3* |
| Co-operatives, 1,000 ha | 241 | 243 | 210 | 142 | 130 |
| % | *0.9* | *1.0* | *1.0* | *0.7* | *0.6* |
| Companies, 1,000 ha | 1,908 | 1,954 | 1,720 | 1,531 | 1,519 |
| % | *7.6* | *7.9* | *7.9* | *7.0* | *7.1* |
| Private, 1,000 ha | 12,886 | 13,074 | 11,810 | 13,191 | 13,430 |
| % | *51.0* | *52.6* | *54.5* | *60.3* | *63.0* |
| Total | 25,263 | 24,840 | 21,670 | 21,874 | 21,330 |
| | *100.0* | *100.0* | *100.0* | *100.0* | *100.0* |

The large number of small private forest holdings is regarded as one of the greatest problems of Finnish forestry. It is a problem which creates difficulty in both promoting enhanced management standards and control of procurement costs. The total number of private forest holdings in Finland exceeds 400,000. These are distributed among different size classes as follows:

| Size class, hectares | Number of holdings |
|---|---|
| — 9.99 | 171,439 |
| 10 — 29.99 | 126,742 |
| 30 — 49.99 | 49,824 |
| 50 — 99.99 | 42,075 |
| 100 — 199.99 | 15,380 |
| 200 — 299.99 | 2,524 |
| 300 — 499.99 | 1,039 |
| 500 — 749.99 | 220 |
| 750 — | 121 |

## 5.2 The State Forests of Finland

### *5.2.1 Organisational Structure*

The organisational basis and the working methods of the State Board of Forestry are laid down in the Forest Administration Act of 1921 and in the Cabinet Decree on the Rules and Regulations for the Forest Administration of 1922, as subsequently amended. Accordingly it is the duty of the State Board of Forestry to manage, supervise and promote forestry in Finland. The

State Board of Forestry shall manage the State forests, in the interests of the public good and according to the requirements of the particular time, as well as in an economically profitable way. The public supervision of forestry and the promotion of private forestry are also the responsibility of the State Board of Forestry.

The State lands under the supervision of the State Board of Forestry are divided into the following four regions: North Finland (20 districts) and East Finland (13 districts). A forest supervisor is responsible for the management and administration of a district. Besides him there are two or three assistant foresters in each district. Furthermore, the districts are divided into rangerships where the forest technicians manage the local forest works.

The area of the State forests under active management was 4.1 million hectares at the end of 1962. Nearly 20 per cent of this area was poorly productive woodland. So there was 3.4 million hectares of the State forests in effective use. Of the productive woodland in the whole country the share of State forests was 19.5 per cent. The main part of State forests lies in the north. The distribution of the forest area under active management at the end of 1962 was as follows:

| *Region* | *1,000 ha* | % |
|---|---|---|
| North Finland | 2,427 | 58.7 |
| Ostrobothnia | 1,102 | 26.7 |
| East Finland | 377 | 9.1 |
| West Finland | 227 | 5.5 |

In the southern half of the country the importance of the State forests is relatively small; their share of the forest land is only five per cent. As a rule, the State lands are situated in the most barren watershed and frontier regions and, because of their remoteness, their access to the timber market is not favourable. Therefore their share of the timber market cannot be as large as their proportion of the forest area would suggest.

*5.2.2 Growing Stock and Removals*

The mean volume per hectare of the growing stock has been on the decrease. In 1938 it was approximately 80 $m^3$/ha (with bark) on productive forest land, while in 1962 it was only 65 $m^3$/ha. This is due partly to the fact that the mean quality of lands in State ownership has deteriorated because best forest lands have been surrendered for building and settlement purposes. Also, during the last decade the especially heavy cuts caused by the rebuilding and the large regeneration fellings of over-mature forests have diminished the average volume. At the same time the area of State-owned forest land has been drastically reduced. As a result, the total volume of State forests in 1962 was only approx. 55 per cent of that in 1945. The annual growth of forests is small, at present on the average 1.44 $m^3$/ha (without

bark) on productive forest land. Total increment is 4.8 million cubic metres which is 10.4 per cent of the total growth of the country as a whole.

In 1963 the State Board of Forestry confirmed the new felling plan by districts; the average was 1.54 $m^3$/ha, i.e. about ten per cent less than earlier. The felling plans by region are on the average as follows:

| *Region* | *Felling plan* $m^3$/*ha* | *Decrease compared with earlier plan, %* |
|---|---|---|
| North Finland | 1.06 | 19 |
| Ostrobothnia | 1.92 | 3 |
| East Finland | 2.64 | 7 |
| West Finland | 2.82 | 11 |
| State Forests | 1.54 | 10 |

When the area of productive forest land (3.4 million hectares) is multiplied by the felling plan calculated per hectare (1.54 cu.m) this gives the total felling plan of 5.2 million cubic metres, including logging waste. After deduction of the logging waste the amount of useful wood in the felling plan will be approximately four million cubic metres. The distribution by region is as follows:

| *Region* | *1,000 cu.m* | % |
|---|---|---|
| North Finland | 1,530 | 38 |
| Ostrobothnia | 1,360 | 34 |
| East Finland | 660 | 16 |
| West Finland | 475 | 12 |
| State Forests | 4,025 | 100 |

As a result of large regeneration cuts in the State forests in the Fifties there was a rising trend in the amounts delivered. A peak of 5.5 million cubic metres was reached in 1958. Since then the fellings have diminished. The share of State forests of the total commercial fellings has varied from 11 to 14 per cent. According to the study made by the State Board of Forestry in 1954-1958 the amount of logging waste was 2.7 million cubic metres per year, i.e. about 29 per cent of the total amount of timber cut. During recent years the amount of logging waste has noticeably diminished.

The position of the State forests in supplying roundwood to the Finnish wood-processing industries has been declining year by year. Especially the amounts of large conifer timber have fallen perceptibly. In 1959-1962 the amount of sawlogs delivered was about 55 million cubic feet a year.

According to the new felling plan its magnitude is 40 million cubic feet per year. The decrease in the forest area of State forests caused by land settlement, the prohibition of cutting in large forest areas reserved for land settlement and the reduction of the felling plan per hectare, are the reasons

for the declining in the amounts delivered during recent years. The more accurate utilisation of tree and the rationalisation of cutting methods have not been able to compensate for the factors mentioned above. By more intensive silviculture and more intensive forest improvement an increase in felling plans might be possible. However, the utilisation of these possibilities is dependent on the appropriation granted in the budget.

*5.2.3 Explanation of Tables*

*Table 5:11*

Annual removal per hectare of productive forest land. Removal here equals the annual amount of timber measured for sale because no separate removal statistics were available. The total annual removal was obtained by adding to the amount measured for sale the estimated amount of logging waste. It should be noted that the removal figures per hectare of productive forest land are too large, because they also include the timber cut from poorly productive forest land. In 1939-1953, the removals are given in cubic metres solid volume with bark, in five-year averages. Since 1954 the removals are given in cubic metres solid volume without bark. In 1959-1962, the removals are given in annual averages.

*Table 5:12*

The area of the productive forest land under commercial management and annual removal, in cubic metres solid volume with bark (without logging waste) per hectare by regions.

The area at the end of each year has been used because, as a result of land settlement, the area has diminished annually. The average have been weighted by the areas.

The removal includes both delivery and stumpage sales and so-called free and other deliveries, all without logging waste.

*Table 5:13*

The percentage distribution of removals by assortment category and district during 1954-1962, three-year averages. The districts correspond to the regions of this study as follows:

North Finland = Region VI
Ostrobothnia = Region V, partly Region IV
West Finland = Regions I, II and partly Region IV
East Finland = Region III

*Table 5:14*

The percentage proportion of the delivery sales of all timber sales in the State forests by district during 1953-1962.

*Table 5:15*

The revenue from timber sales per cubic metre solid volume without bark (without logging waste).

The revenue from timber sales (gross revenue) has been calculated in this study for delivery sales taking the gross revenue as the actual selling price. The gross revenue of that part of the timber which has been sold standing has been calculated as though it had been delivered, in the same circumstances and at same logging cost as the true delivery sales. The cost of logging has been added to the revenues from sales of standing timber. The selling price, calculated in this way, is true to the extent that it is based on the logging costs of the delivery sales by assortment category. The logging costs have been weighted by the amounts of the assortment distribution of standing and other sales. This is the average logging cost per cubic metre solid volume.

The gross revenue calculated in this manner is theoretical.

The figures in question are per cubic metre solid volume without bark, in current prices in S.kr and in the 1962 value of the S.kr. The conversion to constant monetary values has been done by means of the general index for wholesale prices (1935=100). The conversion from Fmk to S.kr has been done by means of the avista selling prices of the Bank of Finland for each year.

*Table 5:16*

This table shows the average total logging costs of the State Board of Forestry per cubic metre ($m^3y$) of felled and delivered timber in current prices in S.kr and prices adjusted to the 1962 value of S.kr.

The following cost items have been included in the logging costs: felling costs (including bark removal), haulage, other costs of transport to the delivery places, floating costs, indirect logging costs.

*Table 5:17*

The percentage distribution of the total logging costs in the main cost groups for Northern and Southern Finland.

Northern Finland=the districts of northern Finland and Ostrobothnia. Southern Finland=the districts of western and eastern Finland. The distribution of logging costs has been possible only into three items: felling, haulage and other logging costs. The State Board of Forestry has no separate statistics for annual timber cut. The figures used in this connection represent the annual deliveries of timber. The amount of annual timber cut is not the same as that of delivery. In some years a certain amount of timber may be felled, but it is not sold and delivered until the following year. Such removals are rather common. However, the errors will be adjusted using five-year averages. The costs of felling and haulage are calculated for the actual timber cut and haulage.

*Table 5:18*
Distribution of logging costs in 1962 by regions.

*Table 5:19*
Net conversion surplus for the timber output in the State forests of Finland, S.kr per $m^3y$.

Net conversion surplus is the difference gross revenue minus logging costs. On the other hand, it has been taken from the statistics, where the N.C.S. has been calculated for the delivery sales and standing sales.

These figures are actual and are in accordance with business accounting.

*Table 5:20*
Net conversion surplus per hectare of productive forest land in the State forests of Finland.

*Table 5:21*
Silvicultural costs in the State forests per hectare of productive forest land under active management, 1958-1962.

The following cost items have been included in the silvicultural costs: wages, costs of machines and equipment, and material costs. The different operations are: clearing of cut-over areas, ground preparations (scarifying), burning, artificial seeding, planting and weeding.

*Table 5:22*
Cost-revenue coefficients ($\frac{\text{Silvicultural costs}}{\text{Gross revenue}}$) and percentage share of the silvicultural costs, in the net conversion surplus.

*Table 5:23*
Percentage distribution of silvicultural costs by various operations, 1958-1962, five-year average.

*Table 5:24*
Unit costs of different silvicultural operations, 1958-1962, five-year averages. Artificial seeding includes supplementary seeding and planting supplementary planting.

*Table 5:25*
Established staff in relation to area of productive forest land and volume of timber cut.

Productive forest area is the whole productive forest land of the State forest of Finland.

Timber cut is in cubic metres solid volume, including logging waste.

*Table 5:26*

Administrative costs per hectare of productive forest land under commercial management. These include the costs of control and regional forest administrative offices and contents of: salaries, travelling expenses, pensions, office expenses, accident insurance, marking trees for cutting.

*Table 5:27*

Administrative costs expressed as cost-revenue coefficients and as percentage of the net conversion surplus.

*Table 5:28*

Costs of maintenance of facilities per hectare productive forest land under active management. These include: maintenance of existing ditches, maintenance of existing forest roads, maintenance of buildings, forest mensuration and boundary clearing.

*Table 5:29*

Percentage distribution of the costs of maintenance of facilities to different operations, 1958-1962, five-year averages.

*Table 5:30*

Cost for improvement and expansion per hectare of productive forest land under active management, five-year average during the period 1958-1962.

The following cost items belong to this group: constructions of new drainage facilities and forest roads, and construction of buildings. Costs of machines and equipment do not belong to this group, but they have been taken into consideration in all these main groups.

*Table 5:31*

Distribution of costs for improvement and expansion by various operations, 1958-1962, five-year averages.

*Table 5:32*

Taxation per hectare of productive forest land under commercial management.

*Table 5:33*

Taxes expressed as cost-revenue coefficients and as percentage of the net conversion surplus (N.C.S.), 1958-1962.

*Table 5:34*

Percentage distribution of taxes by main components, 1960-1962, two-year averages. As it is shown on the table the following types of taxes are

distinguished: (1) local income tax, (2) ecclesiastical tax, (3) forest management fee, and (4) assessment unit payment.

*Table 5:35*

Net profit per sold and delivered timber $m^3y$, 1958-1962. This has been calculated from data appearing in Table 5:38.

*Table 5:36*

Net profit per hectare of productive forest land in the State forests of Finland, 1958-1962.

*Table 5:37*

The profitableness of the State forests of Finland expressed as a relationship between total income and total expenditure, i.e. the profit ratio.

If the result is more than 1, total expenditure has been smaller than total income. In Finland, according to this study, the result has been profitable throughout these years. The method used in this study and the results are not comparable with those of Finnish State Board of Forestry, as the principles involved are somewhat different.

*Table 5:38*

Income and expenditure per $m^3y$ of sold and delivered timber, 1958-1962, five-year averages.

All S.kr are in 1962 value.

In the table there is also the annual timber cut (average) 1,000 $m^3y$ of solid volume without bark and logging waste.

**Table 5:11. Total Timber Cut in the State Forests of Finland, Annual Average, 1939—1962**
*(cubic metres per hectare)*

| | | |
|---|---|---|
| 1939—1943 | 0.73 | With bark |
| 1944—1948 | 0.98 | With bark |
| 1949—1953 | 1.11 | With bark |
| 1954—1958 | 1.39 | Without bark |
| 1959 | 1.31 | Without bark |
| 1960 | 1.44 | Without bark |
| 1961 | 1.39 | Without bark |
| 1962 | 1.52 | Without bark |

*Source:* FOS (Finnish Official Statistics), *Forest Statistics*, 1939—1962

**Table 5:12. Area Distribution and Timber Cut, by Regions, in the State Forests of Finland, 1958—1962**

| Period | | Regions | | | | | | Average for State forests |
|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | |
| 1962 | Area, *1,000 ha*[a] | 23 | 145 | 275 | 71 | 746 | 2,086 | 3,345 |
| | Timber cut, $m^3y/ha$ | 4.70 | 3.67 | 2.58 | 2.09 | 1.51 | 0.91 | 1.35 |
| 1958—62 | Area, *1,000 ha*[a] | 28 | 144 | 278 | 76 | 792 | 2,190 | 3,507 |
| | Timber cut, $m^3y/ha$ | 4.65 | 3.82 | 2.91 | 2.60 | 1.61 | 1.02 | 1.48 |

*a.* Productive forest land under commercial management

**Table 5:13. Percentage Distribution of Felled Timber, by Assortments and Regions, in the State Forests of Finland, Three-Year Average, 1954—1962**

| Region[a] | Year | Logs, sleepers, piles and poles | Coniferous pulpwood and props | Deciduous pulpwood | Other classes of usable timber | Fuelwood |
|---|---|---|---|---|---|---|
| North Finland | 1954—56 | 57.2 | 34.3 | 0.0 | 0.2 | 8.3 |
| | 1957—59 | 50.6 | 40.1 | 0.2 | 0.7 | 8.4 |
| | 1960—62 | 48.0 | 44.8 | 1.2 | 0.3 | 5.7 |
| Ostrobothnia | 1954—56 | 42.3 | 40.9 | 0.3 | 0.3 | 16.2 |
| | 1957—59 | 42.4 | 42.3 | 0.6 | 0.2 | 14.5 |
| | 1960—62 | 41.2 | 47.7 | 0.9 | 0.6 | 9.6 |
| West Finland | 1954—56 | 35.8 | 37.1 | 1.8 | 0.3 | 25.0 |
| | 1957—59 | 37.4 | 36.4 | 2.5 | 0.5 | 23.2 |
| | 1960—62 | 36.5 | 39.0 | 2.2 | 5.2 | 17.1 |
| East Finland | 1954—56 | 47.9 | 38.1 | 0.4 | 0.1 | 13.5 |
| | 1957—59 | 43.5 | 44.5 | 0.3 | 0.1 | 11.6 |
| | 1960—62 | 35.8 | 51.9 | 0.7 | 2.5 | 9.1 |
| Average for State forests | 1954—56 | 47.7 | 37.6 | 0.4 | 0.2 | 14.1 |
| | 1957—59 | 45.0 | 41.1 | 0.6 | 0.4 | 12.9 |
| | 1960—62 | 42.3 | 46.0 | 1.2 | 1.5 | 9.0 |

*Source: Forest Statistics* 1954—1962
*a.* See map, Figure 5—1

**Table 5:14. Felled Timber as Percentage of Total Timber Sales, by Regions, in the State Forests of Finland, 1953—1962**

| Year | Region[a] | | | | |
|---|---|---|---|---|---|
| | North Finland | Ostrobothnia | West Finland | East Finland | Average for State Forests |
| 1953 | 35.8 | 35.2 | 92.0 | 63.0 | 49.1 |
| 1954 | 50.2 | 46.4 | 92.0 | 72.9 | 58.5 |
| 1955 | 48.1 | 52.0 | 94.6 | 76.5 | 62.4 |
| 1956 | 43.0 | 50.4 | 95.9 | 80.8 | 59.9 |
| 1957 | 53.6 | 62.8 | 94.9 | 87.6 | 64.6 |
| Average | 47.0 | 49.2 | 93.9 | 76.7 | 59.3 |
| 1958 | 40.8 | 56.4 | 96.2 | 87.7 | 62.3 |
| 1959 | 48.0 | 67.2 | 95.3 | 90.0 | 68.0 |
| 1960 | 57.0 | 76.0 | 96.6 | 94.1 | 74.1 |
| 1961 | 51.7 | 81.6 | 97.2 | 93.5 | 72.6 |
| 1962 | 53.4 | 85.8 | 98.0 | 96.7 | 76.8 |
| Average | 50.3 | 72.0 | 96.6 | 92.0 | 70.4 |

*Source:* FOS, *Forest Statistics* 1953—1962
*a.* See map, Figure 5—1

**Table 5:15. Gross Revenue from Timber Sales, by Regions, in the State Forests of Finland, 1958—1962**
*(annual average per m³y sold and delivered timber)*

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr |
| 1958 | 50.93 | | 48.10 | | 46.72 | | 47.47 | | 43.57 | | 43.83 | | 45.01 | |
| 1959 | 45.79 | | 46.34 | | 58.27 | | 45.98 | | 42.33 | | 43.23 | | 45.85 | |
| 1960 | 54.48 | | 52.43 | | 53.88 | | 51.77 | | 44.39 | | 46.55 | | 48.12 | |
| 1961 | 60.68 | | 58.28 | | 59.05 | | 59.57 | | 52.67 | | 49.87 | | 53.23 | |
| 1962 | 61.32 | | 59.79 | | 59.05 | | 57.93 | | 51.83 | | 49.60 | | 53.39 | |
| Average | | 56.04 | | 54.40 | | 56.52 | | 53.41 | | 48.12 | | 48.05 | | 50.45 |

*Source:* Statistical Office of the Forest Service

**Table 5:16. Logging Costs per m³y for Sold and Delivered Timber, by Regions, in the State Forests of Finland, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr |
| 1958 | 22.38 | | 22.62 | | 28.13 | | 24.87 | | 29.69 | | 33.76 | | 29.98 | |
| 1959 | 19.29 | | 24.51 | | 41.28 | | 24.93 | | 28.88 | | 33.53 | | 31.83 | |
| 1960 | 24.55 | | 25.23 | | 31.38 | | 24.97 | | 26.31 | | 30.43 | | 28.65 | |
| 1961 | 24.21 | | 25.10 | | 33.44 | | 26.13 | | 28.38 | | 31.87 | | 30.24 | |
| 1962 | 26.54 | | 26.30 | | 36.09 | | 27.52 | | 31.22 | | 32.41 | | 31.67 | |
| Average | | 24.03 | | 25.51 | | 34.77 | | 26.41 | | 29.82 | | 33.43 | | 31.42 |

*Source:* Statistical Office of the Forest Service

**Table 5:17. Percentage Distribution of Logging Costs, by Main Geographical Areas, in the State Forests of Finland, Annual Average, 1958—1962**

| | Northern Finland | | | | | | Southern Finland | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—1962 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—1962 |
| Felling and haulage .. | 60 | 62 | 72 | 63 | 61 | 64 | 70 | 59 | 58 | 60 | 59 | 62 |
| Indirect logging costs | 40 | 38 | 28 | 37 | 39 | 36 | 30 | 41 | 42 | 40 | 41 | 38 |
| Total ..... | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

*Source:* Statistical Office of the Forest Service

**Table 5:18. Distribution of Logging Costs, by Different Operations and by Regions, in the State Forests of Finland, 1962**
(*S.kr per m³y*)

| Region | Felling | Haulage | Indirect logging costs | Total logging costs |
|---|---|---|---|---|
| I ..... | 10.92 | 6.01 | 9.61 | 26.54 |
| II ..... | 11.16 | 6.24 | 8.91 | 26.30 |
| III ..... | 12.52 | 6.00 | 17.57 | 36.09 |
| IV ..... | 11.61 | 6.11 | 9.81 | 27.52 |
| V ..... | 13.12 | 6.32 | 11.78 | 31.22 |
| VI ..... | 12.52 | 7.20 | 12.68 | 32.41 |

**Table 5:19. Net Conversion Surplus for Sold and Delivered Timber, by Regions, in the State Forests of Finland, 1958—1962**
(*S.kr per m³y*)

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1958 | 28.55 | | 25.48 | | 18.59 | | 22.60 | | 13.88 | | 10.07 | | 15.03 | |
| 1959 | 26.50 | | 21.83 | | 16.99 | | 21.05 | | 13.45 | | 9.70 | | 14.02 | |
| 1960 | 29.93 | | 27.20 | | 22.50 | | 26.80 | | 18.08 | | 16.12 | | 19.47 | |
| 1961 | 36.47 | | 33.18 | | 25.61 | | 33.44 | | 24.29 | | 18.00 | | 22.99 | |
| 1962 | 34.78 | | 33.49 | | 22.96 | | 30.41 | | 20.61 | | 17.19 | | 21.72 | |
| Average | | 32.01 | | 28.89 | | 21.75 | | 27.00 | | 18.30 | | 14.62 | | 19.03 |

*Source:* Statistical Office of the Forest Service, Delivery Statistics, 1958—1962

**Table 5:20. Net Conversion Surplus per Hectare Productive Forest Land, by Regions, in the State Forests of Finland, Annual Average, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1958 | 120.72 | | 102.63 | | 70.45 | | 72.58 | | 26.30 | | 10.62 | | 24.83 | |
| 1959 | 113.47 | | 86.32 | | 45.92 | | 56.61 | | 20.29 | | 9.08 | | 19.49 | |
| 1960 | 144.15 | | 107.49 | | 63.91 | | 70.62 | | 29.74 | | 16.98 | | 29.27 | |
| 1961 | 197.04 | | 116.27 | | 67.86 | | 76.85 | | 36.56 | | 20.68 | | 34.63 | |
| 1962 | 163.52 | | 122.85 | | 59.15 | | 63.56 | | 31.08 | | 15.57 | | 29.31 | |
| Average | | 148.91 | | 110.36 | | 63.29 | | 70.18 | | 29.50 | | 14.90 | | 28.21 |

**Table 5:21. Silvicultural Costs per Hectare Productive Forest Land, by Regions, in the State Forests of Finland, Annual Average, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1958 | 6.39 | | 7.96 | | 6.94 | | 5.68 | | 3.52 | | 2.31 | | 3.28 | |
| 1959 | 5.59 | | 6.77 | | 5.67 | | 4.41 | | 2.78 | | 1.42 | | 2.38 | |
| 1960 | 3.63 | | 6.07 | | 5.26 | | 4.31 | | 2.28 | | 1.34 | | 2.13 | |
| 1961 | 5.98 | | 6.98 | | 5.45 | | 4.52 | | 2.27 | | 1.61 | | 2.40 | |
| 1962 | 7.20 | | 7.88 | | 6.24 | | 4.34 | | 3.17 | | 1.85 | | 2.85 | |
| Average | | 5.85 | | 7.36 | | 6.10 | | 4.82 | | 2.89 | | 1,76 | | 2.68 |

**Table 5:22. Silvicultural Costs, expressed as Cost-Revenue Coefficients and as a Percentage of the Net Conversion Surplus, by Regions, in the State Forests of Finland, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. |
| 1958 | 0.030 | *5.4* | 0.041 | *7.8* | 0.039 | *9.9* | 0.037 | *7.8* | 0.043 | *13.4* | 0.049 | *21.7* | 0.044 | *13.2* |
| 1959 | 0.029 | *4.9* | 0.037 | *7.8* | 0.036 | *12.4* | 0.036 | *7.8* | 0.044 | *13.7* | 0.035 | *15.6* | 0.037 | *12.2* |
| 1960 | 0.014 | *2.5* | 0.029 | *5.6* | 0.034 | *8.2* | 0.032 | *6.1* | 0.031 | *7.6* | 0.027 | *7.9* | 0.029 | *7.3* |
| 1961 | 0.018 | *3.0* | 0.034 | *6.0* | 0.035 | *8.0* | 0.033 | *5.9* | 0.028 | *6.2* | 0.028 | *7.8* | 0.030 | *6.9* |
| 1962 | 0.025 | *4.4* | 0.036 | *6.4* | 0.041 | *10.5* | 0.036 | *6.8* | 0.040 | *10.2* | 0.041 | *11.8* | 0.040 | *9.7* |
| Average | 0.022 | *3.9* | 0.035 | *6.7* | 0.037 | *9.6* | 0.035 | *6.9* | 0.037 | *9.8* | 0.036 | *11.8* | 0,036 | *9.5* |

**Table 5:23. Percentage Distribution of Silvicultural Costs, by Various Operations, in the State Forests of Finland, Average 1958—1962**

| Operation | Region | | | | | | |
|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | Average for State Forests |
| Clearing of cutover areas.... | 16.6 | 11.7 | 19.2 | 18.8 | 37.2 | 37.1 | 30.0 |
| Ground preparation (scarifying) ..... | 1.9 | 1.4 | 9.4 | 0.6 | 8.5 | 12.7 | 9.1 |
| Broadcast burning ..... | 4.7 | 11.1 | 11.3 | 4.1 | 7.0 | 3.6 | 6.7 |
| Artificial seeding ..... | 8.7 | 17.3 | 24.3 | 17.9 | 15.6 | 10.3 | 15.2 |
| Planting ..... | 17.8 | 20.5 | 11.6 | 23.1 | 14.0 | 12.3 | 14.0 |
| Weeding ..... | 50.3 | 38.0 | 24.2 | 35.5 | 17.7 | 24.0 | 25.0 |
| Total ..... | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Table 5:24. Costs per Area Unit for various Silvicultural Operations, in the State Forests of Finland, Average, 1958—1962**
*(in 1962 value of S.kr per ha)*

| Operation | Region | | | | | | |
|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | Average for State Forests |
| Clearing of cutover areas.... | 44 | 43 | 57 | 53 | 46 | 47 | 48 |
| Ground preparation ..... | 83 | 87 | 83 | 68 | 75 | 70 | 73 |
| Burning..... | 78 | 72 | 99 | 57 | 71 | 52 | 71 |
| Artificial seeding ..... | 119 | 126 | 107 | 123 | 91 | 87 | 99 |
| New planting ..... | 278 | 301 | 255 | 254 | 178 | 135 | 183 |
| Weeding ..... | 62 | 62 | 69 | 57 | 54 | 56 | 59 |

**Table 5:25. Established Staff in Relation to Area of Productive Forest Land and Volume of Timber Cut, in the State Forests of Finland, 1953—1957 and 1962**

| Period | Annual average no of staff[a] | Productive forest land *ha* | Productive forest land per employee *ha* | Total timber cut, annual average[b] $m^3y$ | Timber cut per employee $m^3y$ |
|---|---|---|---|---|---|
| 1953—57 | 1,779 | 4,514,000 | 2,537 | 5,852,000 | 3,290 |
| 1962.... | 1,877 | 4,290,000 | 2,286 | 6,528,000 | 3,478 |

*Source:* FOS, *Forest Statistics* 1953—1962
*a.* Includes about 300 forest guards employed on a non-permanent basis at a small wage (about 30–40 Fmk a month)
*b.* With logging waste

**Table 5:26. Administrative Costs per Hectare Productive Forest Land, by Regions, in the State Forests of Finland, Annual Average, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1958 | 26.04 | | 18.91 | | 10.76 | | 17.99 | | 5.57 | | 2.66 | | 5.15 | |
| 1959 | 27.65 | | 20.66 | | 10.96 | | 18.63 | | 6.10 | | 3.01 | | 5.58 | |
| 1960 | 28.81 | | 20.98 | | 11.36 | | 19.32 | | 6.31 | | 3.16 | | 5.78 | |
| 1961 | 39.24 | | 21.38 | | 12.01 | | 21.43 | | 6.80 | | 3.59 | | 6.38 | |
| 1962 | 43.60 | | 23.81 | | 13.49 | | 24.16 | | 7.94 | | 3.89 | | 7.15 | |
| Average | | 33.18 | | 21.80 | | 12.07 | | 20.83 | | 6.71 | | 3.34 | | 6.16 |

**Table 5:27. Administrative Costs, expressed as Cost-Revenue Coefficients and as a Percentage of the Net Conversion Surplus, by Regions, in the State Forests of Finland, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. | C/R coefficients | % of N.C.S. |
| 1958 | 0.121 | *21.6* | 0.098 | *18.4* | 0.061 | *15.3* | 0.118 | *24.8* | 0.068 | *21.2* | 0.058 | *25.1* | 0.069 | *20.8* |
| 1959 | 0.141 | *24.4* | 0.113 | *24.0* | 0.070 | *23.9* | 0.151 | *32.9* | 0.095 | *30.1* | 0.075 | *33.2* | 0.088 | *28.6* |
| 1960 | 0.110 | *20.0* | 0.101 | *19.5* | 0.074 | *17.8* | 0.142 | *27.4* | 0.087 | *21.3* | 0.065 | *18.7* | 0.080 | *19.8* |
| 1961 | 0.120 | *19.9* | 0.105 | *18.4* | 0.077 | *17.7* | 0.156 | *27.9* | 0.086 | *18.6* | 0.063 | *17.3* | 0.080 | *18.4* |
| 1962 | 0.151 | *26.7* | 0.109 | *19.4* | 0.089 | *22.8* | 0.200 | *38.0* | 0.101 | *25.5* | 0.087 | *25.0* | 0.099 | *24.4* |
| Average | 0.127 | *22.3* | 0.105 | *19.7* | 0.073 | *19.0* | 0.150 | *29.7* | 0.086 | *22.7* | 0.068 | *22.5* | 0.082 | *21.8* |

**Table 5:28. Costs for Maintenance of Facilities per Hectare Productive Forest Land, by Regions, in the State Forests of Finland, Annual Average, 1958—1962**

| Year | Region | | | | | | | | | | | | Whole country | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | I | | III | | IV | | V | | VI | | | |
| | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1958 | 1.48 | | 2.07 | | 1.80 | | 1.74 | | 0.59 | | 0.29 | | 0.59 | |
| 1959 | 1.87 | | 2.96 | | 1.81 | | 1.27 | | 0.59 | | 0.28 | | 0.61 | |
| 1960 | 2.05 | | 2.27 | | 1.41 | | 1.79 | | 0.36 | | 0.32 | | 0.53 | |
| 1961 | 2.40 | | 3.05 | | 1.88 | | 2.97 | | 0.43 | | 0.29 | | 0.64 | |
| 1962 | 2.48 | | 2.78 | | 2.27 | | 2.47 | | 0.56 | | 0.29 | | 0.68 | |
| Average | | 2.08 | | 2.71 | | 1.89 | | 2.08 | | 0.52 | | 0.30 | | 0.63 |

*Sources:* (1) Statistical Office of the Forest Service, Drainings, 1958—1962; Forest Roads, 1958—1962
(2) SVT, *Forest Statistics*

**Table 5:29. Percentage Distribution of Costs for Maintenance of Facilities, by Various Operations and by Regions, in the State Forests of Finland, Average, 1958—1962**

| Operation | Region | | | | | | |
|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | Average for State Forests |
| Maintenance of drainage facilities | 42.5 | 32.8 | 19.8 | 31.9 | 20.3 | 5.0 | 19.2 |
| Maintenance of roads | 36.8 | 29.5 | 40.7 | 19.8 | 32.9 | 42.1 | 36.1 |
| Maintenance of buildings | 11.4 | 29.6 | 32.9 | 41.6 | 32.9 | 34.6 | 32.9 |
| Forest mensuration and boundary clearing | 9.3 | 8.1 | 6.6 | 6.7 | 13.9 | 18.3 | 11.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Table 5:30. Costs of Improvement and Expansion per Hectare Productive Forest Land, by Regions, in the State Forests of Finland, Annual Average, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* | Current *S.kr* | 1962 value of *S.kr* |
| 1958 | 10.36 | | 11.44 | | 9.00 | | 4.99 | | 3.10 | | 1.23 | | 2.82 | |
| 1959 | 20.65 | | 10.32 | | 8.57 | | 8.94 | | 3.65 | | 2.05 | | 3.57 | |
| 1960 | 4.20 | | 11.06 | | 6.46 | | 6.05 | | 0.95 | | 1.42 | | 2.20 | |
| 1961 | 2.01 | | 4.84 | | 8.50 | | 4.02 | | 2.30 | | 1.25 | | 2.30 | |
| 1962 | 3.23 | | 5.14 | | 7.44 | | 9.29 | | 4.02 | | 1.58 | | 2.93 | |
| Average | | 9.09 | | 8.83 | | 8.25 | | 6.85 | | 2.89 | | 1.56 | | 2.87 |

*Source:* Statistical Office of the Forest Service

**Table 5:31. Percentage Distribution of Costs for Improvement and Expansion, by Various Operations and by Regions, in the State Forests of Finland, Average, 1958—1962**

| Operation | Region | | | | | | |
|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | Average for State forests |
| Construction of drainage facilities | 56.4 | 29.6 | 36.7 | 47.8 | 40.0 | 17.1 | 31.0 |
| Construction of new forest roads | 43.6 | 69.8 | 60.1 | 51.9 | 45.7 | 78.2 | 63.3 |
| Construction of new buildings | — | 0.6 | 3.2 | 0.3 | 14.3 | 4.7 | 5.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Table 5:32. Tax Burden per Hectare Productive Forest Land, by Regions, in the State Forests of Finland, Annual Average, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr |
| 1958 | 6.42 | | 5.10 | | 1.98 | | 3.18 | | 0.71 | | 0.32 | | 0.86 | |
| 1959 | 5.97 | | 4.93 | | 1.99 | | 3.33 | | 0.97 | | 0.26 | | 0.86 | |
| 1960 | 5.89 | | 4.71 | | 2.00 | | 3.31 | | 0.95 | | 0.34 | | 0.89 | |
| 1961 | 7.07 | | 4.79 | | 2.06 | | 3.30 | | 1.00 | | 0.48 | | 1.01 | |
| 1962 | 8.30 | | 5.96 | | 2.49 | | 4.39 | | 1.40 | | 0.61 | | 1.30 | |
| Average | | 6.84 | | 5.26 | | 2.17 | | 3.59 | | 1.02 | | 0.41 | | 1.00 |

**Table 5:33. Tax Burden, expressed as Cost-Revenue Coefficients and as a Percentage of the Net Conversion Surplus, by Regions, in the State Forests of Finland, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. | C/R coeffi-cients | % of N.C.S. |
| 1958 | 0.030 | *5.3* | 0.026 | *5.0* | 0.011 | *2.8* | 0.021 | *4.4* | 0.009 | *2.7* | 0.007 | *3.1* | 0.011 | *3.4* |
| 1959 | 0.030 | *5.3* | 0.027 | *5.7* | 0.013 | *4.3* | 0.027 | *5.9* | 0.015 | *4.8* | 0.006 | *2.8* | 0.013 | *4.4* |
| 1960 | 0.022 | *4.1* | 0.023 | *4.4* | 0.013 | *3.1* | 0.024 | *4.7* | 0.013 | *3.2* | 0.007 | *2.0* | 0.012 | *3.1* |
| 1961 | 0.022 | *3.6* | 0.023 | *4.1* | 0.013 | *3.0* | 0.024 | *4.3* | 0.012 | *2.7* | 0.009 | *2.4* | 0.013 | *2.9* |
| 1962 | 0.029 | *5.1* | 0.027 | *4.8* | 0.016 | *4.2* | 0.036 | *6.9* | 0.018 | *4.5* | 0.014 | *3.9* | 0.018 | *4.5* |
| Average | 0.027 | *4.7* | 0.025 | *4.8* | 0.013 | *3.5* | 0.027 | *5.3* | 0.014 | *3.7* | 0.009 | *2.9* | 0.014 | *3.7* |

**Table 5:34. Percentage Distribution of Taxes, by Main Components and by the Main Geographical Regions, in the State Forests of Finland, 1960—1962**

| Region | Local income tax | Ecclesiastical tax | Forest management fee | Assessment unit payments |
|---|---|---|---|---|
| Northern Finland ..... | 83.8 | 8.4 | 7.8 | — |
| Southern Finland ..... | 81.7 | 8.8 | 5.7 | 3.8 |
| Average for State forests... | 82.9 | 8.6 | 6.8 | 1.7 |

**Table 5:35. Net Profit for Sold and Delivered Timber, by Regions, in the State Forests of Finland. 1958—1962**
*(S.kr per $m^3y$)*

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr |
| 1958 | 16.54 | | 14.20 | | 10.54 | | 12.19 | | 6.77 | | 3.61 | | 7.32 | |
| 1959 | 12.08 | | 10.28 | | 6.26 | | 7.42 | | 4.10 | | 2.18 | | 4.66 | |
| 1960 | 20.66 | | 15.78 | | 13.15 | | 13.62 | | 11.46 | | 9.89 | | 11.78 | |
| 1961 | 25.97 | | 21.46 | | 14.34 | | 17.69 | | 15.80 | | 11.74 | | 14.52 | |
| 1962 | 20.98 | | 21.07 | | 10.56 | | 9.05 | | 9.29 | | 8.13 | | 10.69 | |
| Average | | 19.75 | | 16.84 | | 11.26 | | 12.31 | | 9.60 | | 7.39 | | 10.02 |

**Table 5:36. Net Profit per Hectare Productive Forest Land, by Regions, in the State Forests of Finland, Annual Average, 1958—1962**

| Year | Region | | | | | | | | | | | | Average for State Forests | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | | V | | VI | | | |
| | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr | Current S.kr | 1962 value of S.kr |
| 1958 | 70.02 | | 57.14 | | 39.94 | | 39.02 | | 12.81 | | 3.80 | | 12.17 | |
| 1959 | 51.73 | | 40.70 | | 16.92 | | 23.03 | | 6.23 | | 2.07 | | 6.48 | |
| 1960 | 99.57 | | 62.39 | | 37.39 | | 35.84 | | 18.92 | | 10.40 | | 17.77 | |
| 1961 | 140.34 | | 75.22 | | 37.99 | | 40.63 | | 23.77 | | 13.48 | | 21.92 | |
| 1962 | 98.71 | | 77.28 | | 27.22 | | 18.91 | | 13.99 | | 7.35 | | 14.40 | |
| Average | | 91.87 | | 64.40 | | 32.81 | | 32.01 | | 15.47 | | 7.53 | | 14.87 |

**Table 5:37. Profitableness of Forestry Operations, by Regions, in the State Forests of Finland, 1958—1962**

$$\left(\textit{profit ratio} = \frac{\textit{total income}}{\textit{total expenditure}}\right)$$

| Region | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—62 | |
|---|---|---|---|---|---|---|---|
| I | 1.481 | 1.358 | 1.611 | 1.749 | 1.520 | 1.544 | |
| II | 1.419 | 1.285 | 1.431 | 1.583 | 1.544 | 1.448 | |
| III | 1.291 | 1.120 | 1.323 | 1.321 | 1.218 | 1.249 | |
| IV | 1.345 | 1.192 | 1.357 | 1.425 | 1.185 | 1.299 | |
| V | 1.184 | 1.107 | 1.348 | 1.429 | 1.218 | 1.249 | |
| VI | 1.090 | 1.053 | 1.270 | 1.308 | 1.196 | 1.182 | |
| Average for State forests | 1.194 | 1.113 | 1.324 | 1.375 | 1.250 | 1.248 | |

**Table 5:38. Income and Expenditure for Sold and Delivered Timber, by Regions, in the State Forests of Finland, Average, 1958—1962**
*(in 1962 value of S.kr per $m^3y$)*

| Period | 1958—1962 | | | | | | |
|---|---|---|---|---|---|---|---|
| Region ..... | I | II | III | IV | V | VI | Total |
| Volume of cut; annual average, 1000 $m^3y$ ..... | 128 | 549 | 809 | 197 | 1,278 | 2,234 | 5,195 |
| 1. Gross revenue..... | 56.04 | 54.40 | 56.52 | 53.41 | 48.12 | 48.05 | 50.45 |
| 2. Logging costs ..... | 24.03 | 25.51 | 34.77 | 26.41 | 29.82 | 33.43 | 31.42 |
| 3. Net conversion surplus .. | 32.01 | 28.89 | 21.75 | 27.00 | 18.30 | 14.62 | 19.03 |
| 4. Silvicultural costs..... | 1.26 | 1.93 | 2.10 | 1.85 | 1.79 | 1.72 | 1.82 |
| 5. Administrative costs .... | 7.13 | 5.71 | 4.15 | 8.02 | 4.16 | 3.28 | 4.16 |
| 6. Maintenance costs ..... | 0.45 | 0.71 | 0.65 | 0.80 | 0.32 | 0.30 | 0.42 |
| 7. Costs of improvement and expansion ..... | 1.95 | 2.32 | 2.84 | 2.64 | 1.79 | 1.53 | 1.93 |
| 8. Taxes ..... | 1.47 | 1.38 | 0.75 | 1.38 | 0.64 | 0.40 | 0.68 |
| 9. Total managing costs (4—8) ..... | 12.26 | 12.05 | 10.49 | 14.69 | 8.70 | 7.23 | 9.01 |
| 10. Total costs (2+9) ..... | 36.29 | 37.56 | 45.26 | 41.10 | 38.52 | 40.66 | 40.43 |
| 11. Net profit ..... | 19.75 | 16.84 | 11.26 | 12.31 | 9.60 | 7.39 | 10.02 |

**Table 5:39. Income and Expenditure per Hectare Productive Forest Land, by Regions, in the State Forests of Finland, Average, 1958—1962**
*(in 1962 value of S.kr)*

| Period | 1958—1962 | | | | | | |
|---|---|---|---|---|---|---|---|
| Region | I | II | III | IV | V | VI | Total |
| Area: 1000 hectares ..... | 27 | 144 | 278 | 76 | 792 | 2190 | 3507 |
| 1. Gross revenue..... | 260.64 | 207.76 | 164.40 | 138.82 | 77.70 | 49.00 | 74.75 |
| 2. Logging costs ..... | 111.73 | 97.40 | 101.11 | 68.64 | 48.20 | 34.10 | 46.54 |
| 3. Net conversion surplus.. | 148.91 | 110.36 | 63.29 | 70.18 | 29.50 | 14.90 | 28.21 |
| 4. Silvicultural costs ..... | 5.85 | 7.36 | 6.10 | 4.82 | 2.89 | 1.76 | 2.68 |
| 5. Administrative costs .... | 33.18 | 21.80 | 12.07 | 20.83 | 6.71 | 3.34 | 6.16 |
| 6. Maintenance costs ..... | 2.08 | 2.71 | 1.89 | 2.08 | 0.52 | 0.30 | 0.63 |
| 7. Costs of improvement and expansion ..... | 9.09 | 8.83 | 8.25 | 6.85 | 2.89 | 1.56 | 2.87 |
| 8. Taxes ..... | 6.84 | 5.26 | 2.17 | 3.59 | 1.02 | 0.41 | 1.00 |
| 9. Total managing costs (4—8) ..... | 57.04 | 45.96 | 30.48 | 38.17 | 14.03 | 7.37 | 13.34 |
| 10. Total costs (2+9) ..... | 168.77 | 143.36 | 131.59 | 106.81 | 62.23 | 41.47 | 59.88 |
| 11. Net profit ..... | 91.87 | 64.40 | 32.81 | 32.01 | 15.47 | 7.53 | 14.87 |

**Table 5:40. Cost-Revenue Coefficients, by Regions, in the State Forests of Finland, Average, 1958—1962**

| Period | 1958—1962 | | | | | | |
|---|---|---|---|---|---|---|---|
| Region | I | II | III | IV | V | VI | Total |
| 1. Gross revenue..... | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 2. Logging costs ..... | 0.429 | 0.469 | 0.615 | 0.494 | 0.620 | 0.696 | 0.632 |
| 3. Silvicultural costs..... | 0.022 | 0.035 | 0.037 | 0.035 | 0.037 | 0.036 | 0.036 |
| 4. Administrative costs ..... | 0.127 | 0.105 | 0.073 | 0.150 | 0.086 | 0.068 | 0.082 |
| 5. Maintenance costs..... | 0.008 | 0.013 | 0.011 | 0.015 | 0.007 | 0.006 | 0.008 |
| 6. Costs of improvement and expansion | 0.035 | 0.043 | 0.050 | 0.049 | 0.037 | 0.032 | 0.038 |
| 7. Taxes..... | 0.027 | 0.025 | 0.013 | 0.027 | 0.014 | 0.009 | 0.014 |
| 8. Total managing costs (3—7)..... | 0.219 | 0.221 | 0.184 | 0.276 | 0.181 | 0.151 | 0.178 |
| 9. Total costs (2+8) ..... | 0.648 | 0.690 | 0.799 | 0.770 | 0.801 | 0.847 | 0.810 |

# Chapter 6

# GERMANY
## (Federal Republic)

# Germany
## (Federal Republic)

by
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## 6.1 General Information about Forestry

### *6.1.1 Contribution of Forestry to the Gross National Product*

In the German Federal Republic (*Bundesrepublik Deutschland=B.R.D.*) forestry has not kept pace with the rate of growth of the Gross National Product, which has more than doubled in the last decade. Although the actual amount forestry has contributed to the G.N.P. has remained approximately the same, its relative share in the total economy has declined steadily. To-day the ratio of the turnover in forestry to agriculture and to industry is approx. 1:10:100. The deduction of the initial intakes gives the actual contribution of the sectors to the G.N.P. In the case of forestry these initial intakes are very small, approx. 10 per cent. The net production value of

**Table 6:1. Share of Forestry in the Gross National Product of the B.R.D. at Market Prices**

| Year | Gross National Product | Net Production value of Forestry | Forestry as *per cent* of G.N.P. | Gross National Product | Net Production value of Forestry |
|---|---|---|---|---|---|
| | (*Milliard DM, current values*) | | | (*Milliard DM, 1962 value*) | |
| 1953 | 147.1 | 1.370 | *0.93* | 156.1 | 1.454 |
| 1954 | 157.9 | 1.390 | *0.88* | 170.4 | 1.500 |
| 1955 | 180.4 | 1.730 | *0.96* | 191.2 | 1.834 |
| 1956 | 198.8 | 1.530 | *0.77* | 207.7 | 1.599 |
| 1957 | 216.3 | 1.740 | *0.80* | 221.9 | 1.785 |
| Average 1953—1957 | 180.1 | 1.552 | *0.86* | 189.5 | 1.634 |
| 1958 | 231.5 | 1.640 | *0.71* | 238.4 | 1.689 |
| 1959 | 250.9 | 1.440 | *0.57* | 260.4 | 1.495 |
| 1960 | 296.8 | 1.380 | *0.46* | 304.5 | 1.416 |
| 1961 | 326.2 | 1.650 | *0.51* | 329.5 | 1.667 |
| 1962 | 345.5 | 1.540 | *0.45* | 345.5 | 1.540 |
| Average 1958—1962 | 290.2 | 1.530 | *0.53* | 295.7 | 1.561 |

*Source: Statistisches Bundesamt* (Federal German Bureau of Statistics)

forestry is calculated from turnover registered by the Federal Statistical Office on the basis of appropriate key figures. Table 6:1 shows that forestry accounted for 0.86 per cent of the G.N.P. for 1953-1957 and only 0.53 per cent for 1958-1962.

These relative figures should not be allowed to obscure the fact that forestry with its annual production value of 1,500 million DM, makes a very considerable contribution to the German economy. Neither would it be correct to measure the economic value only by the share of the G.N.P. accounted for by the prime production. The possibility of self-sufficiency in times of emergency must be considered as being extremely important. Also the importance of timber as a raw material can only be realised to the full when the subsequent wood-processing and wood-using industries are taken into consideration. Finally, the contribution of the forests to the culture of the country—something which is irreplaceable but which cannot be measured in monetary terms —is not taken into account in the above calculation.

### *6.1.2 Timber Balance*

Despite the not unfavourable conditions of growth and the correspondingly high yield per unit of area the timber production of German forests has been insufficient to cover German demands for almost a century. Table 6:3 shows the total timber balance of the B.R.D. for the years 1953-1962. With replenishment of the growing stock, which had been depleted by the heavy over-exploitation of the German forests during the war and the immediate post-war period, it was possible to increase the annual timber cut during the decade 1953-1962 by 20 per cent, and to-day it has reached 26-27 million cubic metres without bark, an amount which probably corresponds to the production on a sustained-yield basis.

This increase in home timber production would have been sufficient to cover an increased demand for timber brought about by the population growth

**Table 6:2. Conversion Factors**

| | Basis | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Index of Industrial Producers' Prices | 1958=100 | 97.1 | 95.5 | 97.2 | 98.6 | 100.4 | 100.0 | 99.2 | 100.4 | 101.9 | 103.0 | 103.6 | 105.2 |
| | 1962=100 | 94.3 | 92.7 | 94.4 | 95.7 | 97.5 | 97.1 | 96.3 | 97.5 | 98.9 | 100.0 | 100.6 | 102.1 |
| Conversion factor to 1962 currency value | | 106.1 | 107.9 | 106.0 | 104.5 | 102.6 | 103.0 | 103.8 | 102.6 | 101.0 | 100.0 | 99.4 | 97.9 |

Conversion factors to $m^3y$ (cu.m roundwood without bark)
cu.m standing timber ($m^3f$ including bark) less logging losses (10%)
=cu.m felled timber with bark less 10% for bark
=cu.m felled timber without bark

The following conversion factors are used to obtain roundwood equivalents ($m^3y$) given in the tables:

| | | | |
|---|---|---|---|
| Roundwood | 1 ton=1.55 cu.m | Mechanical and chemical pulp | 1 ton=4.50 cu.m |
| Sawnwood | 1 ton=2.60 cu.m | Paper and paperboard | 1 ton=2.40 cu.m |
| Veneers, plywood and barrel wood | 1 ton=3.97 cu.m | Books, maps, bank-notes, etc. | 1 ton=4.00 cu.m |
| Pulpwood | 1 ton=1.60 cu.m | Wooden products | 1 ton=4.50 cu.m |

*Sources:* (1) Statistisches Bundesamt (Federal German Bureau of Statistics)
(2) Speer, J., Section on Statistics in *Grundlagen der Forstwirtschaft*, Hanover, 1959

**Table 6:3. Total Timber Balance of the B.R.D.**
*(without changes in stocks)*

| Year | Timber cut | Imports | Total | Exports | Home consumption | Population | Consumption *per capita* | Home production as % of consumption | Timber balance in international trade |
|---|---|---|---|---|---|---|---|---|---|
| | *Thousands of cubic metres roundwood equivalent* | | | | | 1,000 | *cu.m* | | 1,000 *cu.m* |
| 1953 | 22,634 | 7,025 | 29,659 | 748 | 28,911 | 51,350 | 0.56 | *78* | – 6,277 |
| 1954 | 22,440 | 8,940 | 31,380 | 1,246 | 30,134 | 51,880 | 0.58 | *74* | – 7,694 |
| 1955 | 26,095 | 13,516 | 39,611 | 1,212 | 38,399 | 52,382 | 0.73 | *68* | –12,304 |
| 1956 | 22,288 | 12,910 | 35,198 | 1,564 | 33,634 | 53,008 | 0.63 | *66* | –11,346 |
| 1957 | 23,567 | 13,678 | 37,245 | 1,823 | 35,413 | 53,656 | 0.66 | 67 | –11,856 |
| Average 1953—1957 | 23,405 | 11,214 | 34,619 | 1,319 | 33,300 | 52,455 | 0.63 | *70* | – 9,895 |
| 1958 | 23,611 | 13,380 | 36,991 | 1,711 | 35,280 | 54,292 | 0.65 | *67* | –11,069 |
| 1959 | 25,126 | 15,019 | 40,145 | 1,858 | 38,287 | 54,876 | 0.70 | *66* | –13,161 |
| 1960 | 25,148 | 17,929 | 43,077 | 2,203 | 40,874 | 55,433 | 0.74 | *62* | –15,725 |
| 1961 | 26,478 | 18,931 | 45,409 | 2,358 | 43,051 | 56,175 | 0.77 | *62* | –16,573 |
| 1962 | 27,778 | 19,257 | 47,035 | 2,384 | 49,651 | 56,998 | 0.78 | *62* | –16,873 |
| Average 1958—1962 | 25,629 | 16,903 | 42,532 | 2,103 | 40,429 | 55,543 | 0.73 | *63* | –14,800 |
| 1963 | 23,579 | 20,141 | 43,720 | 2,592 | 41,178 | 57,588 | 0.73 | *58* | –17,599 |
| 1964 | 26,262 | 22,269 | 48,531 | 3,012 | 45,519 | 58,000 | 0.78 | *58* | –19,257 |

*Sources:* (1) *Statistisches Jahrbuch für die BRD*
(2) *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten*
(3) Speer, J., *Jahresberichte in der AFZ*

**Table 6:4. Timber Cut by Assortments**
*(all Ownership Categories)*

| Year | Logs | | Pit-props | | Pulpwood and other stacked roundwood for industrial use | | Fuelwood | Total timber cut |
|---|---|---|---|---|---|---|---|---|
| | Deciduous | Coniferous | Deciduous | Coniferous | Deciduous | Coniferous | | |
| | *Thousands of cubic metres without bark* | | | | | | | |
| 1953 | 2,644 | 11,074 | 142 | 1,818 | 1,086 | 2,054 | 4,793 | 23,611 |
| 1954 | 3,136 | 11,664 | 136 | 1,512 | 1,088 | 2,707 | 5,285 | 25,128 |
| 1955 | 3,247 | 12,002 | 152 | 1,403 | 1,436 | 2,206 | 4,701 | 25,148 |
| 1956 | 3,571 | 12,559 | 146 | 1,634 | 1,574 | 2,434 | 4,567 | 26,485 |
| 1957 | 3,304 | 13,750 | 167 | 1,553 | 1,571 | 2,640 | 4,793 | 27,778 |
| Average 1953—1957 | 3,180 | 12,210 | 149 | 1,584 | 1,351 | 2,328 | 4,828 | 25,630 |
| | | | *Distribution in percentage* | | | | | |
| 1958 | *11.2* | *46.9* | *0.6* | *7.7* | *4.6* | *8.7* | *20.3* | *100* |
| 1959 | *12.5* | *46.4* | *0.5* | *6.0* | *4.3* | *9.2* | *21.1* | *100* |
| 1960 | *12.9* | *47.7* | *0.6* | *5.6* | *5.7* | *8.8* | *18.7* | *100* |
| 1961 | *13.5* | *47.4* | *0.6* | *6.2* | *5.9* | *5.7* | *17.2* | *100* |
| 1962 | *11.9* | *49.5* | *0.6* | *5.6* | *9.2* | *9.5* | *17.2* | *100* |
| Average 1958—1962 | *12.4* | *47.6* | *0.6* | *6.2* | *5.3* | *9.1* | *18.8* | *100* |

*Source:* Speer, J., *Ergebnisse und Betrachtungen am Ende der FWJ 1958—1962*, published annually in the *AFZ*

of 10 per cent. However, as during this period, the *per capita* consumption of timber went up by almost 40 per cent, i.e. from 0.56 cubic metres in 1953 to 0.78 cubic metres in 1962, the percentage of German consumption accounted for by home production fell from 78 per cent to 62 per cent, despite a marked increase in production.

Tables 6:5 to 6:7 show the international trade of the B.R.D. in forests products, where the amounts have been converted, according to the "Directives", into roundwood equivalents using the customary German conversion factors (see Table 6:2).

### *6.1.3 Labour Market*

The reconstruction of the German economy and the persistently favourable trend of the economy brought about a constantly increasing demand for labour; this was intensified by the general shortening of working hours and could not be met by increased streamlining of procedure and mechanisation of production. On 30 September 1963 there were five jobs vacant for every person then unemployed. Unemployment accounted for less than 0.5 per cent of the total population gainfully employed.

**Numbers Employed and Unemployed**
*(Thousands)*

| | Federal Republic excl. Berlin | | | | Federal Republic incl. Berlin | | |
|---|---|---|---|---|---|---|---|
| Average for the year | 1950 | 1958 | 1959 | 1960 | 1960 | 1961 | 1962 |
| No. employed (without assisting family-members) | 13,963 | 18,519 | 18,865 | 19,418 | 20,331 | 20,730 | 21,053 |
| Unemployed (registered) | 1,584 | 689 | 480 | 237 | 271 | 181 | 154 |
| Unemployed as percentage of employed | 11.4 | 3.7 | 2.5 | 1.2 | 1.3 | 0.9 | 0.7 |

*Source: Statistisches Jahrbuch für die BRD*, 1964, p. 147.

At first, the increasing demand for labour was centred in the cities and industrial areas, while the forest enterprises which generally were remote from the towns were less affected. However, high wages in industry induced many country-dwellers to work in industry despite the long daily travelling time involved. By establishing branches in small townships, German industry competed directly for the services of agricultural and forestry workers.

Compared with the customary all-the-year-round employment for most workers in industry, only a corps of forest workers are employed throughout the year in forestry. Accordingly, extra labour is engaged for the seasonal peak period of forestry work. The felling is often done by smallholders whose revenue from agriculture is not sufficient to cover their needs. Women are employed temporarily in large numbers for planting.

Efforts are being made to increase the size of the permanently employed corps of forest workers, who by training and specialising can ensure a high level of productivity, and this can be seen clearly from the statistics of forest

**Table 6:5. Share of Timber and Wood Products in the Total International Trade of the B.R.D.**

| Year | Total Imports | Imports of timber and wood products | | Total Exports | Exports of timber and wood products | | Balance of payments with timber and wood products |
|---|---|---|---|---|---|---|---|
| | *Million DM* | | *Per cent* | *Million DM* | | *Per cent* | |
| 1953 | 16,010 | 904.6 | *5.7* | 18,526 | 177.7 | *1.0* | — 726.9 |
| 1954 | 19,337 | 1,104.8 | *5.7* | 22,035 | 282.8 | *1.3* | — 922.0 |
| 1955 | 24,472 | 1,703.7 | *7.0* | 25,717 | 326.9 | *1.3* | —1,376.8 |
| 1956 | 27,964 | 1,574.8 | *5.6* | 30,861 | 423.4 | *1.4* | —1,151.4 |
| 1957 | 31,697 | 1,881.0 | *5.9* | 35,968 | 479.4 | *1.3* | —1,401.6 |
| Average 1953—1957 | 23,897 | 1,433.8 | — | 26,621 | 338.0 | *1.3* | —1,115.7 |
| 1958 | 31,133 | 1,943.0 | *6.2* | 36,998 | 473.2 | *1.3* | —1,469.8 |
| 1959 | 35,823 | 2,072.2 | *5.8* | 41,184 | 512.4 | *1.2* | —1,559.8 |
| 1960 | 42,723 | 2,594.6 | *6.1* | 47,946 | 623.5 | *1.3* | —1,971.1 |
| 1961 | 44,363 | 2,867.6 | *6.5* | 50,978 | 684.9 | *1.3* | —2,182.7 |
| 1962 | 49,498 | 2,927.4 | *5.9* | 52,975 | 698.5 | *1.3* | —2,228.9 |
| Average 1958—1962 | 40,708 | 2,481.0 | *6.1* | 46,016 | 598.5 | *1.3* | —1,882.5 |
| 1963 | 52,277 | 3,128.1 | *6.0* | 58,310 | 785.0 | *1.3* | —2,243.1 |

*Source: Statistisches Jahrbuch für die BRD*
Speer, J.: *Ergebnisse und Betrachtungen am Ende der FWJ*, published annually in the *AFZ*

**Table 6:6. Volume of International Trade in Timber and Wood Products**

| Year | Imports Exports Balance | Round-wood | Sawn-wood | Veneers, plywood and barrel-wood | Pulp-wood | Mechanical and chemical pulp | Paper and paper-board | Books, maps | Wooden products | Industrial wood total | Fuel-wood | Char-coal | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Thousands of cubic metres roundwood equivalent* | | | | | | | | | | | |
| 1958 | I | 3,013 | 4,229 | 388 | 1,267 | 2,876 | 1,529 | 46 | 113 | 13,461 | 248 | 70 | 13,780 |
| | E | 209 | 287 | 253 | 22 | 397 | 177 | 154 | 189 | 1,688 | 11 | 12 | 1,711 |
| | B | −2,804 | −3,942 | −136 | −1,245 | −2,480 | −1,351 | +108 | +76 | −11,774 | −237 | −58 | −12,069 |
| 1959 | I | 3,034 | 4,698 | 511 | 1,325 | 3,182 | 1,815 | 47 | 180 | 14,792 | 163 | 64 | 15,019 |
| | E | 163 | 261 | 306 | 24 | 507 | 196 | 178 | 196 | 1,830 | 13 | 14 | 1,858 |
| | B | −2,871 | −4,437 | −205 | −1,301 | −2,675 | −1,619 | +131 | +16 | −12,962 | −149 | −50 | −13,161 |
| 1960 | I | 3,519 | 5,356 | 666 | 1,441 | 3,923 | 2,435 | 52 | 252 | 17,644 | 207 | 77 | 17,929 |
| | E | 168 | 325 | 427 | 17 | 522 | 265 | 173 | 254 | 2,150 | 36 | 17 | 2,203 |
| | B | −3,351 | −5,031 | −239 | −1,424 | −3,401 | −2,170 | +121 | +2 | −15,495 | −171 | −60 | −15,725 |
| 1961 | I | 3,784 | 5,534 | 862 | 1,286 | 4,009 | 2,731 | 60 | 313 | 18,579 | 273 | 80 | 18,931 |
| | E | 188 | 361 | 410 | 8 | 557 | 292 | 204 | 285 | 2,303 | 39 | 16 | 2,358 |
| | B | −3,596 | −5,174 | −452 | −1,278 | −3,452 | −2,439 | +144 | −28 | −16,276 | −234 | −64 | −16,573 |
| 1962 | I | 3,181 | 5,701 | 981 | 1,321 | 4,116 | 3,129 | 70 | 373 | 18,873 | 313 | 71 | 19,257 |
| | E | 222 | 367 | 410 | 11 | 507 | 308 | 217 | 288 | 2,329 | 39 | 15 | 2.384 |
| | B | −2,959 | −5,334 | −572 | −1,310 | −3,610 | −2,821 | +147 | −85 | −16.543 | −274 | −56 | −16.873 |
| | | *Distribution of the volume of imports in percentage* | | | | | | | | | | | |
| 1958 | | *22* | *31* | *3* | *9* | *21* | *11* | *1* | *1* | *98* | *2* | *0* | *100* |
| 1959 | | *20* | *31* | *4* | *9* | *21* | *12* | *0* | *1* | *98* | *2* | *0* | *100* |
| 1960 | | *20* | *30* | *4* | *8* | *22* | *13* | *0* | *2* | *98* | *2* | *0* | *100* |
| 1961 | | *20* | *29* | *5* | *7* | *21* | *14* | *0* | *2* | *98* | *2* | *0* | *100* |
| 1962 | | *16* | *30* | *5* | *6* | *21* | *16* | *0* | *3* | *98* | *2* | *0* | *100* |

*Source:* Speer, J., *Ergenbisse und Betrachtungen am Ende der FWJ 1958—1962*, published annually in the *AFZ*

**Table 6:7. Value of International Trade in Timber and Wood Products**
*(Balance of Payments)*

| Year | Imports Exports Balance | Round-wood | Sawn-wood | Veneers, plywood and barrel-wood | Pulp-wood | Mechanical and chemical pulp | Paper and paper-board | Books, maps | Wooden products | Industrial wood total | Fuel-wood | Char-coal | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Millions DM* | | | | | | | | | | | |
| | I | 360 | 533 | 92 | 78 | 348 | 459 | — | 60 | 1,929 | 11 | 3 | 1,943 |
| 1958 | E | 24 | 40 | 76 | 2 | 42 | 132 | — | 156 | 472 | 0 | 1 | 473 |
| | B | −336 | −493 | −16 | −76 | −306 | −327 | — | +96 | −1,458 | −11 | −2 | −1,470 |
| | I | 356 | 559 | 109 | 70 | 357 | 524 | — | 88 | 2,063 | 8 | 2 | 2,072 |
| 1959 | E | 28 | 33 | 88 | 2 | 53 | 140 | — | 168 | 511 | 1 | 1 | 512 |
| | B | −328 | −526 | −21 | −68 | −304 | −384 | — | +80 | −1,552 | −7 | −1 | −1,560 |
| | I | 450 | 661 | 140 | 73 | 436 | 699 | — | 124 | 2.584 | 9 | 2 | 2,595 |
| 1960 | E | 29 | 42 | 115 | 1 | 57 | 177 | — | 200 | 621 | 1 | 1 | 624 |
| | B | −421 | −619 | −26 | −72 | −379 | −522 | — | +76 | −1,963 | −8 | −1 | −1,971 |
| | I | 499 | 708 | 178 | 73 | 462 | 785 | — | 149 | 2,855 | 10 | 3 | 2,868 |
| 1961 | E | 23 | 48 | 119 | 1 | 61 | 207 | — | 224 | 683 | 1 | 1 | 685 |
| | B | −477 | −661 | −59 | −72 | −401 | −578 | — | +75 | −2,172 | −9 | −2 | −2,183 |
| | I | 427 | 718 | 197 | 71 | 446 | 872 | — | 182 | 2,912 | 13 | 2 | 2,972 |
| 1962 | E | 27 | 50 | 114 | 1 | 56 | 211 | — | 237 | 696 | 1 | 1 | 699 |
| | B | −400 | −668 | −83 | −70 | −390 | −661 | — | +53 | −2,217 | −12 | −1 | −2,229 |

*Source:* Speer, J., *Ergebnisse und Betrachtungen am Ende der FWJ*, published annually in the *AFZ*

**Table 6:8. Indices of Import and Export Prices**
*(1958 = 100)*

| Year | Sawnwood and other manufactured timber | | Mechanical and chemical pulp, paper and paperboard | | Paper and paperboard products | |
|---|---|---|---|---|---|---|
| | Imports | Exports | Imports | Exports | Imports | Exports |
| 1953..... | — | — | — | — | — | — |
| 1954..... | 98.3 | 99.2 | 93.9 | 103.3 | — | 94.9 |
| 1955..... | 108.6 | 105.4 | 98.7 | 102.7 | — | 97.2 |
| 1956..... | 105.4 | 100.8 | 100.4 | 102.7 | — | 97.6 |
| 1957..... | 105.7 | 98.8 | 103.6 | 102.4 | — | 99.3 |
| 1958..... | 100 | 100 | 100 | 100 | 100 | 100 |
| 1959..... | 94.3 | 77.1 | 94.8 | 97.2 | 93.5 | 98.8 |
| 1960..... | 101.3 | 99.3 | 95.2 | 98.8 | 92.4 | 99.8 |
| 1961..... | 103.8 | 97.5 | 93.5 | 99.5 | 96.3 | 105.2 |
| 1962..... | 102.3 | 93.8 | 89.8 | 96.3 | 79.7 | 107.4 |
| 1963..... | 102.2 | 94.6 | 89.7 | 94.3 | 82.0 | 108.6 |

*Source: Statistisches Jahrbuch für die BRD*, 1964, pp. 482—483

labour in recent years. The number of workers employed in forestry on the whole has been declining year by year, whereas, on the other hand, the share of the total accounted for by permanently employed forest workers is rising steadily.

German forest workers have been divided into three groups according to their period of employment in forestry:

a. Permanently employed forest workers.
   These must have worked during the last three years a total of 600 working days; in certain cases it may also be stipulated that at least 200 working days are worked in each of the three last years.
b. Regularly employed forest workers.
   Here it is required for them to have been employed for a total of 180 working days during the last three years; sometimes it is stipulated that at least 60 working days are worked in each of the last three years.
c. Temporarily employed.
   This category covers all the other workers.

The period of notice to be given for termination of employment is for group (a) 2-4 weeks according to length of service, for group (b) one week, and for group (c) one day. This regulation forms part of the wage and labour agreements. Such agreements are concluded after negotiations between representatives of the workers and the employers and can be terminated after the period stipulated in the agreement. In the case of the State Forest Administrations it is the Wage Agreements Association of the German *Länder* which concluded wage agreements with the trade unions representing the workers. For each of the *Länder* comprising the B.R.D. a separate agreement is negotiated, but basically these are the same. Such agreements apply to all workers, and membership of the trade union is not required. In the case of municipally owned forests the local government employment associations conclude agreements with the trade unions in a similar manner; the same applies in the case of the large privately owned forests. Owners of small forest properties agree on wages and conditions of work in most cases directly with the individual forest workers.

### *6.1.4 Conditions for Forest Growth*

The territory of the B.R.D. is situated in the deciduous forest region of the temperate zone (mean annual temperature 9°C or 48°F). Only in very limited areas in the high mountains is the growth of forests prevented by extreme climatic conditions. The uniform climate of the B.R.D. does not allow a division of the territory into a small number of typical forest growth areas. In the main the forest areas are determined by the basic rock formation and by the annual amount of precipitation and its distribution throughout the year. However, there are frequent changes in the type of soil and the annual amount

**Table 6:9. Timber and Timber-processing Industries**
*(September 1962)*

| No. employed by enterprises | Sawmills and timber manufacturing industries | | Mechanical and chemical pulp, paper and paperboard producing industries | | Timber processing industries | | Paper and paperboard processing industries | |
|---|---|---|---|---|---|---|---|---|
| | No. of enterprises | No. employed | No. of enterprises | No. employed | No. of enterprises | No. employed | No. of enterprises | No. employed |
| 1—9 | 5,296 | 16,173 | 40 | 189 | 2,196 | 8,318 | 757 | 3,298 |
| 10—49 | 1,545 | 30,872 | 88 | 2,235 | 1,939 | 48,750 | 781 | 19,066 |
| 50—99 | 155 | 10,511 | 70 | 5,024 | 679 | 47,022 | 249 | 17,572 |
| 100—199 | 72 | 10,269 | 64 | 9,277 | 379 | 51,837 | 173 | 24,429 |
| 200—499 | 49 | 14,849 | 71 | 24,089 | 163 | 48,974 | 127 | 36,061 |
| 500—999 | 13 | 9,078 | 33 | 23,154 | 23 | 15,019 | 24 | 16,226 |
| 1,000 and over | 3 | 3,286 | 12 | 18,876 | 7 | 11,258 | 4 | 7,451 |
| Total | 7,133 | 95,047 | 378 | 82,838 | 5,386 | 231,178 | 2,115 | 124,103 |

**Table 6:10. Number of Forest Workers in 1958 and 1962**
*(position on 15.12.1957 and 15.12.1961, respectively)*

| Distribution a number b index 1958=100 | State forests | | Municipal forests | | Private forests | | Total | |
|---|---|---|---|---|---|---|---|---|
| | 1958 | 1962 | 1958 | 1962 | 1958 | 1962 | 1958 | 1962 |
| Permanently ....a | 17,042 | 21,980 | 8,715 | 8,670 | 6,693 | 6,572 | 32,450 | 37,222 |
| employed .....b | 100 | 129 | 100 | 99 | 100 | 98 | 100 | 115 |
| Regularly .....a | 19,326 | 9,153 | 14,971 | 12,009 | 6,350 | 5,632 | 40,647 | 26,794 |
| employed .....b | 100 | 47 | 100 | 80 | 100 | 89 | 100 | 66 |
| Temporarily ....a | 13,937 | 10,383 | 17,353 | 16,132 | 6,171 | 5,879 | 37,461 | 32,394 |
| employed .....b | 100 | 74 | 100 | 93 | 100 | 95 | 100 | 86 |
| Total .....a | 50,305 | 41,516 | 41,039 | 36,811 | 19,214 | 18,083 | 110,558 | 96,410 |
| b | 100 | 83 | 100 | 90 | 100 | 94 | 100 | 87 |

**Trend in the Number of Forest Workers**
*(all Ownership Categories; on 15 December each year)*

| | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|
| No. employed ..... | 110,558 | 104,376 | 108,370 | 97,923 | 96,010 | 85,935 |
| Index 1957=100 ... | 100 | 94 | 98 | 89 | 87 | 78 |

*Sources:* (1) *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten 1962*, Hamburg & Berlin, 1963
(2) *Forstwirtschaft der BRD*, Bonn, 1958

of precipitation within small areas. For the division of the forest areas reference is made to the work of K. Rubner: *Die Pflanzen-geographischen Grundlagen des Waldbaus*, 5th ed., Radebeul and Berlin, 1960.

Although forest was the original type of vegetation in this region, forests now cover only 29 per cent of the area of the B.R.D., while 58 per cent is devoted to agriculture and the remaining 13 per cent is taken up by buildings, industrial sites, roads and railways. Waste lands exist only to a small extent.

The clearing of woodland for agricultural purposes has been done mainly where there is fertile soil, while forests remain on the less productive soil. In mountainous areas forests are also to be found on fertile soil, but where the slopes are too steep for agricultural use; it is here that the best conditions of growth exist yielding above-average timber production (annual precipitation averages for the B.R.D. 500-700 mm., medium-altitude mountains from 700 to over 1,000 mm.). The North German Plain which is largely devoted to agriculture has thus only a limited amount of forests, while the percentage of forest land in the medium-altitude mountains is above the average (30 per cent).

*6.1.5 Distribution of Forests by Ownership Categories*

The public sector of the economy owns 60 per cent of the forest in the B.R.D. (Federal 1.7 per cent, *Länder* 29.5 per cent, Municipalities 28.8 per cent) while the other 40 per cent is in private hands. There are considerable deviations from these averages for the ownership categories in the various *Länder* which comprise the B.R.D., because of the different historical and legal developments in the various *Länder*. In the *Länder* to the west the share of forests owned by the *Länder* is 13-28 per cent below the average for the B.R.D. while in the *Länder* to the east it is 34-40 per cent above that average. Municipal forests are to be found particularly in the south-west and central parts of the B.R.D., while in the eastern part of southern Germany and in the north the forests are mostly in private hands.

Federal forests account only for a small area. Mainly these involve tracts which are needed for special and official purposes, mostly for military purposes. As a rule the forest properties owned by the *Länder* consist of large connected forest estates; this permits a regulated management and consequently the forests are well maintained. With forests owned by municipalities the conditions are much more varied as to size and management status. Only in the case of the largest enterprises are forestry operations as a rule conducted by their own managerial personnel. Many municipalities make use of the possibility of having their forests managed by officials of the State Forest Administration and pay for the costs of this service. Almost without exception the private forests are owned by individuals. The timber industry does not have its own forests to cover its roundwood requirements, but in some cases the large forest enterprises have their own sawmills.

**Table 6:11. Employment Trends in State Forests**

| | 1958 | 1959 | 1960 | 1961 | 1962 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. employed in individual years | | | | | *Per cent* of total staff | | | | | *Per cent of total male staff* | | | | |
| Total No. of male workers of which : | 46,978 | 45,493 | 41,657 | 37,563 | 35,463 | *55* | *57* | *60* | *62* | *63* | *100* | *100* | *100* | *100* | *100* |
| Permanently employed | 18,431 | 18,363 | 18,285 | 22,457 | 22,207 | *22* | *23* | *26* | *37* | *39* | *39* | *40* | *44* | *60* | *63* |
| Regularly employed | 16,132 | 15,683 | 14,404 | 8,160 | 6,538 | *19* | *20* | *21* | *14* | *12* | *32* | *34* | *35* | *22* | *18* |
| Temporarily employed | 13,297 | 11,447 | 8,968 | 6,946 | 6,798 | *16* | *14* | *13* | *11* | *12* | *29* | *26* | *21* | *18* | *19* |
| Total No. of female workers | 37,475 | 33,806 | 27,807 | 22,935 | 21,087 | *45* | *43* | *40* | *38* | *37* | *80* | *74* | *67* | *61* | *59* |
| Total No. of men and women employed | 84,453 | 79,299 | 69,464 | 60,498 | 56,550 | *100* | *100* | *100* | *100* | *100* | | | | | |

*Source: Jahresbericht der Staatsforstverwaltungen ohne Saarland*
(Annual Report of the State Forest Administration, excluding Saar)

**Table 6:12. Number and Distribution of Hours worked in Bavarian State Forests**

| Nature of work piece-rates P time-rates T grand total GT | Hours (*thousands*) | | | | | Hours (1958 = 100) | | | | | *Per cent* of total hours worked accounted for by the groups | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958 | 1959 | 1960 | 1961 | 1962 |
| Timber harvesting P | 9,427 | 9,706 | 8,880 | 8,127 | 7,326 | | | | | | | | | | |
| T | 3,242 | 3,256 | 2,618 | 2,156 | 2,153 | | | | | | | | | | |
| GT | 12,669 | 12,962 | 11,498 | 10,283 | 9,479 | 100 | 102 | 91 | 81 | 75 | *44* | *45* | *45* | *44* | *45* |
| Planting P | 890 | 905 | 919 | 743 | 770 | | | | | | | | | | |
| T | 8,440 | 8,286 | 7,042 | 6,851 | 6,134 | | | | | | | | | | |
| GT | 9,330 | 9,190 | 7,961 | 7,594 | 6,904 | 100 | 98 | 85 | 81 | 74 | *33* | *22* | *31* | *33* | *33* |
| Other forestry operations.. P | 434 | 469 | 364 | 336 | 332 | | | | | | | | | | |
| T | 6,158 | 6,320 | 5,689 | 4,379 | 4,576 | | | | | | | | | | |
| GT | 6,592 | 6,789 | 6,053 | 4,715 | 4,908 | 100 | 103 | 92 | 72 | 74 | *23* | *23* | *24* | *23* | *22* |
| Total hours worked P | 10,751 | 11 076 | 10,163 | 9,207 | 8,427 | | | | | | | | | | |
| T | 17,841 | 17,861 | 15,349 | 14,030 | 12,863 | | | | | | | | | | |
| GT | 28,592 | 28,937 | 25,512 | 23,245 | 21,291 | 100 | 101 | 89 | 81 | 74 | *100* | *100* | *100* | *100* | *100* |
| Paid hours without work | 3,868 | 3,856 | 3,332 | 3,595 | 3,572 | 100 | 100 | 86 | 93 | 92 | *13* | *13* | *13* | *16* | *17* |
| Total paid hours | 32,460 | 32,794 | 28,845 | 26,841 | 24.836 | 100 | 101 | 89 | 83 | 76 | *113* | *113* | *113* | *116* | *117* |

*Source: Jahresberichte der Bayrischen Staatsforstverwaltung*

The 1961 forest inventory shows that there were 470,707 privately owned forest enterprises with 0.5 hectare or more land devoted to timber growing, of these enterprises 368,109 (78 per cent) have an area of less than 5 hectares; they account for 661,835 hectares or 24 per cent of the total area of private forests. In the 5-20 hectares group there are 86,523 enterprises with an area totalling 778,180 hectares, while in the 20-100 hectares group there are 14,191 enterprises with a total area of 509,886 hectares.

The "forestry enterprises" mentioned here are for the most part not independent enterprises, but as a rule form part of agricultural properties. Consequently, they are not independent management units and for the most part they do not permit regular annual fellings. Diminishing returns can be expected from these woodlands which are of too small a size for a proper forest management. However, there is no precise survey of these, particularly because part of the felled timber is not sold commercially but is used directly on the farm. On the other hand, intense silviculture is possible on these small areas, and on account of the considerable share of the forest area that these farm woodlands occupy (24 per cent of the total forests of the B.R.D.) their

**Table 6:13. Number, Area and Ownership of Forest Properties**

| Ownership category | No. of properties | Total area of forest properties | | of which non-forest area | | productive forest area | |
|---|---|---|---|---|---|---|---|
| | | Area (*ha*) | Ownership category as *per cent* | Area (*ha*) | In *per cent* of total area | Area (*ha*) | Ownership category as *per cent* |
| State forests | 1,887 | 2,235,566 | *31.2* | 115,639 | *5.2* | 2,119,927 | *30.6* |
| of which Federal forests | 715 | 122,803 | *1.7* | 10,672 | *8.7* | 112,129 | *1.6* |
| Lander forests | 1,172 | 2,112,763 | *29.5* | 104,967 | *5.0* | 2,007,798 | *29.0* |
| Municipal forests | 24,178 | 2,058,063 | *28.8* | 53,495 | *2.6* | 2,004,571 | *28.9* |
| of which Communal forests | 14,404 | 1,622,587 | *22.7* | 41,651 | *2.6* | 1,580,942 | *22.8* |
| Corporation forests | 6,403 | 188,880 | *2.6* | 5,128 | *2.7* | 183,752 | *2.6* |
| Co-operative forests | 3,371 | 246,596 | *3.5* | 6,716 | *2.7* | 239,877 | *3.5* |
| Private forests | 470,707 | 2,860,797 | *40.0* | 49,318 | *1.7* | 2,811,475 | *40.5* |
| Total for all ownership categories | 496,772 | 7,154,427 | *100.0* | 218,452 | *3.1* | 6,935,973 | *100.0* |

*Source:* Forsterhebung 1961: *Vorbericht Stat. Bundesamt B-FE 1961/V*, Stuttgart & Mainz, 1964

**Table 6:14. Silvicultural Systems by Ownership Categories**

| Ownership category | High forest cut by compartments | Selection forests | Coppice with standards | Coppice | Coppice with standards and coppice in transition to high forest | Non-commercial forests | Total forest area |
|---|---|---|---|---|---|---|---|
| | (a) *thousands of hectares* of productive forest area<br>(b) *per cent* of productive forest area | | | | | | |
| State forests .....a | 2,014 | 12 | 3 | 7 | 5 | 79 | 2,120 |
| b | *95* | *1* | — | — | — | *4* | *100* |
| Municipal forests ...a | 1,803 | 6 | 38 | 80 | 49 | 28 | 2,004 |
| b | *90* | — | *2* | *4* | *3* | *1* | *100* |
| Private forests .....a | 2,508 | 47 | 38 | 153 | 22 | 44 | 2,812 |
| b | *89* | *2* | *1* | *5* | *1* | *2* | *100* |
| Total .....a | 6,325 | 65 | 79 | 240 | 76 | 151 | 6,936 |
| b | *91* | *1* | *1* | *4* | *1* | *2* | *100* |

*Source:* Forsterhebung 1961: *Vorbericht Stat. Bundesamt B-FE 1961/V*, Stuttgart & Mainz, 1964

importance should not be underestimated in any case. More favourable returns are often obtained from the medium-size and large private forests, which are usually well managed. Normally the yields from such forests do not fall far behind the standard of the State forests.

### *6.1.6 Composition of Forests by Species*

For many centuries use has been made of the German forests and for a long time forestry practice has been on a planned basis. Up to 150 years ago deciduous trees were predominant in the ratio of 70 : 30. Through the introduction and promotion of conifers this ratio has been reversed to 30 : 70 in favour of the conifers. Now the expansion of the cultivation of conifers has stopped almost because it is desired to have a sufficient proportion of deciduous trees in relation to the conifers for soil conservation as well as for cultural and economic reasons.

A survey of growing stock in Germany has been carried out only in connection with the 1948 forests survey. The findings are not very well substantiated and the reported average stock of 93 cubic metres solid volume including bark per hectare is surely too low for present conditions. The F.A.O. World Forest Inventory 1958 credits the B.R.D. with a growing stock totalling 875 million cubic metres including bark = 788 million cubic metres without bark = 113 cubic metres without bark per hectare. These figures seem to correspond with the actual state of affairs.

## 6.2 Income and Expenditure in State Forests

### *6.2.1 State Forests as Business Enterprises*

State forests in the B.R.D.—with the exception of the small Federal forests which are not dealt with in this survey—are the property of the various *Länder* which comprise the B.R.D. The State Forest Administrations publish accounts one or two years after the end of the financial year for forestry operations which run from 1 October to 31 September (e.g. 1.10.1961-31.9.1962 constitutes the 1962 financial year for forestry operations). Quite often these statistics are very detailed though there are considerable differences in the nature and extent of the published material for the various *Länder*. There is no regular compilation of these individual results for the B.R.D. as a whole. Generally it is not possible to obtain subsequently data not published in the annual reports of the *Länder*. Thus in the investigation it was necessary from time to time to calculate data for the entire B.R.D. using the conditions in only a few *Länder* as a basis. The forests owned by the cities of Berlin, Bremen and Hamburg have not been included in the cost-revenue analysis as these woods are more intended for the recreation of the inhabitants of these

**Table 6:15. Distribution of High Forest Areas, excluding Selection Forests, by Ownership Categories and Species**
*(excluding areas under 0.5 ha)*

| Ownership category | | Oak | Beech and other deciduous trees | Scots and soft pine, larch | Spruce and other coniferous trees | Total |
|---|---|---|---|---|---|---|
| | a | thousands of hectares | | | | |
| | b | *per cent of ownership category* | | | | |
| | c | *percentage* share of ownership category | | | | |
| | a | 161 | 522 | 502 | 832 | 2,017 |
| State forests ..... | b | *8* | *26* | *25* | *41* | *100* |
| | c | *34* | *36* | *29* | *31* | *32* |
| | a | 192 | 543 | 394 | 674 | 1,803 |
| Municipal forests ..... | b | *11* | *30* | *22* | *37* | *100* |
| | c | *41* | *37* | *23* | *25* | *28* |
| | a | 120 | 395 | 816 | 1,177 | 2,508 |
| Private forests..... | b | *5* | *16* | *32* | *47* | *100* |
| | c | *25* | *27* | *48* | *44* | *40* |
| | a | 473 | 1,460 | 1,712 | 2,683 | 6,328 |
| Total ..... | b | *8* | *23* | *27* | *42* | *100* |
| | c | *100* | *100* | *100* | *100* | *100* |

*Source:* Forsterhebung 1961. *Stat. Bundesamt Wiesbaden, Fachserie B, Heft* 2. Stuttgart, 1966

**Table 6:16. Distribution of High Forest Areas, excluding Selection Forests, as Percentage of Age Classes, in State Forests**

| Species | Cut-over areas and openings | Age classes, years | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1—20 | 21—40 | 41—60 | 61—80 | 81—100 | 101—120 | 121—140 | over 140 |
| | | *per cent* | | | | | | | |
| Oak ..... | 1 | *10* | *7* | *13* | *17* | *14* | *14* | *13* | *11* |
| Beech and other deciduous trees..... | 1 | *17* | *15* | *11* | *11* | *11* | *13* | *13* | *8* |
| Scots and soft pine, larch .. | 2 | *25* | *16* | *15* | *13* | *14* | *10* | *4* | *1* |
| Spruce and other coniferous trees..... | 2 | *22* | *18* | *19* | *15* | *12* | *7* | *4* | *1* |
| Average ..... | 2 | *21* | *16* | *16* | *14* | *12* | *10* | *5* | *4* |

*Source:* Forsterhebung 1961. *Stat. Bundesamt Wiesbaden, Fachserie B, Heft 2.* Stuttgart 1966

cities than for timber production, and also because they account for only 0.5 per cent of the State forests in the B.R.D. By stipulating that forestry shall be run as a going concern on a sustained-yield basis the forestry legislation in the other *Länder* aims at attaining the highest possible timber yield or the greatest economic utility of their forests.

The State Forest Administrations form part of the Ministries of Agriculture. The State forests are not managed as pure business enterprises on the basis of operating surplus. Instead all items of income and expenditure have to be shown in the budget plan which has to be approved by the Parliaments of the *Länder*. As the administration of forests is run at a loss in most of the *Länder* it is no longer considered to be very desirable to give them the position of autonomous business enterprises which are operating at own risk.

The annual felling programme of the State forests is determined in accordance with cutting rates fixed by the forest regulation on a sustained-yield basis for a 10-year period. As a consequence only one-tenth of the enterprises are given new cutting rates per annum, therefore the yearly amount of timber offered on the market is fairly even. Over-cutting following blow-downs and snow-breaks, such as in 1962, has been limited to certain parts of the country and thus has no marked influence on the total results. As has been mentioned before, in the immediate post-war years it was necessary to replenish the timber stocks which had been very much over-exploited. Since then normal timber stocks have probably been replenished in most forest entreprises, so that the present timber cut may well correspond to current growth. The amount of timber sold corresponds surprisingly well to the annual cut; the only discrepancy worth mentioning—and this was a small one—was due to the violent storm in North Germany in 1962.

**Timber Cut and Sales in State Forests**

*(cubic metres without bark per hectare productive forest area)*

| Financial years for forestry operations | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958-1962 |
|---|---|---|---|---|---|---|
| Timber cut | 4.11 | 4.36 | 4.62 | 4.72 | 5.04 | 4.5 |
| Sales | 4.11 | 4.36 | 4.62 | 4.72 | 4.78 | 4.5 |

*Source:* Jahresberichte der Staatsforstverwaltungen, BML Monatsberichte.

Table 6:17 shows the division of the timber cut according to assortments. Here too there are no great variations over the years. The effort to use up the over-aged stands of beech led to an increased felling of deciduous trees, and in 1962 as a result of the violent storms the offers involving coniferous timber were markedly above average. The fuelwood appearing in the statistics is re-sorted to a considerable extent by the trade and resold as pulpwood.

The timber removals in the State forests are carried out as a rule by permanent forest workers in the employment of the forest districts or lately owing to the shortage of labour such work has been undertaken to very limited extent

by contractors. As sales on the stump do not occur, all felled timber which is sold is measured and sorted carefully beforehand. No difficulties can therefore arise in ascertaining the amounts delivered and the sales value per cubic metre. However, an exact calculation is not always possible for the individual roundwood products if they are sold mixed in a lot. For the statistics of assortments the price in such cases is divided up on a mathematical basis using the known ratios in the individual sales.

### *6.2.2 Income from Timber Sales*

The revenue of the forest enterprise is determined by the amount of timber sold, the division into assortments and their prices. To-day the forest enterprises which have a lot of deciduous species are in a particularly difficult position, as hardwoods have a much smaller volume growth than conifers in

**Table 6:17. Percentage Distribution of Timber Cut, by Assortments, in State Forests**

| Year | Industrial deciduous wood | | | | | Industrial coniferous wood | | | | Fuelwood | | Total industrial wood and fuelwood | of which | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Logs | | | Pit-props | Stacked industrial wood | Logs | | Pit-props | Stacked industrial wood | | | | | |
| | oak | beech | other species | | | spruce/fir | pine/larch | | | Deciduous | Coniferous | | deciduous | coniferous |
| 1959 | 2.7 | 9.5 | 0.5 | 0.5 | 5.9 | 36.2 | 9.0 | 5.9 | 9.9 | 14.7 | 5.2 | 100 | 33.8 | 66.2 |
| 1960 | 2.7 | 9.8 | 0.5 | 0.5 | 7.7 | 36.9 | 9.8 | 5.5 | 9.9 | 12.3 | 4.4 | 100 | 33.5 | 66.5 |
| 1961 | 2.5 | 10.8 | 0.6 | 0.5 | 8.0 | 37.1 | 9.6 | 5.7 | 10.0 | 11.8 | 3.4 | 100 | 34.2 | 65.8 |
| 1962 | 2.5 | 8.8 | 0.5 | 0.5 | 7.6 | 39.3 | 9.8 | 5.2 | 10.6 | 11.5 | 3.7 | 100 | 31.4 | 68.6 |
| 1963 | 2.4 | 9.0 | 0.5 | 0.5 | 7.8 | 37.3 | 8.3 | 5.5 | 10.0 | 14.1 | 4.6 | 100 | 34.3 | 65.7 |
| 1964 | 2.5 | 9.5 | 0.5 | 0.6 | 8.7 | 35.5 | 9.1 | 5.9 | 10.2 | 13.6 | 3.9 | 100 | 35.4 | 64.6 |

*Source: Bundesministerium für Ernährung, Landwirtschaft und Forsten*

**Table 6:18. Index of Producers' Prices for Forest Products (State and Municipal Forests)**
*(1958 = 100)*

| Year | Roundwood total | Logs | | | | | | Pitprops | Pulpwood | Fuelwood |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Oak B | Beech A | Beech B | Spruce/Fir B | Scots pine B | | | |
| 1953 | 92.1 | 93.8 | 91.3 | 114.0 | 95.4 | 92.0 | 96.4 | 90.9 | 86.8 | 87.0 |
| 1954 | 87.4 | 88.7 | 87.1 | 100.7 | 92.1 | 83.3 | 89.2 | 76.2 | 83.5 | 86.8 |
| 1955 | 113.3 | 115.8 | 119.9 | 135.8 | 132.7 | 110.6 | 118.1 | 114.5 | 109.1 | 97.0 |
| 1956 | 105.0 | 104.3 | 110.7 | 120.3 | 119.6 | 98.7 | 108.0 | 106.5 | 107.7 | 107.2 |
| 1957 | 108.9 | 109.5 | 109.6 | 118.4 | 117.3 | 107.0 | 111.9 | 107.1 | 107.6 | 107.0 |
| 1958 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1959 | 86.6 | 88.7 | 94.0 | 88.5 | 86.6 | 88.0 | 89.7 | 76.5 | 77.4 | 86.6 |
| 1960 | 88.0 | 91.3 | 99.3 | 88.9 | 85.1 | 90.0 | 95.9 | 74.6 | 75.6 | 81.7 |
| 1961 | 96.7 | 99.6 | 102.8 | 92.6 | 89.4 | 100.3 | 103.2 | 87.0 | 92.7 | 84.0 |
| 1962 | 94.5 | 96.9 | 96.8 | 85.0 | 82.3 | 100.6 | 95.7 | 86.3 | 89.9 | 85.3 |
| 1963 | 88.5 | 90.7 | 93.5 | 79.5 | 76.6 | 92.9 | 92.3 | 75.8 | 76.9 | 90.0 |
| 1964 | 88.1 | 89.9 | 92.9 | 79.1 | 75.6 | 92.6 | 90.2 | 78.1 | 80.0 | 87.8 |

*Source: Wirtschaft und Statistik*, 1965, p. 346, and 1963, p. 381

comparable site conditions and in terms of prices per cubic metre are on average below the prices for the latter. It is true that high prices are still paid for certain rare broadleaved species of good quality, but this is a matter of no great importance owing to the limited number of such cases. The main part of the broadleaved timber cut consists of beech, where the sales value obtained no longer covers the costs of production.

The State Forest Administrations sell the felled timber by negotiations or at auctions. For bulk assortments, i.e. particularly pulpwood, other industrial timber and pitprops, agreements are often made in advance before the felling begins between the Regional Forestry Administrations and the large buyers; in these agreements the quantities and price per unit are laid down. Valuable timber, which grows only in small quantities, is sold mostly by auction in order to give an equal and fair opportunity to bid for the supplies of this raw material to the very many interested parties which include a great number of the craft industries. A very typical example of this is the auction of veneer oak, at which individual logs are offered after having been carefully examined beforehand by the potential buyers. Prices of some 1,000 DM per cubic metre are obtained for the best veneer oak. Often logs of medium quality, as well as fuelwood, are offered for sale individually. At the price negotiations the local forest supervisors keep to the guiding prices recommended for the different assortments by the Regional Forestry Administrations.

Stacked roundwood is sold delivered to the edge of the logging site (roadside) and as a rule can be transported away from there directly by lorries. The cost of skidding of the stacked roundwood to the roadside is always included in the purchase price. Generally sales prices for logs do not include the costs of skidding or hauling. If the forest administration—at the particular wish of a buyer or for reasons of rationalisation or because of silvicultural measures already taken—has carried out the hauling from stump to landing by its own means, then the extra costs of the skidding must be borne by the buyer and are added to the purchasing price in the accounts. In normal circumstances these skidding costs amount to 3-4 DM per cubic metre, but in very steep terrain and where there is a large proportion of small trees then obviously the costs can be more. An exception occurs in the case of the high mountain areas, where due to the steep terrain the possibilities of extraction often become the decisive factor in timber harvesting. In these forest districts the felled timber is brought to central collection points, where it is sold without any extra charges being made for the skidding and hauling.

Even if for the individual buyer the timber price and the skidding costs in the case of logs are separate, such a division is no longer possible with the total volume of timber sold. However, the Federal Ministry of Agriculture receives regular accounts of the revenue obtained from roundwood sales from the ministries of the *Länder*, which are required to give the prices for logs, sleepers and pitprops not skidded, i.e. before extraction, and for stacked

roundwood extracted and delivered to roadside. Tables 6:18—6:20 are based on these accounts; they start from 1953 after the removal of fixed prices for roundwood. After reaching a peak in 1955 the timber prices declined to their lowest point in 1959 and to which they nearly returned in 1962 after a brief rise in 1961. The price trend for the individual species and assortments can be seen from these tables and particularly noticeable is the sharp drop in the price of beech. The declining sales value per cubic metre cannot be so easily distinguished from the gross revenue per hectare as the timber cut was constantly increased throughout the period under survey.

**Table 6:19. Prices of certain Wood Assortments, after Abolition of Price Control, in State Forests**

*(Logs, sleepers and pitprops—not extracted; stacked roundwood extracted and delivered roadside)*

| Year | Logs, Quality B | | | Pitprops | Pulpwood | | Roundwood total |
|---|---|---|---|---|---|---|---|
| | Spruce, diameter class 4 | Pine, diameter class 2 b | Beech, diameter class 3 | Spruce, long under 15 cm diameter | Beech, class A | Spruce, class A | |
| | with bark | | | bark removed | with bark | | |
| | *cu.m* | *cu.m* | *cu.m* | *cu.m* | *cu.m (stacked)* | *cu.m (stacked)* | *cu.m* |
| | *DM* | | | | | | |
| 1953 | 88.80 | 86.40 | 74.40 | 57.60 | 27.14 | 44.16 | 63.62 |
| 1954 | 88.00 | 84.80 | 73.20 | 50.10 | 25.53 | 41.86 | 62.79 |
| 1955 | 108.00 | 109.20 | 105.60 | 72.30 | 27.83 | 57.96 | 81.84 |
| 1956 | 99.20 | 102.00 | 94.80 | 68.10 | 30.82 | 53.59 | 74.92 |
| 1957 | 104.80 | 103.60 | 93.20 | 68.40 | 30.59 | 51.98 | 76.83 |
| 1958 | 98.40 | 93.60 | 78.80 | 64.50 | 27.14 | 48.76 | 71.38 |
| 1959 | 86.00 | 85.60 | 67.60 | 50.10 | 21.85 | 35.19 | 59.77 |
| 1960 | 87.20 | 91.20 | 67.20 | 48.30 | 21.16 | 35.88 | 62.87 |
| 1961 | 97.60 | 99.20 | 70.80 | 56.40 | 21.16 | 47.84 | 69.01 |
| 1962 | 98.00 | 90.80 | 65.20 | 56.70 | 21.39 | 45.08 | 66.99 |
| 1963 | 90.80 | 87.20 | 61.20 | 50.40 | 20.90 | 43.20 | 65.76 |
| | *Index (1958=100)* | | | | | | |
| 1958 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1959 | 81.3 | 91.5 | 85.8 | 77.7 | 80.5 | 72.2 | 82.3 |
| 1960 | 88.6 | 97.5 | 85.3 | 74.9 | 78.0 | 73.6 | 88.1 |
| 1961 | 99.2 | 106.0 | 89.8 | 87.4 | 78.0 | 98.1 | 96.7 |
| 1962 | 99.6 | 97.0 | 82.7 | 87.9 | 78.8 | 92.5 | 93.8 |
| 1963 | 92.3 | 93.2 | 77.7 | 77.7 | 77.0 | 88.6 | 92.1 |

*Source: Stat. Jahrbuch über Ernährung, Landwirtschaft und Forsten*, 1962, Hamburg & Berlin, 1963

**Table 6:20. Average Revenue from Roundwood Sales in State Forests**
*(Logs, sleepers and pitprops—not extracted; other types extracted and delivered roadside)*

| Entries | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1953—57 | Average 1958—62 | Average 1953—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *DM/m³y* | | | | | | | | | | | | |
| 1. Revenue | 63.62 | 62.79 | 81.84 | 74.92 | 76.83 | 71.38 | 59.77 | 62.87 | 69.01 | 66.99 | 68.00 | 66.00 | 67.00 |
| 2. Logging costs | 9.53 | 9.70 | 9.70 | 11.65 | 13.24 | 13.94 | 13.31 | 13.35 | 14.15 | 15.21 | 10.76 | 13.99 | 12.38 |
| 3. Net conversion surplus | 54.09 | 53.19 | 72.14 | 63.27 | 63.59 | 57.44 | 46.46 | 49.52 | 54.86 | 51.78 | 57.24 | 52.01 | 54.62 |
| | *Index (1953—1962 = 100)* | | | | | | | | | | | | |
| 1. Revenue | 95 | 94 | 122 | 112 | 115 | 107 | 89 | 94 | 103 | 100 | 101 | 99 | 100 |
| 2. Logging costs | 77 | 78 | 78 | 94 | 107 | 113 | 108 | 108 | 114 | 123 | 87 | 113 | 100 |
| 3. Net conversion surplus | 99 | 97 | 132 | 116 | 116 | 105 | 85 | 91 | 100 | 95 | 105 | 95 | 100 |

*Sources:* (1) *Stat. Jahrbuch über Ernährung, Landwirtschaft und Forsten*, 1962 and 1963
(2) *Forstwirtschaft der BRD*, Bonn, 1958

The statistics of timber prices published by the Federal Bureau of Statistics are based on the sales results of the State forests and on the reported income of a not necessarily representative selection of forest enterprises in municipal and private ownership. As the timber prices from privately owned small forests do not provide sufficient data, it is not possible to make any well-founded statement. However, it can be assumed that similar prices are paid for the various roundwood products in the same area, regardless of the ownership category. As the small private forests can offer only minor quantities, and as the roundwood they offer is usually less carefully sorted than the timber provided by the State forests and as it is difficult to dispose of different products widely dispersed in small lots, it can be assumed that the sales value obtained by the small private forest owners for the same products is 5-10 per cent less than that attained by the State forests.

The figures given in Tables 6:18—6:20 are not used in the following cost-revenue analysis. Instead full use is made of the budget accounts of the *Länder* as these results are absolutely accurate and complete. They provide the gross revenue per hectare and—since the volume sold is given in the annual reports—the average gross revenue per cubic metre. After deducting all costs for the logging operations including the share of the indirect social charges, one obtains the net conversion surplus or a theoretical selling price "on the stump", namely:

| Financial year for forestry operations | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958-1962 |
|---|---|---|---|---|---|---|
| DM per cu. m. | 57.02 | 46.39 | 46.59 | 53.32 | 47.92 | 50.11 |

### *6.2.3 Operating Costs*

The special book-keeping system of the State Forest Administrations is

unsatisfactory for the presentation of all important data concerning the business of forestry. The expenditures for forestry operations are entered under only a very few headings in the budget, and a further division is seldom made or is done in such varying ways that it is impossible to combine the data for the individual *Länder* into a single result for the B.R.D. as a whole. Thus in Table 6:25 the division of the expenditures for forestry operations have to be restricted to the following five main groups:

Logging costs, silvicultural costs, road building and maintenance costs, miscellaneous operating costs and social charges.

The logging costs include all the costs involved with the felling and transport of timber, as far as these are expenditures of the forest administration. These costs are explained in a separate chapter.

The silvicultural costs include the expenditures for the establishment and tending of the young plantation and the improvement of the stands, as well as for forest protective measures against biotic and abiotic damage. The costs of forest protection amount to about 20 per cent of the silvicultural costs.

In the road-building costs are included the expenditures on the maintenance and extension of the road network. Unfortunately it is not possible to make a distinction between the money spent on construction and that spent on maintenance of roads. Should it be stipulated that such a division should be made in the book-keeping this would not be easy because often it is not possible to decide when a major maintenance or extension work can be considered as new construction work. However, owing to the unfavourable revenue position it cannot be assumed that the building of roads would be carried out to an abnormal extent during the period under survey. The money which has to be spent on ditches and drainage facilities takes up about 5-10 per cent of this group of costs (however, drainage of new plantations comes under silvicultural costs).

The remaining maintenance costs account for the following percentages of a collective group:

| | *approx.* % |
|---|---|
| a. Cruising, marking and mapmaking | 20 |
| b. Construction and maintenance of buildings for the enterprise (excl. administrative buildings) | 30 |
| c. Procurement and maintenance of major machinery for different operational purposes | 30 |
| d. Miscellaneous expenses | 20 |

In addition to wages (allowance for tools comes under wages), the social charges embrace all further expenses for workers, such as holidays with pay, sick pay, payment for idle time (owing to inclement weather), children's allowances, bonuses and wage guarantees. Contributions under the National Health scheme and payments towards old-age pensions for the workers are

included too. In Table 6:29 this cost group has been apportioned to the other groups of costs according to the actual share of the wages involved.

*Harvesting*

State forests usually use their own staff of well-trained forest workers for the cutting of the timber, the main season for felling is the winter half of the year. The considerable increase in wages in recent years are not reflected to the full in this labour-consuming cost item, because the introduction and spread of the use of motor saws have resulted in a rapidly rising rate of productivity. Though workers' earnings were rising the cost per cubic metre rose less markedly on account of the increased efficiency of workers. However, as motor saws are used now almost exclusively, the logging costs per cubic metre have started to rise again in recent years in proportion to the increases in wages. The Bavarian State Forest Administration can serve as a typical example of the forceful introduction of the motor saw into German forestry:

| | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|
| Percentage of workers using own motor saws..... | 4 | 5 | 17 | 33 | 47 |
| Productivity cu.m/hour ..... | 0.43 | 0.43 | 0.47 | 0.51 | 0.53 |

The equipment used in felling work is provided by the worker himself, who receives a tool allowance totalling one-tenth of the contract rate paid for manual work and one-eighth of piece-rate earnings where motor saws are used. The two-man motor saw, which was the usual type when this equipment was introduced, has been replaced now almost entirely by the lighter and more versatile one-man motor saw.

Payments to forest workers are made on the basis of the table of piece rates contained in the wage and working agreement. These tables, which are based on time-and-motion studies, give the piece rates for all species and the various assortments, as well as for all extra work, such as bark removal and skidding of the stacked roundwood. Particular difficulties involved with logging at certain sites are evened out by payments of additional remuneration to the rates in the table.

As these piece-rate payments always include, besides felling, the payments for measuring, limbing and cutting into lengths of the different assortments and in the case of stacked roundwood the skidding from the forest to the roadside and—if such work is done—also payment for bark removal, it is not possible to determine more exactly the share of the known total logging costs which fall on the individual operations.

The share of the skidding costs in the total logging costs of the timber which is not extracted by the buyer himself, is not known exactly, but is probably between 1 and 2 DM per cubic metre of the total volume of timber

sold. As a rule the State Forest Administration does not undertake the further transport of the timber beyond the roadside or collection point.

Furthermore, in the total logging costs are included the costs of assistance with marking and registering cut at the felling place (scaling), special tasks in the felling operations and salvage logging of individual trees. Finally, the general social charges must be entered under this cost item, as has been done here in proportion to the wages.

| | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958-1962 |
|---|---|---|---|---|---|---|
| Logging costs DM/m³y | 10.01 | 10.38 | 10.25 | 10.43 | 12.17 | 10.67 |
| Social charges DM/m³y | 4.24 | 4.42 | 4.28 | 4.50 | 5.24 | 4.55 |
| Total logging costs DM/m³y | 14.25 | 14.80 | 14.53 | 14.93 | 17.41 | 15.22 |

*Silviculture*

The early indiscriminate felling of individual trees was soon limited by law and regulations, which required cuttings by compartments. The systems of forest regulations in the 19th century and its working rules based on very rigid programmes, as well as the demands for a timber output on the most stringent sustained-yield basis together with the increase in the cultivation of conifers gave rise to the policy of clear-cutting. As a counter-measure to this, there was developed a large number of silvicultural systems intended to promote through natural regeneration mixed stands containing trees of various ages. Although both these methods of silviculture have their advocates among the forestry authorities, the principle of artificial reproduction by direct seeding or planting is mostly used in the State forests. As a rule this applies to the establishments of predominantly pine and spruce stands. Only in the areas of optimum conditions for forest growth, mostly in southern Germany and particularly where the silver fir occurs, preference is given to natural reproduction, which also is the most usual method in the management of beech. However, the natural reproduction of beech is often combined with the artificial planting of conifers.

But even in areas where it is possible in practice and where at the first glance it seems to be an inexpensive method of obtaining natural reproduction, the reasons for artificial planting can be summarised as follows. The obtaining of natural reproduction in most cases takes a long time and can extend to several decades; also the young stands require extensive tending and their acreage takes up a large part of the forest area. The felling and skidding of the timber is made difficult and less streamlined in small cutting areas by the presence of young trees, while the dependence on seed-years hampers the flexible organisation of the regeneration process and this often leads to losses

in the timber growth. The measures necessary for the tending of the uneven and often too thickly growing young stands are very expensive and labour consuming. On the other hand, artificial reproduction allows the use of machines, the smaller areas are easier to control and protect, the desired composition of species is easier to obtain, and the quality of the timber raised in stands of uniform growth is better.

### *6.2.4 Administrative Costs*

Besides the management of the State forests, the forest administrations of the *Länder* are obliged by the forest laws to act as forest police in the forest properties of all ownership categories. In addition these forest laws give the private owner the possibility of requesting advice from State forest officers. Municipalities can have their forests managed by State officials against the payment of fees. In North Germany this service is the responsibility of the chambers of agriculture, which are not part of the State Forest Administration.

The services which are provided by the authorities free of charge—and the management of municipal forests for fees which do not cover the costs—obviously necessitate an enlargement of the State Forest Administration and increase its costs accordingly. Consequently, for the purpose of the cost-revenue analysis these outside costs and payments have been excluded to an

**Table 6:21. Forest Officials, Employees and Administrative Trainees according to 1962 Status**
*(position on 15.12.1961)*

| Ownership category | a Forest officials and employees<br>b Administrative trainees<br>c Total | Higher grades | Senior grades | Medium and lower grades | Total |
|---|---|---|---|---|---|
| State forests | a | 1,917 | 5,640 | 3,747 | 11,304 |
| | b | 163 | 621 | 110 | 894 |
| | c | 2,080 | 6,261 | 3,857 | 12,198 |
| Municipal forests | a | 118 | 1,357 | 2,101 | 3,576 |
| | b | 3 | 51 | 15 | 69 |
| | c | 121 | 1,408 | 2,116 | 3,645 |
| Private forests | a | 251 | 1,651 | 1,107 | 3,009 |
| | b | 1 | 92 | 41 | 134 |
| | c | 252 | 1,743 | 1,148 | 3,143 |
| Total | a | 2,286 | 8,648 | 6,955 | 17,889 |
| | b | 167 | 764 | 166 | 1,079 |
| | c | 2,453 | 9,412 | 7,121 | 18,986 |
| Productive forest area (ha) per employee | | 2,828 | (737) | (974) | 365 |
| Felled timber ($m^3$y) per employee | | 10,192 | (2,656) | (3,511) | 1,317 |

*Source: Stat. Jahrbuch über Ernährung, Landwirtschaft und Forsten*, 1962, Hamburg & Berlin, 1963

extent corresponding to the key figures calculated by the forest administrations of the individual *Länder*.

The highest authorities for forest administration of the *Länder* (which form the B.R.D.) are the ministerial forestry departments. Beneath these there are the regional forest administrations which act as the intermediary authorities, with the exception of the cities of Hamburg and Bremen, which have rights equivalent to *Länder*, and also the Saar and Schleswig-Holstein, which are the smallest *Länder* in the B.R.D. The actual management of forest land is carried out by forest supervisors in the forest districts, which cover areas of between 3,000 and 6,000 hectares. These forest supervisors are high-grade civil servants with university training. The forest districts are further divided up in ranger districts with an area between 500 and 1,200 hectares, according to the conditions of the terrain, the volume of annual cut and the educational status of the forest rangers (higher or medium grades of the civil service).

Table 6:21 shows the number of forest officers and other employees in the forest administration, employed in the different ownership categories. It should be emphasised that the State forest officials also administer a large part of the municipal forests and that the small private forests are run by the owners

**Table 6:22. Distribution of Administrative Costs in State Forests**

| Year | Central Administration | | | Local Administration | | | | | | | | Joint costs | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | staff | material | total | staff | | | material | | | | total | staff | | | staff | material | total |
| | | | | total | of which | | total | of which | | | | total | of which | | | | |
| | | | | | salaried | others | | travelling expenses | business requirements | offices, staff housing | | | allowances | staff pensions | | | |
| | *DM per hectare* | | | | | | | | | | | | | | | | |
| 1958 | 9.10 | 2.35 | 11.45 | 32.73 | 32.48 | .25 | 10.28 | 2.99 | 2.11 | 5.18 | 43.01 | 14.02 | .84 | 13.18 | 55.85 | 12.63 | 68.48 |
| 1959 | 9.48 | 2.35 | 11.83 | 33.25 | 33.01 | .24 | 10.35 | 3.06 | 2.12 | 5.17 | 43.60 | 14.04 | .85 | 13.19 | 56.77 | 12.70 | 69.47 |
| 1960 | 10.43 | 2.55 | 12.98 | 36.08 | 35.85 | .23 | 10.20 | 3.19 | 2.21 | 4.80 | 46.28 | 14.49 | .86 | 13.63 | 61.00 | 12.75 | 73.75 |
| 1961 | 11.27 | 2.69 | 13.96 | 39.22 | 38.98 | .24 | 10.90 | 3.34 | 2.27 | 5.29 | 50.12 | 15.08 | .94 | 14.14 | 65.57 | 13.59 | 79.16 |
| 1962 | 11.89 | 2.80 | 14.69 | 40.86 | 40.60 | .26 | 11.87 | 3.61 | 2.41 | 5.85 | 52.73 | 16.34 | 1.02 | 15.32 | 69.09 | 14.67 | 83.76 |
| Average 1958—62 | 10.43 | 2.55 | 12.98 | 36.43 | 36.19 | .24 | 10.72 | 3.24 | 2.22 | 5.26 | 47.15 | 15.04 | .90 | 14.14 | 61.66 | 13.27 | 74.92 |
| | *DM per cubic metre* | | | | | | | | | | | | | | | | |
| 1958 | 2.22 | .57 | 2.79 | 7.98 | 7.92 | .06 | 2.51 | .73 | .51 | 1 27 | 10.49 | 3.42 | .20 | 3.22 | 13.62 | 3.08 | 16.24 |
| 1959 | 2.15 | .53 | 2.68 | 7.56 | 7.51 | .05 | 2.35 | .70 | .48 | 1.17 | 9.91 | 3.19 | .19 | 3.00 | 12.90 | 2.88 | 15.78 |
| 1960 | 2.27 | .55 | 2.82 | 7.84 | 7.79 | .05 | 2.22 | .69 | .48 | 1.05 | 10.06 | 3.15 | .19 | 2.96 | 13.26 | 2.77 | 16.03 |
| 1961 | 2.40 | .57 | 2.97 | 8.34 | 8.29 | .05 | 2.32 | .71 | .48 | 1.13 | 10.66 | 3.21 | .20 | 3.01 | 13.95 | 2.89 | 16.84 |
| 1962 | 2.48 | .58 | 3.06 | 8.51 | 8.46 | .05 | 2.47 | .75 | .50 | 1.22 | 10.98 | 3.40 | .21 | 3.19 | 14.39 | 3.05 | 17.44 |
| Average 1958—62 | 2.32 | .57 | 2.89 | 8.10 | 8.05 | .05 | 2.38 | .72 | .49 | 1.17 | 10.48 | 3.28 | .20 | 3.08 | 13.70 | 2.95 | 16.65 |
| % share 1958—62 | *14* | *3* | *17* | *49* | *49* | *0* | *14* | *4* | *3* | *7* | *63* | *19* | *1* | *18* | *82* | *18* | *100* |

*Source: Jahresberichte der Staatsforstverwaltungen*

themselves. The corresponding figures for 1958 are not given, as they are practically identical with the 1962 data.

The officials in the higher posts of the forest service have had a university training and have graduated from the forestry faculties of the Universities of Freiburg, Göttingen or Munich. For senior posts (forest ranger) it is necessary for the holders to have attended a forestry course of two years at a technical forest school, while the officials in the medium and lower grades are given a more practical training and learn their jobs mainly from experience and courses.

Tables 6:22—6:24 give the total break-down of the administrative costs, excluding overhead costs not attributable to the business proper, i.e. only the costs which are involved with the management of State forest enterprises. Overhead charges, such as pensions, training costs or other payments to workers, are not contained. The administrative income which is attributable to the enterprise has been deducted from the expenditure on housing for employees, as here it is mainly a matter of rent collection from such housing.

Between 1958 and 1962 the administrative costs have increased by more

**Table 6:23. Distribution of Administrative Costs in State Forests by Allocating Joint Costs according to Staff Costs**

| Year | Central Administration | | | Local Administration | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | staff | material | total | staff | material | total | staff | material | total |
| | *DM. per hectare* | | | | | | | | |
| 1958 | 12.17 | 2.35 | 14.52 | 43.68 | 10.28 | 53.96 | 55.85 | 12.63 | 68.48 |
| 1959 | 12.60 | 2.35 | 14.95 | 44.17 | 10.35 | 54.52 | 56.77 | 12.70 | 69.47 |
| 1960 | 13.68 | 2.55 | 16.23 | 47.32 | 10.20 | 57.52 | 61.00 | 12.75 | 73.75 |
| 1961 | 14.63 | 2.69 | 17.32 | 50.94 | 10.90 | 61.84 | 65.57 | 13.59 | 79.16 |
| 1962 | 15.57 | 2.80 | 18.37 | 53.52 | 11.87 | 65.39 | 69.09 | 14.67 | 83.76 |
| Average 1958—1962 | 13.73 | 2.55 | 16.28 | 47.93 | 10.72 | 58.65 | 61.66 | 13.27 | 74.93 |
| | *DM. per cubic metre* | | | | | | | | |
| 1958 | 2.97 | .57 | 3.54 | 10.65 | 2.51 | 13.16 | 13.62 | 3.08 | 16.24 |
| 1959 | 2.86 | .53 | 3.39 | 10.04 | 2.35 | 12.39 | 12.90 | 2.88 | 15.78 |
| 1960 | 2.97 | .55 | 3.52 | 10.29 | 2.22 | 12.51 | 13.26 | 2.77 | 16.03 |
| 1961 | 3.11 | .57 | 3.68 | 10.84 | 2.32 | 13.16 | 13.95 | 2.89 | 16.84 |
| 1962 | 3.24 | .58 | 3.82 | 11.15 | 2.47 | 13.62 | 14.39 | 3.05 | 17.44 |
| Average 1958—1962 | 3.05 | .57 | 3.62 | 10.65 | 2.38 | 13.03 | 13.70 | 2.95 | 16.65 |
| % share 1958—1962 | *18* | *4* | *22* | *64* | *14* | *78* | *82* | *18* | *100* |

*Source: Jahresberichte der Staatsforstverwaltungen*

than 20 per cent. The reason for this lies in the high percentage of staff costs taken up by forest officers and office employees; this amounts to more than 80 per cent and along with the general development in salaries has increased uncommonly fast in recent years.

### *6.2.5 Taxes*

State forests, just like forests in the hands of other owners, have to pay land tax and turnover tax. However, they are exempt from income tax and property tax, while death duties are not involved in the case of public forests.

The land tax is assessed on a unit value, which in principle is an income value and thus should correspond to the capitalised annual net income or operating surplus. This unit value has remained unchanged since the last general assessment which was made in 1936. The amounts of land tax have continued to rise because the municipalities to which these taxes are due have continuously increased the percentage amount to be paid on the unit values. A new assessment of unit values will be made in the near future, and the forest owners are hoping this will provide a relief corresponding to the deteriorated revenue position. In any case, under the new assessment of unit value a certain minimum value will be put on the forest land from which an operating surplus can no longer be secured. In addition to the land tax certain small compulsory

**Table 6:24. Administrative Costs in State Forests, 1962**

| | *Percentage* distribution | Staff costs | Material costs | Total | Staff costs | Material costs | Total |
|---|---|---|---|---|---|---|---|
| | | *DM per hectare* | | | *DM per cubic metre* | | |
| Ministerial (*Länder*) Forestry Department ... | *1.8* | 1.41 | .12 | 1.53 | .29 | .02 | .31 |
| Regional Forestry Department ..... | *7.0* | 4.63 | 1.27 | 5.90 | .96 | .26 | 1.22 |
| Forest cashiers..... | *2.9* | 2.13 | .26 | 2.39 | .44 | .05 | .49 |
| Bureau of Forest Inventory ..... | *3.0* | 2.13 | .39 | 2.52 | .44 | .08 | .52 |
| Forestry schools ..... | *0.3* | .19 | .09 | .28 | .04 | .02 | .06 |
| Training centres for forest workers ..... | *0.8* | .43 | .25 | .68 | .09 | .05 | .14 |
| Research institute ..... | *1.7* | .97 | .42 | 1.39 | .20 | .09 | .29 |
| Local administration ... | *63.0* | 40.86 | 11.87 | 52.73 | 8.51 | 2.47 | 10.98 |
| Pensions and allowances | *19.5* | 16.34 | — | 16.34 | 3.42 | — | 3.42 |
| Total ..... | *100.0* | 69.09 | 14.67 | 83.76 | 14.39 | 3.06 | 17.45 |
| Total % share ..... | | *82* | *18* | *100* | *82* | *18* | *100* |

*Source: Jahresberichte der Staatsforstverwaltungen*

dues and fees will be imposed, they cannot be specified exactly and these are included under the heading land tax.

The Federal State receives the turnover tax which has to be paid every time there is a transfer of goods and also for the own consumption of commodities produced on the property. Generally German turnover tax amounts to four per cent of the purchase value, but in the case of forestry it was reduced to 1.5 per cent and has been abolished completely from 1965.

| Financial year for forestry operations | Land tax | Turnover tax | Total taxes | Land tax | Turnover tax | Total taxes |
|---|---|---|---|---|---|---|
| | | DM/hectare | | | DM/cu.m. | |
| 1958 | 13.72 | 4.69 | 18.41 | 3.41 | 1.14 | 4.48 |
| 1959 | 14.29 | 4.61 | 18.90 | 3.29 | 1.06 | 4.35 |
| 1960 | 15.03 | 4.87 | 19.90 | 3.25 | 1.06 | 4.31 |
| 1961 | 16.10 | 5.14 | 21.24 | 3.41 | 1.09 | 4.50 |
| 1962 | 16.17 | 5.39 | 21.56 | 3.38 | 1.13 | 4.51 |
| Average 1958-1962 | 15.06 | 4.94 | 20.00 | 3.33 | 1.09 | 4.42 |

*6.2.6 Net Profit*

The net profit of the State forests, expressed as the difference between income and expenditure including taxes, shows no definite trend for the period under survey (1958-1962). In 1958 and 1961 the maximum was attained with a good 20 per cent of the gross revenue, while in 1962 there was a minimum which totalled a little more than 10 per cent of the gross revenue. Only by continually increasing the cutting volume was it possible to show a net profit each year in the face of constantly rising costs. Furthermore, it should be noted that this average net profit contains a large number of forest enterprises that have reported losses on their operations, and their deficits can be made good in the accounts only by a correspondingly higher profit from the forest enterprises where there is an extensive felling of conifers.

Even if there is no definite trend noticeable in net revenue over these five years, there is one item, namely costs, which shows an even rise. Accordingly, the fluctuations have been caused more by the varying volumes of cut and particularly by the changing prices for timber. One cannot disregard the possibility that forestry costs could be reduced within the foreseeable future without giving up the intensive forest management which has been considered necessary up to now. As now even the volume of annual cut cannot be raised substantially within the near future without harming the sustained-yield forestry, and as a rise in the timber prices is not seen, no profit is likely to be yielded by German forestry on the whole, though particularly favourable forest enterprises may be profitable. The reports published up to now for the

1963 and 1964 financial years for forestry operations regrettably confirm this tendency.

The present cost-revenue analysis has been compiled according to the "Directives" of the actual annual records based on the volume of timber sold; thus no "objectivisation" or "rectification" of the data have been made. As possible changes in the timber stock have not been taken into consideration and the timber cut not checked in respect of its distribution by assortments, the net profit so attained is not completely valid in the strict accountancy sense (*Bilanztheorie*). Also all expenditures have been transferred at their actual values with the exception of the administrative costs from which the expenditure of outside services has been deducted. The equalisation of the cut and sold annual volumes of timber set down in the "Directives" in effect corresponded to actual conditions throughout the period under survey. Only in 1962 was there an unsold volume of timber totalling 0.26 cubic metres per hectare. This has resulted in too high figures being given in Tables 6:25 and 6:29 for the 1962 logging costs. In actual fact they amounted to 11.54 DM per cubic metre and when the appropriate social costs of 4.97 DM per cubic metre have been added corresponding to Table 6:29 they totalled only 16.51 DM per cubic metre of timber output.

**Table 6:25. Costs and Revenue in State Forests**
(*entire B.R.D.*)

| Year | Gross revenue | Logging costs | Silvicultural costs | Road-construction costs | Costs for other operations | Social charges | Administrative costs | Taxes | Net profit |
|---|---|---|---|---|---|---|---|---|---|
| | a DM per hectare | | | | | b DM per cubic metre | | | |
| 1958 a | 292.94 | 41.14 | 36.20 | 23.51 | 3.92 | 36.59 | 68.48 | 18.41 | 64.69 |
| b | 71.27 | 10.01 | 8.81 | 5.72 | 0.95 | 8.90 | 16.66 | 4.48 | 15.74 |
| 1959 a | 266.81 | 45.29 | 34.76 | 23.55 | 3.99 | 38.14 | 69.47 | 18.90 | 32.71 |
| b | 61.19 | 10.38 | 7.97 | 5.40 | 0.92 | 8.74 | 15.93 | 4.35 | 7.50 |
| 1960 a | 282.36 | 47.34 | 33.22 | 25.89 | 4.12 | 37.91 | 73.75 | 19.90 | 40.23 |
| b | 61.12 | 10.25 | 7.19 | 5.60 | 0.89 | 8.21 | 15.96 | 4.31 | 8.71 |
| 1961 a | 322.12 | 49.24 | 34.24 | 27.82 | 4.06 | 41.27 | 79.16 | 21.24 | 65.09 |
| b | 68.25 | 10.43 | 7.26 | 5.89 | 0.86 | 8.75 | 16.77 | 4.50 | 13.79 |
| 1962 a | 312.30 | 58.17 | 34.60 | 30.15 | 4.37 | 44.92 | 83.76 | 21.56 | 34.77 |
| b | 65.33 | 12.17 | 7.24 | 6.31 | 0.91 | 9.40 | 17.52 | 4.51 | 7.27 |
| Average a | 295.31 | 48.24 | 34.60 | 26.18 | 4.09 | 39.77 | 74.92 | 20.00 | 47.51 |
| 1958—62 b | 65.33 | 10.67 | 7.65 | 5.79 | 0.90 | 8.80 | 16.58 | 4.43 | 10.51 |

*Source: Jahresberichte der Staatsforstverwaltungen*

**Table 6:26. Costs and Revenue in State Forests of Lower-Saxony (Niedersachsen)**

| Year | Gross revenue | Logging costs | Silvicultural costs | Road-construction costs | Costs for other operations | Social charges | Administrative costs | Taxes | Net profit |
|---|---|---|---|---|---|---|---|---|---|
| | a DM per hectare | | | | | b DM per cubic metre | | | |
| 1958 a | 252.77 | 28.85 | 36.20 | 19.46 | 4.70 | 32.21 | 77.42 | 21.08 | +32.85 |
| b | 68.32 | 7.80 | 9.78 | 5.26 | 1.27 | 8.71 | 20.92 | 5.70 | + 8.88 |
| 1959 a | 229.43 | 30.18 | 37.33 | 17.13 | 4.51 | 32.55 | 78.41 | 22.34 | + 6.98 |
| b | 59.75 | 7.86 | 9.72 | 4.46 | 1.17 | 8.48 | 20.42 | 5.82 | + 1.82 |
| 1960 a | 244.80 | 33.22 | 35.50 | 18.86 | 4.60 | 31.62 | 81.26 | 23.44 | +16.30 |
| b | 57.60 | 7.82 | 8.35 | 4.44 | 1.08 | 7.44 | 19.12 | 5.52 | + 3.83 |
| 1961 a | 254.34 | 35.09 | 36.47 | 20.89 | 5.01 | 35.07 | 87.71 | 24.56 | + 9.54 |
| b | 59.99 | 8.28 | 8.60 | 4.93 | 1.18 | 8.27 | 20.69 | 5.79 | + 2.25 |
| 1962 a | 239.71 | 51.16 | 32.88 | 22.63 | 5.42 | 38.95 | 91.98 | 24.30 | −27.61 |
| b | 45.06 | 9.62 | 6.18 | 4.25 | 1.02 | 7.32 | 17.29 | 4.57 | − 5.19 |

*Source: Jahresberichte der Niedersächsischen Staatsforstverwaltung*

**Table 6:27. Costs and Revenue in State Forests of Hesse (Hessen)**

| Year | Gross revenue | Logging costs | Silvicultural costs | Road-construction costs | Costs for other operations | Social charges | Administrative costs | Taxes | Net profit |
|---|---|---|---|---|---|---|---|---|---|
| | a DM per hectare | | | | | b DM per cubic metre | | | |
| 1958 a | 248.25 | 40.79 | 28.08 | 18.65 | 2.99 | 38.61 | 57.90 | 22.56 | 38.67 |
| b | 55.54 | 9.13 | 6.28 | 4.17 | 0.67 | 8.64 | 12.95 | 5.05 | 8.65 |
| 1959 a | 260.69 | 48.22 | 27.41 | 14.25 | 3.04 | 39.81 | 60.91 | 22.34 | 44.71 |
| b | 52.56 | 9.72 | 5.53 | 2.87 | 0.61 | 8.03 | 12.28 | 4.51 | 9.01 |
| 1960 a | 271.26 | 47.95 | 25.36 | 16.32 | 2.91 | 38.78 | 65.34 | 23.21 | 51.39 |
| b | 52.67 | 9.31 | 4.92 | 3.16 | 0.57 | 7.53 | 12.69 | 4.51 | 9.98 |
| 1961 a | 308.89 | 54.49 | 29.07 | 19.03 | 3.25 | 44.48 | 71.71 | 24.24 | 62.62 |
| b | 56.57 | 9.97 | 5.32 | 3.49 | 0.60 | 8.15 | 13.13 | 4.44 | 11.47 |
| 1962 a | 282.13 | 65.38 | 29.59 | 20.32 | 3.37 | 48.25 | 78.72 | 26.90 | 9.60 |
| b | 49.93 | 11.57 | 5.23 | 3.60 | 0.60 | 8.54 | 13.93 | 4.76 | 1.70 |

*Source: Jahresberichte der Hessischen Staatsforstverwaltung*

**Table 6:28. Costs and Revenue in State Forests of Bavaria (Bayern)**

| Year | Gross revenue | Logging costs | Silvicultural costs | Road-construction costs | Costs for other operations | Social charges | Administrative costs | Taxes | Net profit |
|---|---|---|---|---|---|---|---|---|---|
| | a DM per hectare | | | | | b DM per cubic metre | | | |
| 1958 a | 298.11 | 45.24 | 34.32 | 26.25 | 2.99 | 36.47 | 57.62 | 12.82 | 82.40 |
| b | 75.85 | 11.51 | 8.73 | 6.68 | 0.76 | 9.28 | 14.66 | 3.26 | 20.97 |
| 1959 a | 272.37 | 51.53 | 32.87 | 28.05 | 3.01 | 39.32 | 56.58 | 13.31 | 47.70 |
| b | 63.94 | 12.10 | 7.71 | 6.58 | 0.70 | 9.23 | 13.28 | 3.12 | 11.22 |
| 1960 a | 276.62 | 49.74 | 32.93 | 31.66 | 3.28 | 39.01 | 61.67 | 13.66 | 44.67 |
| b | 65.39 | 11.76 | 7.78 | 7.48 | 0.78 | 9.22 | 14.58 | 3.23 | 10.56 |
| 1961 a | 338.78 | 49.64 | 34.16 | 35.31 | 2.98 | 42.54 | 66.33 | 16.64 | 91.18 |
| b | 78.24 | 11.46 | 7.89 | 8.16 | 0.69 | 9.82 | 15.32 | 3.84 | 21.06 |
| 1962 a | 338.66 | 56.05 | 36.06 | 37.62 | 3.42 | 45.75 | 70.85 | 16.54 | 72.37 |
| b | 74.43 | 12.31 | 7.93 | 8.27 | 0.75 | 10.05 | 15.57 | 3.64 | 15.91 |

*Source: Jahresberichte der Bayerischen Staatsforstverwaltung*

**Table 6:29. Costs and Revenue in State Forests with Allocation of Social Charges**
*(entire B.R.D.)*

| Year | Gross revenue | Logging cost | Silvicultural costs | Road-construction cost | Costs for other operations | Administrative costs | Taxes | Net profit |
|---|---|---|---|---|---|---|---|---|
| | a DM per hectare | | | | b DM per cubic metre | | | |
| 1958 a | 292.94 | 58.57 | 49.18 | 28.09 | 5.52 | 68.48 | 18.41 | 64.69 |
| b | 71.27 | 14.25 | 11.97 | 6.83 | 1.34 | 16.66 | 4.48 | 15.74 |
| 1959 a | 266.81 | 64.55 | 47.29 | 28.26 | 5.65 | 69.47 | 18.90 | 32.71 |
| b | 61.19 | 14.80 | 10.84 | 6.48 | 1.29 | 15.93 | 4.35 | 7.50 |
| 1960 a | 282.36 | 67.11 | 44.79 | 30.80 | 5.78 | 73.75 | 19.90 | 40.23 |
| b | 61.12 | 14.53 | 9.69 | 6.67 | 1.25 | 15.96 | 4.31 | 8.71 |
| 1961 a | 322.12 | 70.47 | 46.88 | 33.53 | 5.75 | 79.16 | 21.24 | 65.09 |
| b | 68.25 | 14.93 | 9.94 | 7.10 | 1.22 | 16.77 | 4.50 | 13.79 |
| 1962 a | 312.30 | 83.23 | 47.17 | 35.62 | 6.19 | 83.76 | 21.56 | 34.77 |
| b | 65.33 | 17.41 | 9.87 | 7.45 | 1.30 | 17.52 | 4.51 | 7.27 |
| Average a | 295.31 | 68.79 | 47.05 | 31.26 | 5.78 | 74.92 | 20.00 | 47.51 |
| 1958—62 b | 65.33 | 15.22 | 10.40 | 6.92 | 1.28 | 16.58 | 4.42 | 10.51 |

*Source: Jahresberichte der Staatsforstverwaltungen*

# Chapter 7

# NORWAY

# Norway

by

FRITS JÖRGENSEN and TORSTEN OPHEIM

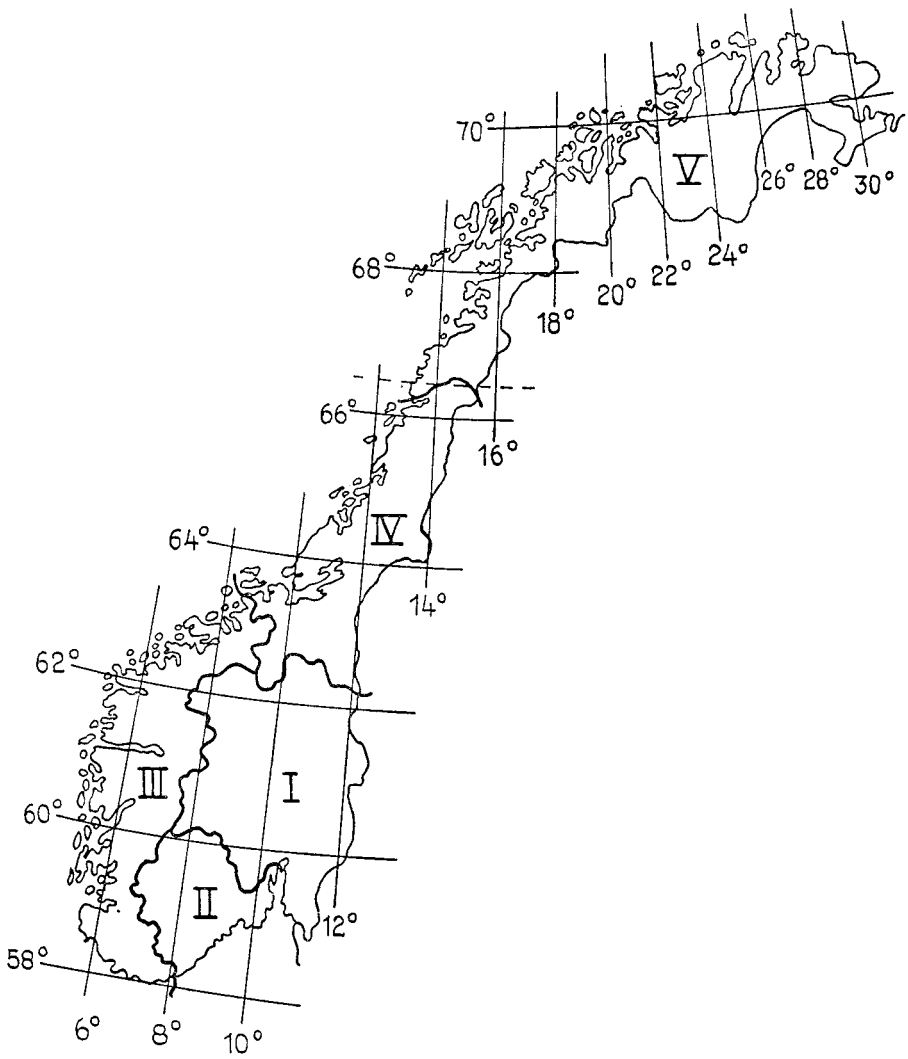


Fig. 7-1. Forest Economic Regions in Norway

## 7.1 Introduction

In 1963 the Department of Forest Economics of the Royal College of Forestry in Stockholm proposed that efforts be made to compile cost-revenue data about forestry operations in the countries of western Europe. The Institute of Forest Economics (*Institutt for Skogøkonomi*) of the Agricultural College of Norway (*Norges Landbrukshøgskole*) has had the responsibility for the compilation of the data for Norway.

We think that the correct line of approach is to precede our analyses with a discussion of the theoretical problems involved in such cost-revenue analyses. This has been done in Sections 7.2 and 7.3.

Section 7.4 constitutes an economic survey of Norwegian forestry. Tables 7:7, 7:8, 7:10 and 7:11 present forestry in the context of the Norwegian economy. Figure 7—1 shows the geographical division which is used in Table 7:13. It is this regional division which has been used when stratifying the accounting data for the Norwegian National Forests. Tables 7:14—7:21 contain certain data obtained from this material. In addition to the regional distribution the Norwegian National Forests are divided into two groups, A and B. In the typical forest regions of Norway the major part of the forests in Group B have a more favourable situation and a higher level of production than the forests in Group A.

Section 7.5 contains certain analyses of models of cost-revenue structures. The analyses may be regarded as a further interpretation of the average figures presented in Tables 7:14—7:21.

Section 7.6 contains such average data set out in diagrammatic form. The purpose of these diagrams is, firstly, to show the differences between the forests in Group A and the forests in Group B in a specific region. Secondly, it is to show the differences between the regions and, thirdly, to demonstrate how the levels of cost and revenue change from year to year together with the degree of change. In order to illustrate the direction of development more clearly statistics up to 1965 are provided.

## 7.2 Cost Comparisons—Problems and Possibilities

### *7.2.1 Introduction*

Cost comparison from one period to another or from one locality to another is a frequently applied method in economic analysis of a production process. Within an individual enterprise, or possibly between enterprises, comparisons are made between the costs of two or more similar stages of production processes, or the actual recorded costs are compared with standard figures. Contingent *deviations* can be regarded as "errors" or "deficiencies". Should these deviations be great, then there is reason to analyse their *causes* so that errors can be corrected.

One arrives at a number of causes, which in the main can be put into the following groups and sub-groups:

1. Variations in methods of production.
2. Variations in conditions of production:
   a. Variations in physical conditions of production,
   b. Variations in prices of factors of production,
   c. Variations in product and product prices.

Where the deviations in a given case belong entirely to Group 1, one may conclude from the comparison that the locality which has the lowest costs applies the most favourable method of production. This supposition is often used more or less consciously as a basis for cost comparisons between different parts of the enterprise. (In order to confine the problem this analysis presupposes that a work is carried out with the same *technique* but with varying intensity to represent two different working methods.)

Where the deviations belong entirely to Group 2, one may conclude from the comparison that the locality which has the lowest cost of production has the most favourable conditions for the production involved.

In the main, the differences between costs in a given case can be traced back to simultaneous variations in methods and conditions. In order to draw useful conclusions in such circumstances one must record, in addition to costs, the most important causes of deviation. The purpose of this is to eliminate, as far as possible, the effects of factors irrelevant to the problem in question.

Section 7.3 of this Norwegian chapter, "Adequate Sampling Techniques in Cost Comparison Studies", shows by means of examples how a simultaneous recording of costs and certain factors influencing costs sustains a causal analysis and thus provides a basis on which relatively dependable conclusions can be drawn from cost comparisons.

In so far as the causal relations in the differences in costs between one location and another can be clarified, cost comparisons can serve as an aid towards the development of a method of production well suited to the conditions of production.

In an analysis for such a purpose it will be necessary to apply detailed analyses of processes where both the methods of production and the conditions of production are well defined. However, it is of lesser importance whether the processes which are analysed are representative of a specific area.

In other cases it may be of decisive consequence to have representative data. This applies where the purpose of the analysis is a comparison of the competitive ability of forest production in different areas. This matter can be of interest where there is a demand for measures, such as levies and subsidies, which will have an effect on competition in regions producing for the same market area.

Cost comparisons used as a guide in the selection of methods of production will be dealt with below. This will be followed by a review of some of the

problems which are connected with representative cost comparisons for the purpose of showing the relative competitive power of the different regions.

In as far as the causal factor "Variations in product and product prices" (see Group 2 c above) is of considerable significance, the revenue should also be included in the comparisons.

### *7.2.2 Selection of Methods of Production*

Cost comparisons for the purpose of guidance in the selection of methods of production are known primarily from internal analysis within the enterprise. However, it also appears in comparisons between enterprises within a relative homogenous geographical area.

Theoretically, a comparison between remoter areas would involve both advantages and disadvantages. The advantages would be increased opportunities for profit, because of an increased variety in the methods of production. However, at the same time the number of causes of variation and the extent of variation in the conditions of production also increase. This impedes, if not prevents completely, a consistent causal analysis. Nevertheless, the question of selecting a method of production has been raised in this connection, because the analysis of this problem provides us with certain basic elements on which further developments may be based.

The fundamental problems connected with the question of selecting a method of production on the basis of cost comparisons can best be illustrated by some simple examples.

However, it should be emphasised that the simplest and most dependable procedure when selecting a method of production is to compare the various methods of production under identical conditions on an experimental basis. In this way it is possible to eliminate the conditions of production as a cause of variation. However, such a method of procedure is costly when many methods and conditions are included in the comparison. In other cases, such an approach may be too time consuming to be practical. Instead efforts should be made to record in more or less detail the costs of production and conditions of production pertaining to the methods to be compared.

*Variations in Physical Conditions of Production*

Figure 7—2 presents a basic example of cost comparisons applied in selecting a method of production. It is assumed that the cost data used in the analysis came from an area with varying physical conditions of production. The purpose of the analysis is to determine the most favourable method of the extraction of timber. The alternatives are hauling by horse and hauling by tractor. In the given example two conditions of production are assumed to be of particular importance for the extraction. One is the distance to the road and the other is the number of obstacles (obstructions, unevenness, etc.)

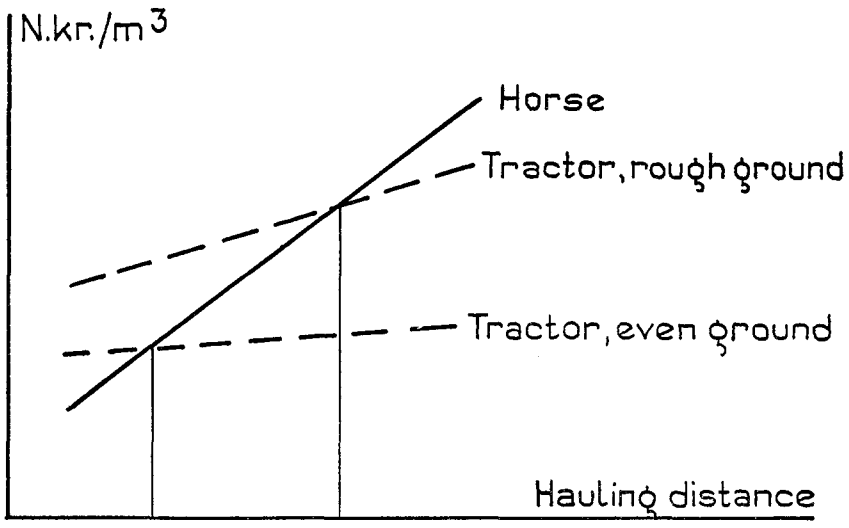


Fig. 7-2. Variation in Transport Costs with Length of Extraction and Number of Obstacles on the Ground. Hauling by Horse and by Tractor Respectively

on the ground. Furthermore, it is presumed that data about costs, hauling distance and ground obstacles have been recorded for a series of operations. The material is divided into two classes according to ground obstacles, while costs are given as a function of the hauling distance (Figure 7—2). The unbroken line represents hauling by horse and the broken lines hauling by tractor. The analysis shows that hauling by horse is not markedly affected by ground obstacles of the type present in the case. Consequently, in the diagram only one line is given for hauling by horse and this indicates the costs of hauling by horse as a function of hauling distance irrespective of ground obstacles.

However, in the case of hauling by tractor the number of obstacles on the ground has a substantial effect on costs and this effect increases with distance. Consequently, the break-even point, where the costs of hauling by tractor and by horse are equal, is at a notably shorter distance on even ground than on rough ground.

*Variations in Prices of Factors of Production*

The above example presupposes a comparison between different methods of production under various physical conditions of production, but with identical prices for the factors of production. However, in an attempt to apply

the experience in the selection of a method of production in one country or region to another it is necessary to take into consideration the fact that the optimum method of production depends on the prices of the factors of production and that these prices generally vary between countries. The problem is illustrated by the example which follows.

We assume that the intention is to compare the costs of forest production in two regions, A and B, where it is presupposed that the same techniques of production are applied but that there are different prices for the factors of production. We can divide the factors of production into two groups: manual labour and machinery. The relationship between output and input of the two factors of production is shown by the isoquant Q in Figure 7—3. In this case the optimum combination of the factors of production can be read from the diagram when their price ratio is known. Assuming that the price of machinery (i.e. the cost of using machinery) in country A to be four times the cost of using manual labour, then this relationship will determine the slope of the cost line $C_A$. The cost line is tangential to the isoquant at point A, which corresponds to an input of 120 working days for machinery and 400 working days for manual labour.

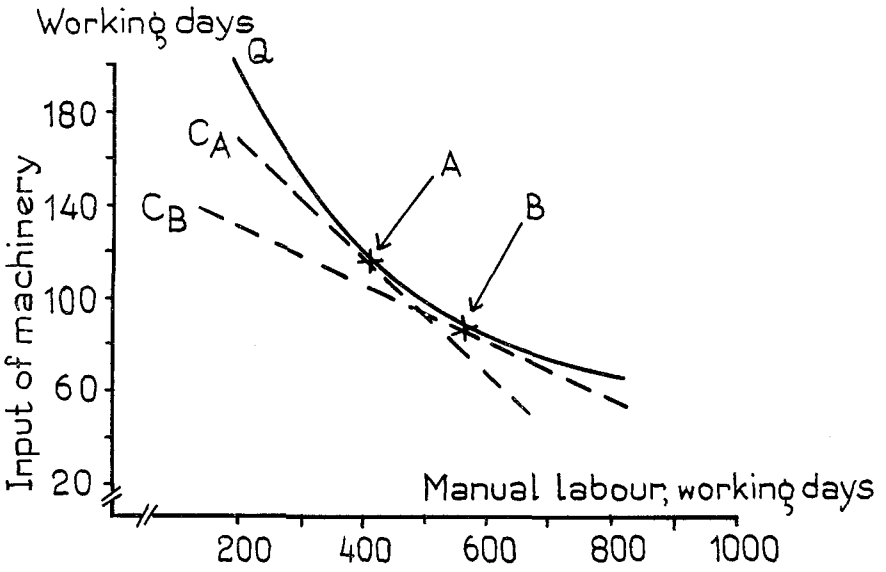


Fig. 7-3. Optimum Adaption in two Regions, A and B, with Identical Product Function but Divergent Price of Input Factors

In region B the price of machinery is assumed to be eight times the cost of using manual labour. This ratio determines the slope of the cost line $C_B$ (less steep than the slope of $C_A$). The cost line $C_B$ is tangential to the isoquant at point B, which corresponds to an input of 85 working days for machinery and 550 working days for manual labour.

Table 7:1 contains a further elaboration of the example. The monetary cost of a working day in region A is 75 kroner for manual labour and $4 \times 75 = 300$ kroner for machinery. The corresponding figures for region B are 55 kroner and $8 \times 55 = 440$ kroner, respectively. Production in both cases is 1,000 cubic metres of timber.

For region A the total costs and the unit costs have been calculated assuming an optimum combination of manual labour and machinery, i.e. 400 working days for manual labour and 120 working days for machinery, and this gives a cost of 66 kroner per cubic metre.

In region B calculations have been made for both alternatives. Alternative 1 presupposes the same relationship between the inputs of manual labour and machinery as in region A. The combination of resources which is optimal in region A is not optimal in region B owing to a diverging price ratio for the factors of production. Alternative 2 is based on the optimum combination of production factors for region B. With alternative 1 applied in region B the unit cost works out at 74.80 kroner per cubic metre, or 8.80 kroner more than in region A. Alternative 2 applied in region B gives a unit cost of 67.65 kroner per cubic metre, or only 1.65 kroner more than in region A.

From this it can be concluded that a production method which gives relatively low costs with a given process of production in one region can involve relatively high costs in another region if the price ratios of the factors of production are different in the two cases. As a rule, the selection of a method of production cannot be made directly on the basis of the experience of another region where different ratios for the prices of the factors of production may exist. Accordingly, experiments applying the same method of production in various countries or regions do not provide a valid basis for comparison of the costs of production in those countries. A comparison of

**Table 7:1. Cost Comparison between two Countries or Regions, A and B, with varying Ratio between Prices of Factors of Production**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Countries or Regions | Manual labour input | | | Input of machinery | | | Total costs *N.kr* | Costs *N.kr per cu.m* | Input of manual labour working days per *cu.m* |
| | No. of working days | *N.kr* per working day | Total costs manual labour *N.kr* | No. of working days | *N.kr* per working day | Total costs machinery *N.kr* | | | |
| A | 400 | 75 | 30,000 | 120 | 300 | 36,000 | 66,000 | 66.00 | 0.40 |
| B alt. 1 | 400 | 55 | 22,000 | 120 | 440 | 52,800 | 74,800 | 74.80 | 0.40 |
| B alt. 2 | 550 | 55 | 30,250 | 85 | 440 | 37,400 | 67,650 | 67.65 | 0.55 |

this kind should be based on a combination of factors of production which is the optimum combination under the conditions involved.

*Variations in Product and Product Prices*

The above two examples illustrate the nature of the problems arising in the selection of the method of production when there are variations in the physical conditions of production and in the prices of the factors of production.

This sub-section of the Norwegian paper will be devoted to an examination of the problems arising with variations in product and product prices. Generally this is the case where the choice of tree species is involved. According to the nature of the problem this is a choice of methods, and the various methods (in this case tree species) lead to more or less substantial variations in products and product prices. Consequently, revenue from production must be included in the comparison (see above). Another factor to be taken into account is that the length of rotation may vary from one species to another. Often the extensive length of time involved limits the value of the actual cost data, except in the field of regeneration costs. Other kinds of costs have to be estimated partly on the basis of experience and partly on subjective judgements of future prospects.

Expectations of prospective revenues, cost and time span of production can form a basis for the calculation of the present value of production or the internal rate of return for the tree species in question. One of these criteria would provide an indication in the matter of the choice of tree species, though additional factors may have some influence, such as the risk of damage, etc., and imponderable beneficial effects.

It is unnecessary to elaborate this example further to see that simultaneous variations in physical conditions of production, prices of factors of production, product and product prices will render cost comparisons an unreliable basis for the selection of methods of production.

However, cost comparisons between regions can be useful as a basis for method selection, but they should be restricted to clearly defined stages of production and preferably be regarded as supplementary to comparisons based on actual experiments. A special warning must be given against the many possibilities of drawing wrong conclusions owing to differences in the prices of the factors of production. The same risk is present in comparisons between the results of research, too.

Locally, i.e. within the individual enterprise or between different enterprises in the same region, the number of causes of variations is limited. Cost comparisons combined with cost-revenue analyses will always be a useful aid in the continuous process of development of methods of production adapted to the local conditions of production. Comparisons with other regions may contribute to this process to a certain extent. However, in the main, one must expect economic adaptation to take place on a local level.

### *7.2.3 Evaluation of Relative Competitive Ability*

*Discussion of the Approach*

In the introductory part of this chapter it was stated that cost comparisons serve two purposes. Firstly, they may serve as a basis for the choice of methods of production. Secondly, they may be used to support an evaluation of the relative competitive power of forest production in various regions. This latter problem deserves a closer examination.

As stated above, cost comparisons on a local level lead, as a rule, to the adaption of methods of production to the conditions of production, thus providing a simultaneous variation of the conditions of production and the methods of production. According to this adaption, more extensive methods will be applied where the conditions of production are poorer. This will lead finally to the discontinuation of production, because there are no methods yielding positive results. The costs of production exceed the benefits from production. Consequently, on the basis of cost-revenue analysis the forest area can be divided into two groups, of which only one is in use. The borderline between the two groups varies according to the variations in the costs of production and the product value.

This problem is well known from the world forest statistics. We know that of the total land area of the world as much as one-third, or 44 million square kilometres, is covered with forest. However, of this forest area only one-third, or 14 million square kilometres, is being utilised. Increases in the prices of forest products or lower costs of production would be likely to bring new areas into use—and cost comparisons can indicate areas where extended production would probably be most profitable. On the other hand, it must be expected that reductions in the prices of forest products or higher costs of production would cause a reduction in the areas in use. This is the economic regulation of forest production. Also there is a corresponding regulation through the variation in the intensity of production in the non-marginal forest areas permanently in use.

The regulation of the extension of forest production outlined above is likely to be founded, consciously or unconsciously, on local cost-revenue analyses and cost comparisons. Thus an obvious need of inter-regional cost comparisons is not created. The adaption of the extent of production is made on the local level in the same way as the adaption of the methods of production.

In the discussion here it has been argued as if local prices and costs are the only factors determining the adaptation of local production. However, in most regions a wide range of measures influencing competition (tariffs, tariff rates, subsidies, levies and taxes) are at work and will affect the intensity of production and determine the limits for the areas in use within the specific region. Such circumstances become particularly apparent if the forest industries are included in the analysis and, as a rule, this is an advantage when

the discussions involve a macro-economic scale. In many cases this network of control measures is vitally important for the ability of forestry to compete for capital and labour, and consequently decisive for its position in the economy of the region.

During the post-war period there has been an increasing amount of international economic integration, and control measures are no longer of an internal national character. The trend is now worldwide, though its strongest manifestations to date have been the formation of the European trading blocs.

The idea behind these trading blocs has been the most favourable utilisation of the natural variations in productive efficiency from one region to another. It is desirable to produce where costs are lowest. This goal is presumed to be attainable through free competition in the international market, and this requires the elimination, or at least harmonisation, of measures restricting competition. However, the harmonisation of such measures should not be forced to the degree where whole industries in a region suffer unduly from an abrupt disturbance of the competitive balance. For this reason the harmonising measures should be introduced successively.

Cost comparisons between regions may provide an effective basis for international negotiations on the abolition or harmonisation of control measures affecting competition. In this connection cost comparisons could be applied for two different purposes:

A. By direct comparisons of the costs of production in the regions in question it might be possible to judge whether competition from one region would be likely to have undesirable effects in another region.
B. Cost-revenue analysis from each individual region might provide a basis for evaluation of the effects which harmonisation will have on the intensity of production, e.g. on the borderline between areas in use and not in use.

These two problems raise certain questions which can be divided roughly into the following four groups:

1. Choice of relevant cost classification and profit criteria,
2. Adjustment for incomplete method adaptation,
3. Compilation of representative data,
4. Problems of exchange rates.

*Choice of Relevant Cost Classification and Profit Criteria*

Table 7:2 presents an example of revenue and costs of a forest enterprise which illustrates this problem. All figures are calculated as percentages of the revenue from sales for the period. The short-term costs are divided into variable and fixed costs, both of which are directly deductible from revenue. The long-term costs (investments) are divided into three groups according to their nature. These are all entered as both revenue and costs, because investments are presumed to increase the value of the enterprise by an amount corresponding to the costs involved.

**Table 7:2. Example of Calculation of Net Revenue in a Forest Enterprise**

| | Costs | Revenue |
|---|---|---|
| 1. Gross revenue (sales, subsidies, etc.) | | 100 |
| 2. Variable annual costs | 40 | |
| 3. Fixed costs (excluding depreciation) | 15 | |
| 4. Investments: | | |
| a. Regeneration costs | 10 | 10 |
| b. Afforestation costs | 4 | 4 |
| c. Miscellaneous investments (roads, machinery, fertilisers, etc.) | 16 | 16 |
| 5. Annual depreciation (real value depreciation of all investments) | 18 | |
| 6. Forest value increment less stumpage value of fellings | | 5 |
| 7. Interest costs | 12 | |
| Total | 115 | 135 |
| 8. Net Revenue | | 20 |

The depreciation (the writing-off of current and previous investments) are presented as costs in the table. In a well-established forest enterprise, as found in countries where forestry has been practised for a long time, the annual depreciation is often assumed to be equal to the value of annual investment. When this is the case, the investment entries can be omitted from the revenue column and the depreciation entries from the cost column.

Furthermore, the accounts include the difference between the value increment of the forest and the stumpage value of the fellings. This amount is often relatively small in countries where forestry has been practised for a long time, but it may be substantial in other countries.

Finally, the survey includes calculated interest costs. These costs arise when forest production employs capital which alternatively used might yield a profit.

The net revenue (i.e. the difference between revenue and costs, as illustrated in Table 7:2) could provide a logical background for comparison of the competitive ability of forest production in different regions.

Unfortunately, in practice immense difficulties would be met by a revenue calculation of this kind, and in order to indicate the nature and extent of these problems the individual entries will be examined in detail.

Entry 1, gross revenue, creates no major problems as long as the forest industries are excluded from the analysis. Should the forest industries be included in the analysis then a calculated conversion return for the sectors involved must be substituted for the sales revenue.

Neither the variable annual costs nor fixed costs create fundamental difficulties, although the compilation of representative data may raise problems. These will be treated later.

The compilation of the cost data in entry 4 is a fairly simple task, as a rule. However, in practice the figures entered as revenue are identical with those entered as costs only in exceptional cases. Table 7:2 is therefore a special case

in this respect. Entry 4 in a practical case might well appear as shown in Table 7:3.

**Table 7:3. Alternative Example of Investment Costs (cf. Table 7:2)**

| | Costs | Revenue |
|---|---|---|
| 4. Investments: | | |
| a. Regeneration costs | 10 | 6 |
| b. Afforestation costs | 4 | 7 |
| c. Miscellaneous investments | 16 | 25 |

In Table 7:3 it is presumed that investment is evaluated in terms of benefits, while, on the other hand, Table 7:2 presupposes investments being entered as revenue by an amount equal to costs.

In practice it is impossible to make a conclusive estimate of the investment benefits. On the other hand, it constitutes an essential part of the calculation for entry 8, the net revenue of the period. It is also of decisive importance in the evaluation of the true competitive ability of the forest enterprise.

Entries 5 and 6 present the same fundamental problems as the revenue column in entry 4. A relatively exact basis is accessible for the estimate of actual depreciation of machinery and equipment. Depreciation of roads and the estimated depreciation of forested land and growing stock must be regarded in close connection with entry 6. The total estimate of the change in value of the forest raises both theoretical evaluation problems and practical problems of quantification. The evaluation problems are due to the lack of absolute and generally accepted principles of evaluation, while the problems of quantification arise from the lack of a measuring technique to provide the data required at a reasonable cost.

Neither are there any generally accepted principles for interest costs calculations. Interest costs may be entered implicitly when calculating entries 4-6, or they may be calculated explicitly, as in Table 7:2, according to preference. In any case there are obvious variations in the demand for capital from one region to another; this causes interest costs to have a definite influence on the relative competitive ability of the various regions.

Entries 4-7 in Table 7:2 may be summed up as follows:

a. they cannot be subject to standard quantification,
b. they will vary from one region to another, and
c. they will have a significant influence on the relative competitive ability of forest production within a region.

An inter-regional comparison of profit as calculated in entry 8 in Table 7:2 is not without value, but it must be assumed that the necessary estimates are based on common and theoretically tenable principles.

The difficulties involved in profit calculation, as in Table 7:2, makes it a natural thing to try to find other profit measures, such as the present value of the production or the internal rate of return. However, with both these

profit measures there arise the same evaluation problems as in the revenue calculation in Table 7:2. There are no basic advantages to be gained and both these criteria may attain general acceptance with greater difficulty.

Calculation of profit, as shown in Table 7:2, or alternatively of the present value or the internal rate of return is done for the purpose set out under point (A) above (page 268). If it is decided to deal with the problem by method (B) then the profit, entry 8 in Table 7:2, is of no interest. This method requires the calculation of marginal costs, partly from the marginal areas in use and not in use and partly from the central forest areas. Marginal costs provide the basis for an evaluation of the effects of changes in competition control measures on the intensity of production.

A change in the cost-revenue structure in central forest areas has an influence on the marginal dimension, i.e. the smallest tree dimension that can be logged with profit. The marginal dimension is determined by comparison between marginal revenue and marginal cost for various tree dimensions. Section 7.3 of this Norwegian paper explains how registrations from account vouchers used in forestry can provide the basis for calculation of variation in costs according to tree dimensions. Analyses of this kind can be made with a relatively high degree of reliability in all present forest areas. As a rule, the marginal revenue pertaining to tree dimensions can also be determined with a reasonable degree of reliability.

The borderline between areas in use and not in use is primarily a question of distance, though variations in cost according to tree dimensions come into the matter, too. Figure 7—4 illustrates the principal aspects of the problem by showing the relationship between product price at the point of delivery

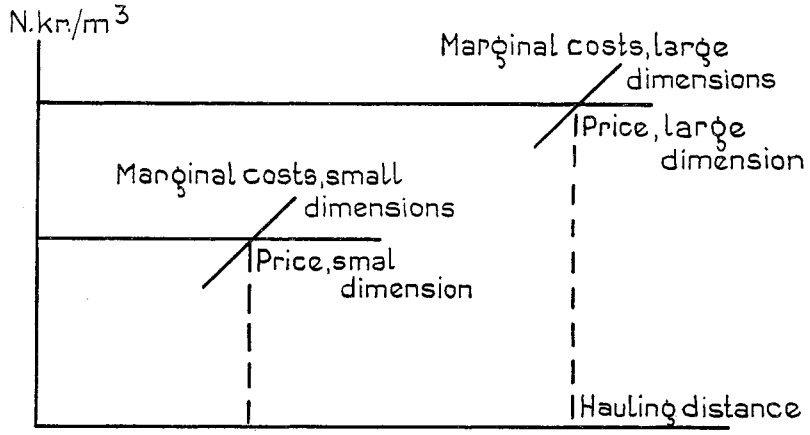


Fig. 7-4. Product Price at Point of Delivery and the Marginal Cost of Timber, as a Function of Hauling Distance to Point of Delivery, for a Large and a Small Tree Dimension

and the marginal costs of a small dimension and a large dimension as a function of the hauling distance to the point of delivery.

The product price of a given tree dimension appears to be unaffected by the hauling distance, while the marginal costs increase with distance. Furthermore, it can be seen that the price rises and the costs fall with increasing dimensions. Therefore, the break-even point between unit price and marginal costs lies at a shorter hauling distance for small dimensions than for large dimensions. This turns the borderline between areas in use and not in use into a problem partly of distance and partly of dimension.

Section 7.3 of this Norwegian chapter also goes into the principle of the distance function. In the present analysis it is necessary to include possible investment in roads in addition to the variable costs. The problems still remain relatively small compared with those arising when taking into account the entire field of costs and changes in value, as set out in Table 7:2.

From the above it is permissible to conclude that the necessary cost-revenue analyses pertaining to method (B) are less complex than those required under (A) and that method (B) can be applied with a higher degree of reliability.

As to the choice of the relevant type of cost or profit measures, it may be said conclusively that the purpose of comparisons between regions may be an examination of the relative competitive ability of the different regions. To this end useful conclusions may be drawn on the basis of the direct comparison of profit and loss, as in Table 7:2. However, in order to be valid all estimates must be made on a common and the theoretically reliable basis. One must, nevertheless, work on the assumption that there will be a considerable degree of uncertainty in the revenue evaluation. Reliable conclusions, therefore, are dependent on considerable differences in revenue.

Comparisons between regions for the same purpose can be made by means of a comparison of the results of marginal cost-revenue analyses for the individual regions. These marginal analyses can be made with a higher degree of reliability than can total profit calculations according to Table 7:2. Also it will be easier to draw conclusions from marginal analyses with bearing on the potential effects of possible changes in competition control measures.

*Adjustment of Incomplete Method Adaption*

As previously mentioned, a continuous local adaption of the methods of production to the conditions of production is expected. In the cost comparisons between regions the principal interest is in the costs of the adapted method of production. However, method adaption will be a continual growing process. The primary causes of this are technical development, variations in the product prices and variations in the relationship between the prices of the factors of production. In a period of rapid technical and economic development the costs of the previous period can be accepted only with definite reservations as a basis for conclusions regarding a future period. On

the other hand, there exists a series of factors which have a retarding effect on the process of economic adaption. This may well make the process of adaption a lengthy one and could possibly prevent a complete method adaption on purely economic grounds. In such circumstances there arise two different types of problems, which can be illustrated by the following examples.

The difficulty in using the costs of a previous period to calculate future costs can be illustrated by a comparison of two hypothetical forest areas, A and B. Starting in 1960 the intention is to record the costs from 1960 to 1965. Using these costs as a basis, conclusions for the period 1965-1970 will then be drawn. In 1960 area A has a fully developed road network, while the transport in area B takes place mainly off roads. Area B starts to build a road network in 1963 and it is planned to have it fully developed by 1967. Area A has no corresponding development possibilities. From cost comparisons it will appear that the area B would be in a weak competitive position, despite the fact that it may actually be fully capable to compete with area A in the period subject to competition control.

Secondly, there is the problem of the numerous elements impeding the economic method adaption. Certain of them will be regarded below in relation to the problem of choice of tree species. As stated above this question is principally one of method adaption. In countries where forestry has been practised for a long time this form of method adaption has taken place over a lengthy period, while in other countries it has hardly begun. The problem is complicated as the previous adaption was largely a matter of biological adaption than of economics. Another complication is that the length of adaption may vary considerably from one region to another.

Also it is significant that the adaption can never be expected to become the optimum one from a pure economic point of view. This is particularly due to the fact that indirect beneficial effects of forestry cannot be quantified in economic calculations. With this in mind it can be stated that the use of direct cost comparisons to elucidate the relative competitive ability of the various regions depends to a certain extent on the competence of the forest economist to assess the present and potential degree of adaption in a region.

The first problem set out in this part of the Norwegian chapter creates the greatest practical difficulties in definite comparisons. The second problem involves some basic questions in connection with the purpose behind cost comparisons. To ignore in principle the comparison of method-adapted production would involve the risk of maintaining or establishing competition control measures that would help to mantain irrational methods of production.

*Compilation of Representative Data*

As a rule, the variation in forestry costs within a region are greater than the variations in average costs from one region to another. This emphasises the importance of obtaining representative data for the regions to be compared.

Basically, the easiest way to solve the problem is to avoid it, in other words, total registrations should be used. In cost comparisons between countries there is a certain opportunity to do so by using national accounting figures. Here it is presumed that the national accounts for the respective countries are divided into sections and that forestry constitutes an individual section.

Furthermore, it is presumed that the countries which are to be compared employ the same principles for their national accounts and that the definitions of forestry as against other sectors are identical. A further requirement is that the labour statistics permit the calculation of labour costs.

So far only relatively few countries have adopted special section accounts for forestry. In order to attain a representative account of forestry revenue and costs it is necessary to choose a number of forest units according to accepted sampling methods. However, this is both expensive and time consuming.

An acceptable substitute is provided by the average cost data from large unit groups, such as Crown and State forests. In most countries these forests can provide adequate account data, though only in exceptional cases can these forests be considered as representative of forestry as a whole for the country. However, this disadvantage can be counteracted by dividing the material into "good" and "poor" forests, i.e. forests which can be assessed as better or poorer respectively than the national average. This method provides well-defined limits for an estimated average (cf. Tables 7:14—7:21).

Some of the disadvantages involved with comparisons of account data from large unit groups, such as Crown and State forests, can be avoided by comparing instead hypothetical models of typical forests of various localities in every country. Models of this kind should be constructed to allow variations in a series of important factors, such as site class, hauling distance and average tree dimensions. Together with the above-mentioned group averages for various types of Crown and State forests, the model forests can supply a relatively good outline of the cost structure of the forestry of a country. However, this does not provide a definite account of average costs.

The argument in this part of the chapter endeavours to clarify some of the problems which occur in the attempt to obtain a representative account of costs in a country or region. The purpose of a representative account of this kind is to facilitate direct comparisons of the profit and loss involved in forestry operations in various regions. As mentioned in the paragraph on cost classification, the procedure of direct comparison may not be the most profitable to our enquiry into the evaluation of the relative competitive ability of various regions. The difficulties in obtaining representative material involve a further reservation in this approach to the problem.

*The Exchange Rate Problem*

A given quantity of forest products exported to England represents a certain

value, say £100. For the exporting country this value depends also on the current price in that country of £100, i.e. on the rate of exchange.

The rate of exchange in a country depends on the supply and demand of the pound sterling, as well as on circumstances of a commercial nature. In most countries the cost-revenue structure of forestry will have a strictly limited influence on the factors which determine the rate of exchange. The amount in local currency obtained by the forestry sector selling £100 can often have different effects in two countries, A and B, despite an existing balance between their mutual rates of exchange and their respective rates of exchange for the pound sterling. This would indicate that a direct comparison of forestry costs in countries A and B can give a distorted picture of their relative competitive ability when the official rate of exchange between the countries is used as a conversion factor.

## 7.3 Sampling Techniques in Cost Comparison Studies

### *7.3.1 Specification of Basic Requisites*

The previous section which set out the problems involved in cost comparison studies, emphasises the necessity of clarifying the conditions of production. A partial registration of costs which does not attempt to clarify the conditions provides a poor basis for comparison.

Details of the conditions of production include data about dimensions of trees, haulage distance, nature of ground and the technical equipment employed. In the plan for the registration of costs it is possible to obtain such data via supplementary questions. This may be regarded as a necessary matter because these are the details which determine how valuable a cost comparison is.

There are two factors which to a very definite degree affect the form of the supplementary questions important in the registration of costs. The first concerns the purpose of the cost comparison. In the previous section it was explained how the nature of the comparison changes when its purpose is changed. A comparison based on average figures from large regions has another purpose, and requires other supplementary questions, than a detailed comparison of marginal costs.

The second concerns the structure of those costs which it is intended to register. Here, prior knowledge of the process of production and the conditions play an important part. For instance, if the problem is to clarify the actual conditions in felling work, it is natural to begin with the system used for the payment of such work.

Starting with certain examples an attempt will be made to illustrate some of the problems arising in a comparative cost analysis. The examples are the sampling of costs involved with two operations, namely, the felling of timber

and hauling by horse. This is a rather restricted field and involves dealing with only a small section of all the possible comparative questions. Nevertheless, this approach has been chosen in order to simplify the demonstration of the importance of supplementary data in a cost comparison.

### *7.3.2 The Sample Selection*

The basic lines of approach to be followed in devising a sampling plan can be found in the general literature on statistics.[1] However, such does not cover satisfactorily the structural analysis which it is desirable to incorporate in a definite plan. For this reason attention here will be concentrated on this question.

Specific forest areas were chosen as a basis for sampling. The cost of felling and hauling within each region were taken from the account vouchers. In the main, this was done in accordance with the system used for the calculation of payment for such work. The greater part of the felling payment was calculated as a fixed sum per cubic metre plus a sum per tree. Payment for hauling consisted of a fixed sum per cubic metre for loading and unloading plus a sum calculated on the hauling distance. For both types of work additional payment was made on the basis of assortment, tree species, difficulty of working conditions, etc.

Figures 7—5 and 7—6 present the data obtained. Column 10, total costs in kroner per cubic metre solid measure, represents the main object of the task. Other details are included primarily to facilitate a fuller analysis of the main column. They can be regarded as supplementary questions.

Now some of the results of this sampling investigation will be examined in detail. We shall confine the discussion to two selected forest areas, which will be referred to below as A and B respectively.

Fig. 7—5. Form for Recording Felling Costs in a Forest District

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Period of time in which work to be done | Data on quantity felled | | | Basic costs *N.kr/cu.m solid measure* | *Percentage* addition to basic costs for difficulties regarding: | | | | Total costs *N.kr/cu.m solid measure* | Remarks |
| | Assortment | cu.m solid measure | No. of trees | | Terrain | Forest | Snow | Miscellaneous | | |

Fig. 7—6. Form for Recording Hauling Costs in a Forest District

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Period of time in which work to be done | Data on quantity hauled | | | Basic costs *N.kr/cu.m solid measure* | *Percentage* addition to basic costs for difficulties regarding: | | | | Total costs *N.kr/cu.m solid measure* | Remarks |
| | Assortment | cu.m solid measure | Hauling distance | | Terrain | Forest | Snow | Miscellaneous | | |

[1] See, e.g., W. G. Cochran: *Sampling Techniques*, London and New York, 1963.

*7.3.3 Felling Costs*

Table 7:4 contains certain figures representing the felling costs in each of the two areas. The figures are for timber without bark. Line 1 shows the number of cases; this corresponds to the number of forestry vouchers supplying the data used here. Line 2 gives the average felling costs; these figures are based on the data in column 10 of Figure 7—5. Line 3 contains the standard deviations.

**Table 7:4. Comparison of Felling Costs in two different Forest Areas**

| | Forest area | |
|---|---|---|
| | A | B |
| 1. No. of cases (forestry vouchers) ..... | 21 | 32 |
| 2. Average felling costs, N.kr./m³ ..... | 14.6 | 22.4 |
| 3. Standard deviation, N.kr./m³ ..... | 0.8 | 3.8 |
| 4. Average no. of trees/m³ ..... | 1.1 | 6.7 |
| 5. Correlation coefficient (N.kr./m³ × no. of trees/m³) ... | **0.87** | 0.89 |

The size of the trees is an important factor which causes variations in the felling costs. Line 4 in the table shows the average number of trees felled; the figures are calculated on the basis of the data presented in columns 3 and 4 of Figure 7—5. The correlation between felling costs per cubic metre and the number of trees per cubic metre is indicated by the correlation coefficient given in the bottom line in the table. The result of this calculation suggests a marked interdependence.

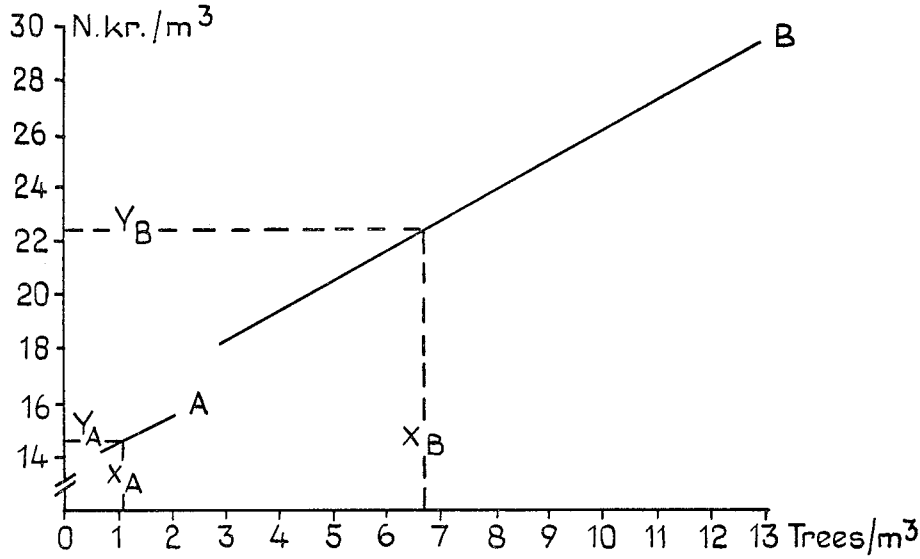


Fig. 7-7. Felling Costs as a Function of the Number of Trees per Cubic Metre, in two Forest Areas (A and B)

Figure 7—7 illustrates this correlation by means of a graph on which felling costs per cubic metre are presented as a function of the number of trees per cubic metre. In the graph the lines are drawn for only a part of the way where there are accessible data on the independent variable (trees/$m^3$). By means of this method we have determined the influence of tree dimensions on felling costs. Figure 7—5 shows that our sampling plan allows also the introduction of other factors in the analysis. In our example it appears that there is a tendency for the additional payment to be greater in area B than in area A, this is primarily because of the forest conditions, see column 7 in Figure 7—5.

One must note that in area A mostly Scots pine was felled, while area B provided mainly Norway spruce. One can see from Table 7:4 and Figure 7—7 that the pine felled in area A was, on the whole, of bigger dimensions. Also this pine was assessed as very fine and with relatively few branches. On the other hand, the timber cut in area B was much more varied, both in respect of dimensions and quality.

One might well presume on the basis of this information that the working conditions are the primary cause of the great variation in felling costs in the two regions. The material does not support the conclusion that felling work is carried out more rationally in area A than in area B.

### *7.3.4 Hauling Costs*

Table 7:5 presents certain figures which permit a comparison of hauling costs between the two forest areas. This table is set out in the same manner as Table 7:4.

**Table 7:5. Comparison of Hauling Costs in two different Forest Areas**

| | Forest area | |
|---|---|---|
| | A | B |
| 1. No. of cases (forestry vouchers) | 5 | 9 |
| 2. Average hauling costs, N.kr./$m^3$ | 10.6 | 11.8 |
| 3. Standard deviation, N.kr./$m^3$ | 0.9 | 1.9 |
| 4. Average hauling distance, m | 270 | 625 |
| 5. Correlation coefficient (N.kr./$m^3$ × m) | 0.99 | 0.93 |

In the analysis of hauling costs we have used distance as a factor to explain the cause of variation. One can see from the bottom line in the table that there is a high correlation between hauling costs and hauling distance. Figure 7—8 illustrates this correlation in the form of a graph. The sampling plan allows an evaluation of the causes of cost variations other than hauling distance. However, with the few cases at our disposal it proved impossible here to arrive at other reliable explanations.

Table 7:5 shows that there is only a moderate difference in the average hauling costs in the two forest areas, and that this is true despite a relatively

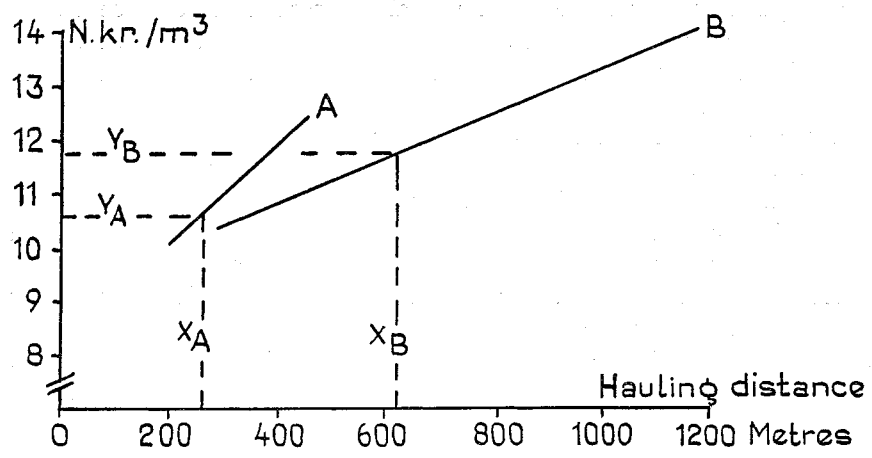


Fig. 7-8. Hauling Costs as a Function of Hauling Distance in Metres, in two Forest Areas (A and B)

large difference in the average hauling distance. Figure 7—8 permits the reason to be deduced at least partly. One can see that the level of costs is clearly higher in area A than in area B. This compensates to some extent the difference in distance. One can also note that total costs related to distance rise much faster in area A than in area B. One is justified in concluding that the difference is due to timber of larger dimensions being hauled in area A.

Thus it is legitimate to draw attention to the fact that there are considerable differences in hauling conditions. However, it is impossible on these premises to conclude from a comparison between hauling costs of the two forest areas that hauling has been carried out more rationally in one or other of the areas.

### *7.3.5 Conclusions*

The central point of the outlined sampling plan is the part played by supplementary information in the comparison of cost figures. If we are to draw any conclusions from a cost comparison we must know on what basis the cost comparison has been compiled. Consequently, we should examine the supplementary data in order to determine that which is necessary for the cost investigation. A realistic comparison demands a specification of basic requisites of the cost factors under investigation. Recording of the costs and scrutinising the requisites must be done simultaneously.

This chapter has dealt with a plan for recording the costs of felling and hauling timber. It has emphasised the importance of supplementary data which can clarify important points about the work undertaken. Figures 7—5 and 7—6 illustrate how the work of recording data should be done. A

sampling plan, such as the one outlined above, requires records containing more details than are normally found in accounts. It is suggested how the basic data for forestry accounts, the information on the vouchers, can be utilised as sampling objects.

One can regard data obtained in this way as being satisfactory on the whole, though it has proved necessary also to make use of other sources of information, such as working schedules and other notes. However, provided that the sampling is restricted to specific, well-defined forest areas, it has proved fairly easy to integrate the various items of information available.

Certain results of two forest areas are presented here. Felling costs are shown in Table 7:4 and Figure 7—8. In the given cases the analysis shows the great differences in the conditions behind these felling and haulage costs. Consequently, a superficial comparison could lead to wrong conclusions.

## 7.4 Analysis of Income and Expenditure in Norwegian Forestry

The statistical material which is presented here has been completed partly on the basis of official statistics and partly on the published accounts of the Norwegian National Forests. All values in these tables are in Norwegian kroner. The following brief explanation of the compilation of the tables may be helpful.

Tables 7:6 and 7:7 provide details of certain items from the national accounts. Table 7:6 deals with forestry while table 7:7 shows the contribution of forestry to the Gross National Product of Norway.

In the tables the terms *gross product* and *net product* are used for a single sector of the economy, while *gross national product* and *net national product* are the collective terms for the economy as a whole.

Gross product = gross production of the sector of the economy—goods and services.
In forestry the gross production (gross income) is made up in the following manner:
Sales of forest products + changes in stock + changes in standing timber capital + investments done with own productive factors.

Net product = gross product—depreciation of capital equipment (writing-down of capital).

Factor income = net production adjusted with reference to support from public funds, i.e. net product of the sector of the economy + subsidies—indirect taxation.

Table 7:8 gives details of employment in terms of man-years (1 man-year =250 man-days) and figures for the average net national product and net product per man-year.

**Table 7:6. Gross Product, Net Product and Factor Income in Forestry**
*(current values in million N.kr)*

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962*a* | 1963*a* | 1964*a* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Sales of forest products | 730 | 707 | 784 | 938 | 1,003 | 897 | 762 | 787 | 869 | 858 | 780 | 932 |
| 2. Changes in stock of roundwood | 9 | −10 | 9 | 4 | −9 | −6 | 8 | −1 | −3 | −3 | 5 | −3 |
| 3. Changes in timber capital | 5 | 48 | 14 | −8 | 15 | 44 | 50 | 48 | 52 | 53 | 65 | 50 |
| 4. Improvement and extension work done with own productive factors | 40 | 38 | 36 | 54 | 66 | 72 | 63 | 75 | 77 | 78 | 80 | 82 |
| 5. Total of above | 784 | 783 | 843 | 988 | 1,075 | 1,007 | 883 | 909 | 995 | 986 | 927 | 1,061 |
| 6. Goods and services supplies by other sectors of the economy | 45 | 49 | 53 | 63 | 63 | 63 | 57 | 57 | 58 | 60 | 62 | 64 |
| 7. Gross product (5−6) | 739 | 734 | 790 | 925 | 1,012 | 944 | 826 | 852 | 937 | 926 | 865 | 997 |
| 8. Writing-off of capital equipment | 19 | 19 | 19 | 23 | 25 | 26 | 27 | 33 | 35 | 37 | 39 | 40 |
| 9. Net product (7−8) | 720 | 715 | 771 | 902 | 987 | 918 | 799 | 819 | 902 | 889 | 826 | 957 |
| 10. Net grants from public funds | 11 | 9 | 9 | 11 | 9 | 13 | 14 | 14 | 16 | 16 | 16 | 17 |
| 11. Factor revenue (9+10) | 731 | 724 | 780 | 913 | 996 | 931 | 813 | 833 | 918 | 905 | 842 | 974 |

*a.* Provisional figures
*Sources:* (1) N.O.S. A 95. *Nasjonalregnskap 1949—1962*, Oslo, 1964
(2) N.O.S. XII 160. *Økonomisk utsyn over året 1964*, Oslo, 1965

**Table 7:7. Contribution of Forestry to the Norwegian Economy**
*(in million N.kr and as a percentage)*

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962*a* | 1963*a* | 1964*a* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gross National Product | 22,884 | 24,806 | 26,376 | 29,747 | 31,775 | 31,919 | 33,946 | 36,101 | 39,245 | 42,197 | 45,080 | 49,643 |
| Gross product in forestry | 739 | 734 | 790 | 925 | 1,012 | 944 | 826 | 852 | 937 | 926 | 865 | 997 |
| Relative share, % | *3.2* | *3.0* | *3.0* | *3.1* | *3.2* | *3.0* | *2.4* | *2.4* | *2.4* | *2.2* | *1.9* | *2.0* |
| Net National Product | 18,526 | 20,134 | 21,305 | 24,095 | 25,422 | 25,097 | 26,556 | 28,337 | 30,963 | 33,404 | 35,791 | 39,786 |
| Net product in forestry | 720 | 715 | 771 | 902 | 987 | 918 | 799 | 819 | 902 | 889 | 826 | 957 |
| Relative share, % | *3.9* | *3.6* | *3.6* | *3.7* | *3.9* | *3.7* | *3.0* | *2.9* | *2.9* | *2.7* | *2.3* | *2.4* |
| Factor revenue, all sectors of the economy | 16,915 | 18,389 | 19,432 | 21,864 | 23,081 | 22,481 | 23,687 | 25,385 | 27,669 | 29,732 | 32,020 | 35,539 |
| Factor revenue in forestry | 731 | 724 | 780 | 913 | 996 | 931 | 813 | 833 | 918 | 906 | 842 | 974 |
| Relative share, % | *4.3* | *3.9* | *4.0* | *4.2* | *4.3* | *4.1* | *3.4* | *3.3* | *3.3* | *3.0* | *2.6* | *2.7* |

*a.* Provisional figures
*Sources:* (1) N.O.S. A 95. *Nasjonalregnskap 1949—1962*, Oslo, 1964
(2) N.O.S. XII 160. *Økonomisk utsyn over året 1964*, Oslo, 1965

Table 7:9 shows the forest products balance. The volume of annual cut includes the total usable amounts of industrial roundwood and fuelwood.

Table 7:10 sets out total exports and exports of forest products. The export figures do not include sales of vessels abroad. Such exports would be of an annual value totalling 300 million Norwegian kroner.

Table 7:11 gives information of the average hourly earnings of adult men. In the case of forestry the basic material from which the details are obtained is scantier.

Table 7:12 shows the percentage distribution of productive forest land. By the term productive forest land is meant forest area below the coniferous timber line; in normal conditions this can produce a minimum of 1.4 cubic metres per hectare per year. There are some six million hectares of such

forest land in Norway. The table shows that there is a relatively large part of the forest land made up of smallholdings with combined forestry and agriculture.

Figure 7—1 and Table 7:13 show a Regional Division of Norway. Norway is divided into five Forest Economic Regions in the following tables.

Table 7:7 provides some details which indicate the nature of the individual regions. "Typical forestry" conditions are to be found in Regions I, II and IV.

Afforestation in Region III greatly affects the forestry situation there.

Region V, which is north of the Arctic Circle, is naturally marked by inferior growth conditions.

Tables 7:14—7:21 are based on the published accounts of Norwegian National Forests. In this table the forests in public ownership are divided into two groups:

*Group A* has throughout a lower productive capacity and a less favourable accessibility than the average for the Region in question.

*Group B* has a higher productive capacity and a more favourable accessibility than the average for the Region.

Primarily these characteristics can be seen in typical forest areas. In Forest Economic Region V the area of forests which can be ascribed to Group B is too small to provide satisfactory figures. A comparison between the two groups should therefore be made on a regional basis and not from the total averages.

For conversion of prices and monetary values to the 1962 value of money the following indices of wholesale prices have been used for the Norwegian tables:

| | |
|---|---|
| 1958: | 96 |
| 1959: | 96 |
| 1960: | 97 |
| 1961: | 98 |
| 1962: | 100 |

Two points worthy of note emerge from the tables:

a. The assortment delivered considerably affects the gross revenue (item No. 1 in Tables 7:14—7:21).

b. Operating conditions, particularly such as terrain and haulage distance, to a large degree can affect logging costs.

* * *

It must be emphasised that such tables can provide only a limited picture of the cost-revenue structure of Norwegian forest enterprises.

Average figures of the above types will be of a very general nature and not indicate the wide extremes which occur in a country as varied as Norway.

**Table 7:8. Man-Years Worked, Net National Product per Man-Year, and Net Product per Man-Year**
*(thousand man-years; values in N.kr)*

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| All sectors of the economy: | | | | | | | | | | |
| Man-years worked | 1,461 | 1,479 | 1,478 | 1,473 | 1,475 | 1,475 | 1,463 | 1,470 | 1,489 | 1,490 |
| Net National Product per man-year, N.kr | 12,860 | 13,613 | 14,415 | 16,358 | 17,235 | 17,225 | 18,152 | 19,277 | 20,794 | 22,232 |
| Industry: | | | | | | | | | | |
| Man-years worked | 346 | 352 | 361 | 357 | 357 | 345 | 348 | 352 | 361 | 363 |
| Net product per man-year, N.kr | 14,861 | 16,006 | 16,374 | 18,062 | 18,487 | 19,162 | 20,198 | 21,750 | 23,083 | 24,636 |
| Forestry: | | | | | | | | | | |
| Man-years worked | 33 | 31 | 30 | 32 | 31 | 29 | 26 | 25 | 24 | 22 |
| Net product per man-year, N.kr | 21,818 | 23,065 | 25,700 | 28,188 | 31,839 | 31,655 | 30,731 | 32,760 | 37,583 | 40,409 |

*Source:* N.O.S. A 95. *Nasjonalregnskap 1949—1962*, Oslo, 1964

**Table 7:9. Forest-Products Balance**

| Year | Annual cut | Imports | Total requirements | Exports | Domestic consumption | |
|---|---|---|---|---|---|---|
| | | | | | Total | *Per capita* cu. m. 5-year average |
| | *Thousand cubic metres roundwood equivalent* | | | | | |
| 1953 | 10,740 | 370 | 11,110 | 4,130 | 6,980 | |
| 1954 | 10,350 | 1,010 | 11,360 | 4,340 | 7,020 | |
| 1955 | 10,650 | 1,330 | 11,980 | 4,330 | 7,650 | 2.1 |
| 1956 | 11,650 | 960 | 12,610 | 4,410 | 8,200 | |
| 1957 | 11,090 | 445 | 11,535 | 4,685 | 6,850 | |
| 1958 | 10,060 | 700 | 10,760 | 4,480 | 6,280 | |
| 1959 | 8,950 | 950 | 9,900 | 4,640 | 5,260 | |
| 1960 | 9,620 | 1,740 | 11,360 | 5,140 | 6,220 | 1.8 |
| 1961 | 9,720 | 2,400 | 12,120 | 4,700 | 7,420 | |
| 1962 | 9,670 | 2,100 | 11,770 | 4,700 | 7,070 | |

*Sources:* (1) N.O.S. *Statistisk årsbok för Norge* (utg. hvert år), Oslo
(2) N.O.S. *Utenrikshandel* (utg. hvert år), Oslo
(3) N.O.S. *Skogstatistik* (utg. med forskjellig årsmellomrom), Oslo
(4) F.A.O. *Yearbook of Forest Products Statistics*, Rome

**Table 7:10. Total Exports and Exports of Forest Products**
*(million N.kr and as a percentage)*

| Year | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total exports | 3,466 | 3,959 | 4,307 | 5,056 | 5,435 | 5,137 | 5,583 | 5,995 | 6,222 | 6,610 | 7,183 |
| Index (1954=100) | 88 | 100 | 109 | 128 | 137 | 130 | 141 | 151 | 157 | 167 | 181 |
| Export of forest products | 855 | 1,086 | 1,136 | 1,204 | 1,269 | 1,173 | 1,193 | 1,327 | 1,311 | 1,265 | 1,364 |
| Index (1954=100) | 88 | 100 | 105 | 111 | 117 | 108 | 110 | 122 | 121 | 116 | 126 |
| Share of forest products in total exports, % | *28* | *27* | *26* | *24* | *23* | *23* | *21* | *22* | *21* | *19* | *19* |
| Exports of forest products by type, %: | | | | | | | | | | | |
| 241. Fuelwood | *0.2* | *0.2* | *0.2* | *0.1* | *0.3* | *0.2* | — | — | — | — | — |
| 242. Roundwood | *4.7* | *4.2* | *3.9* | *3.4* | *3.5* | *3.1* | *2.5* | *2.2* | *2.8* | *2.1* | *1.6* |
| 243. Strips | *4.5* | *2.6* | *2.7* | *3.1* | *4.2* | *4.3* | *2.4* | *2.7* | *1.3* | *1.5* | *2.5* |
| 631. Plywood, veneers, etc. | *0.7* | *0.8* | *0.8* | *0.8* | *0.6* | *0.6* | *0.7* | *0.7* | *0.8* | *1.0* | *1.0* |
| 632. Sawnwood | *1.9* | *1.5* | *1.4* | *2.1* | *1.3* | *1.2* | *1.1* | *0.9* | *1.3* | *1.7* | *2.0* |
| 641.6. Fibreboard | *1.3* | *1.3* | *1.7* | *1.9* | *2.0* | *2.1* | *2.3* | *2.5* | *2.4* | *2.7* | *2.6* |
| 251.2. Mechanical pulp | *16.1* | *17.3* | *18.0* | *20.3* | *18.6* | *16.5* | *16.5* | *17.6* | *17.2* | *16.8* | *16.1* |
| 251. Chemical pulp | *32.9* | *29.8* | *29.8* | *26.5* | *25.6* | *28.0* | *26.1* | *25.0* | *23.1* | *23.7* | *21.8* |
| 641. Paper and paperboard | *37.4* | *42.0* | *41.2* | *41.6* | *43.6* | *43.2* | *47.4* | *47.7* | *50.2* | *49.4* | *51.1* |
| 642. Products of pulp, paper, paperboard | *0.4* | *0.4* | *0.3* | *0.2* | *0.4* | *0.8* | *0.9* | *0.7* | *1.0* | *1.2* | *1.4* |

*Sources:* (1) N.O.S. *Statistisk årsbok för Norge* (utg. hvert år), Oslo
(2) N.O.S. *Utenrikshandel* (utg. hvert år), Oslo

**Table 7:11. Average Hourly Earnings for Adult Men**
*(N.kr per hour: index 1954=100)*

| Year | Forest work | | Sawmilling industry | | Wood-processing industry | | All industries | |
|---|---|---|---|---|---|---|---|---|
| | per hour | index | per hour | index | per hour | index | per hour | index |
| 1953 | 4.0 | 95 | 4.0 | 95 | 4.3 | 93 | 4.3 | 96 |
| 1954 | 4.2 | 100 | 4.2 | 100 | 4.6 | 100 | 4.5 | 100 |
| 1955 | 4.4 | 105 | 4.4 | 105 | 4.8 | 104 | 4.8 | 107 |
| 1956 | 4.6 | 110 | 4.7 | 112 | 5.1 | 111 | 5.1 | 113 |
| 1957 | 4.9 | 117 | 4.9 | 117 | 5.4 | 117 | 5.5 | 122 |
| 1958 | 5.1 | 121 | 5.1 | 121 | 5.7 | 124 | 5.7 | 127 |
| 1959 | 5.3 | 126 | 5.4 | 129 | 6.1 | 133 | 6.2 | 138 |
| 1960 | 6.1 | 145 | 5.6 | 133 | 6.4 | 139 | 6.5 | 144 |
| 1961 | 6.4 | 152 | 6.1 | 145 | 6.9 | 150 | 6.9 | 153 |
| 1962 | 7.0 | 167 | 6.7 | 160 | 7.4 | 161 | 7.6 | 169 |
| 1963 | 7.7 | 183 | 7.0 | 167 | 7.8 | 170 | 8.0 | 178 |

*Source:* N.O.S. *Statistisk Arsbok för Norge* (utg. hvert år). Oslo

**Table 7:12. Percentage Distribution of Productive Forest Land**
*(hectares)*

| Agricultural land in *hectares* | Productive forest land below coniferous timber line | | | | | |
|---|---|---|---|---|---|---|
| | 0—50 | 50—200 | 200—1,000 | 1,000—5,000 | over 5,000 | Total |
| Without agricultural land ..... | 1.9 | 3.5 | 5.4 | 6.0 | 8.4 | 25.2 |
| 0—2..... | 4.0 | 1.9 | 0.8 | 0.7 | 1.0 | 8.4 |
| 2—5..... | 9.8 | 7.6 | 3.7 | 1.3 | 0.7 | 23.1 |
| 5—10..... | 5.9 | 6.8 | 4.0 | 1.5 | 1.2 | 19.4 |
| 10—50..... | 3.4 | 5.7 | 5.4 | 3.3 | 2.4 | 20.2 |
| Over 50 ..... | 0.1 | 0.2 | 0.3 | 1.3 | 1.8 | 3.7 |
| Total ..... | 25.1 | 25.7 | 19.6 | 14.1 | 15.5 | 100.0 |

*Source:* N.O.S. *Skogsbrukstellingen i Norge*, 1957

**Table 7:13. Regional Division**

| | Region | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | Total |
| Productive forest land, thousand ha | 2,700 | 825 | 695 | 1,100 | 680 | 6,000 |
| Productive forest land as *percentage* of total area | *34.7* | *30.6* | *10.5* | *19.4* | *6.8* | *18.4* |
| Productive forest land distributed by ownership categories, % | | | | | | |
| State forests | *7.8* | *3.4* | *3.4* | *17.7* | *40.7* | *12.2* |
| Municipal and communal forests | *11.5* | *1.5* | *1.7* | *5.0* | *0.8* | *6.6* |
| Company forests | *10.8* | *4.1* | *1.0* | *12.9* | *1.4* | *8.1* |
| Private forests | *69.9* | *91.0* | *93.9* | *64.4* | *51.1* | *73.1* |
| Total | *100* | *100* | *100* | *100* | *100* | *100* |
| Volume of standing timber, $m^3$/ha without bark | 69.4 | 79.4 | 45.4 | 50.7 | 22.4 | 59.3 |
| Annual increment, $m^3$/ha without bark | 2.7 | 3.0 | 1.6 | 1.6 | 0.5 | 2.2 |
| Potential production, $m^3$ha without bark | 4.0 | 3.8 | 4.3 | 3.4 | 1.0 | 3.8 |

*Source:* N.O.S. *Skogbrukstellingen i Norge*, 1957. Taksering av Norges skoger utført av Landsskogtakseringen

**Table 7:14. Income and Expenditure, by Regions and Forest Groups, in Public Forests of Norway, Annual Average, 1958—1962**

*(1962 values of N.kr per $m^3$y)*

| | *Group A* | | | | | | *Group B* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Region | I | II | III | IV | V | I—V | I | II | III | IV | I—IV |
| Volume of cut, thousand $m^3$y | 115.1 | 22.7 | 8.0 | 121.5 | 43.5 | 310.8 | 65.0 | 7.3 | 9.9 | 11.1 | 93.3 |
| 1. Gross revenue | 86.9 | 95.0 | 90.1 | 87.5 | 76.2 | 87.1 | 97.4 | 99.5 | 97.6 | 88.5 | 95.7 |
| 2. Direct expenditure of logging | 41.1 | 52.9 | 31.3 | 44.2 | 31.0 | 40.1 | 35.5 | 41.1 | 43.9 | 37.4 | 39.5 |
| 3. Social charges | 4.6 | 6.8 | 5.4 | 5.7 | 3.2 | 5.1 | 4.6 | 5.6 | 5.7 | 4.9 | 5.2 |
| 4. Indirect expenditure of logging | 2.2 | 3.6 | 4.1 | 3.9 | 3.5 | 3.5 | 2.4 | 1.8 | 4.6 | 3.1 | 2.9 |
| 5. Total logging costs | 47.9 | 63.3 | 40.8 | 53.8 | 37.7 | 48.7 | 42.5 | 48.5 | 54.2 | 45.4 | 47.6 |
| 6. Net conversion surplus (1—5) | 39.0 | 31.7 | 49.3 | 33.7 | 38.5 | 38.4 | 54.9 | 51.0 | 43.4 | 43.1 | 48.1 |
| 7. Silvicultural costs | 2.8 | 4.8 | 10.0 | 7.7 | 5.3 | 6.1 | 4.1 | 5.6 | 8.0 | 8.6 | 6.6 |
| 8. Costs of improvement and expansion | 2.5 | 2.4 | 2.7 | 6.4 | 3.2 | 3.5 | 4.9 | 5.9 | 3.2 | 4.1 | 4.5 |
| 9. Administrative costs | 7.7 | 10.6 | 14.1 | 7.3 | 9.7 | 9.8 | 7.9 | 8.5 | 11.5 | 10.1 | 9.5 |
| 10. Total managing costs | 13.0 | 17.8 | 26.8 | 21.4 | 18.2 | 19.4 | 16.9 | 20.0 | 22.7 | 22.8 | 20.6 |
| 11. Total costs (5+10) | 60.9 | 81.1 | 67.6 | 75.2 | 55.9 | 68.1 | 59.4 | 68.5 | 76.9 | 68.2 | 68.2 |
| 12. Operating surplus (1—11) | 26.0 | 13.9 | 22.5 | 12.3 | 20.3 | 19.0 | 38.0 | 31.0 | 20.7 | 20.3 | 27.5 |

**Table 7:15. Revenue and Costs per Hectare, Annual Average for Five-Year Period, 1958—1962**
*(in 1962 value of N.kr)*

| | *Group A* | | | | | | *Group B* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Region | I | II | III | IV | V | I—V | I | II | III | IV | I—IV |
| Area in thousand ha | 146.7 | 19.1 | 10.0 | 172.6 | 115.9 | 464.3 | 35.9 | 3.8 | 9.0 | 8.8 | 57.5 |
| 1. Gross revenue | 67.9 | 112.0 | 66.3 | 61.5 | 20.7 | 65.6 | 173.3 | 185.0 | 100.6 | 108.6 | 141.9 |
| 2. Direct expenditure of logging | 31.6 | 61.9 | 19.3 | 30.5 | 7.6 | 30.2 | 61.5 | 74.2 | 41.4 | 43.8 | 55.2 |
| 3. Social charges | 3.6 | 8.0 | 3.2 | 4.0 | 0.8 | 3.9 | 8.0 | 10.2 | 5.3 | 5.8 | 7.3 |
| 4. Indirect expenditure of logging | 1.8 | 4.2 | 3.3 | 2.7 | 0.9 | 2.5 | 4.0 | 3.1 | 4.3 | 3.3 | 3.7 |
| 5. Total logging costs | 37.0 | 74.1 | 25.8 | 37.2 | 9.3 | 36.6 | 73.5 | 87.5 | 51.0 | 52.9 | 66.2 |
| 6. Net conversion surplus (1—5) | 30.9 | 37.9 | 40.5 | 24.3 | 11.4 | 29.0 | 99.8 | 97.5 | 49.6 | 55.7 | 75.7 |
| 7. Silvicultural costs | 2.3 | 5.9 | 8.4 | 5.5 | 2.0 | 4.8 | 7.8 | 10.7 | 9.0 | 11.1 | 9.6 |
| 8. Costs of improvement and expansion | 2.2 | 3.0 | 2.0 | 4.7 | 1.3 | 2.6 | 9.3 | 11.2 | 3.4 | 5.0 | 7.3 |
| 9. Administrative costs | 6.0 | 12.6 | 11.3 | 5.1 | 3.6 | 6.6 | 14.8 | 16.3 | 13.2 | 13.2 | 14.4 |
| 10. Total managing costs | 10.5 | 21.5 | 21.7 | 15.3 | 6.9 | 14.0 | 31.9 | 38.2 | 25.6 | 29.3 | 31.3 |
| 11. Total costs (5+10) | 47.5 | 95.6 | 47.5 | 52.5 | 16.2 | 50.6 | 105.4 | 125.7 | 76.6 | 82.2 | 97.5 |
| 12. Operating surplus (1—11) | 20.4 | 16.4 | 18.8 | 8.9 | 4.5 | 15.0 | 67.9 | 59.3 | 24.0 | 26.4 | 44.4 |

**Table 7:16. Revenue and Costs, Annual Average for All Forest Economic Regions**
*(N.kr per cubic metre)*

| Year | *Group A* | | | | | | *Group B* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* |
| | Current prices | | | | | | Current prices | | | | | |
| 1. Gross revenue | 84.8 | 80.4 | 80.4 | 89.4 | 89.7 | 87.1 | 94.2 | 88.6 | 88.6 | 97.6 | 97.7 | 95.7 |
| 2. Direct expenditure of logging | 36.6 | 37.4 | 37.5 | 39.2 | 44.6 | 40.1 | 37.1 | 37.9 | 37.9 | 37.6 | 42.1 | 39.5 |
| 3. Social charges | 4.2 | 4.7 | 5.2 | 4.8 | 6.1 | 5.1 | 4.5 | 4.7 | 5.7 | 4.6 | 5.7 | 5.2 |
| 4. Indirect expenditure of logging | 3.2 | 3.2 | 3.8 | 3.6 | 3.2 | 3.5 | 2.3 | 2.3 | 5.0 | 2.6 | 2.2 | 2.9 |
| 5. Total logging costs | 44.0 | 45.3 | 46.5 | 47.6 | 53.9 | 48.7 | 43.9 | 44.9 | 48.6 | 44.8 | 50.0 | 47.6 |
| 6. Net conversion surplus (1—5) | 40.8 | 35.1 | 33.9 | 41.8 | 35.8 | 38.4 | 50.3 | 43.7 | 40.0 | 52.8 | 47.7 | 48.1 |
| 7. Silvicultural costs | 5.9 | 5.9 | 6.8 | 6.0 | 5.2 | 6.1 | 5.7 | 5.8 | 7.2 | 7.4 | 6.1 | 6.6 |
| 8. Costs of improvement and expansion | 2.9 | 3.3 | 3.6 | 2.9 | 4.2 | 3.5 | 3.6 | 3.8 | 6.9 | 4.1 | 3.7 | 4.5 |
| 9. Administrative costs | 9.3 | 9.4 | 10.1 | 9.8 | 9.6 | 9.8 | 8.2 | 8.6 | 7.6 | 11.6 | 10.3 | 9.5 |
| 10. Total managing costs | 18.1 | 18.6 | 20.5 | 18.7 | 19.0 | 19.4 | 17.5 | 18.2 | 21.7 | 23.1 | 20.1 | 20.6 |
| 11. Total costs (5+10) | 62.1 | 63.9 | 67.0 | 66.3 | 72.9 | 68.1 | 61.4 | 63.1 | 70.3 | 67.9 | 70.1 | 68.2 |
| 12. Operating surplus (1—11) | 22.7 | 16.5 | 13.4 | 23.1 | 16.8 | 19.0 | 32.8 | 25.5 | 18.3 | 29.7 | 27.6 | 27.5 |

## Table 7:17. Revenue and Costs, Forest Economic Region I

(*N.kr per cubic metre*)

| Year | *Group A* | | | | | | *Group B* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* |
| | Current prices | | | | | | Current prices | | | | | |
| 1. Gross revenue | 81.8 | 78.8 | 78.8 | 91.9 | 92.3 | 86.9 | 93.2 | 90.2 | 90.2 | 100.8 | 100.4 | 97.4 |
| 2. Direct expenditure of logging | 38.7 | 39.5 | 39.5 | 38.6 | 43.3 | 41.1 | 33.4 | 34.2 | 34.2 | 33.2 | 38.0 | 35.5 |
| 3. Social charges | 3.2 | 3.9 | 3.6 | 5.5 | 6.2 | 4.6 | 3.4 | 3.8 | 5.3 | 4.6 | 5.4 | 4.6 |
| 4. Indirect expenditure of logging | 1.6 | 1.8 | 2.5 | 2.1 | 2.9 | 2.2 | 1.3 | 1.5 | 4.2 | 2.1 | 2.4 | 2.4 |
| 5. Total logging costs | 43.5 | 45.2 | 45.6 | 46.2 | 52.4 | 47.9 | 38.1 | 39.5 | 43.7 | 39.9 | 45.8 | 42.5 |
| 6. Net conversion surplus (1−5) | 38.3 | 33.6 | 33.2 | 45.7 | 39.9 | 39.0 | 55.1 | 50.7 | 46.5 | 60.9 | 54.6 | 54.9 |
| 7. Silvicultural costs | 2.8 | 2.8 | 2.6 | 3.0 | 2.6 | 2.8 | 3.4 | 3.6 | 4.2 | 4.5 | 4.5 | 4.1 |
| 8. Costs of improvement and expansion | 0.8 | 1.7 | 1.6 | 3.4 | 5.0 | 2.5 | 3.0 | 3.8 | 5.3 | 5.3 | 6.7 | 4.9 |
| 9. Administrative costs | 7.2 | 7.2 | 8.0 | 7.9 | 7.2 | 7.7 | 6.6 | 7.0 | 7.4 | 9.5 | 8.2 | 7.9 |
| 10. Total managing costs | 10.8 | 11.7 | 12.2 | 14.3 | 14.8 | 13.0 | 13.0 | 14.4 | 16.9 | 19.3 | 19.4 | 16.9 |
| 11. Total costs (5+10) | 54.3 | 56.9 | 57.8 | 60.5 | 67.2 | 60.9 | 51.1 | 53.9 | 60.6 | 59.2 | 65.2 | 59.4 |
| 12. Operating surplus (1−11) | 27.5 | 21.9 | 21.0 | 31.4 | 25.1 | 26.0 | 42.1 | 36.3 | 29.6 | 41.6 | 35.2 | 38.0 |

## Table 7:18. Revenue and Costs, Forest Economic Region II

(*N.kr per cubic metre*)

| Year | *Group A* | | | | | | *Group B* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* |
| | Current prices | | | | | | Current prices | | | | | |
| 1. Gross revenue | 91.8 | 88.8 | 88.8 | 96.8 | 96.8 | 95.0 | 97.4 | 94.4 | 94.4 | 99.5 | 99.0 | 99.5 |
| 2. Direct expenditure of logging | 48.3 | 49.1 | 49.1 | 55.1 | 56.0 | 52.9 | 39.1 | 39.9 | 39.9 | 40.7 | 40.5 | 41.1 |
| 3. Social charges | 5.2 | 5.7 | 7.9 | 6.7 | 7.6 | 6.8 | 4.8 | 5.1 | 7.7 | 4.5 | 5.2 | 5.6 |
| 4. Indirect expenditure of logging | 2.8 | 3.0 | 5.0 | 4.1 | 2.7 | 3.6 | 1.7 | 1.8 | 2.5 | 1.4 | 1.1 | 1.8 |
| 5. Total logging costs | 56.3 | 57.8 | 62.0 | 65.9 | 66.3 | 63.3 | 45.6 | 46.8 | 50.1 | 46.6 | 46.8 | 48.5 |
| 6. Net conversion surplus (1−5) | 35.5 | 31.0 | 26.8 | 30.9 | 30.5 | 31.7 | 51.8 | 47.6 | 44.3 | 52.9 | 52.2 | 51.0 |
| 7. Silvicultural costs | 4.5 | 4.6 | 4.8 | 5.5 | 4.2 | 4.8 | 5.0 | 5.0 | 5.3 | 7.1 | 5.1 | 5.6 |
| 8. Costs of improvement and expansion | 1.4 | 2.3 | 2.8 | 1.7 | 3.5 | 2.4 | 4.9 | 4.9 | 7.1 | 7.3 | 4.7 | 5.9 |
| 9. Administrative costs | 9.3 | 9.4 | 12.0 | 11.7 | 9.2 | 10.6 | 8.0 | 8.1 | 8.3 | 9.0 | 8.0 | 8.5 |
| 10. Total managing costs | 15.2 | 16.3 | 19.6 | 18.9 | 16.9 | 17.8 | 17.9 | 18.0 | 20.7 | 23.4 | 17.8 | 20.0 |
| 11. Total costs (5+10) | 71.5 | 74.1 | 81.6 | 84.8 | 83.2 | 81.1 | 63.5 | 64.8 | 70.8 | 70.0 | 64.6 | 68.5 |
| 12. Operating surplus (1−11) | 20.3 | 14.7 | 7.2 | 12.0 | 13.6 | 13.9 | 33.9 | 29.6 | 23.6 | 29.5 | 34.4 | 31.0 |

**Table 7:19. Revenue and Costs, Forest Economic Region III**
(*N.kr per cubic metre*)

| Year | *Group A* | | | | | | *Group B* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* |
| | Current prices | | | | | | Current prices | | | | | |
| 1. Gross revenue | 96.3 | 83.3 | 83.0 | 89.8 | 87.1 | 90.1 | 102.9 | 89.9 | 89.9 | 97.9 | 95.1 | 97.6 |
| 2. Direct expenditure of logging | 28.6 | 29.4 | 29.4 | 30.7 | 34.7 | 31.3 | 40.9 | 41.7 | 41.7 | 41.8 | 48.0 | 43.9 |
| 3. Social charges | 5.0 | 5.1 | 7.5 | 3.2 | 5.6 | 5.4 | 5.3 | 5.4 | 6.4 | 4.5 | 6.0 | 5.7 |
| 4. Indirect expenditure of logging | 4.5 | 4.3 | 4.0 | 3.5 | 3.9 | 4.1 | 4.3 | 4.2 | 5.3 | 5.0 | 3.7 | 4.6 |
| 5. Total logging costs | 38.1 | 38.8 | 40.9 | 37.4 | 44.2 | 40.8 | 50.5 | 51.3 | 53.4 | 51.3 | 57.7 | 54.2 |
| 6. Net conversion surplus (1−5) | 58.2 | 44.5 | 42.1 | 52.4 | 42.9 | 49.3 | 52.4 | 38.6 | 36.5 | 46.6 | 37.4 | 43.4 |
| 7. Silvicultural costs | 9.9 | 9.9 | 10.5 | 10.6 | 8.0 | 10.0 | 7.2 | 7.4 | 8.7 | 8.4 | 7.2 | 8.0 |
| 8. Costs of improvement and expansion | 2.8 | 3.2 | 5.2 | 0.9 | 1.0 | 2.7 | 2.7 | 2.8 | 6.8 | 2.0 | 1.4 | 3.2 |
| 9. Administrative costs | 13.9 | 14.0 | 14.0 | 12.7 | 14.2 | 14.1 | 10.4 | 10.8 | 7.3 | 14.2 | 13.2 | 11.5 |
| 10. Total managing costs | 26.6 | 27.1 | 29.7 | 24.2 | 23.2 | 26.8 | 20.3 | 21.0 | 22.8 | 24.6 | 21.8 | 22.7 |
| 11. Total costs (5+10) | 64.7 | 65.9 | 70.6 | 61.6 | 67.4 | 67.6 | 70.8 | 72.3 | 76.2 | 75.9 | 79.5 | 76.9 |
| 12. Operating surplus (1−11) | 31.6 | 17.4 | 12.4 | 28.2 | 19.7 | 22.5 | 32.1 | 17.6 | 13.7 | 22.0 | 15.6 | 20.7 |

**Table 7:20. Revenue and Costs, Forest Economic Region IV**
(*N.kr per cubic metre*)

| Year | *Group A* | | | | | | *Group B* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* |
| | Current prices | | | | | | Current prices | | | | | |
| 1. Gross revenue | 83.1 | 80.0 | 80.0 | 92.2 | 91.1 | 87.5 | 83.1 | 80.0 | 80.0 | 92.1 | 96.2 | 88.5 |
| 2. Direct expenditure of logging | 41.1 | 41.9 | 41.9 | 42.0 | 48.3 | 44.2 | 34.8 | 35.6 | 35.6 | 34.5 | 41.7 | 37.4 |
| 3. Social charges | 5.1 | 5.4 | 4.5 | 5.7 | 7.1 | 5.7 | 4.7 | 4.8 | 3.6 | 4.7 | 6.0 | 4.9 |
| 4. Indirect expenditure of logging | 3.5 | 3.5 | 4.4 | 4.0 | 3.6 | 3.9 | 1.8 | 1.8 | 8.2 | 1.8 | 1.6 | 3.1 |
| 5. Total logging costs | 49.7 | 50.8 | 50.8 | 51.7 | 59.0 | 53.8 | 41.3 | 42.2 | 47.4 | 41.0 | 49.3 | 45.4 |
| 6. Net conversion surplus (1−5) | 33.4 | 29.2 | 29.2 | 40.5 | 32.1 | 33.7 | 41.8 | 37.8 | 32.6 | 51.1 | 46.9 | 43.1 |
| 7. Silvicultural costs | 7.0 | 7.0 | 8.6 | 7.7 | 7.1 | 7.7 | 7.1 | 7.1 | 10.5 | 9.7 | 7.7 | 8.6 |
| 8. Costs of improvement and expansion | 6.3 | 6.4 | 5.3 | 5.9 | 7.4 | 6.4 | 3.8 | 3.7 | 8.5 | 1.8 | 2.1 | 4.1 |
| 9. Administrative costs | 6.7 | 6.8 | 7.0 | 7.2 | 8.0 | 7.3 | 7.9 | 8.3 | 7.4 | 13.8 | 11.8 | 10.1 |
| 10. Total managing costs | 20.0 | 20.2 | 20.9 | 20.8 | 22.5 | 21.4 | 18.8 | 19.3 | 26.4 | 25.3 | 21.6 | 22.8 |
| 11. Total costs (5+10) | 69.7 | 71.0 | 71.7 | 72.5 | 81.5 | 75.2 | 60.1 | 61.3 | 73.8 | 66.3 | 70.9 | 68.2 |
| 12. Operating surplus (1−11) | 13.4 | 9.0 | 8.3 | 19.7 | 9.6 | 12.3 | 23.0 | 18.7 | 6.2 | 25.8 | 25.3 | 20.3 |

**Table 7:21. Revenue and Costs, Forest Economic Region V**
*(N.kr per cubic metre)*

| Year | Group A | | | | | |
|---|---|---|---|---|---|---|
| | 1958 | 1959 | 1960 | 1961 | 1962 | Annual Average in 1962 value of *N.kr* |
| | Current prices | | | | | |
| 1. Gross revenue | 71.2 | 71.2 | 71.2 | 76.5 | 81.4 | 76.2 |
| 2. Direct expenditure of logging | 26.4 | 27.2 | 27.2 | 29.5 | 41.0 | 31.0 |
| 3. Social charges | 2.7 | 3.2 | 2.7 | 3.1 | 3.8 | 3.2 |
| 4. Indirect expenditure of logging | 3.5 | 3.4 | 3.0 | 4.3 | 3.0 | 3.5 |
| 5. Total logging costs | 32.6 | 33.8 | 32.9 | 36.9 | 47.8 | 37.7 |
| 6. Net conversion surplus (1−5) | 38.6 | 37.4 | 38.3 | 39.6 | 33.6 | 38.5 |
| 7. Silvicultural costs | 5.4 | 5.4 | 7.4 | 3.2 | 4.3 | 5.3 |
| 8. Costs of improvement and expansion | 3.1 | 3.1 | 2.9 | 2.6 | 3.7 | 3.2 |
| 9. Administrative costs | 9.4 | 9.4 | 9.5 | 9.5 | 9.6 | 9.7 |
| 10. Total managing costs | 17.9 | 17.9 | 19.8 | 15.3 | 17.6 | 18.2 |
| 11. Total costs (5+10) | 50.5 | 51.7 | 52.7 | 52.2 | 65.4 | 55.9 |
| 12. Operating surplus (1−11) | 20.7 | 19.5 | 18.5 | 24.3 | 16.0 | 20.3 |

## 7.5 Model Analysis of Costs and Revenue in Norwegian Forestry

### *7.5.1 Introduction*

Norwegian statistical studies published to date on the costs and revenue in the State forests of Norway show variations from district to district. It is only to a limited extent that we know the causes of these variations. For instance, we know that the site quality class of the forest land and the terrain conditions play an important part. Other factors to be taken into consideration are the dimension of the trees, the hauling distance and the species.

The purpose of the model analyses presented here is to show the effect which a number of factors has on costs and revenue in forestry. When such essential data about the causes of the variations and their significance is at our disposal we shall have better possibilities to draw important conclusions from the reports and statistics of the State forests. It must be emphasised that the model analysis shows the effect of variations only for a limited number of factors. For this reason it is not possible to take into consideration a number of possible causes of variations.

In devising these models it has been impossible in many cases to get a picture of the variations only on the basis of the statistical material. The models are constructed, firstly, on analyses of actual statistics, secondly, on norms and, thirdly, on calculations.

### *7.5.2 Effect of Tree Dimension and Transport Distance on the Net Conversion Surplus*

Statistics from which the net conversion surplus per cubic metre is derived are obtained from data collected in 1962 from selected type areas (type forests). These areas can be described as relatively *favourable* for forestry. The material does not contain any extreme results from any of the factors mentioned above.

*Norway Spruce*

Norway spruce and Scots pine account for approximately 95 per cent of the annual cut of coniferous timber which is sold on the Norwegian market. Norway spruce is dominant of the coniferous species and amounts to 70 per cent of the total cut, while pine represents about 20 per cent.

In scaling the logs of Norway spruce for sale two kinds of measurements are used, namely "top measure" and "mid-point measure". The difference between the two types of timber is brought about, firstly, by dimension and, secondly, by quality. The quantity of Norway spruce is divided approximately equally between the two types.

From the "top measured" timber about 60 per cent of the quantity goes to the sawmills, while the rest is used for pulping. Almost all of the "mid-point measured" timber, at least 95 per cent, goes for pulp.

Table 7:22 shows the revenue from sales, as well as costs and net conversion surplus in N.kr./$m^3y$ for forestry operations in East Norway. In this table the revenue from sales and the logging costs (lines 1 and 2) are analysed with reference to the number of logs per cubic metre, while the analysis of the transport costs (line 3) is based on the hauling distance being the variable.

Figures 7—9, 7—10 and 7—11 present these items in graphic form. The continuous lines in Figure 7—10 represents the data in Table 7:22. The three broken lines indicate the deviations which have been obtained by analyses of the logging costs in different type forests.

Line 4 in Table 7:22 is an estimate of the social charges. To some extent, the costs are proportional to the direct costs of felling and transport (lines 2 and 3) and, to some extent, to the time taken for the work.

Line 5 in the table gives the total costs of felling, marking the stems for cross-cutting, timber measuring, maintenance of roads and of forest accommodation. These costs have been determined mainly by the calculation of certain averages from various management reports.

Tables 7:23 and Figures 7—12, 7—13 and 7—14 provide statistics obtained from forestry operations in Central Norway (the Tröndelag District). A somewhat lower net conversion surplus is obtained from such data than is indicated in Table 7:22. This is due, firstly, to the revenue from sales, and, secondly, to the fact that the costs are somewhat higher (lines 2-4). However, the variations of the net conversion surplus are almost the same in both cases. One can see from Table 7:22 that the extremes are 66 kroner and 40 kroner per cubic metre, i.e. a difference of 26 kroner. The corresponding figures for Table 7:23 are 55 kroner and 30 kroner per cubic metre, i.e. a difference of 25 kroner.

**Table 7:22. Revenue, Costs and Net Conversion Surplus for Norway Spruce (East Norway)**
*(N.kr per m³y)*

| | Logs per m³y | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 | | | 6 | | | 9 | | |
| | Hauling distance, km | | | | | | | | |
| | 0.2 | 0.6 | 1.5 | 0.2 | 0.6 | 1.5 | 0.2 | 0.6 | 1.5 |
| 1. Gross revenue | 105.0 | 105.0 | 105.0 | 102.0 | 102.0 | 102.0 | 99.0 | 99.0 | 99.0 |
| 2. Logging costs | 19.4 | 19.4 | 19.4 | 22.0 | 22.0 | 22.0 | 24.9 | 24.9 | 24.9 |
| 3. Transport costs | 9.5 | 12.5 | 17.2 | 9.5 | 12.5 | 17.2 | 9.5 | 12.5 | 17.2 |
| 4. Social charges, including holidays | 4.7 | 5.0 | 5.6 | 5.5 | 5.8 | 6.2 | 6.2 | 6.5 | 7.0 |
| 5. Marketing, maintenance costs | 5.4 | 5.7 | 6.4 | 6.5 | 6.9 | 7.8 | 8.1 | 8.6 | 9.6 |
| 6. Total | 39.0 | 42.6 | 48.6 | 43.7 | 47.4 | 53.4 | 48.7 | 52.5 | 58.7 |
| 7. Net conversion surplus | 66.0 | 62.4 | 56.4 | 58.3 | 54.6 | 48.6 | 50.3 | 46.5 | 40.3 |

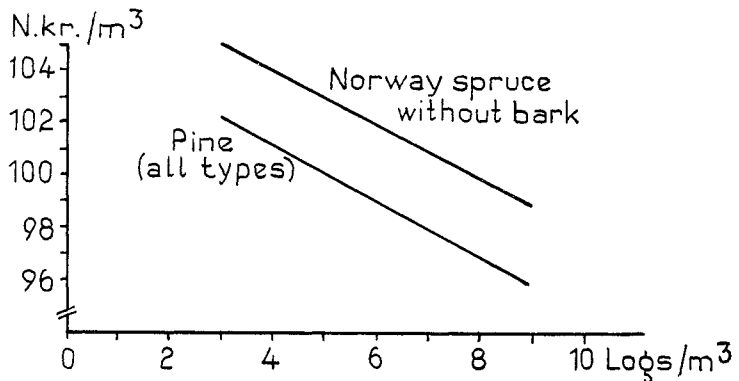


Fig. 7-9. Revenue as a Function of the Number of Logs per Cubic Metre (East Norway)

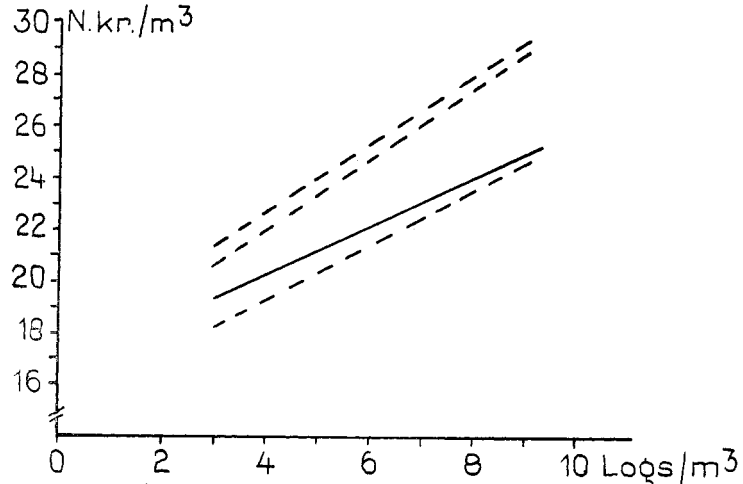


Fig. 7-10. Felling Costs as a Function of the Number of Logs per Cubic Metre (Data from Various Logging Areas, East Norway)

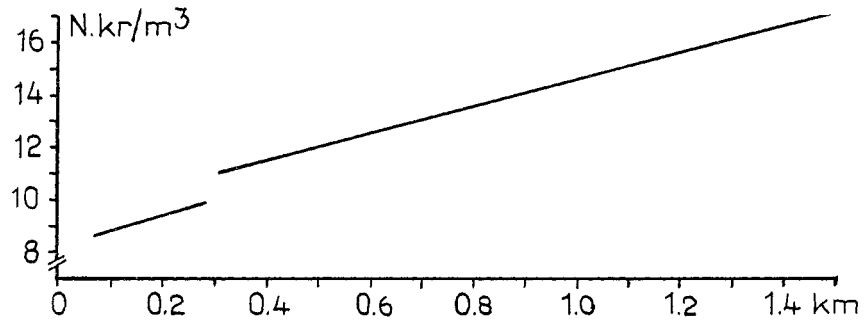


Fig. 7-11. Extraction Costs as a Function of Hauling Distance (East Norway)

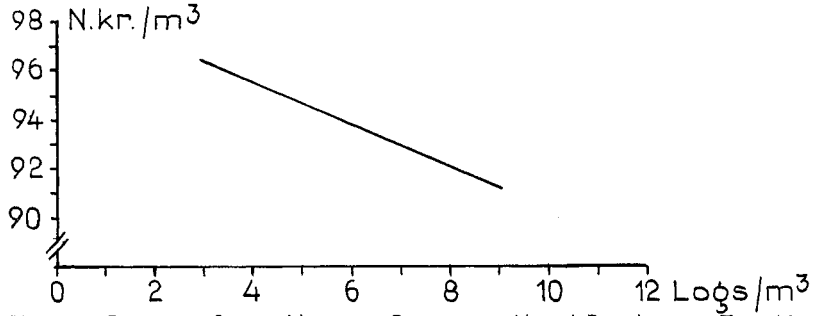


Fig. 7-12. Revenue from Norway Spruce without Bark as a Function of the Number of Logs per Cubic Metre (Central Norway)

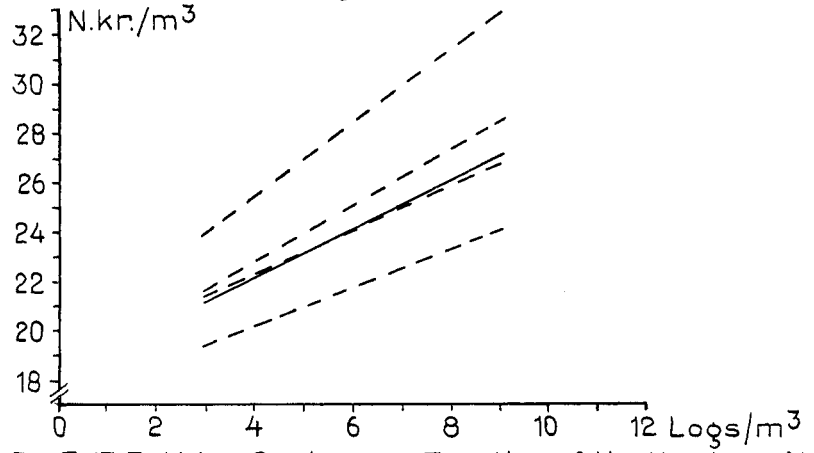


Fig. 7-13. Felling Costs as a Function of the Number of Logs per Cubic Metre (Data from Various Logging Areas, Central Norway)

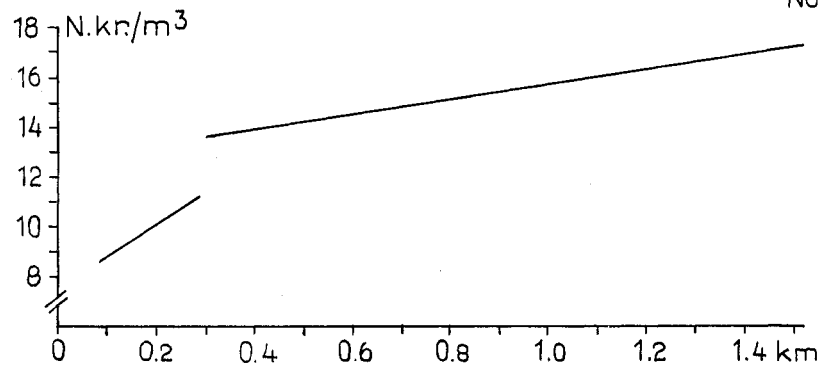


Fig. 7-14. Extraction Costs as a Function of Hauling Distance (Central Norway)

**Table 7:23. Revenue, Costs and Net Conversion Surplus for Norway Spruce (Central Norway)**
*(N.kr per m³y)*

| | Logs per m³y | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 | | | 6 | | | 9 | | |
| | Hauling distance, km | | | | | | | | |
| | 0.2 | 0.6 | 1.5 | 0.2 | 0.6 | 1.5 | 0.2 | 0.6 | 1.5 |
| 1. Gross revenue | 96.3 | 96.3 | 96.3 | 93.8 | 93.8 | 93.8 | 91.3 | 91.3 | 91.3 |
| 2. Felling costs | 21.2 | 21.2 | 21.2 | 24.1 | 24.1 | 24.1 | 27.1 | 27.1 | 27.1 |
| 3. Transport costs | 10.1 | 14.6 | 17.3 | 10.1 | 14.6 | 17.3 | 10.1 | 14.6 | 17.3 |
| 4. Social charges, including holidays | 4.9 | 5.3 | 5.7 | 5.7 | 6.1 | 6.4 | 6.4 | 6.8 | 7.2 |
| 5. Marking, maintenance costs | 5.4 | 5.7 | 6.4 | 6.5 | 6.9 | 7.8 | 8.1 | 8.6 | 9.6 |
| 6. Total | 41.6 | 46.8 | 50.6 | 46.4 | 51.7 | 55.6 | 51.7 | 57.1 | 61.2 |
| 7. Net conversion surplus (1 – 6) | 54.7 | 49.5 | 45.7 | 47.4 | 42.1 | 38.2 | 39.6 | 34.2 | 30.1 |

*Scots Pine*

The main assortments of pine are also "top-measured" and "mid-measured" and together these account for approximately 90 per cent of the total cut of Scots pine. About 85 per cent of the top-measured timber goes to the sawmills, while the rest is used for the manufacture of pulp. Some eight per cent of the mid-measured timber goes to the sawmills, while most of the quantity cut, more than 90 per cent, is used for pulping.

Also there are certain special assortments of pine, which account for about eight per cent of the total cut of pine.

However, the accounts of gross revenues in Table 7:24 and Figure 7—10 incorporate a substantially larger proportion of special timber, about 25 per cent. This sets the level of gross revenue higher than could be expected on the average.

The cost figures contained in Table 7:24 should correspond to those given for Norway spruce in East Norway (Table 7:22), although it is difficult to say whether this would be so in practice. However, as the piece-rate schedule applied in Norway does not distinguish between spruce and pine, we have assumed that the most important cost items (felling and transport) are the same for both species under the same conditions.

### *7.5.3 Effect of Site Quality Class on the Net Conversion Surplus and the Operating Profit*

In the statistics which we have used up to now the site quality class has not been taken as a cause of variation. The reason for this is that there are no records on which such an analysis could be based.

However, to give some idea of the effect of site quality class we have presented in Table 7:25 figures based on the production tables for Norway spruce forests.

A "normal forest" model has been constructed for each site quality class. The production tables, together with costs and revenue from Table 7:23 (given that there are six logs per cubic metre and that the hauling distance is one kilometre) have provided the basis for the calculation of the net conversion surplus per hectare. The silvicultural costs, the other investment costs and the costs of administration are based on estimated figures.

**Table 7:24. Revenue, Costs and Net Conversion Surplus for Scots Pine (East Norway)**
*(N.kr per m³y)*

| | Logs per m³y | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 | | | 6 | | | 9 | | |
| | Hauling distance, km | | | | | | | | |
| | 0.2 | 0.6 | 1.5 | 0.2 | 0.6 | 1.5 | 0.2 | 0.6 | 1.5 |
| 1. Gross revenue | 102.2 | 102.2 | 102.2 | 99.0 | 99.0 | 99.0 | 95.8 | 95.8 | 95.8 |
| 2. Felling costs | 19.4 | 19.4 | 19.4 | 22.2 | 22.2 | 22.2 | 24.9 | 24.9 | 24.9 |
| 3. Transport costs | 9.5 | 12.5 | 17.2 | 9.5 | 12.5 | 17.2 | 9.5 | 12.5 | 17.2 |
| 4. Social charges, including holidays | 4.7 | 5.0 | 5.6 | 5.5 | 5.8 | 6.2 | 6.2 | 6.5 | 7.0 |
| 5. Marking maintenance costs | 5.4 | 5.7 | 6.4 | 6.5 | 6.9 | 7.8 | 8.1 | 8.6 | 9.6 |
| 6. Total | 39.0 | 42.6 | 48.6 | 43.7 | 47.4 | 53.4 | 48.7 | 52.5 | 58.7 |
| 7. Net conversion surplus (1—6) | 63.2 | 59.6 | 53.6 | 55.3 | 51.6 | 45.6 | 47.1 | 43.3 | 37.1 |

**Table 7:25. Net Conversion Surplus, Costs of Silviculture, Other Investment and Administration as a Function of Site Quality Class "Normal Forest Model" for Norway Spruce**
*(N.kr per hectare)*

| Site quality class | B | C | D | E |
|---|---|---|---|---|
| Productive capacity, m³/ha | 8.3 | 6.1 | 4.1 | 2.4 |
| Net conversion surplus | 243 | 150 | 88 | 44 |
| Silvicultural costs | 11 | 6 | 2 | 1 |
| Other investment costs | 15 | 12 | 9 | 6 |
| Administrative costs | 18 | 15 | 12 | 9 |
| Operating surplus | 199 | 117 | 65 | 28 |

# Chapter 8

# SWITZERLAND

# Switzerland

by

H. TROMP and W. SCHWOTZER

*(Slightly condensed from the original contribution in German)*

## 8.1 General

### *8.1.1 Share of Forestry in the Gross National Product*

The share of the net production value of forestry in the Gross National Product of Switzerland for 1958-1962 is shown in Table 8:1. The figures in the table refer to total forest, i.e. both publicly and privately owned.

The lack of statistical data necessitates different assumptions both for private forests and for the total calculation. For the assessment of the known amount of fellings by private forest owners the same average annual revenue per cubic metre as for the publicly owned forests has been taken. Also the determination of the costs of materials and machinery, produced in other branches of industry, which are necessary for the calculation of the net production value, has been made on the assumption that the costs needed to obtain revenue are the same as in the publicly owned forests.

For the total calculation it has been assumed that the costs of materials and machinery produced in other branches of industry amounted to between 10 and 20 per cent, i.e. on average 15 per cent, of the total expenditure.

**Table 8:1. Share of Forestry Production in the Gross National Product of Switzerland, 1958—1962**

| | 1958 | 1959 | 1960 | 1961 | 1962 | Average 1958—1962 |
|---|---|---|---|---|---|---|
| *Gross National Product* | | | | | | |
| million Sw.Fr. (current values) | 31,520 | 33,840 | 37,055 | 41,490 | 46,050 | |
| million Sw.Fr. (1962 value)... | 35,998 | 38,599 | 40,841 | 43,835 | 46,050 | 41,065 |
| *Net Production Value of Forestry* | | | | | | |
| million Sw.Fr. (current values) | 217 | 205 | 224 | 253 | 327 | |
| million Sw.Fr. (1962 value)... | 246 | 238 | 253 | 255 | 327 | 264 |
| *Share of Forestry Production in the Gross National Product, %* | *0.7* | *0.6* | *0.6* | *0.6* | *0.7* | *0.64* |

Basic data for the figures have been published in the following

*Sources:* (1) *Statistisches Jahrbuch der Schweiz*, 1965
(2) *Volkwirtschaft*, 1964, 9
(3) *Schweizerische Forststatistik*, 1958—1962

*The factor for the conversion* of the gross national product at current prices adjusted to the 1962 value of the Swiss franc is based on data published in the economic journal *Die Volkswirtschaft,* 1964, 9.

The factor for the conversion of the net production value of forestry has been derived from the sales income per cubic metre for the various years.

### *8.1.2 Roundwood Balance, Exports and Imports of Forest Products*

Table 8:2 shows the development of production, imports, exports and home consumption for the years 1953-1962. However, it should be noted that as far as home consumption is concerned this is an apparent consumption, because for obvious reasons it is not possible to take changes in stock into consideration. All figures are given in terms of the same unit. It should be noted that the annual cut of roundwood for 1962 was extraordinarily large. This was because the heavy damage caused by wet snow and storms at the beginning of 1962 and in the autumn of that year resulted in the over-exploitation of the Swiss forests. The actual annual cut was reduced in the following years. For this reason the home consumption of almost 6.8 million cubic metres which appears for 1962 is undoubtedly much too high. In fact, at the end of that year the sawmills and pulp mills were overstocked with raw material.

Table 8:3 shows the export value of forest products and their share of the total exports of Switzerland. It should be noted that Switzerland is an importing country; consequently, the share of timber and processed forest products, in terms of volume and value in the total exports of the country, is rather slight. Small quantities of certain final products, such as paper,

**Table 8:2. Total Roundwood Balance of Switzerland and Foreign Trade in Forest Products**

| Year | Roundwood production (annual cut) | Imports | Quantity available | Exports | Home consumption | |
|---|---|---|---|---|---|---|
| | | | | | Total | Consumption *per capita* (5-year average) |
| | *thousand cubic metres roundwood equivalent* | | | | | *cubic metres* |
| 1953 | 3,795 | 865 | 4,660 | 128 | 4,532 | |
| 1954 | 3,490 | 1,130 | 4,620 | 129 | 4,491 | |
| 1955 | 3,750 | 1,760 | 5,510 | 142 | 5,368 | |
| 1956 | 3,765 | 1,536 | 5,301 | 201 | 5,100 | |
| 1957 | 3,555 | 1,524 | 5,079 | 171 | 4,908 | 0.96 |
| 1958 | 3,560 | 1,245 | 4,805 | 165 | 4,640 | |
| 1959 | 3,315 | 1,260 | 4,575 | 221 | 4,354 | |
| 1960 | 3,615 | 1,781 | 5,396 | 259 | 5,137 | |
| 1961 | 3,690 | 2,578 | 6,268 | 225 | 6,043 | |
| 1962 | 4,555 | 2,452 | 7,007 | 231 | 6,776 | 0.99 |

*Sources:* (1) F.A.O., *World Forest Products Statistics,* 1953—1954, Rome 1957
(2) F.A.O., *Yearbook of Forest Products Statistics,* 1955 ff, Rome

veneers, etc., are sold abroad. Unprocessed wood is exported only when there is insufficient demand for it in Switzerland. Typical examples of this in recent years have been the export of beech in the form of roundwood and also deciduous fuelwood. Since 1962 and as a result of the emergency fellings, Switzerland has also exported coniferous roundwood.

Table 8:4 provides details of roundwood removals in Switzerland from 1913 to 1963. Table 8:5 sets out the figures for the same period for the export and import of roundwood and processed forest products with all quantities given in terms of roundwood equivalent.

### *8.1.3 Structure of the Timber Market and Movements of Prices*

On the supply side—as far as primary forest production is concerned—we have a closed type of market which cannot be expanded even in boom periods. On the other hand, in times of economic recessions, when publicly owned forest enterprises are in urgent need of increased revenue from their forests, the supply is limited as much as in times of boom. Thus the supply of roundwood—as a whole—is rather inelastic. On the demand side we have a completely open type of market, as there is no obligation to start or extend wood processing enterprises.

There is obviously an interdependence between prices at home and abroad. This is naturally more perceptible in the case of individual assortments and, as a rule, evens out in the prices of final and semi-finished products. Two examples can be cited.

**Table 8:3. Value of Exports of Forest Products and Share of Total Exports of Switzerland**

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Value of total exports of Switzerland, million Sw.Fr. | 5,165 | 5,272 | 5,622 | 6,203 | 6,714 | 6,649 | 7,274 | 8,131 | 8,822 | 9,580 |
| Index, 1954=100 | 98 | 100 | 107 | 118 | 127 | 126 | 138 | 154 | 167 | 182 |
| Value of exports of forest products, million Sw.Fr. *a* | 95 | 113 | 125 | 150 | 161 | 153 | 180 | 162 | 176 | 186 |
| Index, 1954=100 | 84 | 100 | 111 | 133 | 142 | 135 | 159 | 143 | 156 | 165 |
| Share of forest products in total export value, % | *1.8* | *2.1* | *1.9* | *2.4* | *2.4* | *2.3* | *2.5* | *2.0* | *2.0* | *1.9* |
| *Percentage* distribution of exports by products | | | | | | | | | | |
| Roundwood (242) *b* | *1.3* | *1.1* | *1.2* | *1.1* | *1.5* | *1.9* | *2.8* | *3.0* | *3.2* | *3.4* |
| Sawnwood (243) | *2.4* | *2.0* | *2.1* | *1.3* | *1.5* | *1.8* | *0.8* | *1.2* | *0.8* | *0.6* |
| Veneers (631.1) | *7.7* | *11.0* | *11.1* | *10.7* | *11.1* | *11.8* | *12.1* | *12.4* | *11.7* | *9.3* |
| Plywood (631.2) | + | *0.1* | *0.1* | + | + | + | *0.2* | *0.1* | *0.1* | *0.1* |
| Particle board (631.4) | – | – | – | – | – | – | – | *0.1* | + | + |
| Fibreboard (641.6) | – | – | – | + | *0.4* | + | *0.2* | *0.6* | *0.5* | *0.7* |
| Pulp (251) | *4.1* | *3.1* | *3.4* | *4.0* | *3.8* | *3.2* | *3.0* | *5.3* | *4.6* | *3.8* |
| Paper and paperboard (641 excl. 641.6) | *9.8* | *12.8* | *11.5* | *13.8* | *11.1* | *10.9* | *12.9* | *12.5* | *10.8* | *11.3* |
| Other products *c* | *74.7* | *69.9* | *70.6* | *69.1* | *70.6* | *70.4* | *68.0* | *64.8* | *68.3* | *70.8* |
| Total | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* |

*a.* Groups 24, 25, 63 and 64 of S.I.T.C. (Standard International Trade Classification)
*b.* Numbers given in parentheses refer to the revised S.I.T.C.
*c.* Paper and cellulose products; manufactures of wood. Method of calculation: Total 24, 25, 63, 64 S.I.T.C. less "roundwood" to "paperboard"

*Sources:* (1) F.A.O., *Yearbook of Forest Products Statistics*, Rome
(2) *Jahresstatistik des Aussenhandels der Schweiz*

The customs reductions within E.F.T.A. have led to the stability of pulpwood prices over the last eight years despite the fact that forest owners have had increased costs of production. This stability in prices is not attributable to increased imports of lower-priced pulpwood, but to the cheaper import of chemical pulp and mainly industrial paper. These reductions forced the producers of mechanical and chemical pulp to adjust their selling prices to import prices; on the one hand, they were able to do this by internal streamlining of production and, on the other hand, by quoting relatively low prices for pulpwood.

The sawnwood prices for spruce/fir adjusted themselves in the parts of Switzerland bordering Austria to the import prices of such products from Austria, which is Switzerland's greatest supplier of timber. Generally distance itself plays a protective role in such a matter.

Agreements concerning roundwood prices and quantities of the most important assortments to establish a common level for Switzerland as a whole have been made to ensure order in the price system for roundwood. Such agreements have existed in the period under survey for sleepers, impregnated poles, pulpwood and sawlogs of spruce/fir. Here it should be noted that the agreements concerning poles, sleepers and pulpwood establish uniform prices which are binding for the whole of Switzerland, while the agreement involving sawlogs of spruce/fir deals only with standard prices. In

**Table 8:4. Volume of Annual Cut, Selected Years, 1913—1963**
*(thousand cubic metres)*

| Year | Total cut | Of which Industrial wood | Fuelwood |
|---|---|---|---|
| 1913 | 2,470 | 1,170 | 1,300 |
| 1923 | 2,950 | 1,240 | 1,710 |
| 1933 | 2,860 | 1,370 | 1,490 |
| 1943 | 5,250 | 2,225 | 3,025 |
| 1953 | 3,795 | 2,275 | 1,520 |
| 1954 | 3,490 | 2,070 | 1,420 |
| 1955 | 3,750 | 2,300 | 1,450 |
| 1956 | 3,765 | 2,335 | 1,430 |
| 1957 | 3,555 | 2,115 | 1,440 |
| 1958 | 3,560 | 2,120 | 1,440 |
| 1959 | 3,315 | 2,050 | 1,265 |
| 1960 | 3,615 | 2,295 | 1,320 |
| 1961 | 3,690 | 2,410 | 1,280 |
| 1962 | 4,555 | 3,205 | 1,350 |
| 1963 | 4,050 | 2,800 | 1,250 |

*Sources:* (1) F.A.O., European Timber Statistics, 1913, 1923 & 1933, Geneva, 1953
(2) Schweiz. *Forststatistik*, 1943
(3) F.A.O., *World Forest Products Statistics*, 1953 & 1954, Rome, 1957
(4) F.A.O., *Yearbook of Forest Products Statistics*, 1955, ff, Rome

recent years no agreement for the country as a whole has been made in respect of the latter assortment, so the sellers and buyers now make recommendations to their associate members. On the basis of these recommendations the cantons try to bring about such market agreements within their regions.

Tables 8:6 and 8:7 show the price trends for different roundwood assortments, and these figures speak for themselves.

The category "pitprops" is unknown in Switzerland. As far as mechanical pulp and chemical pulp as well as fibreboard and particle board are concerned, the prices of these are never published. However, in general it can be said that these prices have remained very stable during the period under survey. The relative trends in the prices of these products can be seen in Table 8:8

One can say that, as a rule, the prices of sawnwood have risen during the period under survey, while industrial wood stacked has been extraordinarily stable in price. Thus even here it can be seen that on account of increased production the products manufactured industrially (i.e. chemical pulp, fibreboard, etc.) have brought about a reduction in costs, whereas this is not the case with hand-made products.

**Table 8:5. Foreign Trade in Forest Products, Selected Years, 1913—1963**
*(thousand cubic metres roundwood equivalent)*

| Year | *Imports* | | | | *Exports* | | | |
|---|---|---|---|---|---|---|---|---|
| | Sawlogs[a] | Pulp-wood[b] | Fuel-wood[c] | Total | Sawlogs[a] | Pulp-wood[b] | Fuel-wood[c] | Total |
| 1913 | 472 | 252 | 161 | 885 | 83 | 43 | 32 | 158 |
| 1923 | 388 | 438 | 432 | 1,258 | 117 | 119 | 20 | 256 |
| 1933 | 501 | 415 | 215 | 1,131 | 31 | 34 | 4 | 69 |
| 1943 | 109 | 313 | 174 | 596 | 43 | 29 | 3 | 75 |
| 1953 | 311 | 336 | 218 | 865 | 38 | 67 | 23 | 128 |
| 1954 | 407 | 561 | 162 | 1,130 | 45 | 68 | 16 | 129 |
| 1955 | 532 | 1,049 | 179 | 1,760 | 45 | 75 | 22 | 142 |
| 1956 | 557 | 793 | 186 | 1,536 | 44 | 133 | 24 | 201 |
| 1957 | 553 | 754 | 217 | 1,524 | 50 | 101 | 20 | 171 |
| 1958 | 418 | 691 | 136 | 1,245 | 64 | 76 | 25 | 165 |
| 1959 | 491 | 659 | 110 | 1,260 | 78 | 108 | 35 | 221 |
| 1960 | 803 | 871 | 107 | 1,781 | 76 | 142 | 41 | 259 |
| 1961 | 1,112 | 1,333 | 133 | 2,578 | 81 | 115 | 29 | 225 |
| 1962 | 1,313 | 1,025 | 114 | 2,452 | 82 | 115 | 34 | 231 |
| 1963 | 1,121 | 1,146 | 76 | 2,343 | 129 | 109 | 44 | 282 |

*a.* Sawlogs (0.00), sawnwood, sleepers (1.43), veneers and plywood (2.50)
*b.* Pulpwood (0.00). mechanical pulp, chemical pulp (5.00), paper (3.65), paperboard (1.80) and fibreboard (1.60)
*c.* Fuelwood (0.00), charcoal (5.00)

*Scources:* (1) F.A.O., European Timber Statistics, 1913, 1923 & 1933, Geneva,1953
(2) Schweiz. *Forststatistik*, 1943
(3) F.A.O., *World Forest Products Statistics*, 1953 & 1954, Rome, 1957
(4) F.A.O., *Yearbook of Forest Products Statistics*, 1955, ff, Rome

**Table 8:6. Prices of Various Roundwood Assortments**
*(current Sw.Fr. per cubic metre)*

| Year | Industrial wood | | | Fuelwood | |
|---|---|---|---|---|---|
| | Spruce/Fir[a] | Beech[b] | Oak[c] | Spruce/Fir[c] | Oak[c] |
| | *(cu.m solid measure)* | | | *(stacked measure, stere)* | |
| 1953 | 85.50 | 116.80 | 160.50 | 32.70 | 44.60 |
| 1954 | 92.40 | 110.00 | 161.00 | 31.40 | 41.80 |
| 1955 | 106.40 | 114.90 | 169.40 | 32.10 | 41.30 |
| 1955/56 | 111.60 | 119.80 | 152.90 | 33.20 | 41.90 |
| 1956/57 | 110.00 | 120.30 | 152.00 | 34.50 | 43.00 |
| 1957/58 | 107.60 | 113.20 | 141.00 | 34.60 | 41.40 |
| 1958/59 | 102.80 | 104.40 | 137.60 | 33.10 | 37.10 |
| 1959/60 | 105.70 | 99.50 | 134.70 | 31.80 | 33.50 |
| 1960/61 | 115.80 | 105.20 | 137.60 | 31.80 | 33.20 |
| 1961/62 | 128.90 | 104.90 | 142.40 | 32.40 | 34.10 |
| 1962/63 | 121.80 | 107.00 | 140.60 | 32.40 | 35.20 |
| 1963/64 | 121.00 | 107.60 | 141.70 | 32.80 | 36.20 |

*a.* Sawlogs (different classes)
*b.* Class III, Quality n
*c.* Splitwood, Quality I
*Source:* Data supplied by the Swiss Federal Office of Price Control, Berne

**Table 8:7. Timber Prices in Switzerland, 1953—1964**
*(Swiss francs)*

| Year | Fuelwood[a] *per stere* | Pulpwood[b] *per $m^3y$* | Coniferous sawlogs[c] free sawmill *per $m^3y$* | Coniferous sawnwood[d] *per $m^3s$* |
|---|---|---|---|---|
| 1953 | 32.7 | 73.4 | 85.5 | 161.0 |
| 1954 | 31.4 | 73.4 | 92.4 | 164.6 |
| 1955 | 32.6 | 76.4 | 106.9 | 189.8 |
| 1956 | 33.5 | 81.6 | 110.7 | 197.1 |
| 1957 | 35.2 | 82.5 | 109.3 | 193.8 |
| 1958 | 34.3 | 82.5 | 105.1 | 184.2 |
| 1959 | 32.6 | 82.5 | 103.5 | 178.4 |
| 1960 | 31.8 | 82.5 | 110.05 | 187.7 |
| 1961 | 31.8 | 82.5 | 123.20 | 213.2 |
| 1962 | 32.4 | 82.5 | 125.90 | 232.7 |
| 1963 | 32.6 | 85.2 | 121.20 | 227.9 |

*a.* Fuelwood, spruce, delivered nearest railway station, not loaded
*b.* Spruce, Class I, without bark, delivered free at standard gauge railway, loaded on wagon, average buying price
*c.* Spruce, delivered nearest railway station
*d.* Spruce, Class II/III, sawfelled
*Sources:* F.A.O./E.C.E., *Timber Bulletin for Europe*, Vol. XIV, No. 2, Geneva, 1964; and Vol. XVIII, No. 2, New York, 1965

### *8.1.4 Structure of the Labour Market and Movements of Wages*

No factual details can be given for Switzerland in this matter, because the labour market conditions differ from canton to canton and even within the cantons they differ from district to district.

As far as forestry is concerned, it can be stated that labour contracts between forestry enterprises and trade unions exist only for a few public forest properties. Without exception these agreements are directly concerned with the rights and duties of those employed in construction work. For the other forest properties, which number more than 4,000, there are no direct wage agreements; however, even in these the rates paid follow those of construction workers in the immediate neighbourhood. In Switzerland, the supply of forest labour is decreasing constantly; this can be attributed not only to the relatively poor wages of forest workers, but also to the drift to industry, where working conditions also are better. Forest owners have tried to stop this drift by various means. Among these can be mentioned over-proportionate wage increases, payment of increased social benefits, the introduction of special forest-worker training courses of three years' duration with the possibilities of promotion to the post of ranger, the introduction of mechanisation into forestry work, the employment of forest workers on a permanent basis, etc.

The situation for those employed in the various wood-processing industries is quite different from that of logging workers. In the wood-processing industries the wages and social benefits are established by the collective

**Table 8:8. Relative Prices of Roundwood and Processed Forest Products, 1953—1962**
*(1953=100)*

| Year | Pulpwood[a] | Coniferous sawlogs[b] (with bark) | Mechanical pulp[c] | Chemical pulp[d] | Particle board[e] | Fibreboard | |
|---|---|---|---|---|---|---|---|
| | | | | | | non-compressed[f] | compressed[g] |
| 1953 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1954 | 100 | 100 | 99 | 87 | 100 | 100 | 100 |
| 1955 | 104 | 100 | 99 | 87 | 100 | 100 | 100 |
| 1956 | 111 | 100 | 105 | 93 | 100 | 100 | 100 |
| 1957 | 113 | 114 | 105 | 93 | 100 | 100 | 100 |
| 1958 | 113 | 114 | 105 | 87 | 100 | 100 | 100 |
| 1959 | 113 | 102 | 100 | 81 | 100 | 100 | 100 |
| 1960 | 113 | 102 | 100 | 81 | 86 | 100 | 100 |
| 1961 | 113 | 102 | 100 | 81 | 86 | 92 | 90 |
| 1962 | 113 | 102 | 100 | 81 | 86 | 92 | 90 |

*a.* Spruce, Class I, without bark. F.A.O./E.C.E.
*b.* Free mill. F. Häring
*c.* Finely ground, V.S.P.P.F.
*d.* Cellulose, Class Ia, bleached. V.S.P.P.F.
*e.* Board, 19 mm, unsmoothed, Novapan
*f.* Board, 12.5 mm. Pavatex
*g.* Board, 3.5 mm. Pavatex
*Source:* Department of Forest Economics, Federal Institute of Technology, Zurich

agreements which, as a rule, are binding for the industry and without the possibility of the individual employers being able to modify them. Although the sawmilling industry is not in a position to offset these constant wage increases by internal rationalisation and consequently is forced to add the increased wage costs to the price of its products, the wood-processing industries have been able to absorb more or less successfully the internal wage increases.

There are no statistics of the numbers working in forestry in Switzerland. Anyway such statistics would not show very much as in very many districts the felling is done by workers not permanently employed in forestry. Periodically a census is carried out. According to the 1955 census there were employed in 3,080 public forest enterprises (75 per cent of the total number) 37,448 men working in forests and 2,073 women. On the basis of the permanence of the employment of labour the forest enterprises fall into the following categories:

25 forest enterprises employed only permanent forest workers;
592 forest enterprises employed both permanent and non-permanent forest workers;
2,463 forest enterprises employed only non-permanent forest workers.

Thus of the 3,080 forest enterprises under one per cent employed solely permanent forest workers and 80 per cent used only non-permanent employees.

The marked participation of the rural population in forest work is evidenced by the fact that the main occupation of 68 per cent of the non-permanent forest workers is farming, while a further 12 per cent also find a secondary occupation in agriculture.

A new census was made in 1965, but the full results are not yet available.

One cannot give a uniform figure for the labour productivity in respect of timber felling and extraction, because Swiss silvicultural practice is carried out at different levels of intensity.

Table 8:9 shows the very different distribution of total hours worked in four different forest enterprises. From Table 8:10 it can be seen that even within the same forest enterprise the total annual number of hours worked fluctuates from year to year and thus is not necessarily related to the annual timber cut.

The Central Bureau of Forestry at Solothurn publishes annually the trends in the wages of forest workers; these have been tabulated in Table 8:11. It is not possible to establish any difference in wage payments between "fellers", "transport workers" and "other forest workers", because in Switzerland individual workers tackle all jobs.

In Switzerland even the social benefits and social charges differ from place to place and only accident insurance, old age pensions and disability pensions are established on a national basis.

**Table 8:9. Distribution of Working Time in four Forest Enterprises**

| | I[a] | II[b] | III[c] | IV[d] |
|---|---|---|---|---|
| **I. Percentage distribution of hours worked annually** | | | | |
| *Nature of work* | | | | |
| Logging and transport | *44* | *68* | *64* | *67* |
| Care of stands (tending) | *9* | *8* | *15* | *7* |
| Establishment of stands (planting) | *18* | — | *6* | *7* |
| Road building | *10* | *12* | — | *4* |
| Holidays | *10* | *8* | *8* | *8* |
| Miscellaneous | *9* | *4* | *7* | *7* |
| Total | *100* | *100* | *100* | *100* |
| **II. Hours worked annually per ha** | | | | |
| *Nature of work* | | | | |
| Logging and transport | 53 | 29 | 39 | 67 |
| Care of stands (tending) | 11 | 4 | 9 | 7 |
| Establishment of stands (planting) | 22 | — | 4 | 7 |
| Road building | 12 | 5 | — | 4 |
| Holidays | 12 | 3 | 4 | 8 |
| Miscellaneous | 11 | 2 | 4 | 7 |
| Total | 121 | 43 | 60 | 100 |

*a.* Experimental and training forest of the Federal Institute of Technology, Zurich, 1957
*b.* Forest Administration of the City of Chur, 1957
*c.* Communal Forest of Neuhausen am Rhein, 1956
*d.* Hofgut Löwenburg, 1958 Plan

*Source:* H. Steinlin, "*Probleme der Arbeitsorganisation im Forstbetrieb*" in *Der Forst- und Holzwirt*, 16 May 1959

**Table 8:10. Distribution of Hours Worked in the Forests of Canton Zug**

| | 1962 | 1963 | 1964 |
|---|---|---|---|
| Total No. of hours worked | 12,432 | 12,414 | 16,358 |
| *Percentage* of hours worked spent on: | | | |
| Cutting, limbing and selecting Xmas trees | *46* (5,763 hours) | *63* (7,776 hours) | *51* (8,250 hours) |
| Clearing of felling area | *4* | *1* | *1* |
| Nursery work / Planting out | *8* | *6* / *2* | *3* / *5* |
| Care of young stands | *5* | *4* | *4* |
| Road maintenance | *14* | *10* | *18* |
| Construction of new roads | *2* | *6* | *7* |
| Improvements of buildings | *14* | *4* | *6* |
| Snow clearance | *4* | *1* | *1* |
| Indoor work | *2* | *2* | *2* |
| Miscellaneous | *1* | *1* | *2* |
| Total cut in cu.m | 1,313 | 1,212 | 1,318 |
| Forested area in ha | 233 | 234 | 263 |

*Source:* Annual Reports of the Forest Administration of the Canton Zug

In forestry in Switzerland the following wage bonuses, fringe benefits and social benefits exist:

A. *Wage bonuses and fringe benefits*
Overtime, night work and Sunday work
Extra pay for special tasks
Clothing allowance
Tool allowance
Danger money; extra pay for dirty work
Travelling allowance
Meal allowance
Payment for idle time due to inclement weather

B. *Social benefits*
Holidays with pay
Bank holidays
Payment for accidents and illness
Compensation for loss of earning on account of old age
Funeral allowance
Children's allowance
Unemployment insurance
Payment of wages during National Service
Paid leave on special occasions
Awards for long service
Additional pay for long service
Payment in kind (e.g. free fuelwood).

**Table 8:11. Wage Trends in Forestry, 1953—1962**
(*current Sw.Fr.*)

| Year | Hourly wage | | | Carter's wage (one-horse vehicle) per day | | |
|---|---|---|---|---|---|---|
| | All Switzerland | Lowland | Alps | All Switzerland | Lowland | Alps |
| 1953 | 2.15 | 2.19 | 2.03 | 31.90 | 32.00 | 31.75 |
| 1954 | 2.19 | 2.24 | 2.06 | 32.65 | 32.85 | 32.50 |
| 1955 | 2.26 | 2.32 | 2.14 | 33.30 | 33.40 | 33.25 |
| 1956 | 2.36 | 2.40 | 2.24 | 34.15 | 34.15 | 34.15 |
| 1957 | 2.50 | 2.56 | 2.34 | 35.80 | 35.95 | 36.00 |
| 1958 | 2.60 | 2.67 | 2.42 | 37.15 | 36.80 | 36.70 |
| 1959 | 2.74 | 2.76 | 2.61 | 38.15 | 37.10 | 38.55 |
| 1960 | 2.81 | 2.89 | 2.64 | 39.00 | 38.00 | 39.60 |
| 1961 | 3.02 | 3.09 | 2.86 | 40.80 | 39.20 | 41.50 |
| 1962 | 3.32 | 3.42 | 3.15 | 44.30 | 43.65 | 45.20 |

*Source:* Solothurn, *Wald und Holz*, various years

Calculations from four forest districts show that these social benefits can vary between 5 and 50 per cent of the basic wages. One can estimate that in the Lowland social benefits to-day amount to 40 per cent for the permanently employed forest workers, and eight per cent for the non-permanent forest workers.

### *8.1.5 Main Features of the Swiss Forestry and Forest Industries*

*Forestry*

Table 8:12 shows the size of the forest area of Swiss forests by owner categories; the average area for the public forest districts is 163 hectares, while for forests under private ownership the average is only 1.9 hectares. Considering the fact that the forests in all ownership categories consist of

**Table 8:12. Forest Enterprises, Forest Land and Average Forest Area per Forest Enterprise, by Ownership Categories**
*(All Switzerland)*

| Type of Ownership | Forest enterprises | Forest land | Average forest area per enterprise |
|---|---|---|---|
| | | *ha* | *ha* |
| Federal forests | 50 | 1,977 | 40 |
| Cantonal forests | 52 | 45,934 | 883 |
| Political community forests | 1,568 | 256,557 | 164 |
| Citizen community forests | 1,121 | 222,026 | 198 |
| Ecclesiastical forests | 253 | 2,691 | 11 |
| School and special purpose forests | 37 | 284 | 8 |
| Corporation and co-operative forests | 955 | 138,498 | 145 |
| Forests belonging to foundations, etc. | 82 | 3,558 | 43 |
| Public forests | 4,118 | 671,525 | 163 |
| Farmer-owned forests: | | | |
| Main occupation | 80,927[a] (80,530) | 134,502 | 1.7 |
| Secondary occupation | 15,491[b] (15,439) | 14,647 | 0.9 |
| Forests under other private ownership | 15,300 | 60,842 | 4.0 |
| Horticultural enterprises | 347 | 222 | 0.6 |
| Forests under private ownership | 112,065 (111,616) | 210,213 | 1.9 |
| Forests of all ownership categories | 116,183 (115,734) | 881,738 | 7.6 |

*a.* of which 397 of unspecified area
*b.* of which 52 of unspecified area
*Source:* 4th Swiss Federal Census of Enterprises, 1955:
Vol. 2 in *Stat. Quellenwerke der Schweiz*, No. 309, Table 2
Vol. 3 in *Stat. Quellenwerke der Schweiz*, No. 310, Tables 4-4c

several lots, it is evident that forest management in Switzerland is chiefly involved with small units and mini-units. Improvements of the area structure of forestry are brought about by amalgamations of forest properties.

Under the Swiss constitution and law the forest area of Switzerland must be maintained. Efforts are made to enlarge the forested areas in mountain torrent valleys and in places subject to avalanches.

Swiss forests are quite easily accessible on the whole. This is especially so in the Lowland and the Jura; also the lower parts of the mountain forests are accessible. The steep mountain slopes are now being opened up using long and medium-length cable cranes.

Wood-processing industries are scattered throughout the country and thus there is no definite processing centre, whereas the large wood-based industries are to be found in the Lowland and at the foot of the Jura mountains. Consequently, it is not possible to give any average distance from forest to factory. Certainly the distances are the greatest for pulpwood (but even here they would as an average hardly be more than 50 km.) and the shortest for sawlogs (approximately 15 km.) as well as obviously for fuelwood.

*Forest Industries*

Table 8:13 gives the roundwood consumption by individual wood-using industries; the table shows that the increase has been very rapid in the case of particle board and slower for sawnwood.

**Table 8:13. Roundwood Consumption by Wood-based Industries, 1950—1962**
*(cubic metres roundwood equivalent)*[a]

| Year | Sawnwood | | Plywood | | Woodpulp (chemical and mechanical) | | Fibreboard | | Particle board | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $m^3$ | % | $m^3$ | % | $m^3$ | % | $m^3$ | % | $m^3$ | % |
| 1950 | 1,580,000 | *72* | 47,500 | *2* | 545,000 | *25* | 21,000 | *1* | 3,000 | *0* |
| 1955 | 1,870,000 | *70* | 55,000 | *2* | 685,000 | *26* | 29,000 | *1* | 33,000 | *1* |
| 1959 | 1,610,000 | *64* | 60,000 | *2* | 770,000 | *30* | 30,000 | *1* | 76,000 | *3* |
| 1960 | 1,920,000 | *65* | 68,000 | *2* | 835,000 | *29* | 32,000 | *1* | 82,000 | *3* |
| 1961 | 1,940,000 | *63* | 75,000 | *2* | 905,000 | *30* | 35,000 | *1* | 115,000 | *4* |
| 1962 | 2,070,000 | *64* | 75,000 | *2* | 925,000 | *29* | 40,000 | *1* | 125,000 | *4* |

*a*. Conversion factors: 1 $m^3$ sawnwood = 1.67 $m^3$ roundwood
1 $m^3$ plywood = 2.5 $m^3$ roundwood
1 ton mechanical pulp = 2.55 $m^3$ roundwood
1 ton chemical pulp = 5.04 $m^3$ roundwood
1 ton fibreboard = 1.6 $m^3$ roundwood
1 ton particle board = 1.82 $m^3$ roundwood

*Source:* Department of Forest Economics, Federal Institute of Technology, Zurich

*8.1.6 Concluding Remarks*

From the trends between 1952 and 1962 slightly wrong conclusions could be drawn for the present state of forestry and the forest industries in Switzerland. The Federal programme to contain the economic boom (restrictions for imported labour, credit and building programmes) plus the reduction of import duties under the E.F.T.A. agreement have resulted in a rapid deterioration in the position of forestry since 1962. The wages of forest workers have risen greatly and continuously, while the roundwood prices have remained the same or have fallen. This has resulted in that to-day particularly mountain forestry to some extent no longer has any operating surplus and even shows a deficit.

## 8.2 Costs and Revenue of Forest Production

*8.2.1 General Remarks*

The main source of the statistical material from which Tables 8:14—8:23 have been compiled is the Swiss Forest Statistics (*Schweizerische Forststatistik —SFS*), while additional source material has been provided by the reports of the Federal Inspectorate for Forestry for 1955-1962.

The public forests consist of State forests and other publicly owned forests. They represent 70.3 per cent of the productive forest area and 72.8 per cent of the total forest area of Switzerland.

The statistical material of the individual regions refers only to the productive forest area of the public forests in four typical cantons for each of the regions. For each region the average has been calculated on the basis of the data from the four appertaining cantons.

The three regions and their respective cantons are as follows:

| | |
|---|---|
| *Region A—Jura* | Cantons Solothurn (SO), Basel-Land (BL), Schaffhausen (SH), Neuenburg (NE). |
| *Region B—Lowland* | Cantons Zürich (ZH), Luzern (LU), Freiburg (FR), Thurgau (TG). |
| *Region C—Alps* | Cantons Uri (UR), Graubünden (GR), Tessin (TI), Wallis (VS). |

Productive forest area of public forests by regions in hectares and percentage of the productive forest area of all public forests in Switzerland (S.F.S. 1962)

| | | ha | % |
|---|---|---|---|
| Region A—Jura: | SO, BL, SH, NE | 59,157 | *9* |
| Region B—Lowland: | ZH, LU, FR, TG | 60,898 | *9* |
| Region C—Alps: | UR, GR, TI, VS | 267,851 | *40* |
| Total for selected cantons | | 387,906 | *58* |
| All public forests of Switzerland | | 675,595 | *100* |

*Total Annual Cut* = all roundwood felled and measured during the financial year and for which the costs of felling, preparation and extraction have been paid.

### *8.2.2 Special Remarks on Assessment of Revenue and Costs*

*Gross Revenue* = income from timber sold plus market value of free timber and of timber for own use. The calculation of the gross revenue per $m^3y$ is based on the actual cut and not on the amount of timber delivered (i.e. timber sold in the financial year, plus delivered free timber and timber for own use).

The gross revenue also includes the income from the sales of standing timber, which in terms of $m^3y$ is considerably lower, as the logging and transport costs have to be defrayed by the buyer. To a certain degree stumpage sales are still made by the municipal authorities in the mountain cantons.

*Logging Costs*

Harvesting and extraction costs = expenditures for felling, skidding and transport for the total timber output, including costs of non-permanent cable cranes, hutments and the like in distant felling areas.

To ascertain the *logging costs per $m^3y$* one must take as the basis for calculation the total annual cut given by the S.F.S.; this includes sales of standing timber. However, no logging costs are paid by the forest enterprise in connection with stumpage sales, as these costs are defrayed by the buyer.

*Sawlogs* are normally delivered by the seller at the roadside where motor transport can be used. Other *industrial wood* is in almost 100 per cent of the cases delivered by the seller free to the nearest railway station.

*Silvicultural Costs* = expenditure for establishment and improvement of stands and for nurseries.

*Administrative Costs*

The object account of these costs can be grouped as follows:

a. Payment of wages, salaries and social charges for senior and subordinate forest staff. As far as forest staff working in privately owned forests is concerned or who have to carry out any non-forestry work, an appropriate deduction is made in the reports to the S.F.S.
b. Travelling allowances for senior and subordinate forest personnel (including technical assistants), payment of salaries for office personnel, payments to outside administrative personnel for certain forestry activities, office rent, office materials, postage, telephones, etc.
c. Costs of the drawing up of working plans (excluding wages for auxiliary workers), maintenance costs for tools, insofar as these are not included in the individual cost items.

It has not been possible to make adjustments in the data for *expenditures on overheads* not directly connected with forestry operations. The S.F.S. data covers expenditure on administration as a whole without specifying separately these overhead costs.

Inasmuch as it is possible to separate the administrative costs for torrent control and the prevention of avalanches as well as for afforestation, these are grouped together under the heading "permanent installations" by the S.F.S.

*Maintenance Costs* = expenditures for the maintenance of roads and other permanent transport facilities, e.g. permanent cable cranes.

Maintenance of "protective constructions and drainage" which are included in the cost account of S.F.S. in the "maintenance costs" for specific forestry purpose. Consequently, the outlay for maintenance of drainage and for minor improvements, which ought to be considered as actual operating costs, have not been included in the tables. However, these can be regarded as of minor consequence.

In the calculation of maintenance costs of roads, the fact that these roads may be used for purposes other than forestry has not been taken into consideration.

*Costs for Improvement and Expansion*

The object account of these cost items can be grouped as follows:

a. Expenditure for road construction, permanent timber slides and cable cranes. Also the costs of land acquisition necessary for the layout of roads are included here. The contribution which is made by third parties, e.g. subsidies by the Confederation and the cantons, have not been deducted from the construction costs of the permanent installations. The fact that the roads may be used for purposes other than forestry (for example, to provide access to alpine pastures) has not been taken into consideration here.

b. Expenditure for marking, surveying, consolidation of forest properties, protection for timber stocks, etc. On the other hand, costs of forest acquisition, forest workers' accommodation, abolition of estate charges (servitutes) have not been taken into consideration by the S.F.S.

For the "Public Forests" both for the whole country ("All Public Forests") and for the individual regions, the expenditure on "Afforestation and construction against avalanches and for torrent control" can be ascertained from the annual reports of the Federal Inspectorate of Forestry in as far as subsidised projects are concerned. In Switzerland the mentioned constructions for the most part do not constitute improvements and extension of the productive capacity of the forests, but serve other purposes. Consequently, the expenditure on these permanent installations is not included in "costs for improvement and expansion" in the "Public Forests".

However, the tables regarding the "Municipal and Corporation Forests, managed by a Forest Engineer" (=*technisch bewirtschaftet*) contain also the expenditure for afforestation and protection as the separation of these cost items by owner categories is difficult.

Under the heading "Afforestation" have been included the costs of such nurseries which produce planting stock solely for the purpose of afforestation.

*Taxes*

Taxes are not given in the S.F.S. data because the taxation system and rates vary greatly from canton to canton. For this reason it has not been possible to introduce any tax amounts into the cost-revenue study.

*Distribution of Social Charges*

Under the heading "Insurance and sundry charges" the premiums for accident, employers' liability and fire insurance have been included in the S.F.S. figures, as far as they are defrayed by the employers and concern the forest enterprises proper. In addition, there are the social charges for the managerial staff and forest workers in those cases where such costs are not already included under other cost items.

The social charges have been distributed proportionally on the total amounts of the individual object accounts in question (logging, silviculture, maintenance, permanent installations). It is true that this method is somewhat crude, as the total amounts which have been used as a basis for the distribution contain not only the actual amount of wages involved with these object accounts but also other cost items (for materials) and perhaps even a part of the social charges. However, even if wages and materials could be separated in cost accounts it would not be easy to attain a proper distribution of the social charges, because not all of the social charges are proportional to wages. Nevertheless, in the given circumstances there is no better method than the one which has been used.

**Table 8:14. Income and Expenditure in the Public Forests of Switzerland**
*(Annual average in 1962 value of Sw.Fr. per $m^3y$ of the total cut)*

| Period | 1955—1957 | | | | 1958—1962 | | | |
|---|---|---|---|---|---|---|---|---|
| Region | All Public Forests | Region A Jura | Region B Lowland | Region C Alps | All Public Forests | Region A Jura | Region B Lowland | Region C Alps |
| Volume of cut: annual average, 1000 $m^3y$ | 2,439 | 292 | 346 | 507 | 2.530 | 317 | 408 | 419 |
| 1. Gross revenue | 79.95 | 77.56 | 91.05 | 73.97 | 75.85 | 70.52 | 82.70 | 73.88 |
| 2. Logging costs | 23.48 | 24.52 | 21.71 | 27.43 | 25.25 | 25.19 | 24.30 | 29.42 |
| 3. Net conversion surplus | 56.47 | 53.03 | 69.34 | 46.54 | 50.60 | 45.34 | 58.39 | 44.47 |
| 4. Silvicultural costs | 4.04 | 5.65 | 6.79 | 0.76 | 4.62 | 5.75 | 6.59 | 1.23 |
| 5. Administrative costs | 6.34 | 9.84 | 7.26 | 3.71 | 7.27 | 10.30 | 7.23 | 5.32 |
| 6. Maintenance costs | 2.61 | 2.76 | 2.49 | 1.29 | 2.77 | 2.26 | 2.43 | 1.93 |
| 7. Costs for improvement and expansion | 5.58 | 7.09 | 5.38 | 6.85 | 7.05 | 8.97 | 6.04 | 9.34 |
| 8. Total managing costs (4—7) | 18.57 | 25.35 | 21.92 | 12.63 | 21.71 | 27.29 | 22.30 | 17.82 |
| 9. Total costs (2+8) | 42.05 | 49.87 | 43.64 | 40.06 | 46.95 | 52.47 | 46.60 | 47.24 |
| 10. Operating profit | 37.90 | 27.69 | 47.41 | 33.91 | 28.90 | 18.05 | 36.09 | 26.64 |

**Table 8:15. Income and Expenditure in the Municipal and Corporation Forests of Switzerland**
*(Annual average in 1962 value of Sw.Fr. per $m^3$y of the total cut)*

| Period | 1955—1957 | | | | 1958—1962 | | | |
|---|---|---|---|---|---|---|---|---|
| Region | Total Forests | Region A Jura | Region B Lowland | Region C Alps | Total Forests | Region A Jura | Region B Lowland | Region C Alps |
| Volume of cut: annual average, $m^3$y | 397,051 | 121,378 | 186,680 | 88,993 | 426,325 | 133,885 | 225,733 | 66.707 |
| 1. Gross revenue | 85.14 | 85.07 | 85.43 | 84.71 | 78.85 | 78.18 | 78.85 | 80.59 |
| 2. Logging costs | 27.13 | 26.64 | 23.82 | 33.83 | 28.17 | 28.55 | 26.00 | 34.46 |
| 3. Net conversion surplus | 58.01 | 58.43 | 61.61 | 50.88 | 50.68 | 49.63 | 52.85 | 46.13 |
| 4. Silvicultural costs | 5.03 | 5.82 | 6.66 | 1.00 | 5.74 | 6.78 | 6.34 | 2.23 |
| 5. Administrative costs | 9.78 | 11.23 | 11.15 | 4.94 | 10.30 | 11.02 | 10.73 | 7.86 |
| 6. Maintenance costs | 3.70 | 4.47 | 3.93 | 2.21 | 3.58 | 4.27 | 3.69 | 2.18 |
| 7. Costs for improvement and expansion | 5.21 | 4.21 | 6.22 | 4.53 | 7.19 | 6.50 | 6.40 | 11.24 |
| 8. Total managing costs (4—7) | 23.72 | 25.73 | 27.96 | 12.68 | 26.81 | 28.57 | 27.16 | 23.51 |
| 9. Total costs (2+8) | 50.85 | 52.37 | 51.78 | 46.51 | 54.98 | 57.12 | 53.16 | 57.97 |
| 10. Operating profit | 34.29 | 32.70 | 33.65 | 38.20 | 23.87 | 21.06 | 25.69 | 22.62 |

**Table 8:16. Income and Expenditure in the Public Forests of Switzerland**
*(Annual average in 1962 value of Sw.Fr. per ha productive forest land)*

| Period | 1955—57 | | | | 1958—1962 | | | |
|---|---|---|---|---|---|---|---|---|
| Region | All Public Forests | Region A Jura | Region B Lowland | Region C Alps | All Public Forests | Region A Jura | Region B Lowland | Region C Alps |
| Forest area, ha | 670,931 | 58,784 | 60,333 | 266,979 | 674,309 | 58,995 | 60,772 | 267,662 |
| 1. Gross revenue | 290.55 | 385.22 | 522.21 | 140.13 | 284.95 | 378.47 | 558.72 | 115.73 |
| 2. Logging costs | 85.27 | 121.75 | 124.52 | 51.88 | 94.93 | 135.19 | 164.50 | 46.06 |
| 3. Net conversion surplus | 205.28 | 263.69 | 397.88 | 88.24 | 190.02 | 243.28 | 394.22 | 69.67 |
| 4. Silvicultural costs | 14.67 | 28.17 | 38.94 | 1.45 | 17.09 | 30.53 | 42.05 | 1.93 |
| 5. Administrative costs | 23.01 | 48.79 | 41.63 | 7.00 | 27.19 | 55.12 | 47.33 | 8.48 |
| 6. Maintenance costs | 9.45 | 13.63 | 14.28 | 2.42 | 10.28 | 11.99 | 15.61 | 3.02 |
| 7. Costs for improvement and expansion | 20.22 | 35.22 | 30.82 | 12.85 | 26.28 | 47.42 | 39.38 | 14.48 |
| 8. Total managing costs (4—7) | 67.37 | 125.83 | 125.69 | 23.74 | 80.86 | 145.07 | 144.37 | 27.91 |
| 9. Total costs (2+8) | 152.64 | 247.60 | 250.22 | 75.63 | 175.81 | 280.27 | 308.87 | 73.97 |
| 10. Operating profit | 137.89 | 137.58 | 272.19 | 64.50 | 109.15 | 98.10 | 249.85 | 41.76 |

**Table 8:17. Income and Expenditure in the Municipal and Corporation Forests of Switzerland**
*(Annual average in 1962 value of Sw.Fr. per ha productive forest land)*

| Period | 1955—1957 | | | | 1958—1962 | | | |
|---|---|---|---|---|---|---|---|---|
| Region | Total Forests | Region A Jura | Region B Lowland | Region C Alps | Total Forests | Region A Jura | Region B Lowland | Region C Alps |
| Forest area, ha | 84,804 | 25,155 | 27,503 | 32,146 | 83,326 | 25,534 | 27,294 | 30.498 |
| 1. Gross revenue | 398.35 | 410.45 | 579.74 | 233.45 | 404.14 | 409.94 | 653.66 | 176.40 |
| 2. Logging costs | 126.90 | 128.57 | 163.09 | 93.17 | 144.47 | 149.87 | 216.34 | 75.41 |
| 3. Net conversion surplus | 271.45 | 281.88 | 416.65 | 140.28 | 259.67 | 260.07 | 437.32 | 100.99 |
| 4. Silvicultural costs | 23.55 | 28.10 | 45.18 | 2.75 | 28.63 | 35.29 | 49.24 | 4.87 |
| 5. Administrative costs | 45.77 | 54.10 | 75.72 | 13.60 | 52.22 | 57.74 | 86.12 | 17.22 |
| 6. Maintenance costs | 17.36 | 21.51 | 26.70 | 6.12 | 17.96 | 22.23 | 29.13 | 4.77 |
| 7. Costs for improvement and expansion | 24.30 | 20.24 | 42.26 | 12.18 | 36.43 | 34.09 | 51.31 | 24.74 |
| 8. Total managing costs (4—7) | 110.98 | 123.95 | 189.86 | 34.65 | 135.24 | 149.35 | 215.80 | 51.60 |
| 9. Total costs (2+8) | 237.88 | 252.52 | 352.95 | 127.82 | 279.71 | 299.22 | 432.14 | 127.02 |
| 10. Operating profit | 160.48 | 157.94 | 226.75 | 105.63 | 124.41 | 110.72 | 221.49 | 49.38 |

**Table 8:18. Cost-Revenue Coefficients in the Public Forests of Switzerland**
*(Averages 1955—1957 and 1958—1962)*

| Period | 1955—1957 | | | | 1958—1962 | | | |
|---|---|---|---|---|---|---|---|---|
| Region | All Public Forests | Region A Jura | Region B Lowland | Region C Alps | All Public Forests | Region A Jura | Region B Lowland | Region C Alps |
| 1. Gross revenue | 1.000 | 1.000 | 1 000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 2. Logging costs | 0.294 | 0.316 | 0.238 | 0.371 | 0.333 | 0.357 | 0.294 | 0.398 |
| 3. Silvicultural costs | 0.050 | 0.073 | 0.074 | 0.010 | 0.061 | 0.081 | 0.080 | 0.017 |
| 4. Administrative costs | 0.079 | 0.127 | 0.080 | 0.050 | 0.096 | 0.146 | 0.087 | 0.072 |
| 5. Maintenance costs | 0.033 | 0.035 | 0.027 | 0.017 | 0.036 | 0.032 | 0.029 | 0.026 |
| 6. Costs for improvement and expansion | 0.070 | 0.091 | 0.059 | 0.093 | 0.093 | 0.127 | 0.073 | 0.126 |
| 7. Total managing costs (3—6) | 0.232 | 0.327 | 0.241 | 0.170 | 0.286 | 0.387 | 0.269 | 0.241 |
| 8. Total costs (2+7) | 0.526 | 0.643 | 0.479 | 0.541 | 0.619 | 0.744 | 0.563 | 0.639 |

**Table 8:19. Managerial Costs as Percentage of the Net Conversion Surplus in the Public Forests of Switzerland**
*(Averages 1955—1957 and 1958—1962)*

| Period | 1955—1957 | | | | 1958—1962 | | | |
|---|---|---|---|---|---|---|---|---|
| Region | All Public Forests | Region A Jura | Region B Lowland | Region C Alps | All Public Forests | Region A Jura | Region B Lowland | Region C Alps |
| 1. Net conversion surplus | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 2. Silvicultural costs | 7 | 11 | 10 | 2 | 9 | 13 | 11 | 3 |
| 3. Administrative costs | 11 | 18 | 10 | 8 | 14 | 23 | 12 | 12 |
| 4. Maintenance costs | 5 | 5 | 4 | 3 | 5 | 5 | 4 | 4 |
| 5. Costs for improvement and expansion | 10 | 13 | 8 | 15 | 14 | 20 | 10 | 21 |
| 6. Total | 33 | 47 | 32 | 28 | 43 | 60 | 38 | 40 |

**Table 8:20. Income and Expenditure in the Public Forests of Switzerland, Annual Average, 1955—1962**
*(Sw.Fr. per m³y of the total cut)*

| Year/Period | 1955 | 1956 | 1957 | 1955—57 | 1955—57 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—62 | 1958—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Sw.Fr. (current values)* | | | | *Sw. Fr. (1962 value)* | *Sw.Fr. (current values)* | | | | | | *Sw. Fr. (1962 value)* |
| 1. Gross revenue | 68.00 | 74.93 | 72.36 | 71.77 | 79.95 | 68.99 | 67.03 | 69.30 | 76.74 | 78.44 | 72.10 | 75.85 |
| 2. Logging costs | 19.47 | 21.61 | 22.17 | 21.08 | 23.48 | 22.46 | 23.36 | 23.29 | 24.55 | 26.31 | 23.99 | 25.25 |
| 3. Net conversion surplus | 48.53 | 53.32 | 50.19 | 50.68 | 56.47 | 46.53 | 43.67 | 46.01 | 52.19 | 52.13 | 48.11 | 50.60 |
| 4. Silvicultural costs | 3.24 | 3.61 | 4.05 | 3.63 | 4.04 | 4.34 | 4.95 | 4.38 | 4.67 | 3.52 | 4.37 | 4.62 |
| 5. Administrative costs | 5.17 | 5.73 | 6.18 | 5.69 | 6.34 | 6.56 | 6.92 | 6.90 | 7.40 | 6.73 | 6.90 | 7.27 |
| 6. Maintenance costs | 1.96 | 2.33 | 2.75 | 2.35 | 2.61 | 2.72 | 2.78 | 2.57 | 2.83 | 2.21 | 2.62 | 2.77 |
| 7. Costs for improvement and expansion | 4.41 | 4.39 | 6.25 | 5.01 | 5.58 | 6.55 | 7.22 | 5.90 | 7.37 | 6.38 | 6.68 | 7.05 |
| 8. Total managing costs (4—7) | 14.79 | 16.06 | 19.23 | 16.69 | 18.57 | 20.17 | 21.87 | 19.75 | 22.27 | 18.84 | 20.58 | 21.71 |
| 9. Total costs (2+8) | 34.25 | 37.67 | 41.40 | 37.77 | 42.05 | 42.63 | 45.23 | 43.04 | 46.82 | 45.15 | 44.57 | 46.95 |
| 10. Operating profit | 33.75 | 37.26 | 30.96 | 33.99 | 37.90 | 26.36 | 21.80 | 26.26 | 29.92 | 33.29 | 27.53 | 28.90 |

**Table 8:21. Income and Expenditure in the Public Forests of Switzerland, Region A—Jura, Annual Average, 1955—1962**
*(Sw.Fr. per m³y of the total cut)*
The Selected Cantons are: Solothurn, Basel-Land, Schaffhausen, Neuenburg

| Year/Period | 1955 | 1956 | 1957 | 1955—57 | 1955—57 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—62 | 1958—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Sw.Fr. (current values)* | | | | *Sw.Fr. (1962 value)* | *Sw.Fr. (current values)* | | | | | | *Sw.Fr. (1962 value)* |
| 1. Gross revenue | 66.96 | 71.39 | 70.48 | 69.61 | 77.56 | 67.45 | 63.22 | 64.95 | 69.59 | 69.68 | 66.98 | 70.52 |
| 2. Logging costs | 20.27 | 22.34 | 23.46 | 22.02 | 24.52 | 24.04 | 23.32 | 23.33 | 23.72 | 25.19 | 23.92 | 25.19 |
| 3. Net conversion surplus | 46.69 | 49.05 | 47.02 | 47.57 | 53.03 | 43.44 | 39.90 | 41.62 | 45.87 | 44.49 | 43.06 | 45.34 |
| 4. Silvicultural costs | 5.26 | 4.69 | 5.28 | 5.07 | 5.65 | 5.61 | 6.19 | 5.19 | 5.56 | 4.68 | 5.45 | 5.75 |
| 5. Administrative costs | 7.81 | 9.34 | 9.36 | 8.83 | 9.84 | 9.73 | 10.00 | 9.40 | 10.09 | 9.66 | 9.78 | 10.30 |
| 6. Maintenance costs | 2.05 | 2.86 | 2.52 | 2.48 | 2.76 | 2.43 | 2.21 | 2.11 | 2.18 | 1.76 | 2.14 | 2.26 |
| 7. Costs for improvement and expansion | 4.97 | 5.59 | 8.60 | 6.39 | 7.09 | 8.84 | 10.15 | 6.91 | 10.08 | 6.47 | 8.49 | 8.97 |
| 8. Total managing costs (4—7) | 20.09 | 22.48 | 25.76 | 22.78 | 25.35 | 26.61 | 28.55 | 23.61 | 27.91 | 22.57 | 25.85 | 27.29 |
| 9. Total costs (2+8) | 40.36 | 44.82 | 49.22 | 44.80 | 49.87 | 50.65 | 51.87 | 46.94 | 51.63 | 47.76 | 49.77 | 52.47 |
| 10. Operating profit | 26.60 | 26.57 | 21.26 | 24.81 | 27.69 | 16.80 | 11.35 | 18.01 | 17.96 | 21.92 | 17.21 | 18.05 |

**Table 8:22. Income and Expenditure in the Public Forests of Switzerland, Region B—Lowland, Annual Average 1955—1962**
*(Sw.Fr. per m³y of the total cut)*
The Selected Cantons are: Zurich, Luzern, Freiburg, Thurgau

| Year/Period | 1955 | 1956 | 1957 | 1955—57 | 1955—57 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—62 | 1958—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Sw.Fr. (current values)* | | | | *Sw.Fr. (1962 value)* | *Sw.Fr. (current values)* | | | | | | *Sw.Fr. (1962 value)* |
| 1. Gross revenue | 80.07 | 85.05 | 79.97 | 81.70 | 91.05 | 75.50 | 71.58 | 74.98 | 83.70 | 87.41 | 78.63 | 82.70 |
| 2. Logging costs | 18.26 | 19.71 | 20.52 | 19.50 | 21.71 | 21.57 | 12.96 | 22.53 | 23.22 | 26.27 | 23.11 | 24.30 |
| 3. Net conversion surplus | 61.81 | 65.34 | 59.45 | 62.20 | 69.34 | 53.93 | 49.62 | 52.45 | 60.48 | 61.14 | 55.52 | 58.39 |
| 4. Silvicultural costs | 5.44 | 6.35 | 6.52 | 6.10 | 6.79 | 6.80 | 7.61 | 6.47 | 6.56 | 3.67 | 6.22 | 6.59 |
| 5. Administrative costs | 6.01 | 6.83 | 6.72 | 6.52 | 7.26 | 6.92 | 7.40 | 7.08 | 7.22 | 5.61 | 6.86 | 7.23 |
| 6. Maintenance costs | 2.02 | 2.38 | 2.31 | 2.24 | 2.49 | 2.66 | 2.57 | 2.16 | 2.60 | 1.48 | 2.29 | 2.43 |
| 7. Costs for improvement and expansion | 4.19 | 3.62 | 6.71 | 4.84 | 5.38 | 6.77 | 5.81 | 5.31 | 6.30 | 4.42 | 5.72 | 6.04 |
| 8. Total managing costs (4—7) | 17.66 | 19.18 | 22.26 | 19.70 | 21.92 | 23.15 | 23.39 | 21.02 | 22.68 | 15.18 | 21.08 | 22.30 |
| 9. Total costs (2+8) | 35.92 | 38.89 | 42.78 | 39.20 | 43.64 | 44.72 | 45.35 | 43.55 | 45.90 | 41.45 | 44.19 | 46.60 |
| 10. Operating profit | 44.15 | 46.16 | 37.19 | 42.50 | 47.41 | 30.78 | 26.23 | 31.43 | 37.80 | 45.96 | 34.44 | 36.89 |

**Table 8:23. Income and Expenditure in the Public Forests of Switzerland, Region C—Alps, Annual Average, 1955—196**
*(Sw.Fr. per m³y of the total cut)*
The Selected Cantons are: Uri, Graubünden, Tessin, Wallis

| Year/Period | 1955 | 1956 | 1957 | 1955—57 | 1955—57 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—62 | 1958—62 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Sw.Fr. (current values)* | | | | *Sw.Fr. (1962 value)* | *Sw.Fr. (current values)* | | | | | | *Sw. Fr. (1962 value)* |
| 1. Gross revenue | 60.66 | 72.45 | 66.10 | 66.40 | 73.97 | 63.88 | 62.18 | 66.46 | 77.13 | 81.94 | 70.32 | 73.88 |
| 2. Logging costs | 22.48 | 25.90 | 25.51 | 24.63 | 27.43 | 24.89 | 26.77 | 27.86 | 29.15 | 31.16 | 27.97 | 29.42 |
| 3. Net conversion surplus | 38.18 | 46.55 | 40.59 | 41.77 | 46.54 | 38.99 | 35.41 | 38.60 | 47.98 | 50.78 | 42.35 | 44.47 |
| 4. Silvicultural costs | 0.63 | 0.65 | 0.79 | 0.69 | 0.76 | 1.04 | 1.24 | 0.98 | 1.15 | 1.44 | 1.17 | 1.23 |
| 5. Administrative costs | 2.98 | 3.19 | 3.85 | 3.34 | 3.71 | 4.56 | 5.04 | 5.18 | 5.51 | 5.96 | 5.25 | 5.32 |
| 6. Maintenance costs | 0.99 | 1.10 | 1.40 | 1.16 | 1.29 | 1.56 | 1.85 | 1.82 | 1.94 | 2.02 | 1.84 | 1.93 |
| 7. Costs for improvement and expansion | 4.64 | 6.44 | 7.41 | 6.16 | 6.85 | 5.32 | 7.23 | 5.65 | 10.18 | 15.99 | 8.87 | 9.34 |
| 8. Total managing costs (4—7) | 9.24 | 11.38 | 13.45 | 11.36 | 12.63 | 12.48 | 15.36 | 13.63 | 18.78 | 25.41 | 17.13 | 17.82 |
| 9. Total costs (2+8) | 31.72 | 37.28 | 38.96 | 35.99 | 40.06 | 37.37 | 42.13 | 41.49 | 47.93 | 56.57 | 45.10 | 47.24 |
| 10. Operating profit | 28.94 | 35.17 | 27.14 | 30.42 | 33.91 | 26.51 | 20.05 | 24.97 | 29.20 | 25.37 | 25.22 | 26.64 |

# Chapter 9

# UNITED KINGDOM

# United Kingdom

by

J. J. MACGREGOR

*Introduction*

To understand the existing structure of the forest industry in the United Kingdom it is first of all necessary to give a brief historical background of the main influences which have moulded the present form. To the visitor from almost any other country in the temperate zone there are several features of forestry in the United Kingdom which will strike him as peculiar. Although to the casual observer the country with many hedgerow trees may give a reasonably heavily-wooded appearance, this is not borne out by closer inspection and reference to comparative statistics shows that it has a smaller proportion of woodland than almost any other country in Europe. There are several things which help to explain this unique position.

During the Industrial Revolution which began in the second half of the 18th century Britain became a pioneer in the industrial techniques which made her favour the principles of free trade. Under what the political economists have called the Law of Comparative Advantage it amply paid her to concentrate her efforts on manufactures, a large proportion of which were exported and exchanged for food and other raw materials. The relative cheapness of ocean transport, the situation of the main industrial areas to the seaports, and the lavish use of coal as domestic fuel all help to explain why a heavy reliance came to be placed on imports of timber in spite of it being a commodity which was bulky in relation to its value. Of the total timber consumption in the years immediately before World War II over 96 per cent came from overseas and all but about six per cent was softwood.

The overwhelming reliance on imports for food and raw materials was not without its dangers in time of war and the bulkiness of timber made it an even more difficult commodity to import when shipping space was severely limited. Such strategic considerations led during the critical times of the two world wars to an examination of the adequacy of the national forestry reserves. The first examination of 1916 led to the creation in the Forestry Act of 1919 of what might be termed the first effective national forest policy in Britain. A Forestry Commission was set up and with it the State became an active partner in the expansion of forestry. Although the Forestry Commission got off to a good start with its planting programme it soon ran into difficulties with the arrival of an economic depression. Uncertainty of the basic finance—based

on an annual vote in Parliament—was to remain a feature of the inter-war period.

In the second war-time examination of the national forest policy the Forestry Commissioners set up, after reviewing the achievements of the previous quarter of a century, the extent to which home forestry should contribute to the future economy of Britain. In brief, the aim was that in England, Scotland and Wales there should be at the end of fifty years about five million acres of productive woodland. Slightly less than two million acres would be private woodlands and the remaining area would be afforested by the Forestry Commission. Broadly, it was hoped that these areas would provide about one-third of the national annual requirement, but if necessary the whole requirement could be obtained for several years by cutting into the forest capital of the growing stock.

The need for a change of emphasis in the policy becomes clear when the causes of the indifferent rate of planting up and restoring woods between the two wars are analysed. The annual reports of the Forestry Commission attributed the apathy of the private growers to the prevailing social, economic and political trends; apart from the poor technical efficiency of the bulk of the estate owners they were badly organised. In the inter-war years the private planting was at the rate of about 7,000 acres per annum and that of the State forests by the Forestry Commission of about 19,000 acres. The combined effort had been criticised as being scarcely capable of reaching the estimated three million acres then scheduled as forestry on a sustained-yield basis. The large inroads which were made into the remaining growing stock to meet the very heavy requirements of the Second World War made the inter-war rate of planting even more inappropriate as a standard for the post-war needs. The post-war policy recognised the need for fresh emphases and these were given in the Forestry Acts of 1945 and of 1947. The first of these Acts was concerned mainly with the reorganisation of the Forestry Commission to meet the special need for speeding up the planting programmes and to provide for the Ministerial responsibility which the increased scale of operations and land acquisition had made necessary.

The main officers of the Forestry Commission include[1] a Director-General, a deputy Director-General, and three Directors of Forestry responsible for England, Scotland and Wales. There are also Directors of Research and of Education, 19 Conservators and 263 Forest, Estate and Engineer Officers. There are 11 Conservancies and two Deputy Surveyor's charges which cover the New Forest and the Forest of Dean. Each Conservancy has its allocation of technical and clerical staff, with District Officers in charge of groups of forests with local supervision of individual forests delegated to foresters and foremen.

[1] Until 1965 when there was a reorganisation of the Forestry Commission—one of the main changes being that the national directorates have been discontinued.

So that a close link may exist between conservators and those who are interested in forestry in the area, Regional Advisory Committees have been set up and these come under the direction of the National Committees.

The 1945 Act did not make any changes in the Forestry Commissioners' administration of forestry operations, grants, education and research. The second statute, the Act of 1947, laid down the policy for private woodlands—a policy which had the main aim of ensuring that existing woodlands would be treated seriously and dedicated to timber growing in perpetuity. As will be shown later this legislation represented a new and in some ways revolutionary approach to the problem of private woodlands: *Laissez-faire* was abandoned for a large element of persuasion and compulsion.

There have only been about four major statutes concerned with forest policy in Britain since 1919 and the last one—the Forestry Act of 1951—had as its main functions the manner in which fellings should be restricted in order to achieve as rapidly as possible the national reserve of growing timber.

Until several years after the Second World War the work of the Forestry Commission was mainly concerned with acquisition and planting of land but it also dealt with a great many other aspects having an important bearing on its forest policy. It has about 2,000 acres of nurseries, the main forms of protection were against fire, rabbits and squirrels. The outbreaks of myxomatosis in the early Fifties have greatly reduced the rabbit population. Thinnings and final fellings have increased in recent years. Other work has included licensing of timber for felling, construction of roads and houses, organising the Dedication Scheme for private woodlands, research, experiment with study, education and publicity.

As the Forestry Commission is a branch of the Public Service it is financed by annual estimates of receipts and payments and the net annual expenditure is met by Parliamentary votes. Some measure of the financial structure of the Forestry Commission's activities is contained in Table 9:1.

**Table 9:1. Financial Results of Forestry Commission Activities, 1920—1963**

| Years | Grants in Aid £ | Receipts from Sales £ | Payments £ |
|---|---|---|---|
| 1920—1929 | 3,570,000 | 851,484 | 4,502,018 |
| 1930—1939 | 6,292,800 | 1,821,852 | 7,926,093 |
| 1940—1949 | 18,945,000 | 7,425,778 | 26,238,789 |
| 1950—1959 | 79,023,000 | 25,292,023 | 104,144,134 |
| 1960—1963 | 46,786,000 | 13,493,541 | 60,616,922 |
| Totals | £154,616,800 | £48,884,678 | £203,427,956 |

*Source: Seventh Report from the Estimates Committee*, Session 1963—1964. H.M.S.O., 1964, p. XIII

In the Fifties less attention in the forestry programmes for State and private land was paid to mere expansion of area, and the idea of building up a strategic reserve gave way to the emphasis on the economic contributions. This view found formal expression in 1958 when, instead of having a fixed goal of five million acres of productive forestry about the end of the present century there should be a more flexible approach which aimed at reviewing requirements every five years. This was reviewed again in 1963, and the planting programme was fixed for 10 years ahead. Following the 1958 arrangement private forestry continued to receive the planting grant and a management grant which was operated on a sliding scale with higher amounts for the first hundred acres, less for the second hundred acres and a flat rate for the remainder (these amounts were at 1 October 1962) at 18s., 12s. and 7s. per acre respectively. The planting grant was £20 per acre. (More recently, e.g. 1 October 1964, these rates were 20s. 3d., 13s. 9d. and 8s. 9d. with the planting grant at £22 12s. 0d.)

Other general features of the policy are that the Forestry Commission's planting is to be concentrated in the upland areas; that the Government has confirmed its confidence that private forestry will continue to play a full part in the development of forestry; that the Commission will give more attention to amenity, will continue their policy of providing access and the opportunity for recreation and that the policy will give assistance to the balance of payments problem.

From the annual reports of the Forestry Commission it is possible to arrive at the relative proportions between private and Forestry Commission woodlands which is shown in Table 9:2.

**Table 9:2. Areas of Productive Woodland in Great Britain (England, Wales and Scotland) on 30 September, 1960**

| | *thousand acres* |
|---|---|
| A. Private Woodlands | 1,689 |
| B. Forestry Commission | 1,283 |
| C. Total | 2,972 |

## 9.1 General Information Covering Forestry and Forest Industries

### *9.1.1 Contribution of Forestry to the Gross National Product*

The net output of forestry is included in the figures (Table 9:16) given in the National Income Blue Book, which shows the contribution of each industry to the gross domestic product at factor costs. The amount for forestry is not given separately but is included in the figures for agriculture, forestry and fishing. Table 9:3 shows the figures for forestry only, together with the

gross domestic product and gross national product at factor cost, and the gross national product at market prices. Normally G.N.P. is not analysed at market prices by industry.

For industries, including forestry, outside the scope of the Census of Production, it is not possible to calculate net output from the value of production less purchases from other industries. For these industries net output is measured as the sum of factor incomes arising in the industry. The information used is largely based on Inland Revenue tax assessments, classified by industry. The difficulty here is that a precise industrial allocation is not always possible. For example, some of the wage payments and profits arising from private woodlands may be ascribed to agriculture. Because of this the figures for forestry alone may be low.

**Table 9:3. Forestry's Contribution to Gross Domestic Product, 1958—1963**

| Year | G.D.P. at factor cost | | G.N.P. at factor cost | G.N.P. at market prices | *Percentage contribution* of forestry to G.N.P. |
|---|---|---|---|---|---|
| | Forestry | Total | £ million | | |
| 1958 | 17 | 19,984 | 20,281 | 21,671 | *0.08* |
| 1959 | 17 | 20,993 | 21,263 | 22,750 | *0.07* |
| 1960 | 20 | 22,405 | 22,639 | 24,091 | *0.08* |
| 1961 | 21 | 23,934 | 24,178 | 25,653 | *0.08* |
| 1962 | 24 | 24,883 | 25,212 | 26,853 | *0.09* |
| 1963 | 25 | 26,159 | 26,536 | 28,305 | *0.09* |

*Source: National Income Blue Book*, 1964

The Central Statistical Office for the United Kingdom in measuring the percentage contribution of an industry to G.N.P. normally does this in terms of current prices and not at constant prices. It is felt that in making international comparisons one should proceed with caution since it is not always possible to compare like with like: in Britain the contribution of forestry consists largely of planting and maintenance of forest whereas in Sweden it would be mainly from the felling of timber.

The forestry component of G.N.P. reported in National Income Blue Book is based exclusively on the accounts of the Forestry Commission and the forest service of Northern Ireland; no allowance being made for activity in private forestry in the industry figures. The figure for forestry includes imputed interest charges occurring in the accounts of the State enterprises.

Table 9:4 gives value added or net production; the purchases from other sectors are deducted, so that the values are those produced in the industry itself.

Adopting conventions suggested in S.N.A. the following are the contributions to National Income and product of the Forestry Commission.

*Expenditure on G.N.P.*

a. Final expenditure on machinery and road construction is treated as Capital Formation in fixed assets.

b. Expenditure on growing stock is treated as Capital Formation in stocks. Both these items are valued at cost.

c. Sales value of produce is taken to measure final product of the industry consumed, viz. domestic expenditure.

**Table 9:4. Value Added by the Forestry Industry, 1959—1963**

| Year | Expenditure on G.N.P. | | | Factor Incomes | |
|---|---|---|---|---|---|
| | Capital Formation | | Domestic Expenditure | Income from Employment | Profits |
| | Fixed | In Stocks | | | |
| | | | *Forestry Commission*[a] | | |
| 1959 | 1.3 | 6.5 | 2.5 | 9.3 | 1.0 |
| 1960 | 1.2 | 6.7 | 2.6 | 9.6 | 0.9 |
| 1961 | 1.3 | 8.4 | 2.8 | 11.2 | 1.3 |
| 1962 | 1.3 | 7.4 | 2.8 | 10.3 | 1.2 |
| 1963 | 1.4 | 7.6 | 2.8 | 10.7 | 1.1 |
| | | | *Private Forestry*[b] | | |
| 1959—63 | 0.2 | 4.3 | 10.0 | 11.5 | 3.0 |

*a.* F.C. Annual Report
*b.* F.C. Accounts (rough estimate) includes tax and subsidy effects

*Factor Incomes*

d. Gives incomes from employment plus purchases from other industries.

The figures given approximate to the actual expenditures in the year. The basis is as far as possible the published accounts of the Forestry Commission, so that they contain some internal allocation, such as charges for use of vehicles and related double counting. A major difference between the figures for capital formation in stocks and that given in the Blue Book results from the inclusion in the Blue Book figures of interest charges: these are imputed charges and do not represent payments to factors—as they would in a company account—so they have been excluded from the attached reckoning.

### *9.1.2 Structure of the Forest-Product Market and Movements in Prices*

The United Kingdom is predominantly an importing country—at present it is reckoned that about 90 per cent of all softwood and hardwood requirements are imported—and thus it is reasonable to expect that the structure of the imported categories gives a reasonable clue to the industrial demand. Table 9:5 shows production, imports and consumption for softwood, hardwood,

mining timber and pulpwood in 1958-1962. The proportion of total consumption which is, however, contributed by domestic production varies greatly from category to category: in recent years sawn softwood, pitprops and sawn hardwoods contributed about 3, 55 and 30 per cent of the total, respectively. Although there has been a decline in the total demand for wooden pitprops, the home-grown proportion has increased steadily since the end of the war and at present is responsible for a third of the total home market for roundwood. A recent study by the Forestry Commission describes the existing structure of the home-grown roundwood production and shows the expected growth for hardwoods and softwoods, distinguishing between the contribution of the Forestry Commission and that of the private grower.

For the categories indicated in the Directives publication the details are given in Table 9:6.

A point worth making in this section is that as the U.K. is one of the largest importers of certain categories of timber this may give the country a special bargaining position.

**Table 9:5. Production, Imports and Consumption of Softwood, Hardwood, Mining Timber and Pulpwood, 1958—1962**

| | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|
| I | | | | | |
| Softwood, including boxboards; excluding sleepers, crossings and poles | | | | | |
| Production 1,000 cu.ft. ..... | 10,450 | 9,958 | 10,872 | 10,772 | 10,398 |
| Imports 1,000 cu.ft. ..... | 357,598 | 405,708 | 502,003 | 449,526 | 432,733 |
| Consumption 1,000 cu.ft. ..... | 388,350 | 437,445 | 463,480 | 474,473 | 455,875 |
| II | | | | | |
| Hardwood | | | | | |
| Production 1,000 cu.ft. ..... | 29,920 | 27,727 | 25,830 | 24,823 | 24,670 |
| Imports 1,000 cu.ft. ..... | 57,922 | 60,983 | 71,035 | 67,071 | 54,969 |
| Consumption 1,000 cu.ft. ..... | 95,422 | 101,140 | 105,827 | 100,240 | 92,222 |
| III | | | | | |
| Mining timber | | | | | |
| Production 1,000 cu.ft. ..... | 55,140 | 52,359 | 51,880 | 49,018 | 49,973 |
| Imports 1,000 cu.ft. ..... | 35,081 | 30,235 | 26,559 | 24,444 | 29,302 |
| Consumption 1,000 cu.ft. ..... | 110,728 | 91,580 | 90,547 | 85,348 | — |
| Total I, II and III | | | | | |
| Production 1,000 cu.ft. ..... | 95,510 | 90,044 | 88,582 | 84,613 | 85,041 |
| Consumption 1,000 cu.ft. ..... | 594,500 | 630,165 | 659,854 | 660,061 | — |
| Production as *percentage* of consumption | *16* | *14* | *13* | *13* | — |
| Pulpwood | | | | | |
| Production 1,000 cu.ft. ..... | 6,417 | 7,704 | 11,488 | 13,440 | 13,267 |
| Imports 1,000 cu.ft. ..... | 8,418 | 10,848 | 11,599 | 11,508 | 10,054 |
| Consumption 1,000 cu.ft. ..... | 16,386 | 19,909 | 22,927 | 21,525 | 23,929 |

Measurement of the price movements of home-grown timber have proved to be rather difficult except for one or two categories. This arises because with a multiplicity of often very small producers operating in a great variety of environment it is not easy to ensure that like is being compared with like. However, if delivered prices are considered it is possible to show the movement of some selected categories which are relatively important in total production as in the Table 9:7.

**Table 9:6. Prices of Imported Processed Forest Products and Industrial Roundwood, 1953—1962**
*(Price per unit c.i.f.)*

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A. Processed Forest Products | | | | | | | | | | | |
| 1. Coniferous sawnwood per cu.ft. ... | d. 111.0 | d. 110.9 | d. 120.4 | d. 122.6 | d. 119.8 | d. 108.9 | d. 91.6 | d. 110.3 | d. 114.8 | d. 131.8 | Sawn soft |
| 2. Chemical and mechanical wood pulp | £ 4.21 | £ 4.43 | £ 4.62 | £ 4.72 | £ 4.72 | £ 4.42 | £ 4.26 | £ 4.25 | £ 4.32 | £ 4.07 | |
| 3. Newsprint (prices per cwt.) ..... | 2.61 | 2.62 | 2.63 | 2.74 | 2.80 | 2.83 | 2.78 | 2.78 | 2.76 | 2.75 | |
| 4. Fibreboard (prices per cwt.) ..... | 2.11 | 1.99 | 2.10 | 2.07 | 2.06 | 2.05 | 1.98 | 1.97 | 1.87 | 1.72 | |
| B. Industrial Roundwood | | | | | | | | | | | |
| 1. Sawlogs per cu.ft. ..... | d. 123.3 | d. 121.0 | d. 118.9 | d. 125.7 | d. 127.1 | d. 123.8 | d. 118.4 | d. 129.7 | d. 136.1 | d. 129.7 | Hewn hard |
| | 57.1 | 56.1 | 60.4 | 65.1 | 65.1 | 55.6 | 56.4 | 53.6 | 55.2 | 54.6 | Hewn soft including roundwood logs |
| 2. Pitprops per cu.ft. ..... | 47.8 | 42.2 | 51.1 | 54.5 | 53.6 | 47.9 | 43.0 | 40.5 | 44.0 | 44.0 | |
| 3. Pulpwood (piled 100 cu. fathom) ... | 72.3 | 86.4 | 78.7 | 76.1 | 76.3 | 74.9 | 74.6 | 76.8 | 76.2 | 66.6 | |

**Table 9:7. Index Numbers of Home-Grown Timber Prices, Great Britain, 1953—1962**
*1954=100*

| Year | Pitprops[a] (peeled) | | Poles | | Sleepers | | Pulpwood Soft | Pulpwood Hard | Railway Wagon Timber | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1953 | 264 | | 312 | | 456 | | | | 255 | |
| 1954 | 245 | *100* | 324 | *100* | 456 | *100* | *100* | *100* | 238 | *100* |
| 1955 | 249 | *102* | 363 | *112* | 495 | *109* | *117* | *114* | 237 | *99* |
| 1956 | 255 | *104* | 311 | *96* | 514 | *113* | *117* | *127* | 245 | *103* |
| 1957 | 262 | *107* | 330 | *109* | 533 | *117* | *136* | *125* | 250 | *105* |
| 1958 | 267 | *109* | 259 | *111* | 528 | *116* | *138* | *121* | | |
| 1959 | 273 | *111* | 346 | *107* | 464 | *102* | *133* | *N.A.* | | |
| 1960 | 285 | *116* | 311 | *96* | 464 | *102* | *N.A.* | *N.A.* | | |
| 1961 | 287 | *117* | 342 | *106* | 464 | *102* | *N.A.* | *N.A.* | | |
| 1962 | 285 | *120* | 345 | *107* | 473 | *104* | *N.A.* | *N.A.* | | |

*a.* England
*Source:* Up until 1957 from The Preparation of Price Index Numbers for Forestry Products, J. J. MacGregor, *Forestry*, Vol. XXXII, No. 1, 1959 (except for pulpwood)

*9.1.3 Structure of the Labour Market and Movement in Wages*

The employment of State and private forest workers has been summarised as follows:

*State Forests*

The staff and labour employed by the Forestry Commission on 1 October 1960, was as follows:

| | |
|---|---|
| *Superior professional staff (mainly University trained):* | |
| Forest | 218 |
| Research and other specialised services | 116 |
| *Subordinate forest staff:* | |
| Trained | 1,041 |
| Untrained | 276 |
| Office staff | 630 |
| Miscellaneous subordinate staff | 376 |
| Labour force | 11,891 |
| | 14,548 |

The decrease in the labour force of 1,135 since 1 October 1955, is mainly due to improved techniques and increased productivity by the workers, and has been accompanied by an increase in average earnings per head amounting to close 40 per cent since 1954, compared with an increase of nearly 30 per cent in the basic wage. The increasing use of self-employed contractors, who are not included in the figures above, for work which in the past has been done by Forestry Commission employees, has also had an effect. As the volume of production increases, it is obvious that the total employment in forestry will grow, though, since it is the Commission's policy to sell as much of their timber standing as practicable, the growth may not always be reflected in the numbers directly employed by the Commission.

There has continued to be no difficulty in recruiting university-trained forest officers during the last five years and the Forestry Commission's Forester Training Schools are supplying an adequate number of trained subordinate forest staff.

*Private Forests*

Few private woodland owners employ a university-trained officer, but a number of forestry graduates practise as forestry consultants or are retained by forestry associations or syndicates.

It is impossible to give with any accuracy the number of persons employed in private forestry. On estates with small areas of woodland the work is frequently done by farm or estate workers at times when they can be spared

from their other duties. It is estimated that numbers have remained fairly steady at about 10,500. In addition, timber merchants employ a considerable number of men (not included in the above figures) who spend the majority of the year felling and extracting timber on private woodland and in the State forests.

The United Kingdom has become an increasingly industrialised country with the result that numbers in agriculture, forestry and fishing now represent about four per cent of the total working population. In private forestry the earnings bear a very close relationship to those for agriculture which employs nearly 40 times as many people as the whole of forestry. The rates in the Forestry Commission are also closely linked to movements of agricultural wages, although decided on a different basis. Since 1940 the basic minimum wage for agricultural workers has been fixed at national levels; previously these rates varied from county to county.

The basic rates since 1958 are shown in the Table 9:8 for England and Wales. (There is a close similarity for wages in Scotland.)

An article by F. E. Balman[1] showed the effect of holidays with pay, changes in national insurance contributions and the hours worked per week. These changes meant that the index of 1954 = 100 had risen to 178 in January 1965.

The basic rates of pay of forest workers are not directly related to the agricultural minimum wage, although the Commission would not in practice pay less than the agricultural minima (for England and Wales, and for Scotland, respectively). In fact, forest workers' wages in the Commission have for

**Table 9:8. Forestry Commission Minimum Wages, England and Wales, 1958—1962**

| Year | Gross weekly rate as at 1 January each year, including National Health Insurance | Hours per week | Working days[a] per year | Cost per hour | |
|---|---|---|---|---|---|
| | | | | d. | Index 1954=100 |
| | s. d. | | | | |
| 1958 | 153 0 | 46 (from 3.2.58, previously 47) | 266 | 39.9 | 121 |
| 1959 | 159 6 | 46 | 266 | 41.6 | 126 |
| 1960 | 159 6 | 45 (from 29.2.60) | 265½ | 41.6 | 126 |
| 1961 | 172 6 | 43 (from 24.7.61) | 260 | 48.1 | 146 |
| 1962 | 172 6 | 43 | 260 | 48.1 | 146 |

*a.* No deduction is made for annual holidays or public and privilege holidays which are two weeks per year and 8½ days respectively

[1] Balman, F. E., "The Trend of Forest Workers' Wages 1938-1961", *Quarterly Journal of Forestry*, October 1961.

some years past been determined by reference to a "formula" which has regard to the wages being paid in four industries which are considered to be most closely related to forestry, i.e. Agriculture, Home-Grown Timber, Government Miscellaneous Workers and Civil Engineering.

### *9.1.4 Main Features of Roundwood Production, Marketing and Processing*

There have been several Censuses covering the area, ages and species of tree in the forests of Britain: broadly speaking hardwoods are mainly found in the southern part of England; with higher rainfall in the western regions there is a greater emphasis on spruces and the drier areas of the east are favourable to pines. The inroads made by the two wars on the growing stock of private woodlands has already been mentioned. This has meant that there has, since the war ended, been a large amount of re-planting in private forestry and the Forestry Commission has been active in afforestation since 1919 when it was first established as the agent of the State. These aspects imply that much of the woodlands contain immature plantations. Table 9:9 gives a more detailed estimate over woodland areas in 1958 and 1960. Table 9:10 shows the average yield class by species.

A broad estimate by the Forestry Commission of the changes which took place in the forest areas of the United Kingdom between 1948 and 1957 can be inferred from the following points selected from a private communication:

The main volume increase is taking place in younger high forest, coniferous crops. The volume of broadleaved species can be expected to decline slowly due to lack of promotion from the younger age classes of high forest and the smaller-size classes of hedgerow timber. The broad general trend of a substantial increase in coniferous volume and the maintenance of or a gradual decrease in the present broadleaved volume is obvious.

**Table 9:9. Estimated Woodland Areas, by Categories, Countries and Ownership Classes, 1958 and 1960**

| | Private Woodlands | | | | Forestry Commission Woodlands | | | | Total Woodlands | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | England | Scotland | Wales | Great Britain | England | Scotland | Wales | Great Britain | England | Scotland | Wales | Great Britain |
| 1958 | | | | | | | | | | | | |
| Productive area *a* .. | 1,109.8 | 417.0 | 125.8 | 1,652.6 | 454.1 | 506.9 | 211.2 | 1,172.2 | 1,563.9 | 923.9 | 337.0 | 2,824.8 |
| Unproductive area *b* | 449.4 | 565.6 | 77.6 | 1,092.6 | 63.9 | 44.3 | 15.7 | 123.9 | 513.3 | 609.9 | 93.3 | 1,216.5 |
| Total area ..... | 1,559.2 | 982.6 | 203.4 | 2,745.2 | 518.0 | 551.2 | 226.9 | 1,296.1 | 2,077.2 | 1,533.8 | 450.3 | 4,041.3 |
| 1960 | | | | | | | | | | | | |
| Productive area *a* .. | 1,118.2 | 441.2 | 129.1 | 1,688.5 | 487.3 | 560.5 | 235.5 | 1,283.3 | 1,605.5 | 1,001.7 | 364.6 | 2,971.8 |
| Unproductive area *b* | 420.3 | 537.9 | 70.6 | 1,028.8 | 65.6 | 39.2 | 14.1 | 118.9 | 485.9 | 577.1 | 84.7 | 1,147.7 |
| Total area ..... | 1,538.5 | 979.1 | 199.7 | 2,717.3 | 552.9 | 599.7 | 249.6 | 1,402.2 | 2,091.4 | 1,578.8 | 449.3 | 4,119.5 |

*a.* Productive area includes High Forest, Coppice with Standards and Simple Coppice
*b.* Unproductive area includes Scrub, Partially Felled and Felled Woodland
*Source:* Forestry Commission

As at 30 September 1957, woodland area in Great Britain just exceeded four million acres, equivalent to 7.1 per cent of the total land area—69 per cent was private and 31 per cent was State owned. Of this area 69 per cent was in productive woodland and of this about 60 per cent was privately owned. Of the high forest 37 and 86 per cent of coniferous and broadleaved areas respectively were private. The coniferous forests were in younger age classes—43 per cent were ten years or under and 85 per cent were forty years or under. For broadleaved areas only about 17 per cent were forty years or less.

Standing volume was estimated at 3,119 million Hoppus feet of which 71 per cent was high forest, fairly evenly divided between coniferous and broadleaved. Gross annual increment was estimated at 123 million Hoppus feet—81 million coniferous and 41½ million broadleaved with net figures respectively 54½ million and 2 million Hoppus feet.

Although there is a wide range in the size of private property a typical association of woodlands is within a wider entity of a rural estate mainly composed of a number of farms leased to tenants. The woodlands are normally retained by the owner of the estate who usually also retains one of the farms —the "home" farm—under his own management. One reason for the retention of the woodlands is that it fits in well with sporting activities—usually based on pheasant rearing—and with amenity considerations and the home-grown timber provides repair materials for the farms.

**Table 9:10. Weighted Average Yield Class**
*(metric units)*

| Species | *Countries* | | | |
|---|---|---|---|---|
| | Great Britain | England | Scotland | Wales |
| Scots pine | 8.3 | 9.8 | 7.2 | 7.8 |
| Corsican pine | 11.0 | 11.4 | 8.5 | 9.8 |
| Lodgepole pine | 7.0 | 6.7 | 7.0 | 7.4 |
| Sitka spruce | 13.1 | 12.3 | 13.6 | 12.4 |
| Norway spruce | 11.6 | 11.5 | 11.6 | 11.6 |
| European larch | 6.8 | 6.9 | 6.7 | 6.5 |
| Japanese larch/Hybrid larch | 9.0 | 8.9 | 8.7 | 9.4 |
| Douglas fir | 14.0 | 13.9 | 15.2 | 13.2 |
| Western hemlock | 15.1 | 14.1 | 15.9 | 16.8 |
| Western red cedar | 15.2 | 15.1 | 15.0 | 15.5 |
| Other Conifers | 13.4 | 12.9 | 11.6 | 15.9 |
| All Conifers | 10.9 | 11.0 | 10.5 | 11.5 |
| Beech | 5.7 | 5.9 | 4.6 | 4.9 |
| Oak | 4.2 | 4.1 | 4.3 | 4.5 |
| Other Broadleaved | 5.1 | 5.1 | 5.3 | 4.7 |
| All Broadleaved | 5.0 | 5.0 | 4.9 | 4.7 |
| All Species | 10.4 | 10.4 | 10.5 | 11.2 |

The Forestry Commission has had to rely mainly on being able to acquire land that is marginal to agriculture mainly at higher altitudes. Under the existing landlord-and-tenant system the tenant farmer has very complete security of tenure. One result is that the Forestry Commission is at a disadvantage in that it cannot plan the purchases of large areas and has to wait until suitable land comes on the market.

It can be claimed that while Britain has extremely good soil and climatic conditions for growing trees its comparative advantage in transport is much less than the size of the country might imply. Moreover, as Britain is usually one of the world's largest importers of timber this gives a range of choice and quality with which domestic supplies find it difficult to compete particularly as in the past they came from private woodlands operating on a small scale and producing many species and qualities.

The twelve conservancies of the Forestry Commission are arbitrary regions based on county boundaries and thus cannot be identified very easily with topography or economic activity. There are no price zones. Some idea of the productivity of different sites and their relative proportions may be covered from Hummel and Grayson's *Production Goals in Forestry with Special Reference to Great Britain.*[1] A useful, contemporary, account projection and analysis of the forest resources in Britain is obtainable from B. W. Holtam's *Home Grown Roundwood.*[2] This emphasises the future importance of the flow of small roundwood thinnings especially from the coniferous forests and the need to foster industry which can use this type of raw material.

## 9.2 Income and Expenditure in the Forestry Sector

### *9.2.1 General Description of Forest Enterprises*

The structures of the private and Forestry Commission areas are indicated in Table 9:9. Although there is a wide range in the size of private property a typical association of woodlands is within the wider entity of a rural estate mainly composed of a number of farms leased to tenants. It has often been customary for landowners to provide the repair material for the agricultural part of the estate and this usually implies that a sawmill is run. Not only do such mills provide useful raw materials for the estate but also saleable products and sometimes are operated intermittently, e.g. to provide wet-time work or when there are seasonal opportunities. The special taxation concessions also fit in well with the long-term ownership of the private estate. In Britain primogeniture has tended to maintain the size of properties even in face of heavy inheritance taxes (Estate Duty).

[1] British Commonwealth Forestry Conference, 1962 (Table 3 of that report).
[2] Forestry Commission Record No. 52.

The locations of forests to large consuming centres as in a small island like Britain are relatively near. Yet, as implied in the introduction to this chapter this gives little advantage in competition with imported supplies because most of these centres are not far from seaports and even Manchester at the end of a large canal is, for all practical purposes, a seaport. It can be claimed that while Britain has extremely good soil and climatic conditions for growing trees its comparative advantage in transport is much less than the size of the country might imply. Moreover, as Britain is usually one of the world's largest importers of timber this gives a range of choice and quality with which domestic suppliers find it difficult to compete, particularly as in the past they came from private woodlands operating on a small scale and producing many species and qualities. With a greater emphasis now placed on the economic—as distinct from the former strategic—considerations and with the Forestry Commission's production geared to a more homogeneous national policy than was formerly the case and with an increasing flow of softwood timber, in particular, in relatively concentrated areas it is clear that forest industries can be attracted to the more homogeneous raw material. The forests themselves can thus be the basis of continuing industries. In spite of the fact that much of the Forestry Commission planting has been on upland and relatively remote areas there has been a substantial development of access roads to join the new forests to the existing road network. There are few parts of Britain where forests are far from main roads. The Forestry Commission has spent a significant part of its budget on road making.

The three countries in Britain: England, Wales and Scotland are divided up into six, two and four Conservancies respectively, but these are arbitrary regions based on existing county boundaries and thus cannot be identified very easily with topography or economic activity. There are, for example, no prices which are subject to zoning. It is true, however, that there are distinct differences in the proportion of the more common species as between the eastern and western halves of the country.

In Forestry Commission's Forest Record No. 52, Professor H. M. Steven in a foreword writes:

> "It is an opportune time to take stock of the production coming from our woodlands during the next decade or so in relation to the requirements of industries based on it. The fruits of the efforts, made both by private owners and by the Forestry Commission, to build up the timber resources of this country after their depletion to meet essential requirements during two world wars, can be seen in a spectacular increase in the flow of timber from our woodlands. Total production of softwood will more than double between 1965 and 1980. It should be noted that until about 1970 potential output from private woodlands will still exceed that from the Forestry Commission, but thereafter supplies from Commission woodlands will increase more rapidly. A considerable part of the increased production of softwood timber, particularly from the Commission, will consist of small roundwood, as defined in this chapter, which comes mainly from thinnings. Thus the importance of

industries has been the largest single market for home grown softwood. Its consumption is falling steeply, however, and this makes it necessary to consider new markets. Scottish woodlands already supply all the timber required by Scottish mines, but a considerable part of English and Welsh requirements are met by imports. Home production should steadily replace these, and accordingly the National Coal Board should remain the principal single market for home-grown softwood for the next five years. By 1970, however, the new and expanded pulpmills will have become the principal market for small roundwood of home grown softwood and increasing supplies will be required also by wood chipboard factories. It is worthy of note that home-grown wood, processed by these industries, is producing high-quality goods which sell in very competitive markets which are served by the best of the world's production.

"The hardwood pattern is quite different. The woodlands are predominantly mature and over-mature and many contain low grade produce mainly of oak. These woodlands are almost entirely in private ownership. In recent years about 25 per cent of the sawn hardwood consumed in this country has been home produced. The problem is the utilisation of low-grade material, one of the outlets being sawn mining timber.

"The pattern of consumption of home-grown timber may well change, and certainly more precise estimates of production and consumption will become available, hence the position will be kept under review and revised papers prepared periodically."

In the actual record, prepared by Mr. Holtam, the following points are made and are summarised in the Forestry Commission Record.

"Total potential production of softwood and hardwood roundwood from the Forestry Commission and private woodlands together is currently equivalent to less than 10 per cent of Great Britain's total requirements for wood and wood products; with the exception of certain special markets which have become accustomed to finding their needs best met by tropical hardwoods or by other imported timbers of larger sizes than those currently avaliable from home sources, most of the traditional markets and of the new markets provided by wood-processing industries offer scope for increased use of home-grown wood. Private woodlands' potential is estimated to be greater than Forestry Commission potential production until 1970 when each will contribute about 33 million Hoppus feet."

### *9.2.2 Annual Cut and Income*

The gross revenue is determined by multiplying the volume of timber cut by the appropriate price for the product. According to the Forestry Commission Annual Reports the annual cut and income (i.e. gross value and revenue at place of delivery) for the five years from 1959 for the Forestry Commission is shown in Table 9:11.

The crude average price for the last three years of the table would be about 2.5s. per Hoppus foot. However, as can be gauged from the data on pages 16 and 17 of the Forestry Commission Record No. 52 the price received for softwood small roundwood at present is heavily weighted by the proportion of pitprops and, to a lesser extent, by the proportion which goes to the pulp

**Table 9:11. Annual Cut and Income: Gross Value and Revenue at Place of Delivery, 1959—1963**

| Year | Sales of timber *millions Hoppus ft* | | | Revenue at place of delivery. £ *million* |
|---|---|---|---|---|
| | Sold Standing | Felled and Converted | Total | |
| 1959 | 7.2 | 10.5 | 17.7 | |
| 1960 | 8.9 | 10.5 | 19.4 | 2.4 |
| 1961 | 12.0 | 9.4 | 21.4 | 2.6 |
| 1962 | 12.2 | 9.3 | 21.5 | 2.6 |
| 1963 | 12.9 | 8.8 | 21.7 | 2.6 |

It would be very difficult to show such data for 1958 because the method by which the accounts were prepared changed between 1958 and 1959

**Table 9:12. Analysis of Volumes, Revenues and Costs, Forestry Commission, 1959—1963**

| | 1959 | 1960 | 1961 | 1962 | 1963 |
|---|---|---|---|---|---|
| Volume of cut, annual average (Solid volume without bark), million Hoppus ft | 17.7 | 19.4 | 21.4 | 21.5 | 21.7 |
| F.C. standing pole prices/Hoppus ft | 17.2d. | 17.9d. | 17.8d. | 16.1d. | 14.5d. |
| 1. Gross revenue (£ million) | 2.2 | 2.4 | 2.6 | 2.6 | 2.6 |
| 2. Logging costs | 0.9 | 1.0 | 1.0 | 1.2 | 1.3 |
| 3. Net conversion surplus | £1.26 | £1.37 | £1.56 | £1.44 | £1.31 |
| 4. Silvicultural costs | — | — | — | — | — |
| 5. Administrative costs and overheads (Labour and management) | 3.2 | 3.5 | 4.0 | 4.0 | 4.3 |
| 6. Maintenance costs (Establishment of plantations) | 4.4 | 4.5 | 5.6 | 4.7 | 4.7 |
| 7. Cost of improvement and expansion (Road and machinery) | 1.9 | 1.9 | 2.5 | 2.4 | 2.7 |
| 8. Taxes | — | — | — | — | — |
| 9. Total management costs (4−8) | 9.5 | 9.9 | 12.1 | 11.1 | 11.7 |
| 10. Total costs (2+9) | 10.4 | 10.9 | 13.1 | 12.3 | 13.0 |
| 11. Net surplus (operating profit) | −8.2 | −8.5 | −10.5 | −9.7 | −10.4 |

**Table 9:13. Output of Private Woodlands, Volume and Value, Great Britain, 1965**

| Category | Volume *million Hoppus ft* | Estimated Price *per Hoppus ft* 3d | Estimated Value £ *million* |
|---|---|---|---|
| Small roundwood | 15.9 | S.W. × 1/9 | =£1.39 |
| Sawlogs | 13.1 | S.W. × 2/6 | =£1.64 |
| Fellings | 36.3 | H.W. × 3/6 | =£6.35 |
| Thinnings | 6.9 | H.W. × 1/9 | =£0.60 |
| | | | £9.98 |

industry. By the forest year 1968 it is expected that the pulpwood requirement will exceed that of the mining industry. Sawlog production—equal to about one-third of the total softwood output—is less than three per cent of the sawn-softwood consumption in Britain.

Hardwood production comes largely from mature and over-mature woodlands, the combined effects of past neglect and of war-time fellings imply that only low-grade saw timber can be produced. Hardwoods come mainly from southern England.

On the basis of the above data in the physical volume of production it is possible to make rough calculations about the total revenue and these may be checked by calculations from other sources, e.g. the annual reports of the Forestry Commission. These data are presented in Table 9:12.

For private woodlands the value when reckoned on a product basis distinguishes between small roundwood and sawlogs for softwoods and between thinnings and fellings for hardwoods provides a total revenue of £10 million for standing trees for the year 1965, which is presented in Table 9:13. It is not thought that the production is very different from the earlier years and on these grounds the analysis of revenues and costs, presented in Table 9:14, seems rather realistic.

In private forestry it is possible to use data collected by the Economics Sections of the Department of Forestry at Aberdeen and Oxford Universities as a basis for determining the income and expenditure of the private sector of the national forests. One of the main problems is that the data on size of private ownership are not complete; and although the Economic Surveys show a breakdown of size structures they do not include woodlands of under 100

**Table 9:14. Analysis of Volumes, Revenues and Costs, Private Woodlands, 1959—1963**

| | 1959 | 1960 | 1961 | 1962 | 1963 |
|---|---|---|---|---|---|
| Volume of cut[a], annual average (Solid volume without bark), million Hoppus ft | | | 72.0 | 72.0 | 72.0 |
| 1. Gross revenue (£ million) | | | 10.0 | 10.0 | 10.0 |
| 2. Logging costs | | | Not available | | |
| 3. Net conversion surplus | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| 4. Silvicultural costs | Not available | | 2.9 | 2.1 | 1.5 |
| 5. Administrative costs and O.H. (Labour and management) | 3.6 | 3.7 | 3.7 | 3.8 | 3.8 |
| 6. Maintenance costs (Establishment of plantations) | 4.4 | 4.5 | 4.7 | 4.5 | 4.5 |
| 7. Costs of improvement and expansion | Not available | | 1.9 | 1.6 | 1.7 |
| 8. Taxes | Not available | | 0.6 | 0.4 | 0.5 |
| 9. Total management costs (4−8) | | | 13.8 | 12.4 | 12.0 |
| 10. Total costs (2+9) | | | Not available | | |
| 11. Net surplus (operating profit) | | | −3.8 | −2.4 | −2.0 |

*a.* These data do not allow for changes in value of growing stock

acres. Another drawback is that the surveys only cover trading accounts and thus do not indicate the rate of capital formation in the growing stock. In other words, valuations are not included in the surveys.

From the last revision I Census of Woodlands in 1947-1949 it is possible to show an estimate of the area of private forests in England and Wales, and also for Scotland.

In spite of the fact that the data on the size of private ownership are incomplete there is sufficient evidence to suggest that the very great bulk of the woodland estates are in units of less than 100 acres. Although the size-structures of the estates belonging to members of the Timber Growers' Organisation (T.G.O.) in England and Wales and of the Scottish Woodland Owners' Association (S.W.O.A.) may not reflect accurately those of all the woodland estates it is probably broadly in line as far as size groupings are concerned.

From these sources it is possible to build up a picture of the National Income and Expenditure on certain broad assumptions. The more important assumptions in this exercise are as follows:

(1) The Economic Survey of Private Forestry (Income and Expenditure) for England and Wales shows results according to the following size classes: 100-499 acres, 500-1,749 acres, 1,750 acres and over. For Scotland the size classes are similar but there is an additional class for estates of over 5,000 acres. The results for the smallest size group is thus taken to be the most representative for multiplying up the results to give a national picture.

(2) The average income and expenditure for unit area for following categories:

| *INCOME* | *EXPENDITURE* |
|---|---|
| A. Sales of Major Produce to Outside Buyers. | A. Management, Supervision and Labour. |
| B. Value of Produce used on Estate (Outside Forest Enterprise). | B. Vehicles, Machines, External Transport Costs and Tools. |
| C. Other Sales. | C. Materials from outside Forest Enterprise. |
| D. Value of State Grants. | D. Buildings and Land. |
| E. Miscellaneous Receipts. | E. Administrative Expenses (excluding staff). |

(3) These results are related to what the Census of Woodlands describes "Productive Woodlands" (i.e. High Forests, coppice with standards and coppice), as distinct from what is regarded as "Unproductive Woodland" (i.e. scrub, devastated woodland and felled areas). However, the coppice areas have in view of their low productivity, been excluded from the calculations in Table 9:15.

(4) The basic data of income and expenditure refer to trading results only and do not take into account changes in valuation.

(5) The results are obtained very largely from Dedicated estates so that this would tend to make them better than average. In the calculations shown in Table 9:15 a deduction of 10 per cent has been made to allow for this position when calculating the aggregate national figures.

The picture which is built up on these assumptions is shown in Tables 9:15 and 9:16.

**Table 9:15. Estimates of Income and Expenditure: England & Wales, Scotland, and Great Britain, 1962**

| | High forest area[a] (*acre*) | 1962 Income | | Expenditure | |
|---|---|---|---|---|---|
| | | *Rate per acre* £ | *Total* £ | *Rate per acre* £ | *Total* £ |
| England and Wales | 1,215,463 | 6.0 | 7,292,778 | 9.2 | 11,182,259 |
| | | | *less* 10% 729,278 | | 1,118,226 |
| | | | 6,563,500 | | 10,064,033 |
| Scotland | 572,799 | 5.0 | 2,863,995 | 7.5 | 4,295,993 |
| | | | *less* 10% 286,399 | | 429,599 |
| | | | 2,577,596 | | 3,866,394 |
| Great Britain | 1,788,262 | | 9,141,096 | | 13,930,427 |

*a.* Area data are based on 1947—1949 Census of Woodlands

**Table 9:16. Analysis of Income and Expenditure of Private Woodlands, England, Wales and Scotland, 1961—1963**
(*Unweighted averages*)

| Year | No. of estates | Expenditure actual | Income actual total £ | £ *per acre* Average exp. | Average inc. | Balance + | Balance − | Inc. as % of exp. | Total area sampled acres | Average area of estate acres |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | England and Wales | | | | | | |
| 1961 | 22 | 60,362 | 42,567 | 9.9 | 7.3 | | 2.6 | *53* | 6,134 | 279 |
| | | | | w9.8 | w7.0 | | w2.8 | w*71* | | |
| 1962 | 29 | 69,702 | 49,228 | 9.0 | 6.3 | | 2.7 | *72* | 7,647 | 264 |
| | | | | w9.1 | w6.4 | | w2.7 | w*71* | | |
| 1963 | 31 | 68,383 | 37,453 | 8.4 | 4.6 | | 3.8 | *61* | 8,100 | 261 |
| | | | | w8.4 | w4.6 | | w3.8 | w*55* | | |
| | | | | Scotland | | | | | | |
| 1961 | 17 | 37,404 | 28,324 | 6.8 | 5.1 | | | *96* | 6,068 | 357 |
| | | | | w6.2 | w4.7 | | | w*76* | | |
| 1962 | 19 | 38,437 | 24,503 | 5.7 | 4.1 | | | *85* | 6,498 | 342 |
| | | | | w5.9 | w3.8 | | | w*64* | | |
| 1963 | 17 | 44,983 | 28,316 | 7.6 | 4.7 | | | *79* | 5,948 | 350 |
| | | | | w7.6 | w4.8 | | | w*63* | | |

w=weighted averages

### *9.2.3 Classification of Costs*

For private forestry it has been possible through the Economic Surveys conducted by Aberdeen and Oxford Universities to show a breakdown of costs and returns as already described on page 337. As the information has been collected from the forestry department accounts of individual rural estates the data on expenditure would refer to some timber which was sold standing and to some which was felled and otherwise processed before sale. The breakdown of costs does, however, follow a logical pattern in that labour (in the widest sense), materials and land are separately identified. Non-labour administrative expenses are also shown separately.

Work on other (cost) surveys has provided the data for England and Wales, and for Scotland separately, which are presented in Table 9:17.

From these data which show overheads to represent about 50 per cent of direct expenditure or one-third of total expenditure it is possible to work out the extent of social charges to some extent although a proportion of "supervision" includes social overheads. A worked example of overheads allocation suggests that about one-third of the total is a social charge. This evidence suggests that social charges in the sample of estates in the private surveys are about one-fifth of the total overhead costs.

### *9.2.4 Logging and Transport Costs*

According to the Forestry Commission accounts, the cost of logging and transport are as shown in Table 9:18.

**Table 9:17. Analysis of Overheads Expenditure on Private Woodlands, 1952—1956**
*(Unweighted averages)*

| Year | Supervision | Labour additions | Tools | Land | Repairs and improvements | Protection | Total *percentage* | Cost of overheads *per acre* (of total woodland) £ |
|---|---|---|---|---|---|---|---|---|
| | | | | England and Wales | | | | |
| 1952—53 (13) | 22 | 11 | 1 | 9 | (5) | — | *48* | — |
| 1953—54 (17) | 20 | 10 | 2 | 5 | 7 | 3 | *48* | 2.2 |
| 1954—55 (15) | 22 | 10 | 2 | 5 | 11 | 4 | *55* | 2.5 |
| 1955—56 (14) | 24 | 10 | 2 | 4 | 10 | 3 | *54* | 2.4 |
| | | | | Scotland | | | | |
| 1952—53 (2) | 20 | 10 | —[a] | 5 | — | — | *36* | 0.6 |
| 1953—54 (4) | 17 | 9 | 2 | 3 | 1 | 5 | *37* | 1.4 |
| 1954—55 (5) | 31 | 17 | 4 | 3 | 9 | 10 | *75* | 2.1 |
| 1955—56 (5) | 23 | 15 | 3 | 3 | 3 | 10 | *57* | 2.2 |

*a.* — = less than 0.5%

From 1959 to 1963 the costs for extraction has worked out at between 5.3d. and 5.7d. but it is stressed that the point of sale varies to such an extent that cost of haulage cannot be generalised—a situation which also applies in private forestry.

In private forestry it would be expected that costs per Hoppus foot would be higher than in the State forests because it is likely that the loads would be less substantial and less frequent. Furthermore, the Forestry Commission has begun to apply the findings of its Work Study section and this would tend to reduce their costs still further below that of private woodlands. On the other hand, it is probably true that private growers find their outlets at shorter average distances than does the State.

Tables 9:19 and 9:20 are relevant to private forestry.

**Table 9:18. Felling and Conversion on Forestry Commission Woodland, 1959—1963**

| Year | Expenditure[a] | |
|---|---|---|
| | *£ million* | *Pence per Hoppus ft* |
| 1959 | 0.7 | 16.0 |
| 1960 | 0.78 | 18.0 |
| 1961 | 0.66 | 17.0 |
| 1962 | 0.66 | 17.0 |
| 1963 | 0.68 | 18.5 |

*a.* Expenditure on felling and conversion varies with the degree of conversion carried out

**Table 9:19. Costs of Harvesting Operations for Hardwood and Softwoods on Private Estates** [a]

| | Hardwoods | | | Softwoods | | |
|---|---|---|---|---|---|---|
| | 1959—60 | 1962 | 1964 | 1959—60 | 1962 | 1964 |
| | *Pence per Hoppus ft* | | | *Pence per Hoppus ft* | | |
| Felling | 5¼ | 5¼ | 5½ | 4¼ | 4¾ | 4¾ |
| Conversion | — | 2½ | 2½ | — | 2½ | 2½ |
| Extraction | 3 | 3¾ | 3½ | 3 | 3¾ | 3½ |
| Leading in | 7¼ | 5 | 5½ | 7¼ | 5 | 5½ |

*a.* These sources do not provide any data on transport charges but some evidence has been summarised as follows from reports by C. E. Hart (see Table 9:20)

**Table 9:20. Transport Costs for Specified Distances**

| | 1959—60 | 1964—65 |
|---|---|---|
| | *Pence per Hoppus ft* | *Pence per Hoppus ft* |
| Large Timber | | |
| First 25 miles | 4—6 | 5—8 |
| 25—30 miles | 8 | 9—12 |
| 50—100 miles | 12 | 12—18 |
| Pit Timber, Pulpwood, etc. | *per ton* | *per ton* |
| First 25 miles | 12s. 6d. | 13s.—15s. |
| 25—30 miles | 17s. 6d. | 15s.—25s. |
| 50—100 miles | 25s. | 25s.—35s. |

*Source:* Hart, C. E., *Home Grown Timber Prices and Forestry Costings 1959—60, 1960 and 1964—65*

*9.2.5 Silvicultural Costs*

The total amount of planting in recent years (1953-1962) is shown in Table 9:21. Establishment, improvement and protection of stands which are "necessary for the undiminished maintenance of productive capacity of a large forest enterprise" in the Forestry Commission is included in the total current expenditure which is of the order of £2.8 million per annum, of this £1.4 million is devoted to weeding, cleaning and beating up plantations in the establishment stage. A further reduction in the rate of expenditure on maintenance and protection could be expected if new afforestation were discontinued.

For the private forest area the average costs of establishment and improvement of stands per acre have been shown from the Private Forest Cost Surveys of the Departments of Forestry at Aberdeen and Oxford Universities as shown in Tables 9:22 and 9:23 which refer to direct costs only. Fifty per cent should be added to these data to cover overheads.

Unweighted average data have been chosen as being more representative of the smaller private woodlands because the Survey reports cover woodland areas of 100 acres or over. The weighted average results are significantly less. The data are presented on the assumption that it takes five years to establish plantations as usually weeding is necessary in the original planting year and in the four subsequent years with beating up in the second and subsequent three years.

For weighting purposes weeding is best placed in establishment of stands section for the first five years. Protection in Britain is likely to be mainly concerned with fencing against rabbits although the outbreak of myxomatosis since 1954 has greatly reduced this need. This kind of protection has been regarded as part of the "direct" cost of establishment of plantations. In addition, protection items appearing in general overheads amounted to a

**Table 9:21. Area of New Planting, by Private Owners and Forestry Commission, in Great Britain, 1953—1963**
(*acres*)

| Year | Private Owners | Forestry Commission |
|---|---|---|
| 1953 | 18,200 | 67,610 |
| 1954 | 19,100 | 70,400 |
| 1955 | 22,100 | 67 900 |
| 1956 | 27,100 | 62,400 |
| 1957 | 31,600 | 57,900 |
| 1958 | 32,100 | 52,400 |
| 1959 | 34,800 | 55,136 |
| 1960 | 36,900 | 61,886 |
| 1961 | 36,836 | 63,693 |
| 1962 | 35,119 | 61,948 |
| 1963 | 31,881 | 55,596 |

further four per cent of direct costs in England and Wales and to another ten per cent in Scotland, this would imply that these percentages would have to be reduced by a third to arrive at proportion occupied by protection—excluding fencing—in total costs.

The structure of the Forestry Commission silvicultural costs is shown in Table 9:24.

**Table 9:22. Representative Direct Costs of Establishing Plantations in England and Wales, 1953—1954 to 1963—1964**
*(Unweighted averages)*

| | Direct costs *per acre* | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1953—54 | | 1954—55 | | 1955—56 | | 1956—57 | | 1957—58 | | 1958—59 | | 1959—60 | | 1960—61 | | 1961—62 | | 1962—63 | |
| | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % |
| Preparation of Ground (Net) | 18.4 | *35* | 18.4 | *35* | 18.7 | *39* | 17.3 | *36* | 20.8 | *38* | 19.6 | *34* | 22.2 | *40* | 25.1 | *42* | 22.0 | *42* | 20.1 | *36* |
| Fencing + | 13.5 | *25* | 12.5 | *24* | 7.6 | *16* | 7.5 | *15* | 9.1 | *16* | 11.4 | *20* | 6.2 | *11* | 10.5 | *18* | 7.5 | *13* | 8.1 | *15* |
| Planting | 21.5 | *40* | 21.6 | *41* | 21.1 | *45* | 24.0 | *49* | 25.1 | *46* | 26.3 | *46* | 26.8 | *49* | 23.6 | *40* | 26.6 | *48* | 27.5 | *49* |
| Weeding (P+0) | 4.6 | | 5.6 | | 6.0 | | 4.9 | | 4.6 | | 5.1 | | 5.5 | | 5.1 | | 4.9 | | 6.2 | |
| Beating up (P+1) | 1.8 | | 1.9 | | 3.3 | | 2.8 | | 3.5 | | 2.9 | | 4.6 | | 3.3 | | 4.2 | | 3.7 | |
| Weeding (P+1) | 4.4 | | 5.2 | | 5.6 | | 5.9 | | 6.7 | | 6.0 | | 4.9 | | 6.4 | | 5.6 | | 6.5 | |
| Beating up (P+2) | 1.3 | | 1.0 | | 1.1 | | 1.7 | | 2.0 | | 1.4 | | 2.3 | | 1.6 | | 2.4 | | 2.3 | |
| Weeding (P+2) | 4.7 | | 4.9 | | 4.5 | | 4.0 | | 5.9 | | 5.2 | | 4.4 | | 5.1 | | 4.5 | | 5.0 | |
| Beating up (P+3) | 0.6 | | 0.7 | | 0.4 | | 1.1 | | 1.4 | | 1.4 | | 1.3 | | 1.2 | | 1.9 | | 0.8 | |
| Weeding (P+3) | 3.7 | | 3.7 | | 3.2 | | 3.3 | | 3.8 | | 4.4 | | 3.6 | | 4.0 | | 4.2 | | 4.3 | |
| Beating up (P+4) | 0.7 | | 0.4 | | 0.5 | | 0.5 | | 0.8 | | 1.0 | | 1.2 | | 1.2 | | 1.1 | | 0.6 | |
| Weeding (P+4) | 2.5 | | 2.6 | | 2.3 | | 2.3 | | 3.5 | | 2.9 | | 3.6 | | 3.0 | | 2.8 | | 3.4 | |
| Total | 77.7 | *100* | 78.5 | *100* | 74.3 | *100* | 75.3 | *100* | 87.2 | *100* | 87.6 | *100* | 86.6 | *100* | 90.1 | *100* | 87.7 | *100* | 88.5 | *100* |
| Initial establishment total | 53.4 | *67* | 52.5 | *67* | 47.4 | *64* | 48.8 | *65* | 55.0 | *63* | 57.3 | *65* | 56.2 | *64* | 59.2 | *66* | 56.1 | *64* | 55.7 | *63* |
| Weeding total | 19.9 | *25* | 22.0 | *28* | 21.6 | *29* | 20.4 | *27* | 24.5 | *28* | 23.6 | *27* | 22.0 | *25* | 23.6 | *26* | 22.0 | *25* | 25.4 | *29* |
| Beating up total | 4.4 | *6* | 4.0 | *5* | 5.3 | *7* | 6.1 | *8* | 7.7 | *9* | 6.7 | *8* | 9.4 | *11* | 7.3 | *8* | 9.6 | *11* | 7.4 | *8* |

**Table 9:23. Representative Direct Costs of Establishing Plantations in Scotland, 1953—1954 to 1961—1962**
*(Unweighted averages)*

| | Direct Costs *per acre* | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1953—54 | | 1954—55 | | 1955—56 | | 1956—57 | | 1957—58 | | 1958—59 | | 1959—60 | | 1960—61 | | 1961—62 | |
| | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % | £ | % |
| | | *a* | | *a* | | *a* | | *a* | | *a* | | *a* | | *a* | | *a* | | *a* |
| Preparation of ground (Net) | 7.1 | *21* | 7.5 | *27* | 9.4 | *32* | 7.9 | *25* | 8.0 | *26* | 10.5 | *27* | 10.7 | *28* | 8.7 | *24* | 7.2 | *21* |
| Fencing | 13.2 | *39* | 6.4 | *23* | 5.1 | *17* | 5.4 | *17* | 4.3 | *14* | 8.6 | *22* | 7.9 | *21* | 8.1 | *22* | 7.4 | *21* |
| Planting | 13.7 | *40* | 14.4 | *50* | 15.3 | *51* | 18.2 | *58* | 19.0 | *60* | 19.4 | *51* | 19.0 | *51* | 19.6 | *54* | 20.2 | *58* |
| Weeding (P+0) | 1.2 | | 1.7 | | 2.6 | | 2.2 | | 1.7 | | 2.8 | | 2.8 | | 3.2 | | 2.3 | |
| Beating up (P+1) | 0.8 | | 1.1 | | 4.1 | | 2.3 | | 2.8 | | 1.7 | | 1.4 | | 1.6 | | 2.0 | |
| Weeding (P+1) | 1.6 | | 2.4 | | 2.4 | | 2.6 | | 2.2 | | 2.1 | | 2.5 | | 2.7 | | 2.2 | |
| Beating up (P+2) | 0.6 | | 1.7 | | 2.0 | | 3.6 | | 2.9 | | 1.6 | | 0.8 | | 1.2 | | 1.0 | |
| Weeding (P+2) | 1.0 | | 1.7 | | 2.1 | | 1.8 | | 2.0 | | 1.4 | | 1.8 | | 2.2 | | 1.7 | |
| Beating up (P+3) | 0.4 | | 1.3 | | 1.0 | | 0.2 | | 1.5 | | 1.6 | | 1.3 | | 0.5 | | 0.8 | |
| Weeding (P+3) | 0.7 | | 1.0 | | 1.3 | | 0.3 | | 1.3 | | 1.1 | | 1.0 | | 1.2 | | 1.0 | |
| Beating up (P+4) | 0.2 | | 0.9 | | 0.7 | | 1.1 | | 0.2 | | 0.3 | | 0.7 | | 0.9 | | 0.6 | |
| Weeding (P+4) | 0.3 | | 0.9 | | 1.1 | | 0.3 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | | 0.6 | |
| Total | 40.8 | *100* | 41.0 | *100* | 47.1 | *100* | 45.9 | *100* | 46.3 | *100* | 51.7 | *100* | 50.7 | *100* | 50.9 | *100* | 47.0 | *100* |
| | | *b* | | *b* | | *b* | | *b* | | *b* | | *b* | | *b* | | *b* | | *b* |
| Initial Establishment total | 34.0 | *83* | 28.3 | *69* | 29.8 | *63* | 31.5 | *68* | 31.3 | *68* | 38.5 | *75* | 37.6 | *74* | 36.4 | *72* | 34.8 | *74* |
| Weeding total | 4.8 | *12* | 7.7 | *19* | 9.5 | *20* | 7.2 | *16* | 7.6 | *16* | 8.0 | *15* | 8.9 | *18* | 10.3 | *20* | 7.8 | *17* |
| Beating up total | 2.0 | *5* | 5.0 | *12* | 7.8 | *17* | 7.2 | *16* | 7.4 | *16* | 5.2 | *10* | 4.2 | *8* | 4.2 | *8* | 4.4 | *9* |

*a. Percentages* of the initial establishment cost
*b. Percentage* of the total cost
Estate overheads excluded

**Table 9:24. Silvicultural Costs on Forestry Commission Plantations, 1959—1963**

| | 1959 | 1960 | 1961 | 1962 | 1963 |
|---|---|---|---|---|---|
| Establishment (Planting, weeding, brashing) £ per acre ..... | 60 | 55 | 59 | 56 | 63 |
| Maintenance (Drains and fences) £ per acre ..... | 0.36 | 0.34 | 0.34 | 0.35 | 0.34 |
| Protection (Fire and other) £ per acre ..... | 0.39 | 0.40 | 0.39 | 0.38 | 0.37 |
| Breakdown of F.C. expenditure by Silvicultural Heads. | | | £ *millions* | | |
| | 1959 | 1960 | 1961 | 1962 | 1963 |
| Establishment ..... | 2.2 | 2.4 | 2.6 | 2.4 | 2.2 |
| Weeding and cleaning and brashing ..... | 1.1 | 1.0 | 1.1 | 1.0 | 1.2 |
| Maintenance ..... | 0.40 | 0.44 | 0.45 | 0.49 | 0.50 |
| Protection ..... | 0.47 | 0.51 | 0.52 | 0.53 | 0.53 |

### *9.2.6 Administrative Costs*

For the Forestry Commission areas the administrative costs in the years 1959-1963 are shown in Table 9:25.

Table 9:17 indicating the contents of overhead items in the Private Forestry Costs surveys reveal that "supervision" added about a quarter to the direct costs and about a further eighth could be attributed to "labour additions". Following the lines of the previous table these items would represent for England and Wales, and for Scotland, the rates which are shown in Table 9:26.

In the absence of more recent data on overheads after 1955-1956 on a sufficiently adequate scale in the private forestry costs survey it will have to be assumed that the trend of these costs have been fully maintained or increased in view of the general rise in wage and salary levels.

### *9.2.7 Costs for Maintenance of Facilities*

In private forestry the evidence from Table 9:17 on overheads distribution would include this section under "Repairs and improvements" except that one-third of the item has already been included in silvicultural costs. In can therefore be assumed that the amounts (two-thirds) indicated in Table 9:27 would represent the totals for England and Wales, and for Scotland.

### *9.2.8 Costs for Improvement and Expansion*

In the private forestry sector which operates on long-established areas of land the construction of new road network and buildings is not likely to be a very significant part of total expenditure; nor is initial planting of new ground not previously used for forest production likely to be on any substantial scale

**Table 9:25. Administrative Costs (Local Supervision and Management) on Forestry Commission, 1959—1963**

| Year | Local Supervision *£ million* | Management *£ million* |
|---|---|---|
| 1959 | 1.2 | 1.2 |
| 1960 | 1.4 | 1.2 |
| 1961 | 1.8 | 1.3 |
| 1962 | 1.7 | 1.4 |
| 1963 | 1.7 | 1.5 |

**Table 9:26. Administrative Costs (Supervision and Labour Additions) on Private Woodlands, 1952—1963**

| Year | England and Wales[a] | | Scotland[b] | | Great Britain |
|---|---|---|---|---|---|
| | *£ per acre* | Total *£ million* | *£ per acre* | Total *£ million* | Total *£ million* |
| 1952—53 | 1.5 | 1.87 | 0.5 | .22 | 2.09 |
| 1953—54 | 1.4 | 1.75 | 1.0 | .43 | 2.18 |
| 1954—55 | 1.5 | 1.87 | 1.3 | .56 | 2.43 |
| 1955—56 | 1.5 | 1.87 | 1.5 | .65 | 2.52 |
| 1956—57 | 1.6 | 2.00 | 1.6 | .69 | 2.69 |
| 1957—58 | 1.7 | 2.13 | 1.7 | .73 | 2.86 |
| 1958—59 | 1.8 | 2.25 | 1.8 | .77 | 3.02 |
| 1959—60 | 1.9 | 2.38 | 1.9 | .82 | 3.20 |
| 1960—61 | 2.0 | 2.50 | 2.0 | .86 | 3.36 |
| 1961—62 | 2.1 | 2.63 | 2.1 | .90 | 3.53 |

*a.* based on 1.25 million acres productive woodlands
*b.* based on 0.43 million acres productive woodlands

**Table 9:27. Cost of Maintenance of Facilities on Private Woodlands, 1953—1963**

| | England and Wales[a] *£000* | Scotland[b] *£000* | Great Britain *£000* |
|---|---|---|---|
| 1952—53 | 200 | 90 | 290 |
| 1953—54 | 280 | 90 | 370 |
| 1954—55 | 430 | 690 | 1,120 |
| 1955—56 | 380 | 340 | 720 |
| 1956—57 | 500 | 110 | 610 |
| 1957—58 | 500 | 110 | 610 |
| 1958—59 | 500 | 110 | 610 |
| 1959—60 | 500 | 110 | 610 |
| 1960—61 | 500 | 110 | 610 |
| 1961—62 | 500 | 110 | 610 |
| 1962—63 | 500 | 110 | 610 |

*a.* based on 1.25 million acres productive woodlands
*b.* based on 0.43 million acres productive woodlands

on the ordinary private estate—although in recent years these activities would be part of the operation of a number of important forest syndicates. Apart from the syndicates the points 1, 2 and 3 under section 15 of the directive could be arrived at as follows:

(1) The extent of expenditure on construction of new roads, buildings and drainage and transport facilities could be based on Income and Expenditure Surveys presented in Table 9:16. These data could be multiplied by the acres shown in Table 9:21. The results are shown in Table 9:28.

(2) The extent of expenditure for acquisition of new machines, tools and equipment could be built up from similar data as for (1) using the percentages shown in Income and Expenditure Surveys (Tables 9:15 and 9:16).

The results are shown in Table 9:29.

*9.2.9 Taxes*

Taxation for forestry can be regarded as incentives as they represent concessions. The net amount of tax paid would be difficult to determine precisely and, for that reason, its determination has been excluded from the Income and Expenditure Surveys. The burden of taxation is in any case largely determined by the non-woodland resources of the woodland owners and favours the owner with the highest income from other sources.

Death duties or inheritance taxes (known as Estate Duty) is highly progressive in Britain and is only payable when timber is sold. It could, however, be regarded as a "cost" tax.

*9.2.10 Allocation of Overhead Charges (Common Costs)*

Some assessment of the overhead charges can be made broadly from the fact that the average proportion of overheads to total costs was shown to be about one-third in the Surveys of Private Forestry Costs (See Table 9:14). Working out the data on this principle, the results are shown in the Tables 9:30 and 9:31 on the assumption that England and Wales had 1.25 million acres and Scotland had 0.45 million acres of productive woodland in each year.

Another source of information on this aspect lies in the expenditure side of the Income and Expenditure Survey accounts but considerable adjustments of the method of presentation would be required to assess the exact proportion attributable to overheads. However, this source does provide some form of check on the results estimated in the previous table.

## 9.3 Revenue and Costs based on Hypothetical Models

One of the best sources of information on Forestry Commission financial activities is available from the *Trading Accounts and Balance Sheets* published annually. A fairly complete analysis of income and expenditure on private forest enterprises has been prepared in the Economic Survey of Private

**Table 9:28. Costs of Improvements on Private Woodlands, 1961—1963**

| Year | England and Wales *Total* £ *million* | Scotland *Total* £ *million* | Great Britain *Total* £ *million* |
|---|---|---|---|
| 1961 | 0.37 | 0.12 | 0.49 |
| 1962 | 0.34 | 0.10 | 0.44 |
| 1963 | 0.42 | 0.10 | 0.52 |

**Table 9:29. Costs of New Machines, Tools and Equipment, 1961—1963**

| Year | England and Wales *Total* £ *million* | Scotland *Total* £ *million* | Great Britain *Total* £ *million* |
|---|---|---|---|
| 1961 | 1.23 | 0.20 | 1.43 |
| 1962 | 1.01 | 0.17 | 1.18 |
| 1963 | 0.84 | 0.29 | 1.13 |

**Table 9:30. Overhead Charges on Private Woodlands (Method A), 1953—1962**

| Year | England and Wales | | Scotland | | Great Britain |
|---|---|---|---|---|---|
| | £ *per acre* | *Total* £ *million* | £ *per acre* | *Total* £ *million* | *Total* £ *million* |
| 1952—53 | 2.2 | 2.750 | 0.6 | .258 | 3.008 |
| 1953—54 | 2.2 | 2.750 | 1.4 | .602 | 3.352 |
| 1954—55 | 2.5 | 3.125 | 2.1 | .903 | 4.028 |
| 1955—56 | 2.4 | 3.000 | 2.2 | .946 | 3.946 |
| 1956—57 | 2.4 | 3.000 | 2.2 | .946 | 3.946 |
| 1957—58 | 2.5 | 3.125 | 2.3 | .989 | 4.114 |
| 1958—59 | 2.5 | 3.125 | 2.3 | .989 | 4.114 |
| 1959—60 | 2.6 | 3.250 | 2.4 | 1.032 | 4.282 |
| 1960—61 | 2.6 | 3.250 | 2.4 | 1.032 | 4.282 |
| 1961—62 | 2.7 | 3.375 | 2.5 | 1.075 | 4.450 |

Estimates based on Surveys of Private Forestry Costs, Forest Economics Sections, Departments of Forestry at Oxford and Aberdeen Universities

**Table 9:31. Overhead Charges on Private Woodlands (Method B), 1961 and 1962**

| Year | England and Wales | | Scotland | | Great Britain |
|---|---|---|---|---|---|
| | £ *per acre* | *Total* £ *million* | £ *per acre* | *Total* £ *million* | *Total* £ *million* |
| 1961.... | 2.50 | 3.125 | 1.52 | 0.654 | 3.779 |
| 1962.... | 2.25 | 2.622 | 1.65 | 0.709 | 3.331 |

Forestry in its report on Income and Expenditure for the years 1960-1961 and 1961-1962 and it is not proposed to analyse the results any further at this stage. (See, however, Table 9:15.) As these reports cover England and Wales, and also Scotland, it is possible, by taking the appropriate acreages and size classes, to calculate an estimate for Great Britain as a whole and to relate this to the national volume of output. A more recent year 1962-1963 is covered in a more recent supplement in the Income and Expenditure report. On the basis of these data an hypothetical model for conifers representing rough averages in two yield classes is constructed and which is shown in Table 9:32.

**Table 9:32. Hypothetical Model**
*(Normal Forest of Two Different Site Quality Classes)*

| Yield Model | I | II |
|---|---|---|
| Average Annual Volume Yields $m^3$/ha | 17.8 | 10.7 |
| | *S.kr per ha* | |
| Average Annual Net Conversion Surplus | 355 | 175 |
| Average expenditure on Silvicultural operations specific to the crop | 20 | 15 |
| Average expenditure on maintenance including road maintenance | 55 | 30 |
| Average expenditure on administration | 35 | 35 |
| Total Management | 90 | 55 |
| Total Expenditure | 110 | 70 |
| Net 'Profit' | 245 | 105 |

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# Chapter 10

# COMPARISON OF NATIONAL LEVELS

# Comparison of National Levels

by

E. STRIDSBERG and K. V. ALGVERE

*Introductory Remarks*

The original purpose of this work was the comparison of production conditions and costs involved in forestry operations in European countries, to which the previous eight chapters have been devoted. The basic idea has been to present the material from the different countries as uniformly as possible in order to avoid difficulties in the actual comparisons which are to be made in this chapter.

However, despite the efforts made at the conference at Munich and the directives drawn up on the basis of the discussions, it was not possible to achieve complete uniformity in the presentation of the basic material. The fact that such material is compiled in different ways makes a large part of important data concerning similar activities in different countries not comparable.

These difficulties are even more marked in the construction of models. The Directives recommended the comparisons of revenue and costs should be done by the construction of hypothetical models for the whole country. However, most of the participants have not constructed such models for their respective countries and consequently a general comparison is not possible. Also the models constructed for different tree species, which should have provided a more exact description of cost-revenue relationship in various countries, proved to be unsuitable for international comparisons; this was evident from the discussions at the conference held at Bad Godesberg on 18 May 1966 during the final stage of the study.

Even in the discussions at the Munich conference it was evident that constructed hypothetical models would be very useful for a detailed explanation of the structural features of the statistical material. Thus such models could be a useful supplement for the individual countries. However, comparisons between the countries could give rise to wrong conclusions, because it would hardly be possible to devise a uniform construction technique which would be also the most appropriate for the countries involved. This is the reason why in this survey the constructions of models has been used only in connection with the individual national accounts.

In most cases the actual accounting records presented by the various countries refer only to State forestry. This is unfortunate as in the majority

of the countries concerned the forests in public ownership constitute a relatively small part of the total forest area. The reason for presenting State forestry data seems to be the failure on the part of private forest owners (with certain exceptions) to provide long-term records concerning their operations. Consequently, the actual accounting records presented in this part of the study cannot be said to be directly representative of forestry as a whole for the respective countries. In order to correspond to the average conditions such data must first be revalued and adjusted.

## 10.1 Main Features of the Forest Economy

*10.1.1 Characteristics of the Forestry Sector in the Participating Countries*

Geographically the forest land dealt with in this study covers a relatively large area, the characteristic features of which are varied. It stretches from the Arctic timber line, which in Europe is at almost the latitude 69°N, i.e. north of the Arctic Circle, to the Alpine timber line in the south, almost at the latitude of 46°N. Thus this extent of some 2,500 kilometres (about 1,500 miles) in a north-south direction provides a view of forestry conditions in countries which have long-standing traditions of forestry but which at the same time can be regarded also as the most advanced industrial countries.

Few people have settled on the fringes of the forests, both in the north and the south. The density of population is greater where there are optimum conditions for forest growth; however, for a long time large parts of the most fertile forest lands have been cleared for settlement and agricultural purposes.

It is obvious that in such a geographical area the natural conditions for primary forest production will vary quite considerably. The average productive capacity is lowest in the transition zones between the tundra and the bare mountain, but even in the central parts of the area, where optimum conditions of growth can generally be expected, there can occur sites of relatively low productivity. One could possibly say that the mean annual increment for the entire area varies between 1-20 cubic metres per hectare, a factor which has far-reaching consequences for the financial results of forestry operations.

Also it is obvious that forestry cannot be practised in exactly the same way and on the equal basis in such varied conditions. Silvicultural systems must therefore be, and in fact are, of quite a varied nature.

However, the difference in forestry practice are dictated not only by the varying natural and economic conditions, which are characteristic of the area in question, but also by the historical development and the traditions of forest management. In actual fact, the methods of cutting and reproduction in each individual country have special characteristic features, which to a considerable extent can be attributed to tradition-bound development in the past.

However, in all the countries concerned the European pattern of forest management is employed. This means that the principle of sustained yield

serves as a main objective for forestry operations which are based on a formal working plan, and that the productive and protective functions of the forest, with due respect to the recreational function, are taken into consideration. Furthermore, it must be kept in mind that great developments have taken place in technical and social spheres and these have affected forestry in western Europe to a great degree. New techniques have changed not only the methods of timber harvesting and of wood-processing but also the structure of the demand for forest products in general. In addition, the arrival of the Welfare State has brought with it completely new conditions which also apply to forestry and which were unknown in earlier times. As a consequence both the costs and revenue of forestry have been subjected to strong pressure.

The most noticeable changes in European forestry have actually come about since the World War II. During the post-war period large-scale mechanisation of forestry work has taken place in most of the countries in western Europe. As a consequence, manual labour to a great extent has been replaced by machines.

There has also been a marked rise in the wages of forest workers, despite the fact that often the increase in productivity has been slight. The wages of forest workers have followed wage increases in other fields, particularly industry, where there have been tangible increases in productivity to some extent due to the automation of the production processes.

Thus the constant rise in wages and the first stage of the mechanisation process involved a considerable increase in costs in forestry production. However, during the post-war period the prices of timber have remained at approximately the same level or have shown even a downward trend because of keener competition in the timber market; this competition has made itself particularly felt since the latter part of the Fifties. In Europe such competition has been intensified as a result of increased offers from the countries of Eastern Europe and the U.S.S.R. and from North America. However, prices have been affected also by the development of new wood products and by non-wood products, which to a great degree have replaced some of the "old" wood products.

It should be emphasised that the development has not been uniform in all the countries covered by this study. One can only discern similar trends in development and during the period being studied the individual countries reached different stages in the process of transformation.

An important factor influencing the forestry practice, in particular the intensity of forest management, is the net conversion surplus or stumpage value. The reports compiled by the individual countries provide clear evidence of the relationship between the intensity of forest management and the stumpage value. In this part of the study this relationship is accepted as one of the main working hypotheses and can be proved quite easily by statistical comparisons.

One can draw a certain line between exporting and importing countries on the differences in the levels of prices of roundwood and the costs of timber production. As a rule, in importing countries the prices of roundwood as well as of standing timber are higher than the prices in the exporting countries. It is these conditions which to a great extent determine the activities in the forests. Forestry operations in the importing countries are in effect considerably more intense than those in exporting countries. As a rule, more intensive forestry practice involves higher costs, and this fact should be kept in mind before any conclusions are drawn concerning the differences in the levels of costs in forestry.

On the basis of the above the countries which are participating in this study can be divided up in the following manner:

a. Timber-exporting countries: Austria, Finland, Norway and Sweden.
b. Timber-producing and timber-importing countries: Denmark, Germany and Switzerland.
c. Timber-importing country: United Kingdom.

Such a division is not completely correct, because all the countries mentioned produce, import and export timber in one form or another. This also applies to the United Kingdom, which is the greatest importer of timber in the world but which is also a producer of roundwood, and the share of such roundwood in the total timber consumption of the United Kingdom is steadily rising. However, the importance of the home production of timber in the economy is relatively slight compared with the volume of imported timber; consequently, the position of the United Kingdom as a pure importing country is not changed.

From the price standpoint such a division into groups seems to be particularly desirable. This division will not be directly applied in the tables presented in this chapter, but generally it will be possible to discern such a division behind the figures in such tables.

### *10.1.2 Share of Forestry in the Gross National Product*

Detailed results of the contribution of forestry to the Gross National Product in the eight countries under survey are given in Table 10:1. The appraisal of the "net production value" of forestry is based on the aggregate sales value of felled timber at the point of delivery for seven of the countries, namely, Austria, Denmark, Finland, Germany, Norway, Sweden and Switzerland. The "net production value" of forestry has been attained by deducting from the gross value the calculated value of materials, machinery, etc., which have been procured from other sectors outside forestry. For comparisons between countries this "net production value" or "value added" is given as a percentage of the G.N.P., which as a rule is taken from official statistics of the respective countries.

**Table 10:1. Contribution of Forestry to the Gross National Product, by Countries, 1953—1962**
*(as percentage of G.N.P.)*

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1953—1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1958—1962 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sweden | 5.0 | 4.7 | 4.8 | 4.6 | 3.9 | 4.6 | 3.3 | 3.3 | 3.4 | 3.6 | 3.2 | 3.4 |
| Austria | 2.4 | 3.1 | 3.4 | 2.8 | 2.9 | 3.0 | 2.4 | 2.3 | 2.0 | 2.2 | 1.9 | 2.2 |
| Denmark | | | | | | | 0.35 | 0.32 | 0.30 | 0.24 | 0.24 | 0.29 |
| Finland | 8.4 | 9.6 | 10.1 | 8.0 | 7.3 | 8.7 | 7.2 | 6.6 | 7.6 | 8.1 | 7.8 | 7.5 |
| Germany | 0.93 | 0.88 | 0.96 | 0.77 | 0.80 | 0.86 | 0.71 | 0.57 | 0.46 | 0.51 | 0.45 | 0.53 |
| Norway | 3.0 | 2.7 | 2.8 | 2.9 | 3.0 | 2.9 | 2.6 | 2.1 | 2.0 | 2.1 | 1.9 | 2.1 |
| Switzerland | | | | | | | 0.7 | 0.6 | 0.6 | 0.6 | 0.7 | 0.64 |
| United Kingdom | | | | | | | 0.08 | 0.07 | 0.08 | 0.08 | 0.09 | 0.08 |

*Source:* Reports of respective countries; Tables 2:1, 3:1, 4:1, 5:1, 6:1, 7:1, 8:1, 9:3

Norwegian and Danish material has been adjusted to allow for other values, such as changes in standing timber and felled timber stocks, as well as the investment costs for this kind of capital formation (see Table 4:1 and Table 7:1, lines 2, 3 and 4). Because such details are lacking in the data supplied by the other participating countries, adjustments have been made so that the material from Norway and Denmark can be compared with data about the other countries.

For the United Kingdom the appraisal of the net output of forestry is different from the procedure described above. The sum of factor incomes arising from forestry activities is regarded as the net output of forestry for the United Kingdom, or to put it more explicitly the contribution of forestry consists largely of planting and maintenance of forests. The calculation is based exclusively on the accounts of the State enterprises and, contrary to the practice in other countries, it includes imputed interest charges.

Figure 10—1 depicts graphically the comparison of the percentage shares of forestry in the G.N.P. of different countries. The United Kingdom has not been included in this comparison for the reason given above, namely that the basis of calculation is different in the United Kingdom and the data obtained consequently not comparable to data from other countries. It is clearly evident from this graphic representation how important forestry is for the various countries and that the contribution of forestry to the economy of exporting countries is greater in all such cases than that in importing countries.

The important fact which emerges is that the relative contribution of forestry to the G.N.P. in most of the countries shows a declining trend. This trend is most conspicuous in the exporting countries. In actual fact, this trend shows that forestry cannot keep pace with the marked growth of industrial production. However, the net production value of forestry in absolute figures maintains a level which is approximately constant, especially if changes in the value of money are disregarded. In a number of countries declining timber

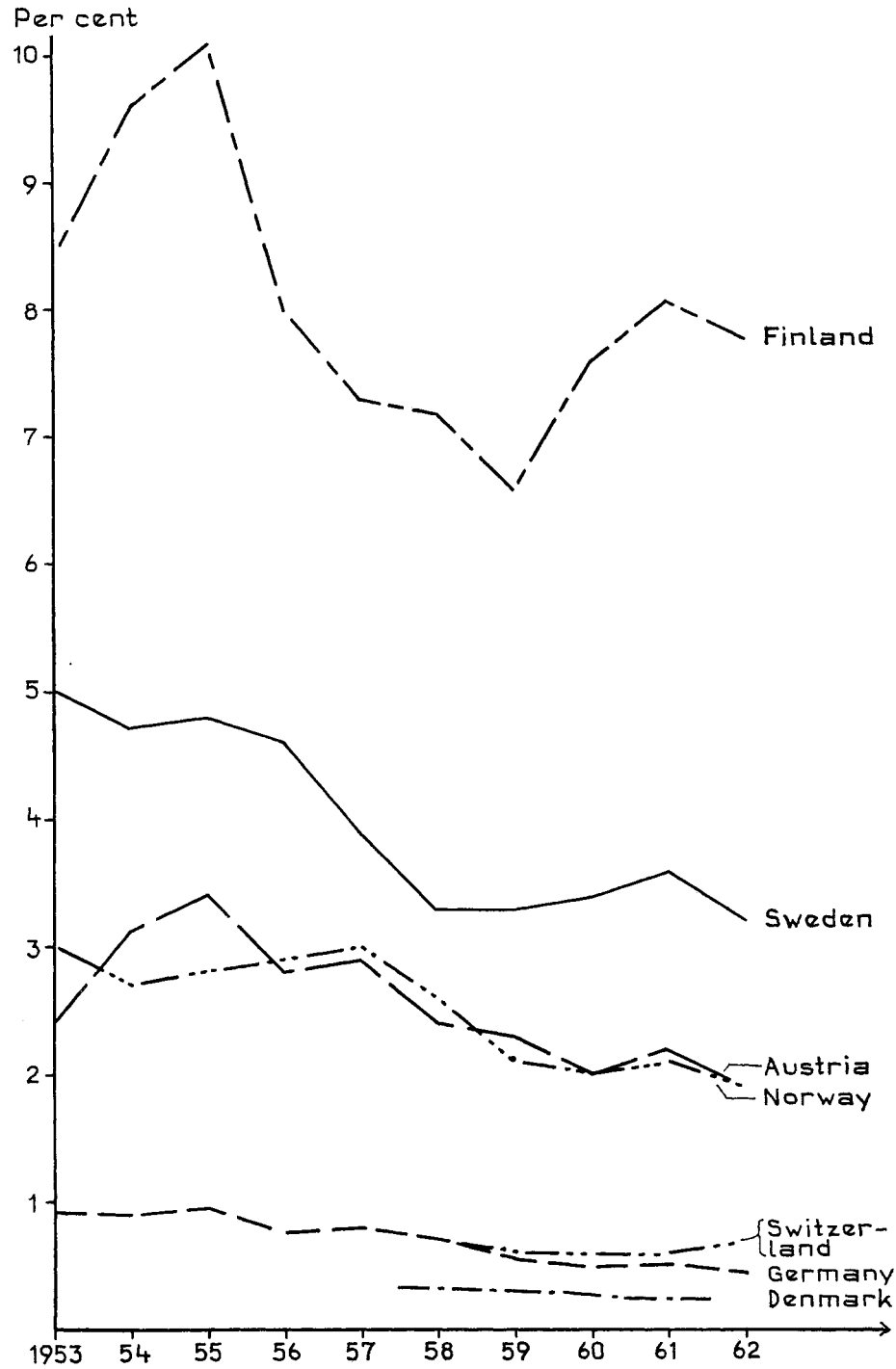


Fig. 10-1. Percentage Contribution of Forestry to the Gross National Product, 1953-1962

prices have been compensated by increased timber output, thus the total "value added" remains unchanged in the main. This can be seen from the graph in Figure 10—2, where the index figures (1954=100) for the G.N.P. and for the "net production value" of forestry (calculated on the basis of the 1962 value of money) for the four selected countries are compared with each other. However, the production function of forests can be better assessed when it is regarded as an integrated part of the entire forestry sector of the economy, which also includes the wood-processing industry. One must also consider the protective and recreational functions of the forests, which usually are in reverse proportion to the relative figures presented here.

### *10.1.3 Total Forest-Products Balances*

Table 10:2 gives details of the timber balances of the various countries and these data serve as the basis for the division of the countries into the mentioned groups: (a) timber exporting, (b) timber producing and timber importing, and (c) timber-importing countries.

One can see from this table that the German Federal Republic is the largest consumer of forest products in absolute figures. English usage of forest products in 1960 amounted to half of the German consumption. It should be emphasised—and this is indicated by a footnote to the table—that England's actual consumption is greater than the presented figures show. However, an upwards adjustment of the English figures would probably not make any great difference in the positions in the table.

Despite the imports of forest products in terms of roundwood equivalent being of approximately the same volume for both Germany and the United Kingdom, their position as importing countries is not the same. The reason why this is so is that Germany produces more than half of its consumption of forest products from its own raw material, while about 85 per cent of the timber used in the United Kingdom is imported. The same can be said for Denmark, although proportionally the amount is less.

Figure 10—3 illustrates the contribution of imports to the total wood supply in seven countries during the period 1953-1962. Attention should be drawn to the fact that there was a tendency for the share of imports to increase in most of these countries. However, this seems to have been reversed in later years.

Table 10:3 shows that the share of domestic production in the total wood supply during the period 1953-1962 has declined even in the exporting countries, although to a much lesser extent than in those countries which have been classified as timber-producing and timber-importing countries (Denmark, Germany and Switzerland).

Table 10:4 indicates the share of exports in the total wood supply of seven countries. It should be noted that the developments in the countries in question (excluding the United Kingdom) are uneven. In the two big exporting

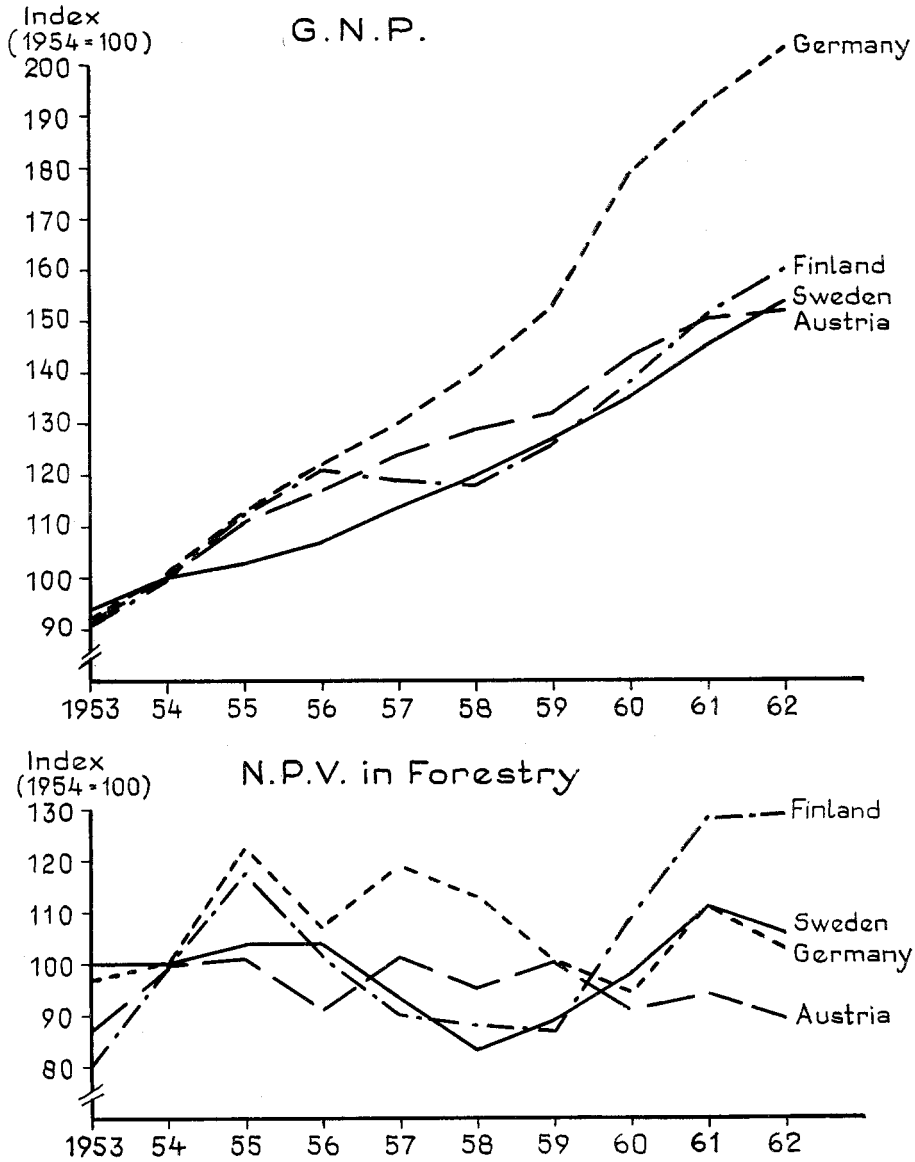


Fig. 10-2. Indices of Gross National Product and Net Production Value in Forestry, by Selected Countries, 1953 - 1962

countries, Finland and Sweden, the developments have been in opposite directions, i.e. for Sweden the export trade has declined in percentage terms while there has been an increase in such for Finland over the same period. It is interesting that even in the traditional importing countries, e.g. Germany and Switzerland, there has been a relative increase in exports.

Table 10:5 sets out wood consumption *per capita*. One can see that the *per capita* consumption is down in Finland, while it has increased or maintained its level in all other countries, including Sweden.

**Table 10:2. Total Timber Balances, by Countries, 1960**
(*thousand cubic metres roundwood equivalent*)

| Country | Roundwood production (annual cut) | Imports | Total supply | Exports | Apparent consumption |
|---|---|---|---|---|---|
| Sweden | 44,800 | 1,615 | 46,415 | 27,605 | 18,810 |
| Austria | 12,089 | 790 | 12,879 | 7,600 | 5,279 |
| Denmark | 1,852 | 3,673 | 5,525 | 562 | 4,963 |
| Finland | 48,090 | 190 | 48,280 | 26,600 | 21,680 |
| Germany | 25,148 | 17,929 | 43,077 | 2,203 | 40,874 |
| Norway | 9,620 | 1,740 | 11,360 | 5,140 | 6,220 |
| Switzerland | 3,615 | 1,781 | 5,396 | 259 | 5,137 |
| United Kingdom | 2,833 | 16,978[a] | 19,811[a] | 478 | 19,333 |

*a.* Does not include all processed forest products
*Source:* Reports of respective countries; Tables 2:3, 3:2, 4:3, 5:2, 6:3, 7:4, 8:2, 9:5

**Table 10:3. Production of Roundwood as Percentage of Total Wood Supply, by Countries, 1953—1962**

| Country | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sweden | 97.8 | 97.7 | 98.1 | 98.0 | 98.0 | 97.6 | 97.4 | 96.5 | 95.5 | 96.6 |
| Austria | | | 96.1 | 97.3 | 97.3 | 97.0 | 96.5 | 93.9 | 92.5 | 92.9 |
| Denmark | | | | | | 40.7 | 38.2 | 33.5 | 32.4 | 31.7 |
| Finland | 100.0 | 100.0 | 100.0 | 99.6 | 99.6 | 99.7 | 99.5 | 99.6 | 99.4 | 99.0 |
| Germany | 76.3 | 71.5 | 65.9 | 63.3 | 63.3 | 63.8 | 62.6 | 58.4 | 58.3 | 59.1 |
| Norway | 96.7 | 91.1 | 88.9 | 92.4 | 96.1 | 93.5 | 90.4 | 84.7 | 80.2 | 82.2 |
| Switzerland | 81.4 | 75.5 | 68.1 | 71.0 | 70.0 | 74.1 | 72.5 | 67.0 | 58.9 | 65.0 |
| United Kingdom[a] | | | | | | 16.6 | 15.0 | 14.6 | 14.3 | |

*a.* Basic data for total wood supply include not all processed forest products
*Source:* Reports of respective countries; Tables 2:3, 3:2, 4:3, 5:2, 6:3, 7:4, 8:2, 9:5

**Table 10:4. Exports as Percentage of Total Wood Supply, by Countries, 1953—1962**

| Country | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sweden | 59.7 | 52.5 | 57.7 | 58.9 | 61.2 | 56.2 | 68.3 | 59.5 | 55.4 | 56.2 |
| Austria | | | 61.3 | 77.1 | 65.8 | 70.6 | 59.7 | 59.0 | 55.5 | 58.6 |
| Denmark | | | | | | 12.2 | 10.2 | 10.2 | 11.4 | 12.2 |
| Finland | 43.9 | 45.7 | 49.9 | 49.5 | 51.2 | 51.0 | 55.6 | 55.1 | 55.9 | 55.6 |
| Germany | 2.5 | 4.0 | 3.1 | 4.4 | 4.9 | 4.6 | 4.6 | 5.1 | 5.2 | 5.1 |
| Norway | 37.2 | 38.2 | 36.1 | 35.0 | 40.6 | 41.6 | 46.9 | 45.2 | 38.8 | 39.9 |
| Switzerland | 2.7 | 2.8 | 2.6 | 3.8 | 3.4 | 3.4 | 4.8 | 4.8 | 3.6 | 3.3 |

*Source:* Reports of respective countries; Tables 2:3, 3:2, 4:3, 5:2, 6:3, 7:4, 8:2

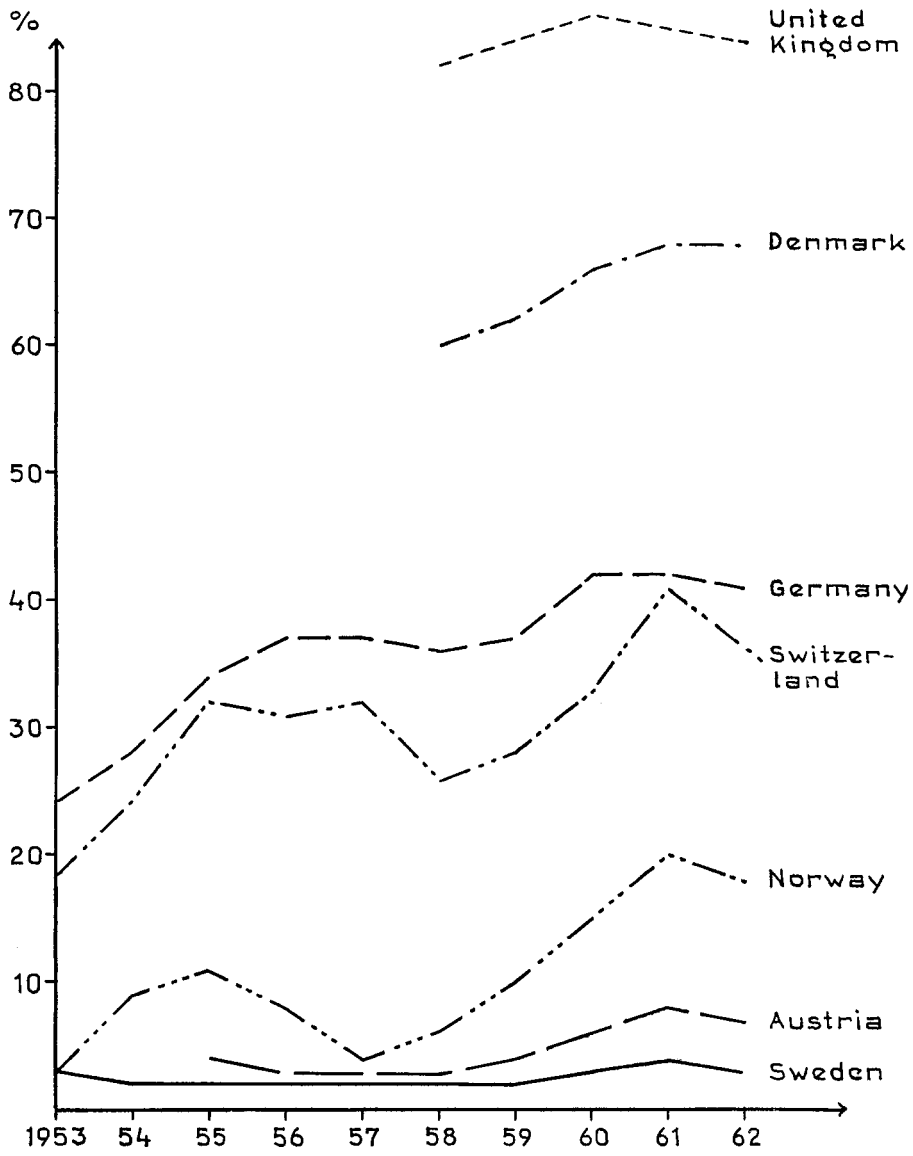


Fig. 10-3. Contribution of Imports to the Total Wood Supply, by Countries, 1953-1962

**Table 10:5. Wood Consumption per Capita, by Countries, Annual Average for 5-Year Periods, 1953—1962**
*(cubic metres roundwood equivalent)*

| Country | 1953—1957 | 1958—1962 |
|---|---|---|
| Sweden | 2.38 | 2.42 |
| Austria | 0.55 | 0.69 |
| Finland | 4.87 | 4.72 |
| Germany | 0.63 | 0.73 |
| Norway | 2.1 | 1.8 |
| Switzerland | 0.96 | 0.99 |

*Sources:* (1) Reports of respective countries; Tables 2:3, 3:2, 5:2, 6:3, 8:2
(2) Complementary information from Norway

### *10.1.4 Value of Forest Products in External Trade*

Table 10:6 shows the percentage share of forest products in the total export value and the development is an interesting one. In the exporting countries with the exception of Finland there has been a markedly declining tendency in this share, while in the traditional importing countries the percentage figures have kept at about the same level or even have risen as in Denmark. This increase in the latter countries is of little importance in international trade, while, on the other hand, the decrease in the exporting countries may have far-reaching consequences for the economy of the country in question.

The situation is such that the export value of the forest products in absolute figures has not declined so much as the percentage share of the total export value because of the greater increase in the size of the latter. However, the fact is that the role of forest products in the export trade of industrial countries is declining; this is true for Sweden, Austria and Norway.

On the other hand, in Finland where the export value of forest products during the period under survey was between 70 and 80 per cent (presumably the highest percentage in the world) the forest products have been able to hold their own.

**Table 10:6. Exports of Forest Products as Percentage of Total Export Value, by Countries, 1953—1962**

| Country | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sweden | 40.4 | 41.3 | 43.1 | 40.2 | 37.4 | 34.2 | 33.5 | 33.6 | 31.1 | 29.0 |
| Austria | 32.0 | 34.0 | 33.0 | 28.0 | 24.0 | 23.0 | 23.0 | 21.0 | 20.0 | 18.0 |
| Denmark | | | | | | 2.7 | 2.9 | 3.3 | 3.4 | 3.5 |
| Finland | 77.4 | 79.8 | 81.1 | 78.4 | 76.8 | 77.6 | 73.7 | 75.3 | 79.3 | 72.2 |
| Germany | 1.0 | 1.3 | 1.3 | 1.4 | 1.3 | 1.3 | 1.2 | 1.3 | 1.3 | 1.3 |
| Norway | 28.0 | 27.0 | 26.0 | 24.0 | 23.0 | 23.0 | 21.0 | 22.0 | 21.0 | 19.0 |
| Switzerland | 1.8 | 2.1 | 1.9 | 2.4 | 2.4 | 2.3 | 2.5 | 2.0 | 2.0 | 1.9 |

*Source:* Reports of respective countries; Tables 2:4, 3:3, 4:4, 5:3, 6:5, 7:5, 8:3

### *10.1.5 Comparative Advantage of Timber Production*

The results of actual management of forest land depend on a considerable number of natural and economic factors. On these factors the productive capacity of the land, the size and composition of the existing timber stock, as well as the accessibility of the forest play the most important roles.

The methods of forestry operations and obviously the financial results are affected to a considerable extent by the type of ownership. Forestry in the eight countries is partly integrated with other economic activities, mainly with agriculture but also with industry; in the latter case the wood-processing industries have procured their own forests to ensure their supplies of raw material.

Independent forestry, i.e. the business of growing trees and their harvesting, is mainly carried out by the State and by local authorities, but some of the large private or estate forests may also be included in this group. Despite common ownership of land the connection between agriculture and forestry is often severed by the leasing out of the agricultural land while in one way or another the owners themselves look after the forests.

Table 10:7 shows the total area of forests and its distribution by ownership categories in the eight countries. One can see that the private forests constitute more than half of the total forest area in most of the countries, though public ownership holds the dominating position in Germany and Switzerland.

**Table 10:7. Distribution of Forest Land by Ownership Categories**

| Country | Forest area | | Ownership categories | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Public forests | | Private forests | | | |
| | *1000 ha* | *% of total land area* | State forests | Municipal, corporation, co-operative and other public forests | Industrial companies | Large (estate) | Small (farm woodlands) | Total |
| | | | *Percentage of total forest area* | | | | | |
| Sweden | 22,258 | *56* | *18.5* | *5.5* | *24.7* | *3.5* | *47.8* | *76.0* |
| Austria | 3,352 | *40* | *15.4* | *17.6* | — | *26.2* | *40.8* | *67.0* |
| Denmark | 438 | *10* | *28.0* | *3.0* | | *47.0* | *22.0* | *69.0* |
| Finland | 21,330 | *71* | *28.0* | *1.9* | *7.1* | *63* | | *70.1* |
| Germany | 6,936 | *29* | *30.6* | *28.9* | | | | *40.5* |
| Norway | 6,000 | *18.4* | *12.2* | *6.6* | *8.1* | *73.1* | | *81.2* |
| Switzerland | 981 (882) | *24* | *5.4* | *70.8* | | | | *23.8* |
| United Kingdom | 1,204 | | *43.2* | | | | | *56.8* |

*Source:* Reports of respective countries; Tables 2:20, 3:8, 4:15, 5:10, 6:13, 7:7, 8:12, 9:2

The size of the forest holding as in industry is of great importance for the efficiency of forestry operations. The total size of a forest owner's holding in itself is not a decisive condition for the economies of scale, in as far as the forest holding is scattered in a number of plots, the claimed advantages are offset. Such splitting up of holdings is common in small private forests or farm woodlands. However, forests in other ownership categories can also be split up into several wood lots, which may be only a few hectares in size. The splitting up of holdings and the fragmentary division of forests between arable land can be seen almost everywhere in the old settled areas both in Northern and Central Europe, and in certain areas it is particularly marked. Vast continuous forest areas are to be found mainly in Scandinavia and Finland, to a lesser extent in the Alps and occasionally elsewhere.

The composition of the tree species in the forests is of great importance as the yield of the different species is not the same.

The number of species in the northern parts of the region which belongs to the temperate coniferous forest belt as well as in the higher elevations of the Alps is relatively small. In the temperate mixed forest belt, which comprises the European continent and the British Isles, the number of species is considerably higher than in the countries of northern Europe. Actually, it may be added that the mixed forests have a large coniferous content, which in volume very often exceeds the broadleaved species. In any case, the number of species on the European continent is considerably less than, for instance, on the same latitudes in North America; this has an important bearing on forest management and timber harvesting.

Table 10:8 shows the percentage distribution of the main commercial tree species. It should be added that the percentage share of the individual species is dependent on both area and volume; the figures given in the table must therefore be regarded with a certain caution. One can see that the two economically most valuable coniferous species (*Picea excelsa* and *Pinus silvestris*) in fact dominate the European forests, a situation which is not only a consequence of the natural development but to a large extent has been brought about by purposeful silviculture.

Table 10:9 shows the distribution of stands by age classes in 20-year intervals and is based on the area occupied by all existing species. Owing to the differences of the forest inventories the table cannot be interpreted in the same way for all the countries in question; moreover, certain details are completely lacking for some of the countries, e.g. Switzerland, where the "Selection" system and method of control have caused uneven-aged stands. Nevertheless, certain interesting facts emerge from the figures in the table: e.g. the figures for the young forests in Sweden are on the low side and for Germany on the high side as compared with the "normal" age class distribution. However, the important thing is that the countries in question have sufficient amounts of old-growth timber ready for harvesting, which primarily

**Table 10:8. Percentage Distribution of Dominant Tree Species, by Countries**

| Country | Pines and larch | Spruce and other conifers | Oak | Beech | Birch, aspen and other deciduous species | Total |
|---|---|---|---|---|---|---|
| Sweden ..... | 40 | 44 | | 1 | 15 | 100 |
| Austria..... | 24 | 60 | 1 | 9 | 6 | 100 |
| Denmark ..... | 5 | 59 | 6 | 22 | 8 | 100 |
| Finland ..... | 44 | 35 | | | 21 | 100 |
| Germany ..... | 27 | 42 | 8 | | 23 | 100 |
| Norway ..... | 30 | 53 | | | 17 | 100 |
| Switzerland ... | 10 | 60 | | 25 | 5 | 100 |

*Sources:* (1) Reports of respective countries; Tables 2:19, 3:11, 4:12, 6:15
(2) Complementary information from Finland, Norway and Switzerland

**Table 10:9. Percentage Distribution of Forests by Age Classes, Selected Countries**

| Country | Cut-overs and openings | 1—20 | 21—40 | 41—60 | 61—80 | 81—100 | 101—120 | 121— | Total |
|---|---|---|---|---|---|---|---|---|---|
| Sweden | 7 | 6 | 13 | 15 | 19 | 15 | 10 | 15 | 100 |
| Austria | 5 | 13 | 16 | 20 | 16 | 13 | 17 | | 100 |
| Germany | 2 | 21 | 16 | 16 | 14 | 12 | 10 | 9 | 100 |

*Source:* Reports of respective countries; Tables 2:20, 3:9, 3:10, 6:16

**Table 10:10. Comparison between Growth and Fellings, by Countries**
(*cubic metres per hectare*)

| Country | Growing stock $m^3f/ha$ | Mean annual increment $m^3f/ha$ | Actual annual cut (average 1958—1962) $m^3f/ha$ | $m^3y/ha$ | % of growing stock[a] |
|---|---|---|---|---|---|
| Sweden | 92 | 3.1 | 2.3 | 1.9 | *2.5* |
| Austria | 151 | 2.9 | | 3.4 | *2.7* |
| Denmark | | $\frac{6.9^b}{5.8^c}$ | | $\frac{4.8^b}{4.1^c}$ | |
| Finland | $68\left(\frac{88^d}{51^e}\right)$ | $2.1\left(\frac{3.1^d}{1.0^e}\right)$ | 2.6 | 2.2 | *3.8* |
| Germany | | | | 3.7 | |
| Norway | 74 | 2.8 | 2.0 | 1.6 | *2.7* |
| Switzerland | 250 | | | 3.8 | *1.8* |

*a.* Computed on the basis of $m^3f$ measure
*b.* Per ha overgrown area
*c.* Per ha total forest area
*d.* Southern Finland
*e.* Northern Finland
*Sources:* (1) Reports of respective countries; Tables 2:2, 2:19, 2:21, 3:12, 3:13, 4:14, 5:9, 6:4
(2) Complementary information from Denmark and Norway

results from the application of working-plan management as a prerequisite of forestry operations.

Table 10:10 presents the average volume of growing stock and annual increment per area unit and such data can be compared with the actual annual fellings during the period 1958-1962. Switzerland, in particular, and Austria too, are countries working with relatively large volumes of growing stock per area unit, because in the Alps special consideration has to be given to the protective function of the forests. For this reason clear-felling is practised only to a limited extent or, as in Switzerland, is forbidden in the mountains. Silvicultural selection systems are the common practice and, as a rule, these necessitate large growing stocks per area unit.

What is remarkable is that it is just in certain exporting countries (Austria and Finland) that timber removals exceed timber growth, but this does not necessarily have a bad effect on the primary production of timber. Instead, it might be a sign that over-mature stands are replaced at an increasing rate by second growth with considerably higher productivity than the old. This probably applies primarily to Austria, where 17 per cent of the productive forest area is covered by stands older than 100 years (see Table 10:9). Where there is no excessive timber output (over-cutting) in mature or over-mature stands the consequences can be more serious for the productivity of the forests. Finland is in a precarious situation through over-cutting, as the average volume of growing stock per area unit is conspicuously low (68 $m^3$/ha) and the cutting percentage excessively high. As the forestry sector plays an extraordinary important role in the Finnish economy, a drastic decline of the timber output can have catastrophic consequences for employment of the population and the export trade of the country. However, a reduction of the removals seem to be unavoidable in the very near future if even greater tribulations are to be averted in the long run. Here we have the reason why Finland in recent years has begun to import roundwood to meet the needs of the wood-processing industries for raw material.

It is not the purpose of this survey to examine in great detail the consequences of excessive cuttings. The balance between growth and fellings is unavoidable in the long run where forestry is based on the principle of sustained yield. However, over-cutting or under-cutting has a great effect on cost and revenue of forestry, and to get an adequate idea of this one must be cognisant of the relationship between timber growth and drain.

### *10.1.6 Forest Production Regions*

Originally the plan was that each country should be divided into forest economic regions according to the differences in the economic conditions under which forestry is carried out, especially on the factors affecting costs. This has not been possible for all the countries participating in this survey.

Sometimes it has been necessary, e.g. in the case of the German Federal Republic, to accept the divisions of the country in administrative regions. Thus the division into regions of the countries given on the map (Figure 1—1, Chapter 1) has been made on different assumptions. As a whole this map must be regarded as a guide indicating the geographical areas for which the presented statistical material applies.

## 10.2 Comparison of Prices for Forest Products

### *10.2.1 Limitations*

For making comparisons between the average prices for the various forest products in different countries it is necessary to establish what is meant in each case. Primarily we must distinguish between export prices and import prices, and whether the prices are c.i.f. or f.o.b. In the main the price differences in the home market are due to transport costs. In the importing countries the distances from the major ports or from the frontier with the country from which the timber comes are of vital importance. However, the price level of the exporting countries is also affected by the distance to the ports for the export shipments and the distance to the importing countries; this is particularly so for roundwood.

Furthermore, in international comparisons of this kind it must be established whether one is actually dealing with similar products of the same quality. In this respect processed wood products are more identical, although there are certain exceptions, and the same can be said of pulpwood. When it comes to the question of comparing the prices of logs (or *Langholz* as such are called in German-speaking countries) difficulties arise immediately owing to the fact that assortments and grades of logs differ from country to country. Consequently, an exact comparison of the price levels for forest products cannot be made between the different countries. One must not forget that these comparisons are based on official exchange rates, which cannot be assumed to reflect exactly the purchasing power of currencies. Despite these limitations and drawbacks of the source material, as well as of the method of comparison, the average price level for forest products in different countries, which appear in the following tables, should be adequate for the purpose of this survey.

### *10.2.2 Coniferous Sawnwood*

In the main the prices of sawn softwood in the competitive European market are probably levelled out and show approximately the same development trends as the general price level of bulk commodities. Table 10:11 shows the development of prices in certain exporting and importing countries. The

graphs in Figures 10—4 and 10—5 provide a further illustration of the material presented in the table, though owing to the prices in the home markets for Germany and Switzerland the index has been calculated on the basis of the total imports. The graphs show the average prices for all assortments with f.o.b. export prices and c.i.f. import prices. One cannot fail to notice that during the trade recession of 1959 the difference between export prices (f.o.b.) and import prices (c.i.f.), which should correspond to freight costs in fact, was almost non-existent. Here it should be added that customs duties of the importing countries during the periods under survey have been imposed only on certain assortments, e.g. planed boards, and on the whole their effect on the average level of prices has not been particularly decisive. The only exception is Switzerland, where the import of sawnwood has been liable to customs duty. However, under the E.F.T.A. Agreement customs duties have begun to lose their importance as the bulk of the Swiss imports of sawnwood comes from Austria. The price index for the other importing countries can be seen in Figure 10—5, but due to the progressive reduction in tariffs there has been a fall in the index as from 1962. One can state that in the main the import prices (c.i.f.) show greater fluctuations than the export prices (f.o.b.), and especially so for the United Kingdom. To some extent this is probably due to the fact that the bulk of British imports of sawnwood comes from countries outside Europe, primarily the U.S.S.R. and Canada, countries which have a great influence on prices through their substantial offers of timber.

**Table 10:11. Average Prices for Coniferous Sawnwood, by Exporting and Importing Countries, 1953—1964**
*(current S.kr per m³s)*

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Exporting Countries* | | | | | | | | | | | | |
| Sweden ..... | 214 | 223 | 230 | 221 | 220 | 217 | 192 | 217 | 228 | 216 | 219 | 232 |
| Austria ..... | | | | | 202 | 195 | 188 | 191 | 211 | 214 | 211 | |
| *Importing Countries* | | | | | | | | | | | | |
| Denmark ..... | 213 | 220 | 234 | 233 | 221 | 211 | 196 | 216 | 232 | 225 | | |
| Germany: | | | | | | | | | | | | |
| from Sweden .. | | | | | | 250 | 220 | 249 | 253 | 239 | 245 | 266 |
| from Austria .. | | 186 | 212 | 205 | 206 | 203 | 195 | 200 | 220 | 220 | 218 | 222 |
| Switzerland ..... | 191 | 196 | 225 | 234 | 230 | 219 | 212 | 222 | 256 | 278 | 274 | 270 |
| United Kingdom | 237 | 237 | 257 | 261 | 255 | 232 | 196 | 236 | 245 | 281 | | |

*Sources:* (1) Reports of respective countries; Tables 2:5, 3:5, 4:6, 8:7, 9:6

(2) Statistisches Bundesamt im Wiesbaden: *Fachserie M: Preise, Löhne, Wirtschaftsrechnungen, Reihe 1*, Stuttgart und Mainz, 1964, s. 55—56

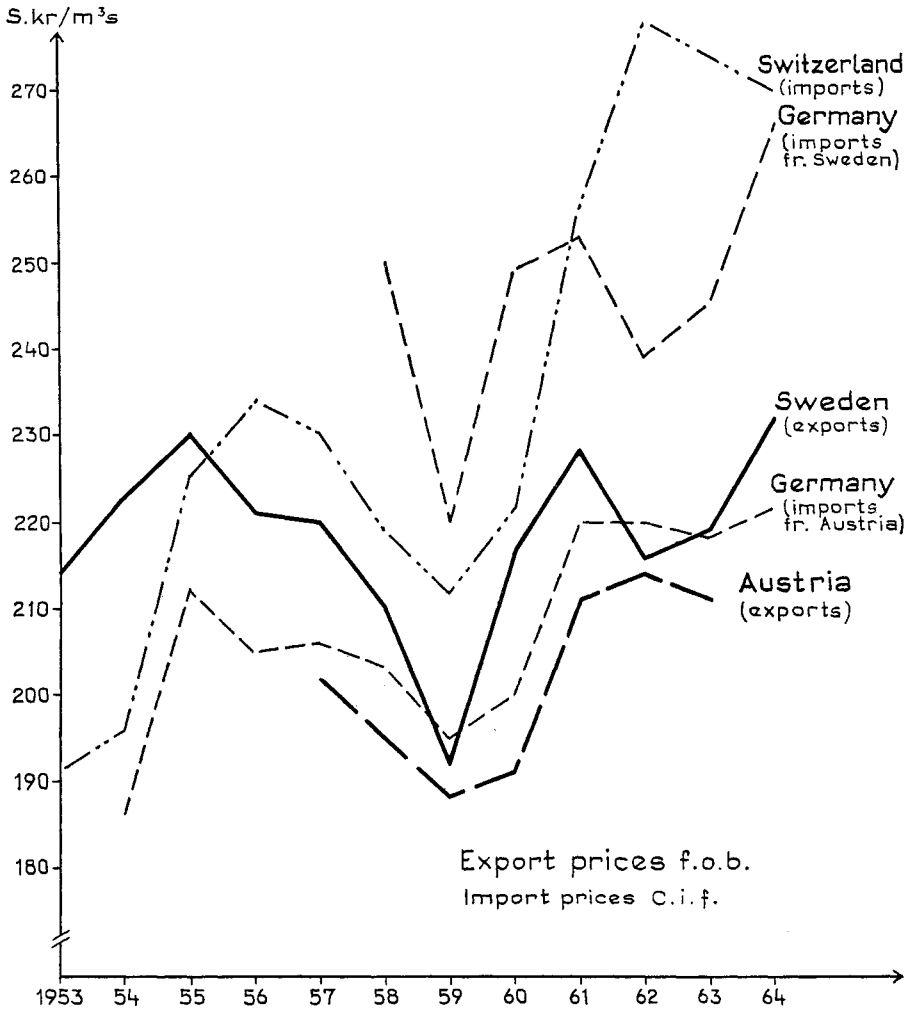


Fig. 10-4. Average Prices for Coniferous Sawnwood, Exports and Imports, S.kr per m³s, in Selected Countries, 1953-1964

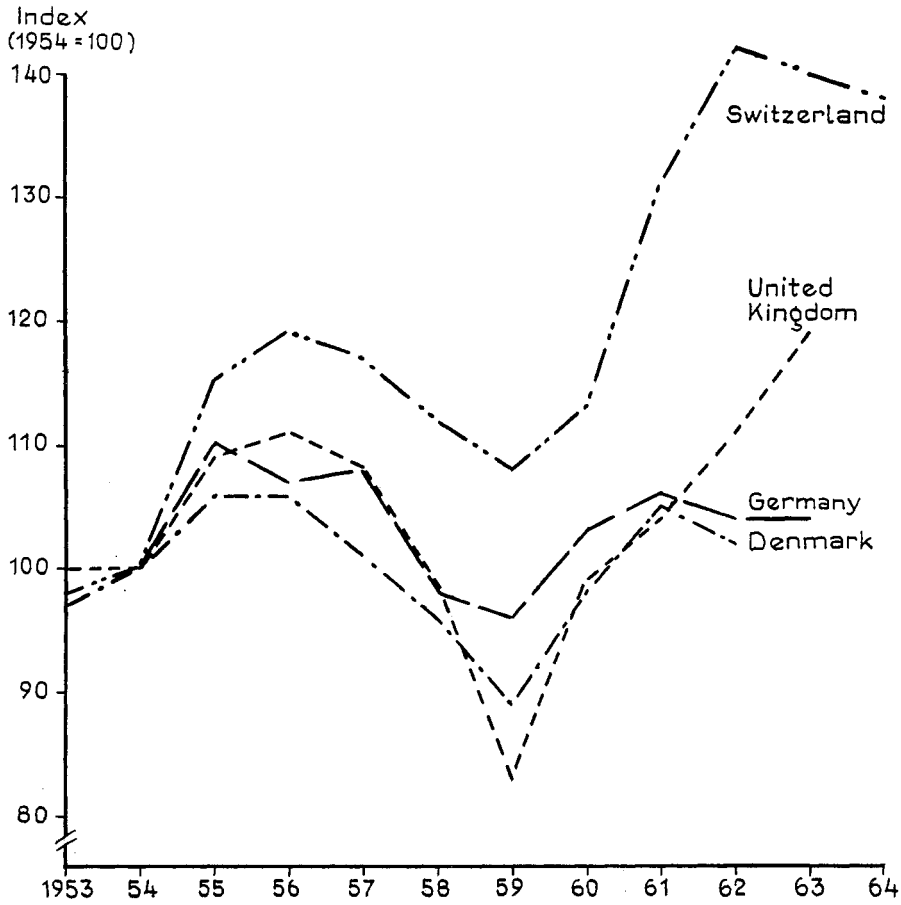


Fig. 10-5. Price Indices for Coniferous Sawnwood, by Importing Countries, 1953 - 1964

### *10.2.3 Woodpulp*

Table 10:12 shows the average prices for chemical and mechanical pulp, export prices (f.o.b.) and import prices (c.i.f.) for five countries. The difference in the price level between importing and exporting countries should be the costs of freight, insurance, etc. Depending on the variations in freight costs (if we disregard other factors which go to make up the price) this price difference is by no means uniform but is subjected to strong fluctuations. However, the f.o.b. prices of the exporting countries and the c.i.f. prices of the importing countries are largely parallel, as can be seen in Figure 10—6. For obvious reasons the comparison of the trade statistics of sulphate and sulphite pulp is made between only two countries, namely Germany and Sweden, but there is no reason to assume that in normal circumstances the development would be different in the trade between other countries. The index in Figure 10—7 shows that the price development for pulp in the biggest importing countries have been rather similar, and this fact provides a certain support for the above statement.

**Table 10:12. Average Prices for Woodpulp, by Exporting and Importing Countries, 1953—1964**
(*current S.kr per ton*)

| | 1953 | 1945 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Exporting countries:* | | | | | | | | | | | | |
| **Sweden:** | | | | | | | | | | | | |
| Sulphate, bleached ..... | 731 | 787 | 805 | 810 | 802 | 758 | 721 | 717 | 713 | 658 | 664 | 717 |
| Sulphite, bleached ..... | 688 | 781 | 806 | 806 | 792 | 750 | 695 | 717 | 714 | 644 | 658 | 713 |
| Mechanical pulp ..... | 338 | 343 | 351 | 384 | 390 | 346 | 327 | 333 | 332 | 331 | 332 | 334 |
| **Austria:** | | | | | | | | | | | | |
| Mechanical pulp ..... | | | | | 489 | 413 | 342 | 383 | 411 | 407 | 406 | |
| Chemical pulp ..... | | | | | 737 | 680 | 657 | 666 | 695 | 665 | 661 | |
| *Importing countries:* | | | | | | | | | | | | |
| **Denmark:** | | | | | | | | | | | | |
| Sulphite ..... | 607 | 690 | 720 | 735 | 711 | 661 | 624 | 631 | 653 | 614 | | |
| Mechanical pulp ..... | 405 | 405 | 435 | 458 | 434 | 383 | 339 | 361 | 368 | 359 | | |
| **Germany:** | | | | | | | | | | | | |
| Sulphate, bleached ..... | | 832 | 843 | 860 | 855 | 813 | 780 | 792 | 783 | 728 | 746 | 803 |
| Sulphite, bleached ..... | | 813 | 830 | 841 | 841 | 803 | 755 | 765 | 768 | 696 | 706 | 763 |
| Mechanical pulp ..... | | 414 | 429 | 466 | 465 | 408 | 391 | 400 | 400 | 392 | 399 | 403 |
| **United Kingdom:** | | | | | | | | | | | | |
| Chemical and mechanical pulp ..... | 611 | 644 | 669 | 684 | 684 | 641 | 620 | 618 | 626 | 592 | | |

*Sources:* (1) Reports of respective countries; Tables 2:6, 3:5, 4:6, 9:6
(2) Statistisches Bundesamt im Wiesbaden: *Fachserie M: Preise, Löhne, Wirtschaftsrechnungen, Reihe 1*, Stuttgart und Mainz, 1964

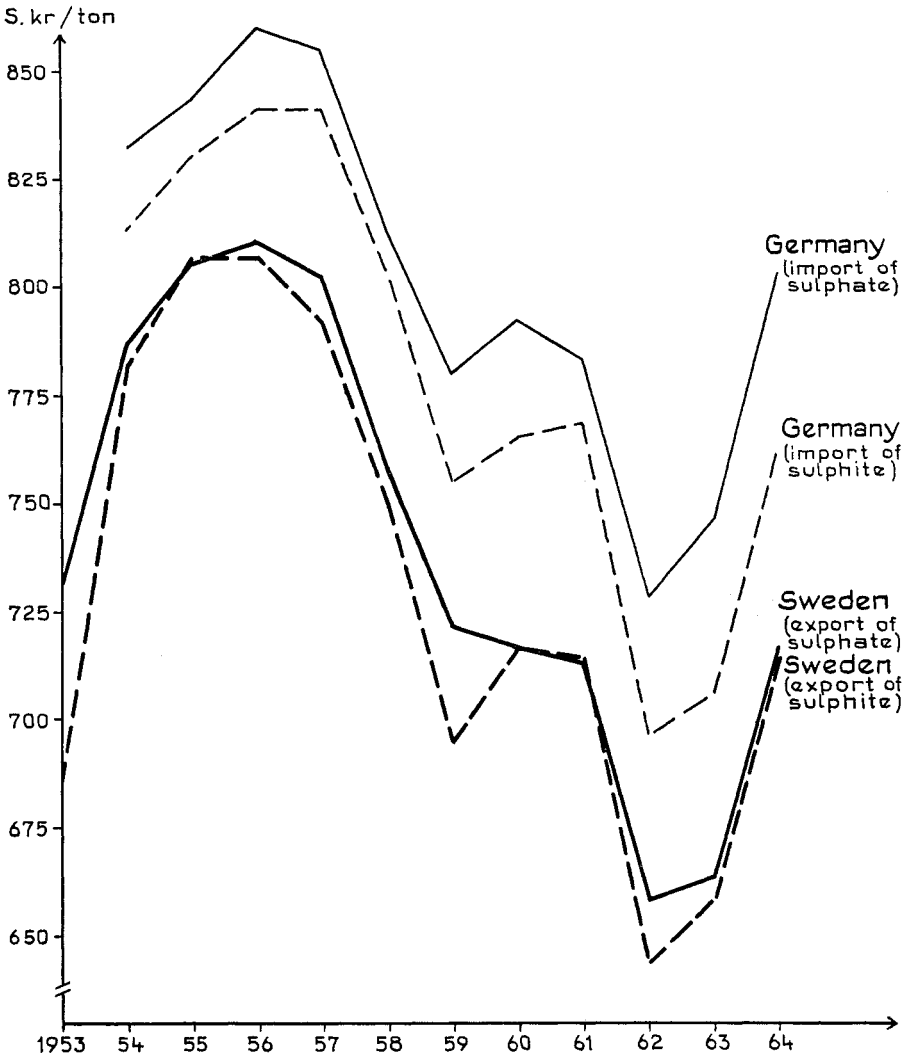


Fig. 10-6. Average Prices for Bleached Sulphate and Sulphite Pulp, in Germany (import) and in Sweden (export), 1953-1964

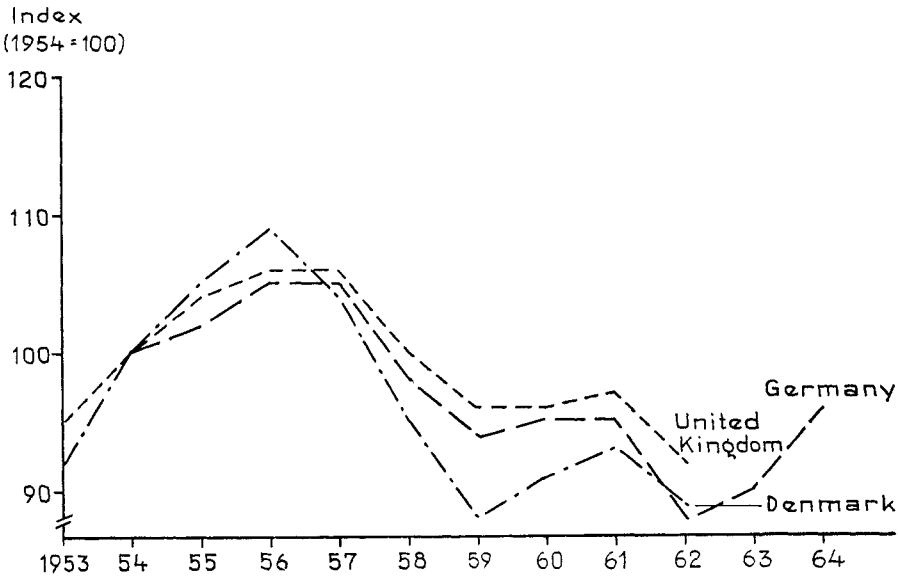


Fig. 10-7. Price Indices for Chemical and Mechanical Pulp, by Importing Countries, 1953-1964

### *10.2.4 Newsprint*

Table 10:13 shows the price developments for newsprint in two exporting countries (Sweden and Austria) and three importing countries (Denmark, Germany and the United Kingdom) during the period 1953-1962. The export prices are quoted f.o.b. and the import prices c.i.f. The same material is presented in graphic form in Figure 10—8. In certain years (1959-1961) the import prices for Denmark have been lower than the export prices of Sweden.

**Table 10:13. Average Prices for Newsprint, by Exporting and Importing Countries, 1953—1964**
*(current S.kr per ton)*

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Exporting countries:* | | | | | | | | | | | | |
| Sweden ..... | 637 | 670 | 718 | 772 | 768 | 730 | 685 | 687 | 691 | 687 | 684 | 679 |
| Austria ..... | | | | | 790 | 708 | 683 | 677 | 703 | 700 | 703 | |
| *Importing countries:* | | | | | | | | | | | | |
| Denmark ..... | 645 | 645 | 690 | 713 | 726 | 721 | 677 | 669 | 683 | 689 | | |
| Germany ..... | | 712 | 756 | 784 | 790 | 756 | 733 | 732 | 730 | 737 | 744 | 741 |
| United Kingdom ..... | 745 | 749 | 750 | 781 | 798 | 807 | 796 | 794 | 781 | 784 | | |

*Sources:* (1) Reports of respective countries; Tables 2:7, 3:5, 4:6, 9:6
(2) Statistisches Bundesamt im Wiesbaden: *Fachserie M: Preise, Löhne, Wirtschaftsrechnungen, Reihe 1*, Stuttgart u Mainz, 1964

This fact cannot be explained in any way other than Denmark buying the bulk of its supplies of newsprint from countries other than its immediate neighbour (Sweden) or that the Danes have been able to secure prices which are lower than the average export sales prices of Sweden. It must be added that the Danish prices are based on data presented in Table 4:6 and that the possibility of certain errors in conversion cannot be excluded. Figure 10—9 shows that the price index for Denmark keeps largely at the same level as those for the big importing countries, namely Germany and the United Kingdom.

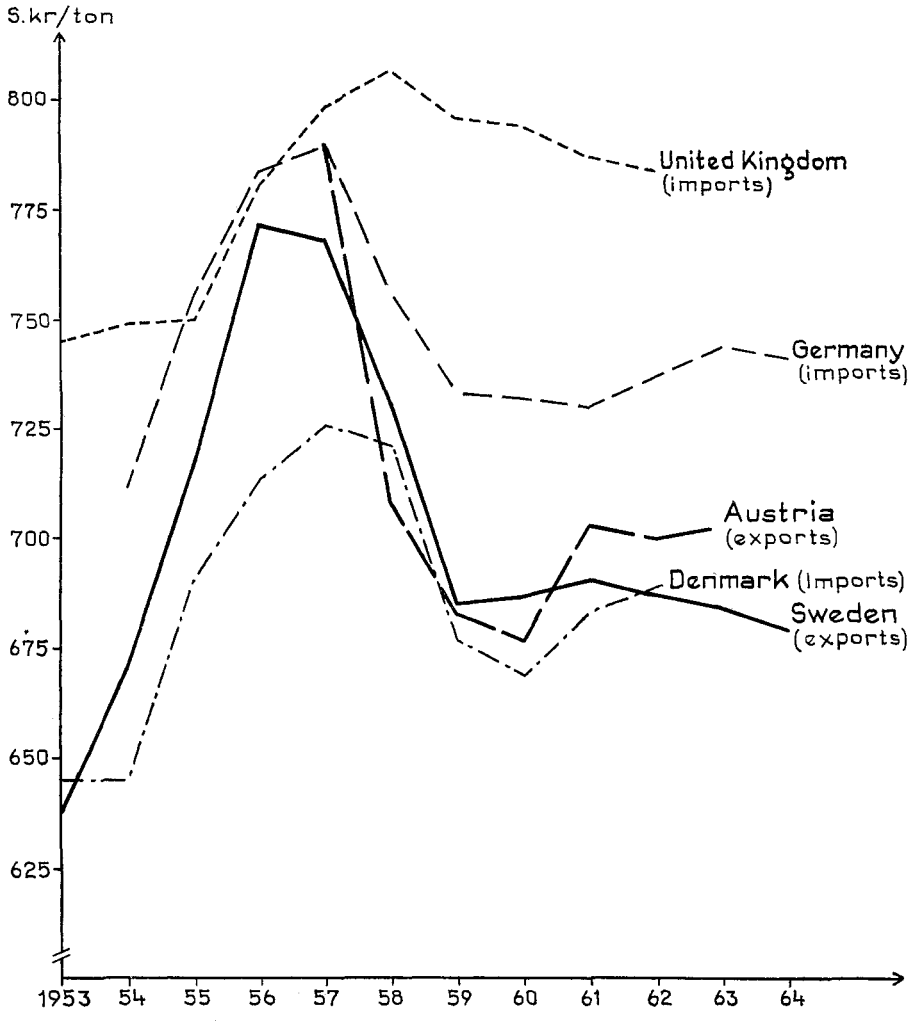


Fig. 10-8. Average Prices for Newsprint, Exports and Imports, by Selected Countries, 1953-1964

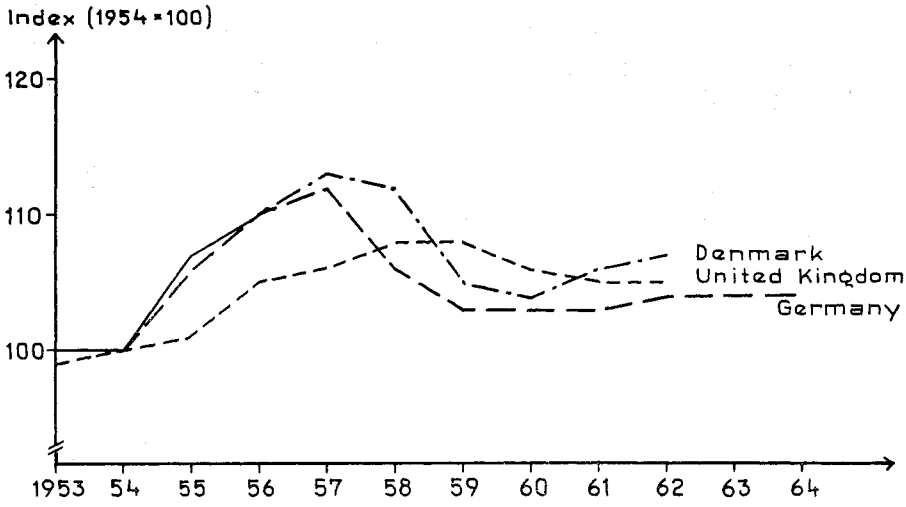


Fig. 10-9. Price Indices for Newsprint, by Importing Countries, 1953-64

*10.2.5 Coniferous Sawlogs*

One of the important purposes of this survey is the comparison of roundwood prices in the different countries. These prices determine the revenue which the forest owners receive from timber sales. Revenues in their turn, provided that long-term financial equilibrium is a prerequisite condition for management, decide how great an expenditure can be made in order to maintain continuity in timber production. In all the countries concerned, which can be regarded as highly industrialised and where the wood-processing industries are by no means lacking, only such timber which can be utilised as raw material by the wood-processing industries and which has been designated as industrial roundwood is of any importance from the income standpoint. Felled timber which is used as fuelwood or as unprocessed construction roundwood has declined considerably in importance during recent decades.

Sales of fuelwood play only a local role in the incomes of forest owners. The most important income-yielding products in all the countries are sawlogs, which provide the raw material for the sawmilling industry. In this survey we shall concern ourselves only with coniferous sawlogs, but this does not mean that sawlogs of deciduous species are of no importance—quite the contrary. In Central Europe hardwood logs from the local forests form an important part of the supply of sawlogs in these countries. On the other hand, in Norway, Sweden and Finland quite an insignificant role is taken by sawlogs of local hardwood. This is the reason why no comparisons will be made in this connection concerning the latter assortments.

Derived demand is a characteristic feature in the market for sawlogs. This means that the prices of sawlogs are determined by the prices of sawnwood, which here can be regarded as the end product, but which in itself is still raw material for different fields of application. The structure and the technical development of the sawmilling industry and its marketing policy are of great importance for prices of sawlogs. However, it can be stated that with the exception of certain parts of Sweden and Finland the sawmilling industry of the countries concerned is made up of relatively small sawmills. These sawmills are owned by a large number of persons who, as a rule, are in keen competition with each other for the procurement of raw material. The associations of sawmill owners, which are formed to strengthen the owners' position in the market and exert an influence on prices, are only weakly developed in most of the countries, and, if one disregards the geographical location of the sawmills and the possibilities of influencing prices stemming from this, it might be possible to regard this form of marketing as some sort of free competition.

The larger exporting sawmills in the north of Europe can be regarded as an exception because, as a rule, they are not owned by individuals but by timber companies or by associations of forest owners. Here the price for sawlogs can deviate to a certain degree from that resulting from free competition. One must not forget that even the big producers must compete with the small in order to obtain the raw material, and a monopsonistic or oligopsonistic situation in the sawmilling industry is a rather unusual occurrence. A factor which should be noted in this connection is that within the sawmilling industry there is an extensive unused capacity. As a rule, the small sawmills are operated for only short periods and are shut down for most of the year. The reason for this is often the shortage of raw material, and thus this becomes an important factor in the determination of prices for sawlogs. In other cases it is a question of sawmills, which even from the start were intended to cover only local requirements and which use mainly the timber from the neighbourhood. However, this does not exclude competition from other buyers of raw material unless the geographical location prevents equal chances for competition.

Actually, there are very great difficulties in obtaining completely correct details of the differences in the prices for sawlogs. As already mentioned, this is primarily because the quality of the logs varies very much; also the different diameter classes fetch different prices, as a rule. For these reasons the average price for the total yield of sawlogs can be misleading in many cases. Moreover, uniform log rules are lacking and each country scales timber in its own way; consequently, direct comparisons with other countries are not possible. Therefore, the data presented in the reports of the various countries can be used as a basis for price comparisons only with certain reservations. Nevertheless, it is quite clear that there are considerable differences in the unit prices for sawlogs, even if certain margins of error have to be taken into consideration.

Table 10:14 shows the price development for sawlogs by countries during the period 1953-1964. In order to facilitate comparisons several series of prices have been compiled for Sweden even though they deviate from each other quite considerably. The highest prices are for export sales (f.o.b.), which have mainly been of special timber (*Stammblöcke*) of particularly high quality. However, the prices for imported sawlogs (c.i.f.) are on about the same level as the current home prices delivered at roadside or at the river mouth.

**Table 10:14. Average Prices for Coniferous Sawlogs, by Countries, 1953—1964**
(*current S.kr per cubic metre solid measure*)

| Country | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sweden** | | | | | | | | | | | | |
| Exports, f.o.b. | | | | | | | | | | | | |
| (Spruce and pine) ..... | 122 | 133 | 143 | 140 | 146 | 133 | 104 | 137 | 146 | 115 | 106 | 113 |
| Imports, c.i.f. | | | | | | | | | | | | |
| (Spruce and pine) ..... | 87 | 95 | 94 | 86 | 79 | 79 | 72 | 85 | 89 | 81 | 82 | 101 |
| Southern Sweden | | | | | | | | | | | | |
| (9″ top diam., with bark) | | | | | | | | | | | | |
| at roadside ..... | | | | | | | | | | | | |
| Pine ..... | 73 | 87 | 86 | 76 | 87 | 66 | 82 | 96 | 95 | 85 | 85 | |
| Spruce ..... | 73 | 87 | 86 | 72 | 85 | 60 | 71 | 81 | 75 | 68 | 72 | |
| **Austria** | | | | | | | | | | | | |
| Exports, f.o.b. | | | | | | | | | | | | |
| (*Nadelrundholz*) ..... | | | | | 102 | 95 | 88 | 88 | 112 | 114 | 114 | |
| **Denmark** | | | | | | | | | | | | |
| (21—24 cm top diam., | | | | | | | | | | | | |
| with bark) at roadside | | | | | | | | | | | | |
| Spruce ..... | | 57 | 64 | 64 | 63 | 63 | 63 | 63 | 69 | 79 | | |
| **Germany** | | | | | | | | | | | | |
| (*Stammholz*, with bark, | | | | | | | | | | | | |
| quality B) at stump | | | | | | | | | | | | |
| Spruce, class 4 ..... | 110 | 109 | 133 | 123 | 130 | 122 | 107 | 108 | 126 | 127 | 118 | |
| Pine, class 2b ..... | 107 | 105 | 135 | 126 | 128 | 116 | 106 | 113 | 128 | 117 | 114 | |
| **Norway** | | | | | | | | | | | | |
| (20 cm top diam., bark | | | | | | | | | | | | |
| removed) at riverside | | | | | | | | | | | | |
| Spruce ..... | 57 | 57 | 66 | 71 | 73 | 72 | 69 | 69 | 76 | 76 | 74 | 76 |
| **Switzerland** | | | | | | | | | | | | |
| (class II/III) | | | | | | | | | | | | |
| Spruce ..... | 102 | 110 | 127 | 131 | 130 | 125 | 124 | 132 | 148 | 150 | 146 | |
| **United Kingdom** | | | | | | | | | | | | |
| Coniferous sawlogs .... | 89 | 76 | 93 | 100 | 100 | 85 | 88 | 84 | 85 | 85 | | |

*Sources:* (1) Reports of respective countries; Tables 2:9, 2:10, 3:5, 4:7, 6:19, 8:7, 9:6
(2) Complementary information from Norway

The distance the sawlogs have to be transported to the most important consuming centres—in this case Germany—seems to have a decisive influence on prices. One should note that the export prices for timber from Austria and Sweden during the Sixties have been at about the same level and that these prices were lower than the corresponding home prices in both Germany and Switzerland.

The prices of sawlogs in Germany, which is a substantial importer and also a producer of such raw material, should be especially noted in the table of comparison. These prices are considerably higher than the corresponding home prices in Sweden. However, it seems not justified to draw far-reaching conclusions from such a state of affairs.

One can also see from this table that the prices for sawlogs are highest in Switzerland, though it must be noted that the prices apply to deliveries at railway stations. Prices in England are at about the same level as home prices in Sweden.

### *10.2.6 Pulpwood*

Pulpwood is the product of roundwood which has come into a constantly increasing use for industrial purposes in recent decades. The price of pulpwood has been the subject of debate in forest industry circles in the large producing countries. Industrialists in the exporting countries emphasise that in the present highly competitive conditions only these countries have the chance of selling pulp and pulp products at a profit in the world markets by their ability to quote low prices. However, producers of this raw material, i.e. forest owners in the exporting countries, consider that the prices for pulpwood have been forced down so much that it will not be possible to produce pulpwood on the sustained-yield basis on poor site quality classes and under conditions of inferior accessibility.

The same view is taken by forest owners in those countries where pulp industries of a significant size already exist but which nevertheless are obliged to import pulp and pulp products in order to meet home demand. The high external common tariffs put on paper and other pulp products by the E.E.C. countries have been imposed on the assumption that the cost of raw material in the exporting countries is considerably less than in the importing countries and that the reduction of the tariffs for final pulp products would not only put the home pulp and paper industries in a difficult position but also the producers of pulpwood. This would be because the reductions in the prices of the final products would be passed on to the raw material producers, as a rule. According to this argument, the consequence would be that the forest owners in the E.E.C. countries would have to expect lower prices for pulpwood when the tariffs on paper are abolished. With this in mind let us examine more closely the current situation in the marketing of pulpwood.

Derived demand is a characteristic of the pulpwood market, too, i.e. requirements of pulp determine the demand for pulpwood. The demand for pulp, which is also an industrial raw material, depends in its turn on the demand for paper and paperboard as well as for other highly processed products, which still can be considered as industrial raw material. However, it is the consumer demand for the final products which determines the raw material requirements in this multi-stage chain of production. On account of the vertical integration of the pulp industry and the industries based on it, the demand for pulpwood may take rather different forms and, consequently, the market situation in the countries concerned can hardly be considered to be uniform. However, the decisive say on prices for pulpwood comes from the pulp industry which is the next stage in the chain of production. The form the marketing organisation of this industry takes in each country plays an important role in this connection.

In most of the countries the pulp industry holds a oligopsonistic position in relation to the producers of roundwood. One could consider this as monopsony in certain cases where a pulpmill unilaterally determines the buying prices for pulpwood in its own neighbourhood. On account of the transport costs the forest owners have no alternative for their sales of pulpwood in the last-mentioned case, if they decide to supply this product at all. The pulp producers in Scandinavia and Finland certainly have a strong bargaining position, but because of the associations of forest owners representing the opposite parties in price negotiations for pulpwood the big industries alone cannot determine the prices for their raw material purchases. Moreover, here the forest owners have the possibility of exporting the pulpwood or restricting the felling of such wood should the industry bring down the prices too much. Now that the associations of forest owners themselves have become owners of pulpmills their position has been strengthened considerably. However, at the same time this has created a new situation in the pulpwood market and to a certain extent this can affect prices. As the associations of forest owners have now gone in for the industrial side of pulpmaking they must try in their capacity as representatives for the sellers in the price negotiations to obtain as high prices as possible for their clients but at the same time they must see to it that these prices do not become so high that the profits of their own industries shrink too much.

There is no doubt that, through the collective price negotiations of the associations of forest owners, the small forest owners, whose individual bargaining power is very weak, get the same prices, as a rule, for their sales of pulpwood as most of the other sellers. However, this is not the case in the countries on the mainland of Europe, particularly Germany, where the pulp industry pays considerably higher prices to the large forest owners than to the small sellers, who do not have the possibilities for collective offers of their pulpwood for bulk sale.

Furthermore, a comparison of pulpwood prices between the different countries is obviously very difficult and can by no means be carried out exactly. The reason why this is so is primarily because there are no uniform rules for measurement and in addition there is always the problem of whether the pulpwood is with or without bark, as well as where it is delivered. However these difficulties are much easier to overcome than for sawlogs because pulpwood as a commodity is fairly homogeneous.

Table 10:15 gives the prices for pulpwood for the period 1953-1964 in certain of the countries participating in this survey. Not all the countries provided the necessary basic material, probably because of the non-availability of such data. As can be seen from the table, the highest prices for pulpwood are paid in Switzerland. This can be explained by the fact that Switzerland imposes relatively high tariffs on pulp products. However, at the end of 1966 tariffs on intra-E.F.T.A. trade were abolished. Also it should be noted that here it is a matter of high-grade pulpwood (Class I), bark removed and loaded on waggon. Of special interest is the price for pulpwood in Germany, which is the big importer.

Figure 10—10 shows in graphic form the prices for pulpwood paid to forest owners in Germany and southern Sweden. The data refer to high-grade pulpwood, (Class A in Germany, Class I in Sweden) with bark in cubic metres stacked volume at roadside. As the Swedish price statistics are for pulpwood with all bark removed while the German statistics are for pulpwood with bark, the Swedish price has been adjusted by the bark reduction percentage which has been put at 10 per cent. In other words, the prices for pulpwood with all bark removed have been reduced by one-tenth, which in itself is a crude simplification. However, as can be seen from the graph, the differences in price are so evident that a more accurate adjustment of the price would hardly result in any change in the picture as a whole. It should be added that the price here in the case of Germany refer to the prices paid for pulpwood to the large forest owners—mainly the State—while the small forest owners have to be content with considerably lower prices. In the case of Sweden it is a question of the prices which are established through collective price negotiations between the representatives of the associations of forest owners and of the industry.

One can state on the basis of the material presented that there are quite big differences in the prices which are paid for pulpwood to forest owners in southern Sweden and in Germany. The question which then must be put is: What is the reason for this difference in the price levels between two areas which in geographical terms are not far from each other? As no import duty has to be paid on pulpwood entering Germany, then providing that there is free competition the price difference ought to be equal to the transport costs from Sweden to Germany, or to put it more accurately to the pulpwood-consuming industries in Germany. However, the difference in pulpwood

prices seems to be greater than the transport costs to the German pulpmills. Theoretically it would therefore be more favourable for the German pulpmills to procure pulpwood in Sweden and to pay higher freight charges for its transport than to pay high prices for pulpwood produced in the Federal Republic. This argument would seem to be quite logical if price alone were the most effective means of competition in the procurement of the raw material for the pulp industry. However, the actual market situation for the product in question proves that this is not so. Thus the situation can be summed up in the following manner: exports of pulpwood from Sweden to Germany take place only

**Table 10:15. Average Prices for Pulpwood, by Countries, 1953—1964**
*(current S.kr per cubic metre stacked measure)*

| Country | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sweden** | | | | | | | | | | | | |
| (bark removed) | | | | | | | | | | | | |
| Exports, f.o.b. | | | | | | | | | | | | |
| (Spruce and pine) ..... | 43 | 49 | 54 | 55 | 50 | 48 | 44 | 46 | 49 | 51 | 48 | 50 |
| Imports, c.i.f. | | | | | | | | | | | | |
| (Spruce and pine) ..... | 39 | 37 | 41 | 44 | 41 | 39 | 36 | 40 | 41 | 41 | 45 | 47 |
| Southern Sweden | | | | | | | | | | | | |
| at roadside: | | | | | | | | | | | | |
| sulphite (spruce) .... | 40 | 47 | 48 | 44 | 40 | 35 | 39 | 47 | 47 | 42 | 45 | |
| sulphate (pine)..... | 30 | 36 | 37 | 34 | 34 | 30 | 33 | 39 | 39 | 37 | 40 | |
| at pulpmill: | | | | | | | | | | | | |
| sulphite (spruce) .... | | | | | | 45 | | 58 | | 52 | | |
| sulphate (pine)..... | | | | | | 40 | | 49 | | 46 | | |
| deciduous species .... | | | | | | | | 30 | | 29 | | |
| **Germany** | | | | | | | | | | | | |
| (with bark, class A) at roadside | | | | | | | | | | | | |
| Spruce ..... | 55 | 52 | 72 | 66 | 64 | 60 | 44 | 45 | 62 | 58 | 56 | |
| Beech ..... | 34 | 32 | 34 | 38 | 38 | 34 | 27 | 26 | 27 | 28 | 27 | |
| **Norway** | | | | | | | | | | | | |
| (bark removed) loaded on wagon | | | | | | | | | | | | |
| Spruce ..... | 33 | 33 | 40 | 42 | 44 | 43 | 41 | 41 | 46 | 46 | 43 | 46 |
| **Switzerland** | | | | | | | | | | | | |
| (bark removed, class I) loaded on wagon | | | | | | | | | | | | |
| Spruce ..... | 87 | 87 | 91 | 97 | 98 | 98 | 99 | 99 | 99 | 99 | 99 | |
| **United Kingdom** | | | | | | | | | | | | |
| Conifers ..... | 53 | 63 | 57 | 55 | 55 | 54 | 54 | 56 | 55 | 48 | | |

*Sources:* (1) Reports of respective countries; Tables 2:9, 2:10, 6:19, 8:7, 9:6
(2) Complementary information from Norway

on the condition that the Swedish industry is not able to absorb the entire Swedish supply of pulpwood.

A further question which may be put here is: What effect do the import duties on the final products have on pulpwood prices? It should be noted that the existence of tariff barriers for pulp and paper products do not seem to have brought about any noticeable differences in the consumer prices between the two countries. In any case, the prices for the final products in this sector of industry in the two countries differ very much less than the raw material prices and there seems to be sufficient reason to examine this question more closely

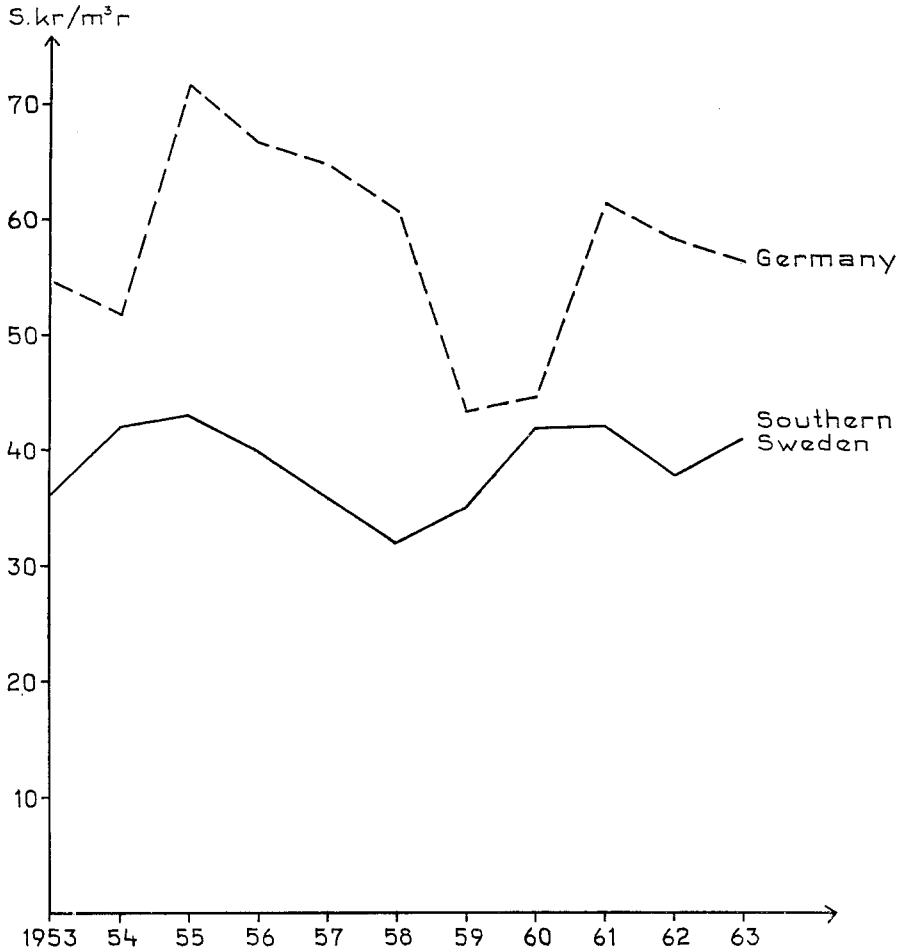


Fig. 10-10. Average Prices for Pulpwood of Spruce, S.kr per Cubic Metre Stacked Measure with Bark, in Southern Sweden and Germany, 1953-63

in the future. A thorough examination of the price formation with both raw material and finished products in the pulp and paper industry would contribute fundamentally to a mutual understanding of questions involving international trade and the removal of artificial barriers to this trade.

## 10.3 Comparison of Wages for Forest Workers

### *10.3.1 Social Charges*

Principally, any international comparison of labour remuneration must be based on wages and social charges taken together, as both of these constitute parts of the costs of production. For such comparisons it is by no means easy to make an assessment of the social charges which represent the costs of social programmes in various countries, and often such calculations are not accurate. The reason why these difficulties occur lies primarily in the great differences in the methods of financing social charges. For instance, in Sweden the bulk of social benefits are financed largely out of general revenue; consequently the employer's direct contribution for such purposes appears to be rather low. Actually, in common with other tax-payers, the employers contribute to the general revenue through taxation, and the share of taxation going to special purposes is not indicated at the time of payment. The opposite is the case, for instance, in Germany and Austria, where the employer directly has to pay the lion's share of social benefits for his workers. One can even say that, with certain reservations, the total earnings of the workers in these countries (i.e. wages plus social benefits) coincide almost entirely with the employer's total expenditure for such labour.

For most of the countries participating in this survey the information is lacking as to how great is the share of compulsory social charges which must be added to money wages, which together comprise the earnings of forest workers and the labour costs for employers. However, such details are available only for the industrial sectors in the countries covered by this study.

Table 10:16 sets out the social charges and cost of days off with pay as a percentage of wages in the woodworking and sawmilling industries for 1957-1963. Holidays with pay and additions for social benefits to workers engaged in silvicultural work and in logging operations cannot be considered to be of exactly the same magnitude as in the wood-processing industries. However, deviations for the percentage given in the table cannot be considered as particularly marked and on the whole they can be accepted for forestry, too.

As can be seen from the table, the additional costs to employers over and above the direct wage costs not only vary between the countries but even show a constantly increasing trend, and this applies in most of the countries concerned here.

**Table 10:16. Social Charges and Cost of Days off with Pay, as Percentage of Wages, by Countries, in Wood-working Industries[a], 1957—1963**

| Country | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 |
|---|---|---|---|---|---|---|---|
| Sweden[b] | 15 | 15 | 15 | 17 | 18 | 19 | 21 |
| Austria[c] | 53 | 53 | 53 | 53 | 53 | 53 | 53 |
| Denmark | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Finland | 16 | 16 | 16 | 18 | 18 | 22 | 25 |
| Germany | 43 | 45 | 47 | 48 | 47 | 48 | 47 |
| Norway | 18 | 18 | 20 | 20 | 20 | 21 | 23 |
| Switzerland | 17 | 17 | 19 | 23 | 25 | 28 | 28 |
| United Kingdom | 10 | 11 | 11 | 11 | 11 | 11 | 11 |

*a.* Including sawmilling industry
*b.* These figures differ slightly from Table 2:17
*c.* For both males and females
*Source:* SAF: *Direkta och totala lönekostnader för arbetare, Internationell översikt 1957—1964*, Stockholm, 1964

### *10.3.2 Average Hourly Earnings*

We have started by mentioning additional wage costs, but the most important purpose of this survey is to examine the average hourly earnings for forest workers and labour costs for employers in the forestry sector of the economy. Basic wages or payments by results must therefore be the centre of our comparative studies. As the basic wages vary according to professional skill, sex, age, civil status, terms of employment, etc., the actual average wage payment per working hour can be assessed only approximately. Moreover, the main part of forestry work is done on piece rates. Consequently, for the calculation of time rates it is necessary first to make a conversion of the wage statistics; this procedure is rather lengthy and by no means can be said to give exact results. This is the reason why the statistical basis for the average hourly wages for forest workers in almost all the countries represented here is very scanty and in most cases unreliable. Now that this material has been presented in Table 10:17 attention must be directed to a number of qualifications and reservations which have been mentioned previously in the reports from the countries concerned. For individual countries it is necessary to keep in mind the following considerations.

In Sweden the term wages means the average hourly earnings for fellers without remuneration for holidays or any other social benefits. Social charges paid by the employer totalled approximately eight per cent at the beginning of the period under survey (1953) but probably increased by the last year for the survey (1962) to approximately 19 per cent, i.e., the same percentage as in the woodworking and sawmilling industries.

Danish average hourly earnings are for all fellers in the public forests. The wages of highly skilled fellers are about five per cent higher. The hourly wages for fellers given in the table are somewhat lower than what appears as the

worker's earnings in the official statistics for the Danish wood-processing industries. No remuneration for holidays or other social benefits are included in the wages accounted for here.

English wages given are for the "minimum wage" in forestry. These are considerably lower than the time earnings for workers in England's wood-processing industries, according to the official statistics. One can assume that the average wages, excluding social benefits, are somewhat higher than those cited in the table.

**Table 10:17. Average Hourly Wages for Forest Workers, by Countries, 1952—1964**
*(in current S.kr)*

| Country | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sweden | | 3.54 | 3.76 | 4.02 | 4.20 | 4.52 | 4.77 | 5.03 | 5.40 | 5.95 | 6.53 | 7.43 | 8.23 |
| Austria | 1.33 | | | | 1.46 | 1.64 | 1.67 | 1.76 | 1.80 | 1.96 | 2.12 | 2.14 | 2.22 |
| Denmark | | | | | 3.20 | 3.23 | 3.46 | 3.81 | 4.10 | 4.81 | 5.23 | | |
| Finland | | 2.88 | 3.16 | 3.59 | 3.97 | 3.76 | 3.07 | 3.21 | 3.59 | 4.29 | 4.41 | | |
| Germany | | | 2.12 | 2.35 | 2.51 | 2.76 | 2.90 | 3.19 | 3.36 | 4.33 | 5.18 | 5.55 | 6.05 |
| Norway | | 2.90 | 3.06 | 3.19 | 3.34 | 3.56 | 3.70 | 3.86 | 4.43 | 4.64 | 5.07 | 5.60 | |
| Switzerland | | 2.55 | 2.61 | 2.68 | 2.80 | 2.96 | 3.08 | 3.29 | 3.37 | 3.62 | 3.97 | | |
| United Kingdom | | | 2.00 | | | | 2.41 | 2.52 | 2.52 | 2.90 | 2.90 | | |

Indices

| Country | | | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sweden | | | 100 | 107 | 112 | 120 | 127 | 134 | 144 | 158 | 174 | 198 | 219 |
| Austria | | | 100 | | 104 | 117 | 119 | 125 | 129 | 140 | 151 | 153 | 159 |
| Germany | | | 100 | 111 | 118 | 130 | 137 | 151 | 159 | 204 | 244 | 262 | 285 |
| Norway | | | 100 | 104 | 109 | 116 | 121 | 126 | 145 | 152 | 166 | 183 | |
| Switzerland | | | 100 | 103 | 107 | 113 | 118 | 126 | 129 | 139 | 152 | | |
| United Kingdom | | | 100 | | | | 121 | 126 | 126 | 146 | 146 | | |

*Sources:* (1) Reports of respective countries; Tables 2:17, 3:6, 4:11, 5:7, 7:6, 8:11, 9:8
(2) *Wirtschaftsergebnisse der Hessischen Staatsforstverwaltung*, 1962 and 1964, Ministerium für Landwirtschaft und Forsten, 1963 and 1965

The average hourly wages for forest workers in the German Federal Republic, given in Table 10:17, have been extracted from the German publication *Wirtschaftsergebnisse*[1] and refer only to forests in public ownership. These figures have been calculated on the basis of special investigations into the wage costs involved with fellers; the daily wage includes also an allowance for tools (1/13 rising to 1/8 of the piece rates). One can see that the wages for forest workers are higher than those for workers in the woodworking and

[1] *Wirtschaftsergebnisse der Hessischen Staatforstverwaltung*, 1962 & 1964, Ministerium für Landwirtschaft und Forsten, 1963 & 1965.

sawmilling industries for a comparison of the hourly earnings published in the official statistics (*Wirtschaft und Statistik*). Here a special feature about forestry wages is that these include an allowance for tools, an extra which is not included in the wages of industrial workers. For the Federal Republic the average hourly earnings for forest workers are probably lower than those given in the table. However, the percentage increase for the social benefits for forest workers, which primarily depends on the average age of the labour force, the size of the family and the special nature of forest work, is probably greater in the main than that for workers in the wood-processing industries.

The Austrian figures in Table 10:17 are for the hourly earnings of a skilled forest worker employed in private forestry and who is married and has two children. He receives a basic hourly wage, the size of which is determined by his years of service. In the case taken here the forest worker is in the group with 6-15 years of service and he also receives a piece-rate supplement. These two items taken together are called the piece-rate basic wage, which is still regarded as a pure payment according to results. The cited basic wages for forest workers are slightly lower than the direct wages paid by the Austrian wood-processing industries. However, the additional costs to the employer for social benefits seem to be considerably lower in industry (e.g. in 1962 such costs totalled 53 per cent of the direct wages, see Table 10:16) than in forestry (73 per cent in that year, according to the Austrian report). The reason why the social charges in Austrian forestry are very much higher than in industry cannot be explained in any other way than the average age of forest workers being higher than that of industrial workers and that the working conditions in the forests necessitate higher social charges and costs (travelling expenses, payment for wet weather, outlay for sickness and accidents, etc.).

Swiss forest workers' wages were below those paid to workers in the wood-processing industries and even lower than those paid by the building industry, according to Swiss official statistics (*Statistisches Jahrbuch*). Such hourly earnings in Switzerland include also certain benefits of a social nature (family allowances, bonuses, etc.) and on top of this there is the addition for the actual social charges (in 1962 this addition totalled 28 per cent, see Table 10:16). The wage supplement for social benefits in Switzerland averages for permanent forest workers approximately 40 per cent and for those seasonally employed in the forests eight per cent. Consequently, the average hourly earnings for forest workers and labour costs to employers in forestry in Switzerland is rather difficult to establish. One therefore has to be satisfied with quite approximate figures.

Figure 10—11 shows in graphic form the average hourly wages in different countries using the same data as contained in Table 10:17. Figure 10—12 presents the changes in direct money wages over the years using an index with 1954 as the base year. Should one add to these direct wages the social benefits,

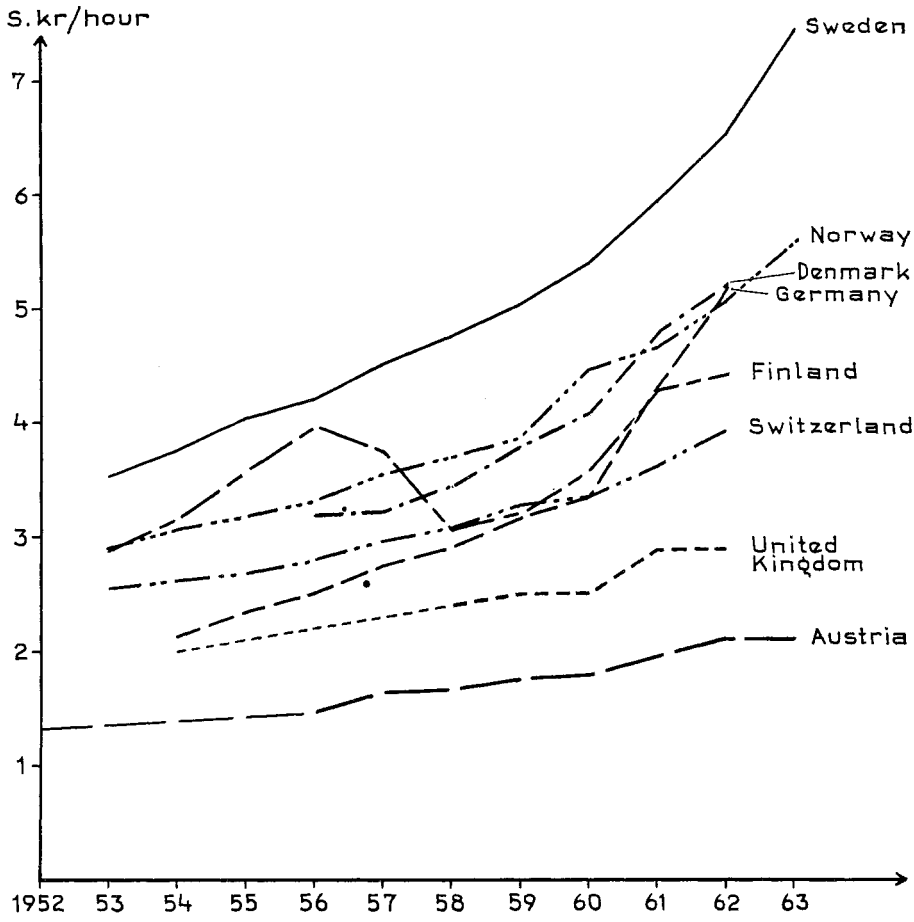


Fig. 10-11. Average Hourly Wages for Forest Workers, by Countries, in prevailing S.kr, 1952-1963

which are paid by the employer in various ways and which are part of his wage costs, the countries would appear in a different order in the figure. First of all, the difference between the highest and lowest wages would be less, and further the course of the development of wages over the years would be more even.

For instance, the employers in Austria, where the money wages are the lowest, have to pay the highest social charges. The social charges falling on the employers in Sweden, the country with the highest money wages, are relatively low.

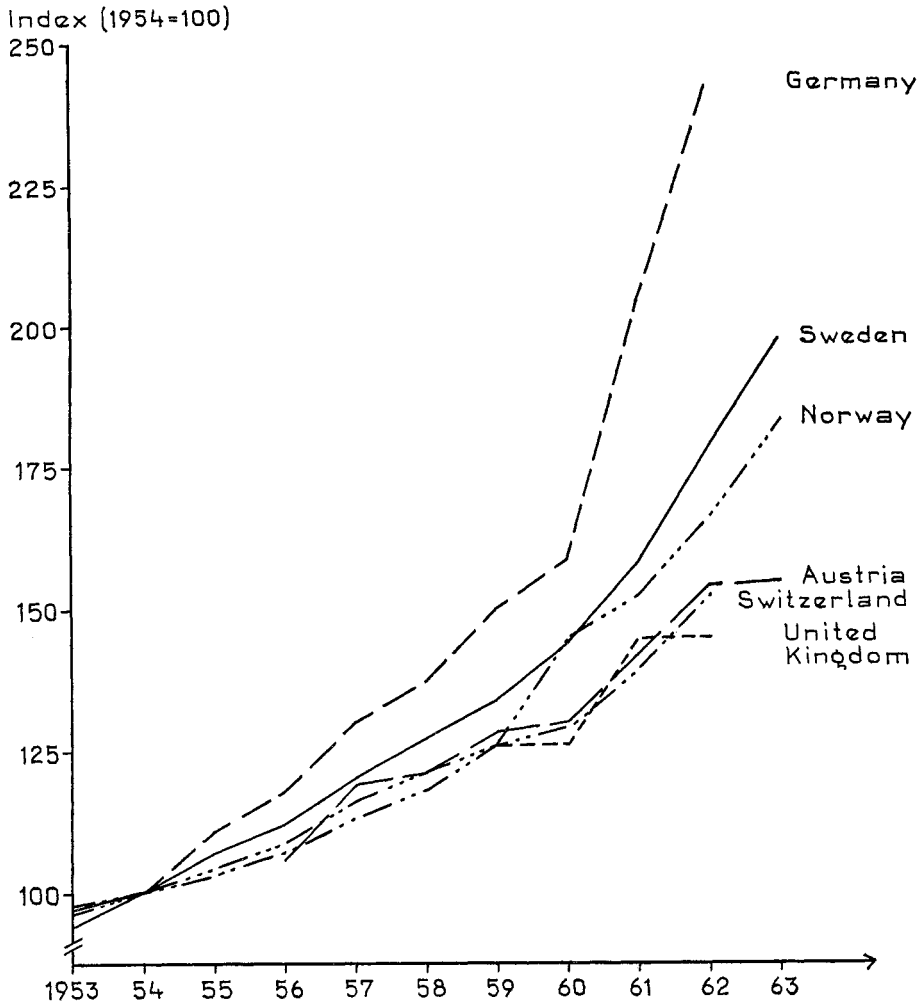


Fig. 10-12. Indices for Average Hourly Wages for Forest Workers, by Selected Countries, 1953-1963

One can therefore state that by means of the social welfare programmes in the countries concerned a systematic levelling of the standard of living of the workers seems to be taking place. Consequently, the differences in money wages alone, particularly when the official exchange rates have been used for the conversion of currencies and not the purchasing power, cannot be regarded as reflecting the differences in the living conditions of the forest workers. Direct wages are of more significance, though as cost items in the expenditure of the employers—and the same applies also to the social charges.

One can say by way of conclusion that wages and the various social benefits are closely related factors in the standard of living of the workers as well as in the costs of production of the employers. However, with the lack of reliable basic material it has not been possible to deal with their total effect in this comparative survey.

## 10.4 Comparison of Revenue and Costs in Timber Harvesting

### *10.4.1 Annual Income and Expenditure in a Going Concern*

In the question of comparisons of revenue and costs incurred in forestry operations, the actual records of account seem to be the only ones relevant in this connection. The material submitted by the participating countries provides a clear confirmation that this is the case, but with one important proviso. The proviso is that the operational statistics involved must be for permanently established forest enterprises which have attained the status of a going concern with an annual income. One can say that, on the whole, this prerequisite condition is fulfilled in countries where forestry has been practised for generations; actually this is the most conspicuous feature of forestry in Europe with the exception of the United Kingdom. The production apparatus, i.e. the growing stock taken as a whole, is in an expanding phase of development in the United Kingdom.

Forestry operations in the last mentioned country to a considerable extent are what is known as the appreciative or progressive type, by which is meant that the balance between annual income and expenditure has not yet been achieved. In actual practice this is reflected by the fact that the annual running expenditure for managing forest land is greater than the income from timber sales. This applies to forests in all ownership categories, but particularly to State forests. In the present situation the actual accounting records of the United Kingdom are not comparable with the corresponding statistical data for other countries, and consequently the United Kingdom is not included in many of the comparative surveys which will be presented later.

Another factor which complicates matters arises when forestry operations are of the depreciative or regressive type. One obtains from such forestry practice during certain periods considerably higher incomes than those which the normal sustained-yield types would make possible in the long run. However, these temporarily higher incomes which come from the larger timber output will, sooner or later, turn into lower incomes when the annual cut has to be reduced in order to make full use of the productive capacity of the land and in order that forestry as a commercial enterprise can survive.

Such a situation seems to prevail in Finland and even in Austria, and this should provide a reason for a rectification of the actual business records in order to have a cost-revenue structure reflecting "normal" conditions. According to the Directives which set out the terms of reference for this survey, no

adjustment of the accounting records should be made as a matter of principle, and no attempts were made to adapt the accounting records supplied by any of the participating countries with the exception of Austria.

If one accepts the actual accounting records as a basis for comparison, one should nevertheless keep in mind that complete comparability can be attained only on the assumption that there has been no change in the timber capital during the period under survey, and that the composition of the annual cut, by quality of products, is in accordance with the growing stock. As such a check on the timber stock and the timber output is lacking, this limits the application of the data submitted.

*10.4.2 Gross Revenue*

The revenue accruing from sales of roundwood products is determined by a number of factors which may be divided into two major groups, namely, external and internal.

The selling prices of wood products, which are the major determining factors for revenue, belong to the first group. Prices have been dealt with in an earlier section and it was shown that there are quite important price differences between the various countries.

The cutting rate or the timber output together with its distribution by different assortments is the other major determining factor for revenue; such can be said to belong to the second group. The question of product distribution in annual fellings is dependent on management decisions in which the external factors play an outstanding role; however, the composition of tree species is of decisive importance in this connection. One very significant function of this survey would have been to determine the value contributed by each individual tree species in the various countries. However, the average figures submitted provide very little information about this and one has to be content with statements in general terms when it comes to the effect of the composition of tree species on the size of income in forestry.

Table 10:18 gives details of income and expenditure adjusted to the 1962 value of the Swedish krona as an annual average for the five-year period 1958-1962 per cubic metre timber output in the different countries. This table has been compiled on the basis of the material presented previously in the reports of the countries. The conversion from the different currencies into Swedish kronor has been made at the selling rates of exchange ruling in Stockholm (see Appendix), a method which has been applied in this study for currency conversions.

Column 3 of the table gives the gross revenue, which is of special interest in this connection. One can see that the highest average value per cubic metre in sales of felled timber occurs in Switzerland and Germany, while the bottom is reached in northern Finland. However, the differences in gross revenue per cubic metre output within the entire geographical area covered here are not

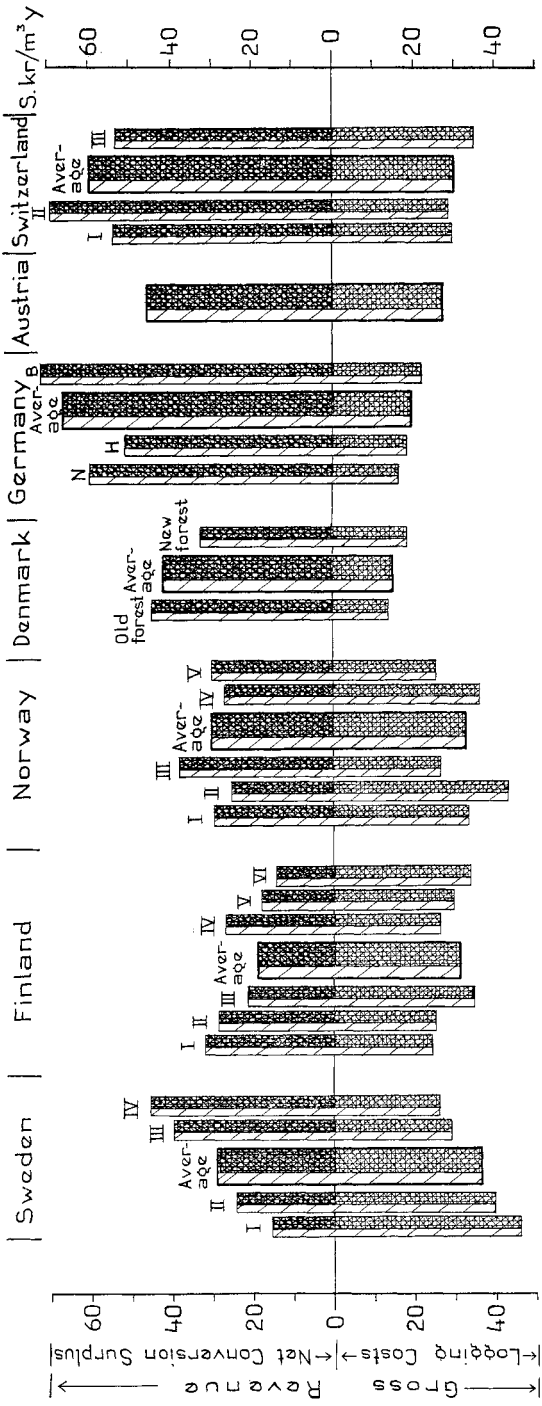


Fig. 10-13. Gross Revenue, Net Conversion Surplus and Logging Costs, 1962 S.kr per $m^3$ y, in Public Forests, by Countries and Regions, Annual Averages, 1958–1962

so great as one would have reason to assume. Figure 10—13 presents this in graphic form where the total lengths of the staples indicate the gross revenue.

The important thing is at which point in the chain of delivery, i.e. from the stump to the point of consumption at the mill, is the gross revenue calculated. According to the Directives, the point of delivery at roadside (or at river mouth) shall be taken as the standard for the assessment of revenue. In actual sales procedure, however, there are many deviations. For example, in Germany sales of sawlogs are made at stump on logging site, while pulpwood sales are at roadside. The consequence of such a procedure would be, if the figures are not adjusted, that the average gross revenue is reduced in comparison with those countries where sawlogs are delivered at roadside. It should be noted that the revenue position in the German Federal Republic shows some interesting features. The lowest revenue (equivalent to 70 S.kr per $m^3y$) is found in Hesse. The reason why this is so is that beech is predominant in Hesse and the roundwood products which are obtained from beech fetch only relatively low prices. The dominating type of timber in Bavaria is high-quality coniferous and the yield of these forests is reflected in the high revenue.

In the northern parts of Sweden where the transport of logs is mainly by floating, the calculation of the gross revenue is done on the basis of the prices the buyer pays for timber at the river mouth. Consequently, these prices are higher as they include the costs of timber floating, and this in its turn makes the assessed revenue higher than if the prices were for delivery at roadside. One thus has a marked distortion of the revenue position, and because of this the location factor or accessibility, i.e. location in respect to the proximity to transport facilities, to a large extent is disregarded for purposes of revenue assessment. In the main, the levelling of revenues per unit of timber output in different forest economic regions depends on the very fact that prices for felled roundwood are not calculated in a uniform way. This must be kept in mind when studying the submitted statistical data.

Another picture of revenue from the sales of roundwood in the different countries and regions is obtained when the forested area is taken as the basis for calculation. Table 10:19, column 3, contains such data. From this it can be seen that the variations in gross revenue between the different regions have become more evident (the extremes are the equivalent of 781 S.kr/ha in Switzerland and 49 S.kr/ha in Finland) than was the case when calculations were made on the basis of volume. This phenomenon is explained by the fact that the productive capacity of forest land is involved here. One obtains considerably larger timber yields in areas with more optimal growth conditions than in those areas which are close to the timber line bordering the high mountains or the tundra. Also as better prices as a rule are paid for the main roundwood products in the first-mentioned areas, it is easy to understand why the gross revenue varies so much in the different geographical regions.

**Table 10:18. Income and Expenditure of Managing Forest Land, by Countries and Regions, Annual Average, 1958—1962**
*(in 1962 value of S.kr per m³y of the total cut)*

| Country / Ownership category | Region / Specification of data | Gross revenue | Logging costs | Net conversion surplus | Managing costs: Silviculture | Administration | Maintenance | Improvement and expansion | Total | Operating surplus | Taxes | Net profit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| **Sweden** | I | 62.10 | 46.40 | 15.70 | 7.20 | 9.30 | 2.10 | 5.10 | 23.70 | −8.00 | 1.20 | −9.20 |
| | II | 64.50 | 40.20 | 24.30 | 5.50 | 8.40 | 1.70 | 5.10 | 20.70 | 3.60 | 1.90 | 1.70 |
| Crown forests | III | 69.00 | 29.20 | 39.80 | 4.00 | 9.70 | 3.20 | 4.70 | 21.60 | 18.20 | 3.40 | 14.80 |
| | IV | 71.90 | 26.40 | 45.50 | 6.60 | 11.20 | 2.40 | 3.50 | 23.70 | 21.80 | 3.30 | 18.50 |
| | Average | 65.90 | 36.90 | 29.00 | 5.30 | 9.10 | 2.30 | 4.90 | 21.60 | 7.40 | 2.40 | 5.00 |
| **Finland** | I | 56.04 | 24.03 | 32.01 | 1.26 | 7.13 | 0.45 | 1.95 | 10.79 | 21.22 | 1.47 | 19.75 |
| | II | 54.40 | 25.51 | 28.89 | 1.93 | 5.71 | 0.71 | 2.32 | 10.67 | 18.22 | 1.38 | 16.84 |
| | III | 56.52 | 34.77 | 21.75 | 2.10 | 4.15 | 0.65 | 2.84 | 9.74 | 12.01 | 0.75 | 11.26 |
| State forests | IV | 53.41 | 26.41 | 27.00 | 1.85 | 8.02 | 0.80 | 2.64 | 13.31 | 13.69 | 1.38 | 12.31 |
| | V | 48.12 | 29.82 | 18.30 | 1.79 | 4.16 | 0.32 | 1.79 | 8.06 | 10.24 | 0.64 | 9.60 |
| | VI | 48.05 | 33.43 | 14.62 | 1.72 | 3.28 | 0.30 | 1.53 | 6.83 | 7.79 | 0.40 | 7.39 |
| | Average | 50.45 | 31.42 | 19.03 | 1.82 | 4.16 | 0.42 | 1.93 | 8.33 | 10.70 | 0.68 | 10.02 |
| **Norway** | I A | 62.90 | 33.10 | 29.80 | 2.00 | 5.60 | 1.60 | 1.80 | 11.00 | 18.80 | | |
| | B | 70.60 | 29.10 | 41.50 | 3.00 | 5.70 | 1.70 | 3.60 | 14.00 | 27.50 | | |
| | II A | 68.80 | 43.20 | 25.60 | 3.50 | 7.70 | 2.60 | 1.70 | 15.50 | 10.10 | | |
| | B | 72.00 | 33.80 | 38.20 | 4.10 | 6.20 | 1.30 | 4.20 | 15.80 | 22.40 | | |
| | III A | 65.20 | 26.60 | 38.60 | 7.20 | 10.20 | 3.00 | 1.90 | 22.30 | 16.30 | | |
| Crown forests | B | 70.70 | 35.90 | 34.80 | 5.80 | 8.30 | 3.40 | 2.30 | 19.80 | 15.00 | | |
| | IV A | 63.30 | 36.10 | 27.20 | 5.60 | 5.30 | 2.80 | 4.60 | 18.30 | 8.90 | | |
| | B | 64.10 | 30.63 | 33.50 | 6.20 | 7.30 | 2.30 | 3.00 | 18.80 | 14.70 | | |
| | V A | 55.20 | 24.80 | 30.40 | 3.90 | 7.00 | 2.50 | 2.30 | 15.70 | 14.70 | | |
| | I—V A | 63.10 | 32.70 | 30.40 | 4.40 | 7.10 | 2.60 | 2.50 | 16.60 | 13.80 | | |
| | I—V B | 69.30 | 32.40 | 36.90 | 4.80 | 6.90 | 2.10 | 3.20 | 17.00 | 19.90 | | |
| **Denmark** | Old | 58.70 | 13.80 | 44.90 | 10.20 | 9.00 | 5.00 | 1.50 | 25.70 | 19.20 | 4.70 | 14.50 |
| Crown forests | New | 51.30 | 18.60 | 32.70 | 13.70 | 10.80 | 4.30 | 1.40 | 30.20 | 2.50 | 3.30 | −0.80 |
| Private forests | Old | 58.70 | 13.80 | 44.90 | 8.80 | 10.10 | 4.90 | | 23.80 | 21.10 | 5.40 | 15.70 |
| | New | 49.30 | 14.70 | 34.60 | 12.50 | 9.80 | 3.90 | | 26.20 | 3.40 | 3.70 | −0.80 |
| **Germany** | Lower Saxony | 76.51 | 16.35 | 60.16 | 14.53 | 25.90 | | 9.45 | 49.88 | 10.28 | 7.21 | 3.07 |
| State forests | Hesse | 70.34 | 18.63 | 51.71 | 10.55 | 17.10 | | 7.19 | 34.84 | 16.87 | 6.12 | 10.75 |
| | Bavaria | 94.17 | 22.03 | 72.14 | 14.46 | 19.32 | | 12.89 | 46.67 | 25.47 | 4.50 | 20.97 |
| | Average | 86.26 | 19.78 | 66.48 | 13.81 | 21.84 | | 10.78 | 46.43 | 20.05 | 5.84 | 14.21 |
| **Austria** | Actual accounting records | 72.90 | 27.30 | 45.60 | 3.00 | 13.20 | 6.00 | 6.80 | 29.00 | 16.60 | 5.40 | 11.20 |
| State forests | Normalised accounting figures | 70.30 | 27.40 | 42.90 | 2.80 | 11.90 | 5.40 | 6.00 | 26.10 | 16.80 | 5.00 | 11.80 |
| All forests | Hypothetical model I | 76.28 | 27.89 | 48.39 | 6.21 | 10.98 | 7.21 | 5.01 | 29.41 | 18.98 | 5.81 | 13.17 |
| | Hypothetical model II | 79.32 | 39.46 | 39.86 | 4.01 | 13.02 | 4.41 | 7.41 | 28.85 | 11.01 | 3.00 | 8.01 |
| **Switzerland** | A. Jura | 84.25 | 30.09 | 54.16 | 6.87 | 12.31 | 2.70 | 10.72 | 32.60 | 21.56 | | |
| | B. Lowland | 98.80 | 29.03 | 69.77 | 7.87 | 8.64 | 2.90 | 7.22 | 26.63 | 43.14 | | |
| Public forests | C. Alps | 88.26 | 35.14 | 53.12 | 1.47 | 6.36 | 2.31 | 11.16 | 21.30 | 31.82 | | |
| | Average | 90.62 | 30.17 | 60.45 | 5.52 | 8.69 | 3.31 | 8.42 | 25.94 | 34.51 | | |
| | A. Jura | 93.40 | 34.11 | 59.29 | 8.10 | 13.16 | 5.10 | 7.77 | 34.13 | 25.16 | | |
| | B. Lowland | 94.20 | 31.06 | 63.14 | 7.57 | 12.82 | 4.41 | 7.65 | 32.45 | 30.69 | | |
| Municipal and corporation | C. Alps | 96.28 | 41.17 | 55.11 | 2.67 | 9.39 | 2.60 | 13.43 | 28.09 | 27.02 | | |
| | Average | 94.20 | 33.65 | 60.55 | 6.86 | 12.30 | 4.28 | 8.59 | 32.03 | 28.52 | | |
| **United Kingdom** | Average *a* Forestry Commissions accounting records | 46.00 | 19.00 | 27.00 | 89.00 | 68.00 | *c* | 40.00 | 197.00 | −170.00 | | |
| State forests | | | | | | | | | | | | |
| Private woodlands | Average *b* (calculated) | — | — | 50.00 | 13.00 | 19.00 | 23.00 | 9.00 | 64.00 | −14.00 | 2.00 | −16.00 |

*a.* Period 1959—1962
*b.* 1961 and 1962
*c.* Shown together with silviculture
*Source:* Reports of respective countries; Tables 2:61, 3:14, 3:18, 3:25, 3:26, 4:22, 5:38, 6:26, 6:27, 6:28, 6:29, 7:8, 8:14, 8:15, 9:12, 9:14

**Table 10:19. Income and Expenditure of Managing Forest Land, by Countries and Regions, Annual Average, 1958—1962**
*(in 1962 value of S.kr per ha productive forest land)*

| Country / Ownership category | Region / Specification of data | Gross revenue | Logging costs | Net conversion surplus | Managing costs: Silviculture | Administration | Maintenance | Improvement and expansion | Total | Operating surplus | Taxes | Net profit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| **Sweden** | I | 53.50 | 39.90 | 13.60 | 6.20 | 8.00 | 1.80 | 4.40 | 20.40 | −6.80 | 1.10 | −7.90 |
| | II | 84.50 | 52.60 | 31.90 | 7.20 | 11.00 | 2.20 | 6.70 | 27.10 | 4.80 | 2.60 | 2.20 |
| Crown forests | III | 248.00 | 105.00 | 143.00 | 14.30 | 34.90 | 11.60 | 16.90 | 77.70 | 65.30 | 12.20 | 53.10 |
| | IV | 310.00 | 114.00 | 196.60 | 28.70 | 48.40 | 10.50 | 15.00 | 102.60 | 94.00 | 14.40 | 79.60 |
| | Average | 102.80 | 57.50 | 45.30 | 8.20 | 14.20 | 3.60 | 7.70 | 33.70 | 11.60 | 3.70 | 7.90 |
| **Finland** | I | 260.64 | 111.73 | 148.91 | 5.85 | 33.18 | 2.08 | 9.09 | 50.20 | 98.71 | 6.84 | 91.87 |
| | II | 207.76 | 97.40 | 110.36 | 7.36 | 21.80 | 2.71 | 8.83 | 40.70 | 69.66 | 5.26 | 64.40 |
| | III | 164.40 | 101.11 | 63.29 | 6.10 | 12.07 | 1.89 | 8.25 | 28.31 | 34.98 | 2.17 | 32.81 |
| State forests | IV | 138.82 | 68.64 | 70.18 | 4.82 | 20.83 | 2.08 | 6.85 | 34.58 | 35.60 | 3.59 | 32.01 |
| | V | 77.70 | 48.20 | 29.50 | 2.89 | 6.71 | 0.52 | 2.89 | 13.01 | 16.49 | 1.02 | 15.47 |
| | VI | 49.00 | 34.10 | 14.90 | 1.76 | 3.34 | 0.30 | 1.56 | 6.96 | 7.94 | 0.41 | 7.53 |
| | Average | 74.75 | 46.54 | 28.21 | 2.68 | 6.16 | 0.63 | 2.87 | 12.34 | 15.87 | 1.00 | 14.87 |
| **Norway** | I A | 49.20 | 25.50 | 23.70 | 1.70 | 4.30 | 1.30 | 1.60 | 8.90 | 14.80 | | |
| | B | 125.50 | 50.30 | 75.20 | 5.60 | 10.70 | 2.90 | 6.80 | 26.00 | 49.20 | | |
| | II A | 81.10 | 50.60 | 30.50 | 4.30 | 9.10 | 3.00 | 2.20 | 18.60 | 11.90 | | |
| | B | 134.00 | 61.10 | 72.90 | 7.80 | 11.80 | 2.30 | 8.10 | 30.00 | 42.90 | | |
| | III A | 48.00 | 16.30 | 31.70 | 6.10 | 8.20 | 2.40 | 1.40 | 18.10 | 13.60 | | |
| Crown forests | B | 72.80 | 33.80 | 39.00 | 6.50 | 9.60 | 3.10 | 2.40 | 21.60 | 17.40 | | |
| | IV A | 44.50 | 25.00 | 19.50 | 4.00 | 3.70 | 2.00 | 3.40 | 13.10 | 6.40 | | |
| | B | 78.60 | 35.90 | 42.70 | 8.00 | 9.60 | 2.40 | 3.60 | 23.60 | 19.10 | | |
| | V A | 15.00 | 6.10 | 8.90 | 1.40 | 2.60 | 0.70 | 0.90 | 5.60 | 3.30 | | |
| | I—V A | 47.50 | 24.70 | 22.80 | 3.50 | 4.70 | 1.80 | 1.90 | 11.90 | 10.90 | | |
| | I—IV B | 102.70 | 45.20 | 57.50 | 7.00 | 10.40 | 2.70 | 5.30 | 25.40 | 32.10 | | |
| **Denmark** | Old | 479.00 | 113.00 | 366.00 | 83.00 | 73.00 | 42.00 | 12.00 | 210.00 | 156.00 | 38.00 | 118.00 |
| Crown forests | New | 167.00 | 62.00 | 105.00 | 45.00 | 35.00 | 14.00 | 5.00 | 99.00 | 6.00 | 10.00 | 4.00 |
| Private forests | Old | 477.00 | 111.00 | 366.00 | 72.00 | 82.00 | 41.00 | | 195.00 | 171.00 | 43.00 | 128.00 |
| | New | 166.00 | 50.00 | 116.00 | 42.00 | 33.00 | 12.00 | | 87.00 | 29.00 | 13.00 | 16.00 |
| **Germany** | Lower Saxony | 321.33 | 70.11 | 251.22 | 60.97 | 109.68 | | 40.09 | 210.74 | 40.48 | 30.45 | 10.03 |
| State forests | Hesse | 360.85 | 96.09 | 264.76 | 54.00 | 88.05 | | 36.85 | 178.90 | 85.86 | 31.38 | 54.48 |
| | Bavaria | 401.20 | 93.94 | 307.26 | 61.56 | 82.38 | | 55.08 | 199.02 | 108.24 | 19.20 | 89.04 |
| | Average | 389.06 | 90.57 | 298.49 | 62.05 | 98.69 | | 48.79 | 209.53 | 88.96 | 26.35 | 62.61 |
| **Austria** | Actual accounting records | 216.52 | 81.32 | 135.20 | 8.81 | 39.06 | 18.03 | 20.03 | 85.93 | 49.27 | 16.22 | 33.05 |
| State forests | Normalised accounting figures | 231.75 | 90.34 | 141.41 | 8.81 | 39.06 | 18.03 | 20.03 | 85.93 | 55.48 | 16.22 | 39.26 |
| | Hypothetical model I | 311.20 | 113.78 | 197.42 | 25.34 | 44.78 | 29.42 | 20.43 | 119.97 | 77.45 | 23.70 | 53.75 |
| All forests | Hypothetical model II | 276.03 | 137.32 | 138.71 | 13.94 | 45.31 | 15.33 | 25.79 | 100.37 | 38.34 | 10.46 | 27.88 |
| **Switzerland** | A. Jura | 452.16 | 161.51 | 290.65 | 36.47 | 65.85 | 14.32 | 56.65 | 173.29 | 117.36 | | |
| | B. Lowland | 667.50 | 196.53 | 470.97 | 50.24 | 56.55 | 18.65 | 47.05 | 172.49 | 298.48 | | |
| Public forests | C. Alps | 138.26 | 55.03 | 83.23 | 2.31 | 10.13 | 3.61 | 17.30 | 33.35 | 49.88 | | |
| | Average | 340.43 | 113.41 | 227.02 | 20.42 | 32.48 | 12.28 | 31.40 | 96.60 | 130.40 | | |
| Municipal and corporation forests | A. Jura | 498.76 | 179.05 | 310.71 | 42.16 | 68.98 | 26.56 | 40.73 | 178.43 | 132.28 | | |
| | B. Lowland | 780.93 | 258.46 | 522.47 | 58.83 | 102.89 | 34.80 | 61.30 | 257.82 | 264.61 | | |
| | C. Alps | 210.75 | 90.09 | 120.65 | 5.82 | 20.57 | 5.70 | 29.56 | 61.65 | 58.99 | | |
| | Average | 480.83 | 172.60 | 310.23 | 34.20 | 62.39 | 21.46 | 43.52 | 161.57 | 148.63 | | |
| **United Kingdom** | Average yield model I | | | 355.00 | 20.00 | 35.00 | 55.00 | | 110.00 | 245.00 | | |
| All forests | Average yield model II | | | 175.00 | 15.00 | 35.00 | 30.00 | | 80.00 | 95.00 | | |

*Source:* Reports of respective countries; Tables 2:62, 3:15, 3:19, 3:25, 3:26, 4:22, 5:39, 6:26, 6:27, 6:28, 6:29, 7:9, 8:16, 8:17, 9:12, 9:14

**Table 10:20. Cost-Revenue Coefficients in Managing Forest Land, by Countries and Regions, 5-Year Average, 1958—1962**

| Country | Region | Gross revenue | Logging costs | Managing costs | | | | | Taxes |
|---|---|---|---|---|---|---|---|---|---|
| Ownership category | Specification of data | | | Silviculture | Administration | Maintenance | Improvement and expansion | Total | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Sweden** | I | 1.000 | 0.747 | 0.116 | 0.150 | 0.033 | 0.082 | 0.381 | 0.020 |
| | II | 1.000 | 0.623 | 0.085 | 0.130 | 0.027 | 0.079 | 0.321 | 0.030 |
| Crown forests | III | 1.000 | 0.423 | 0.058 | 0.141 | 0.047 | 0.068 | 0.314 | 0.049 |
| | IV | 1.000 | 0.367 | 0.092 | 0.156 | 0.034 | 0.049 | 0.331 | 0.046 |
| | Average | 1.000 | 0.560 | 0.080 | 0.138 | 0.035 | 0.074 | 0.327 | 0.036 |
| **Finland** | I | 1.000 | 0.429 | 0.022 | 0.127 | 0.008 | 0.035 | 0.192 | 0.027 |
| | II | 1.000 | 0.469 | 0.035 | 0.105 | 0.013 | 0.043 | 0.196 | 0.025 |
| | III | 1.000 | 0.615 | 0.037 | 0.073 | 0.011 | 0.050 | 0.171 | 0.013 |
| State forests | IV | 1.000 | 0.494 | 0.035 | 0.150 | 0.015 | 0.049 | 0.249 | 0.027 |
| | V | 1.000 | 0.620 | 0.037 | 0.086 | 0.007 | 0.037 | 0.167 | 0.014 |
| | VI | 1.000 | 0.696 | 0.036 | 0.068 | 0.006 | 0.032 | 0.142 | 0.009 |
| | Average | 1.000 | 0.632 | 0.036 | 0.082 | 0.008 | 0.038 | 0.164 | 0.014 |
| **Norway** | I A | 1.000 | 0.525 | 0.033 | 0.089 | 0.026 | 0.029 | 0.177 | |
| | B | 1.000 | 0.412 | 0.043 | 0.081 | 0.025 | 0.051 | 0.200 | |
| | II A | 1.000 | 0.627 | 0.051 | 0.112 | 0.038 | 0.025 | 0.226 | |
| | B | 1.000 | 0.470 | 0.057 | 0.085 | 0.017 | 0.059 | 0.218 | |
| | III A | 1.000 | 0.410 | 0.112 | 0.157 | 0.046 | 0.030 | 0.345 | |
| Crown forests | B | 1.000 | 0.510 | 0.082 | 0.117 | 0.048 | 0.034 | 0.281 | |
| | IV A | 1.000 | 0.570 | 0.088 | 0.084 | 0.045 | 0.073 | 0.290 | |
| | B | 1.000 | 0.478 | 0.098 | 0.113 | 0.037 | 0.048 | 0.296 | |
| | V A | 1.000 | 0.446 | 0.070 | 0.128 | 0.046 | 0.042 | 0.286 | |
| | I—V A | 1.000 | 0.519 | 0.071 | 0.114 | 0.040 | 0.040 | 0.265 | |
| | I—IV B | 1.000 | 0.467 | 0.069 | 0.099 | 0.031 | 0.048 | 0.247 | |
| **Denmark** | Old | 1.000 | 0.236 | 0.173 | 0.153 | 0.087 | 0.025 | 0.438 | 0.080 |
| Crown forests | New | 1.000 | 0.362 | 0.267 | 0.210 | 0.085 | 0.028 | 0.590 | 0.064 |
| Private forests | Old | 1.000 | 0.233 | 0.151 | 0.172 | 0.084 | | 0.407 | 0.091 |
| | New | 1.000 | 0.300 | 0.253 | 0.199 | 0.078 | | 0.530 | 0.076 |
| **Germany** | Lower Saxony | 1.000 | 0.216 | 0.190 | 0.340 | 0.124 | | 0.654 | 0.094 |
| State forests | Hesse | 1.000 | 0.266 | 0.150 | 0.243 | 0.102 | | 0.495 | 0.087 |
| | Bavaria | 1.000 | 0.234 | 0.153 | 0.205 | 0.137 | | 0.496 | 0.048 |
| | Average | 1.000 | 0.233 | 0.159 | 0.253 | 0.125 | | 0.537 | 0.068 |
| **Austria** | Normalised accounting | | | | | | | | |
| State forests | figures | 1.000 | 0.375 | 0.041 | 0.181 | 0.082 | 0.094 | 0.398 | 0.074 |
| | Actual accounting records | 1.000 | 0.390 | 0.038 | 0.169 | 0.078 | 0.087 | 0.372 | 0.070 |
| | Hypothetical model I | 1.000 | 0.366 | 0.081 | 0.144 | 0.095 | 0.066 | 0.386 | 0.076 |
| All forests | Hypothetical model II | 1.000 | 0.497 | 0.051 | 0.164 | 0.056 | 0.093 | 0.364 | 0.038 |
| **Switzerland** | A. Jura | 1.000 | 0.357 | 0.081 | 0.146 | 0.032 | 0.127 | 0.387 | |
| | B. Lowland | 1.000 | 0.294 | 0.080 | 0.087 | 0.029 | 0.073 | 0.269 | |
| Public forests | C. Alps | 1.000 | 0.398 | 0.017 | 0.072 | 0.026 | 0.126 | 0.241 | |
| | Average | 1.000 | 0.333 | 0.061 | 0.096 | 0.036 | 0.093 | 0.286 | |
| | A. Jura | 1.000 | 0.365 | 0.087 | 0.141 | 0.055 | 0.083 | 0.365 | |
| Municipal and | B. Lowland | 1.000 | 0.330 | 0.080 | 0.136 | 0.047 | 0.081 | 0.344 | |
| corporation | C. Alps | 1.000 | 0.427 | 0.028 | 0.097 | 0.027 | 0.139 | 0.292 | |
| | Average | 1.000 | 0.357 | 0.073 | 0.131 | 0.045 | 0.091 | 0.340 | |
| **United Kingdom** | Forestry | | | | | | | | |
| State forests | Commissions calculations | 1.000 | 0.413 | 1.935 | 1.478 | *a* | 0.870 | 4.283 | |

*a.* Shown together with silviculture

*Source:* Reports of respective countries; Tables 2:63, 3:16, 3:18, 3:25, 3:26, 4:22, 5:40, 6:26, 6:27, 6:28, 6:29, 7:8, 8:18, 8:15, 9:12, 9:17

*10.4.3 Logging Costs*

Logging costs constitute a very heterogeneous group and such costs vary from country to country and from area to area. In northern Sweden and Finland the operations involved with timber harvesting can be regarded almost as a logging industry because felling, skidding and transport in the main are carried out mechanically. In certain areas the concept of logging includes quite a number of different jobs, as well as a certain part of the supervision, while in other areas perhaps only felling and limbing are included. Thus the average costs for logging depends not only on wages for forest workers and the expenditure on the acquisition of machinery but also on the number of activities which are included in logging operations. This means that the comparison is not between similar things when logging costs in the different countries are compared. Consequently, the data in the tables must be taken with reservation.

Column 4 in Table 10:18 and Figure 10—13 give an idea of the logging costs in Swedish kronor per cubic metre annual cut, average for the period 1958-1962. One can see that the highest costs of logging are in Sweden, Region I, i.e. in the northern mountains and sub-arctic areas. As mentioned earlier, forest land in this region has a very low productive capacity: thus the volume of timber output per unit area is very small—a factor which adds to cost. It should also be noted that the wages for forest workers in northern Sweden are higher than in the south. Indirect costs for logging operations, such as construction and maintenance of logging camps, building of skidding roads, etc., are also considerably higher in the north than in southern Sweden. Nevertheless, the fact that the logging costs include also expenditure involved with timber floating (as the timber is delivered to the buyer at the river mouth a long way from the logging site) is probably the main cause of the higher costs.

One can see from Table 10:20, column 4, that the cost-revenue coefficient for logging in this region is 0.747, which means that for every cubic metre of timber harvested on average three-quarters of the sales value is used getting this cubic metre to the place of delivery. This applies to the average for all roundwood products—in the case here two main assortments, namely, sawlogs and pulpwood. One has reason to assume that the cost-revenue coefficient for pulpwood in actual fact is higher than that for sawlogs and in certain cases approaches 1.0, which means that the logging costs are as high as the gross revenue.

A closer study of Tables 10:18 and 10:20 shows that logging costs are relatively high in Finland and Norway, too, as well as in Austria and Switzerland when given in absolute values (S.kr/$m^3$y). The fact that logging costs in the Alps are higher than at lower altitudes needs no comment. However, the cost-revenue coefficient is remarkably low for Switzerland, because

Swiss selling prices for roundwood are relatively high compared with those in other countries.

One finds that the lowest average costs for timber harvesting are in Denmark and Germany. The reason why this is so is primarily that the forests in these countries are easily accessible due to a compact and well-established road network, which makes the expenditure to roadside low.

Column 4 in Table 10:19 contains the same data as Tables 10:18 and 10:20 recalculated on the basis of productive forest land (S.kr/ha). Here the variations between the countries are considerably greater as the timber cut per area unit is brought into the picture. However, the costs for timber harvesting per unit area is of less importance for our comparative survey.

*10.4.4 Net Conversion Surplus*

Gross revenue less logging costs gives the net conversion surplus, which can be regarded as a balance for roundwood products. Where it is a matter of standing timber, income from sales is known as stumpage value, which is equated to the net conversion surplus of felled timber. Column 5 in Tables 10:18 and 10:19 contains figures which are based largely on sales of felled timber, but as certain amounts of the timber are sold standing even in the public forests, e.g. Sweden and Finland, the average values of the net conversion surplus have been adjusted accordingly. In the calculations for the United Kingdom the main method used has been to start on the income side with the net conversion surplus, or rather with the stumpage value, as apparently it would have been more difficult to arrive at the gross revenue and logging costs by means of calculation.

It should be noted that the net conversion surplus calculated per area unit shows considerably greater variations than when calculated per cubic metre; this is the logical consequence of the effect of the productive capacity of forest land. Column 5 in Table 10:19 shows that the net conversion surplus per area unit at lower altitudes is the highest in Switzerland (equivalent to 522 S.kr/ha) and the lowest in Norway Region V a (equivalent to 9 S.kr/ha). Sub-arctic regions in Sweden and Finland have somewhat higher figures (14 and 15 S.kr/ha, respectively), but even so these are considerably lower than the values for the public forests in the Alps (Austria the equivalent of 135 S.kr/ha and Switzerland 83 S.kr/ha). One can reckon with a stumpage value between the above extremes in southern Scandinavia and the German Federal Republic (200-300 S.kr/ha).

The net conversion surplus is the best indicator of the conditions on which intentional forestry practice can be carried out and the demands which can be made for the intensity of forest management. At the same time the net conversion surplus indicates the accessibility; this is an important matter which will be determined in this study, and will be dealt with in detail in the following sections.

## 10.5 Comparison of Managing Costs

### *10.5.1 Silviculture*

Continuous production of standing timber can be achieved by proper management of forest land, and under such a system the renewal of the forest crop plays a major role. In addition, the financial balance in forestry organised as a going concern requires that the costs of managing forest land do not exceed the revenue obtained, and that a forest enterprise must defray its own costs in the long run.

When it is a question of silvicultural costs, by which is meant primarily the establishment and improvement of stands, the differences in the cost structure seem to be caused mainly by varied natural and economic conditions as well as by managerial policy. One can systematise these factors as follows:

a. Natural conditions
b. Stumpage value (accessibility)
c. Silvicultural system and intensity of forest management.

a. The natural conditions for practising forestry on the basis of sustained yield, which can be regarded as the broad goal for managerial policy in all the countries in this survey, are of particular significance for the monetary outlay in silviculture. First and foremost of these conditions are the timber-growing potential or the site quality class, the composition of species and the easiness of reproduction. One can say, by and large, that better site qualities involve higher silvicultural costs per area unit. It should be emphasised that in inferior site quality classes one is often obliged to rely on natural reproduction, because for reasons of cost there is no possibility of using artificial planting. One notices this particularly on the periphery of the area covered by our survey in Scandinavia and in the Alps.

b. As far as the stumpage value is concerned, one can take as a hypothesis that where there is a larger net conversion surplus the forests are managed more intensely; this involves higher silvicultural costs per area unit. One can also put it this way: with similar accessibility and price conditions the more intensive silvicultural practice gives a higher net conversion surplus than the less intensive, in other words there is an interplay between the net conversion surplus and the level of silvicultural costs.

c. The main features of a silvicultural system are cutting and reproduction methods. In actual practice also rotation plays an important role. One can say that as a general rule shorter rotations *ceteris paribus* necessitate higher silvicultural costs than longer periods of rotation. Denmark provides a typical example of this; here forestry in most cases is practised with shorter rotations than in the other countries. Thinnings constitute the major part of the timber output and, as a rule, after the final cut use is regularly made of artificial planting. It should be quite clear that such a regeneration method involves relatively high costs per area unit.

The opposite extreme is the extensive management system with long rotations and natural reproduction which are the practice in the north to keep the silvicultural costs as low as possible. The traditional cutting system in the northern areas which are transitional to non-forest lands has been selective logging as only the largest stems were marketable. Such a system involves no actual costs for regeneration, while timber production seemed to go on for ever though at the cost of the quality of the timber stock. As clear cutting with subsequent artificial reproduction has proved impossible to apply within the framework of the net conversion surplus, it is selection felling which seems to be the only possible one on the outer limits of the forests bordering tundra and high mountains. Between these extreme cases efforts have been made to select and apply the most suitable silvicultural system; this is reflected in the data presented in Tables 10:18, 10:19 and 10:20, as well as in the diagram in Figure 10—14. In this diagram the silvicultural costs per area unit of forest land (in S.kr/ha) is indicated by shaded bars, while the net conversion surplus for the same area unit is shown by unshaded bars. This has been done to demonstrate the size of the silvicultural costs in relation to the net conversion surplus, i.e. the financial possibilities for expenditure in this field.

From the data presented it can be seen that the management of Denmark's Old Forests involves the highest silvicultural costs with the German Federal Republic taking second place. In absolute terms the lowest costs occur in Finland and Norway, and to a certain extent also in Sweden. However, it should be noted that the level of costs varies somewhat between the different regions of these countries. Switzerland is the most striking example of a country where costs vary between the different regions. Silvicultural costs per hectare of forest land are definitely the lowest in the vicinities of the arctic and the alpine timber-lines (Norway, Regions I and V; Finland, Region VI; Switzerland, Region C).

Quite a different picture is obtained if regard is paid to the silvicultural costs in relation to the net conversion surplus. The percentage share of the silvicultural costs in the net conversion surplus is the highest in Sweden, Region I (45 per cent), and in the New Forests of Denmark (43 per cent). Denmark's Old Forests (23 per cent) and those of Germany (21 per cent) probably give a typical picture of intensive management system in the more favourable growth conditions. The more extensive system applied in the north and south of the area under survey shows a lower percentage on average (Finland 10 per cent, Switzerland 9 per cent and Austria 6 per cent) than the countries previously mentioned.

It should be emphasised that the submitted material represents the average for all kinds of silvicultural measures and includes all tree species and, with certain exception, applies only to public forests. One should also note that the silvicultural costs in areas of lower productive capacity do not always

refer to artificial reproduction (seeding and planting), but only to the preparatory measures for natural regeneration. Planting is resorted to, as a rule, on site quality classes of higher value.

The percentage share of the silvicultural costs in the net conversion surplus (Figure 10—14) and as cost-revenue coefficients (Table 10:20, column 5) are interesting as indicators and full attention should be devoted to them in this comparative study. One finds the highest percentage share in Sweden, Region

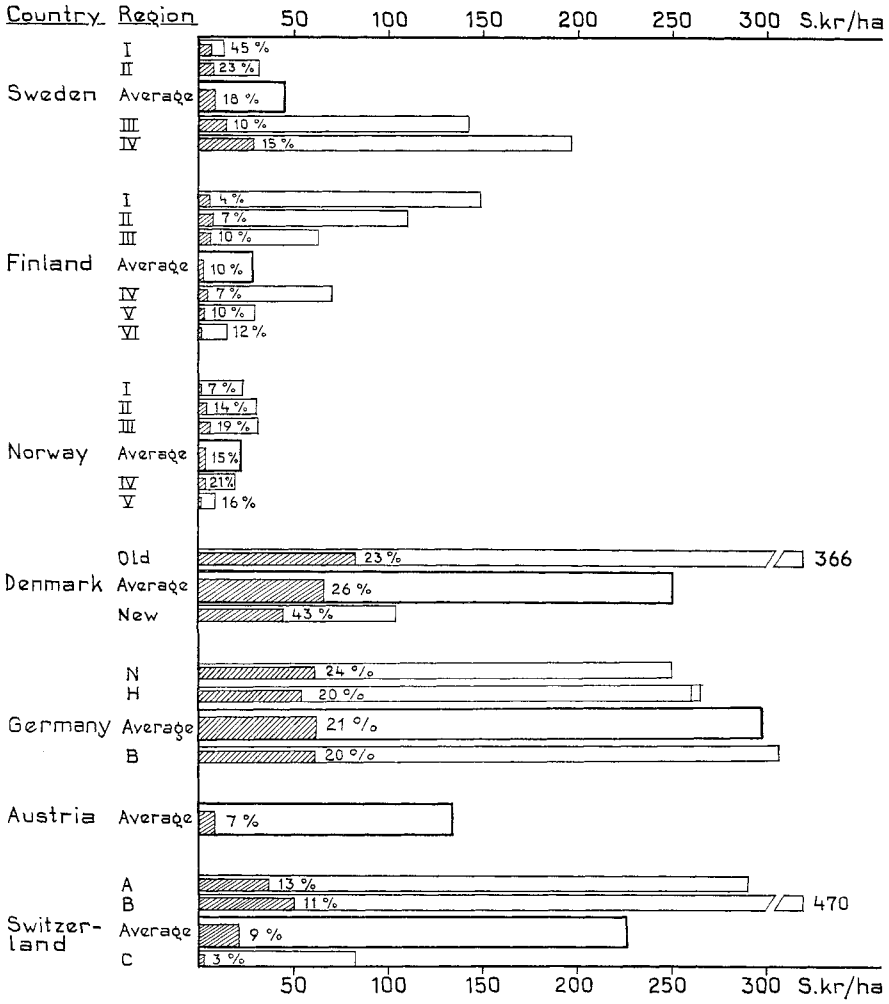


Fig. 10-14. Silvicultural Costs compared with Net Conversion Surplus, 1962 S.kr per ha, in Public Forests, by Countries and Regions, Annual Average, 1958-1962

I (45 per cent), and in the group of New Forests in Denmark (43 per cent). The cost-revenue coefficient for silviculture is also highest in the last-mentioned group (0.267) compared with other regions.

As has been mentioned before, it has not been possible to assess the gross revenue in the same way for all the countries concerned, and therefore the cost-revenue coefficients have lost much of their value for comparative purposes. On the other hand, the assessment of the net conversion surplus has been carried out on a more uniform basis and the percentage share of managing costs in this magnitude probably constitutes a safer basis for such comparisons.

### *10.5.2 Administration*

Administrative or overhead costs arise in connection with conducting and supervising forestry operations. These activities can be of a very varied nature and can therefore involve different cost items. There are, in fact, two components which determine the level of the administrative costs, namely, (1) the number of staff and (2) the salaries of the staff. Consequently the reason for the high costs of administration need not always be attributable to the large numbers of staff and the over-dimensioning of the administrative apparatus but also to the wages and salaries paid to staff on different administrative levels. Other factors to be taken into consideration are the various social charges which not only increase the wage costs of the employer (or the State) for the active staff but also constitute a financial burden for the employer when the members of the staff are pensioned off.

In the statistics for operations in the State forests the pension costs for retired members of the staff are often reckoned as part of the administrative costs, and may contribute towards increasing these costs considerably. Germany and Sweden, where pensions play a particularly important role, should be cited here as examples. However, almost all the other State forest administrations have to pay pensions and a number of other social costs for former members of staff; this makes a comparison between the actual costs items for the administrative apparatus considerably more complicated.

Column 7 in Table 10:18 contains the figures for administrative costs per unit of the timber output in the countries participating in this survey. From this it can be seen that the State forests in Lower Saxony (Niedersachsen) have the highest average costs (the equivalent of 26 S.kr/m³y) for running the administration, while the lowest average costs are to be found in Finland, Region VI (4 S.kr/m³y or, in other words, barely one-sixth of that of the former). The administrative costs in other countries are between these two extremes. One can say that there are generally very large variations even between the different regions within national boundaries. It should be emphasised that the administration costs in non-State forests are by no means lower

than for the State forests; this can be seen from the data presented by Denmark for private forests and by Switzerland for municipal forests.

Column 7 in Table 10:19 gives the administrative costs per hectare of forest land and column 6 in Table 10:20 contains the cost-revenue coefficients for the same item. One can see here that the variations are even greater than would be the case if the costs were calculated on the basis of unit volume ($m^3y$). This is shown even more clearly in Figure 10—15, which at the same

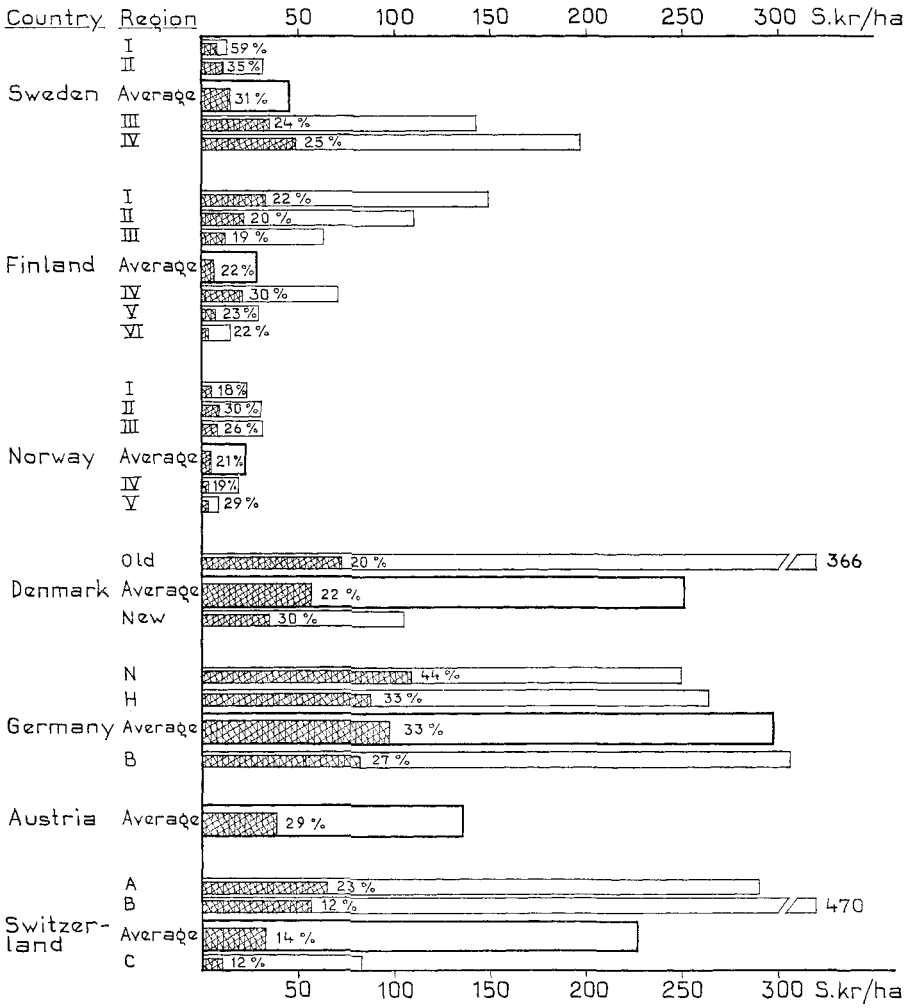


Fig. 10-15. Administrative Costs compared with Net Conversion Surplus, 1962 S.kr per ha, in Public Forests, by Countries and Regions, Annual Average, 1958-1962

time demonstrates the relation of the managing costs to the net conversion surplus. One can clearly see that the German administrative apparatus is the most expensive, even if the costs are calculated on the area unit, while the lowest average costs are those of the Norwegian Crown forests.

As to the percentage share of the administrative costs in the net conversion surplus, the leading position (59 per cent) is taken by Sweden, Region I (northern mountains and sub-arctic areas), and the last position (12 per cent) by the Alpine Region of Switzerland. The average ratios between the administrative costs and the net conversion surplus for the countries in question are as follows: Germany (33 per cent), Sweden (31 per cent), Austria (28 per cent), Denmark (22 per cent), Finland (22 per cent), Norway (21 per cent) and Switzerland (14 per cent).

The question to be answered here is: What factors have caused such great variations in the level of administrative costs? This is a question which cannot be answered directly in a satisfactory manner, as a number of considerations of historical, economic and political nature have had effect on the administrative costs. Economic considerations from the purely business standpoint have not always, or rather very seldom, determined this cost item.

The differences in the level of costs between the countries in question can be considered to a large extent also to be a consequence of the past development of the administrative organisation. In the public forests often the reorganisation of the administrative apparatus is not easy to carry out, particularly when it involves reductions in the numbers of staff and which may result in unemployment for those skilled in forestry.

However, the entire problem is so complicated that it is hardly possible on the basis of the data available to give a reliable reason why the costs of administration show such great variations between the countries participating in this survey. Should the question of the levelling out of cost of administration become topical, as would be the case with entry into the European Common Market, a thorough investigation of this question would be unavoidable.

### *10.5.3 Maintenance, Improvement and Expansion*

This group comprises "produced" means of production in the forest enterprises, e.g. roads, buildings, drainage facilities and machinery. These do not have a direct influence on the biological factors of production, with the exception of drainage as a soil improvement measure, but all the same have an important influence on all the cost items mentioned up to now. For instance, the existence or non-existence of a road network in a forest area has a great effect on the costs of logging, silviculture and administration.

One cannot make any definite statement about the efforts necessary to create a suitable road network, as almost everything can be said to vary from case to case. However, by and large it can be stated that the nature of the land,

the extent to which the area is built up, the density of the population and the infrastructure in general, both in the past and at the present, play a decisive role. Road building in the Alps and other mountainous areas costs considerably more than in the flat country.

For practical reasons it is usual to make a distinction between new constructions and the maintenance of facilities. One is dealing in the former with what might be called investment costs and in the latter with maintenance costs. This differentiation has been adhered to in the data presented by all the countries with certain exceptions, e.g. Germany, but it is not always easy to draw the line for such differentiations.

Columns 8 and 9 in Table 10:18 and 10:19 set out these costs in volume units (in S.kr/$m^3$y) and area unit (in S.kr/ha). Figure 10—16 presents the last-mentioned data in graphic form. One can see here the percentage share of maintenance and improvement costs in the net conversion surplus—the percentage share is highest in Sweden, Region I (45 per cent), while the other regions follow closely. The lowest percentage share occurs in southern Finland, Region I (8 per cent), but the percentage share is also relatively modest in southern Sweden, Region IV (13 per cent). Column 7 of Table 10:20 contains the cost-revenue coefficients for maintenance, while the corresponding figures for improvement and expansion can be found in column 8 of the same table. Sweden and Austria come first in the new investments in this field.

### *10.5.4 Total Managing Costs*

Column 10 in Table 10:18 contains the total managing costs on the basis of timber output, while column 10 in Table 10:19 gives the corresponding figures calculated per area unit. Figure 10—17 presents the latter data in graphic form. Column 9 in Table 10:20 contains the cost-revenue coefficients. One cannot fail to notice that in Region I of Sweden the total managing costs in relation to the net conversion surplus are 150 per cent, in other words the forestry operations here are run at a substantial loss. Later in this chapter it will be discussed what are the consequences of such a situation with regard to European economic integration.

## 10.6 Comparison of Profits in Management of Forest Land

### *10.6.1 Operating Surplus*

The operating surplus is the gross revenue less logging costs and managing costs. As the actual accounting records have not been subjected to any sort of "rectification" or "objectivity" procedure in order to represent normal

conditions, the operating profit can be compared to a balance between payments and receipts in forestry operations. One should not forget that expenditures which have no direct bearing on the forestry operations are excluded from these book-keeping records and the comparison here is over a five-year period in which the temporary yearly variations have been levelled out in all probability. Taxes are not included in managing costs but are treated separately and that the operating profit which is dealt with here is a net return before taxation.

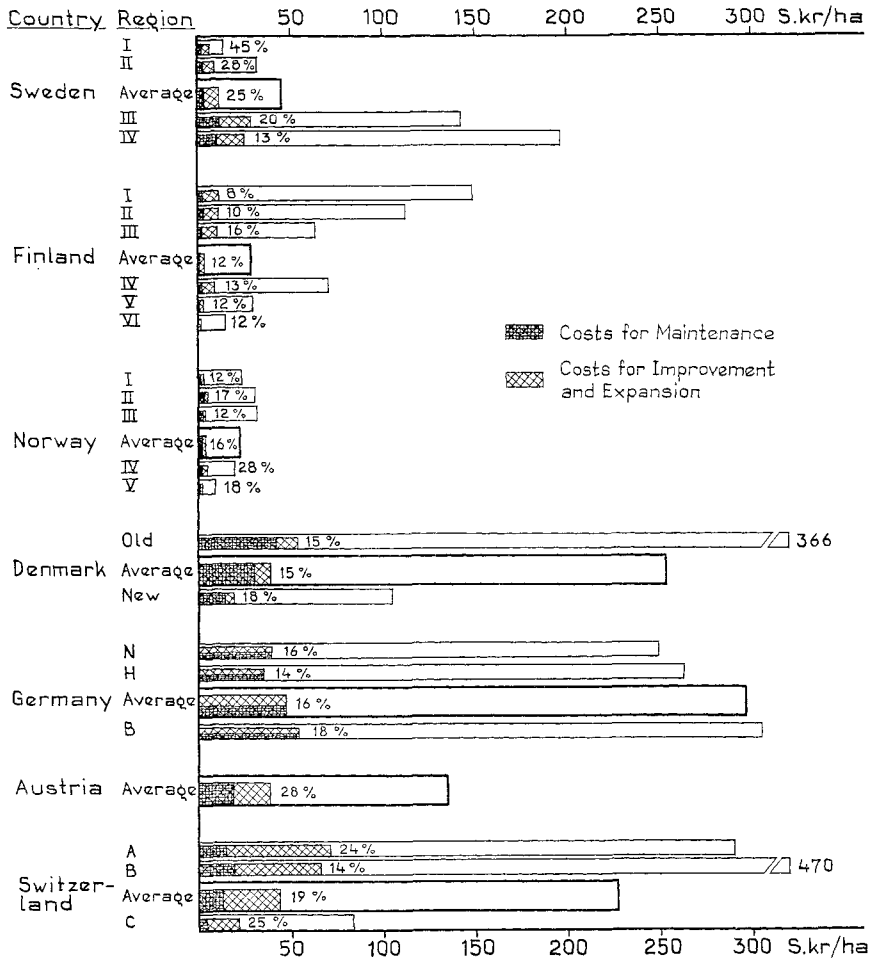


Fig. 10-16. Costs for Maintenance, and for Improvement and Expansion, compared with Net Conversion Surplus, 1962 S.kr per ha, in Public Forests, by Countries and Regions, Annual Average, 1958-1962

Column 11 of Table 10:18 gives the operating surplus per unit of the timber output (in S.kr/m³y), and in column 11 of Table 10:19 that has been calculated per area unit of productive forest land (in S.kr/ha). On account of the productive capacity of the land the surplus calculated per area unit is greater than when calculated in terms of volume. As has been shown earlier, this is also the case with revenue and expenditure, with a few exceptions, namely Sweden, Region I, and Norway, Regions I, III, IV and V, where the

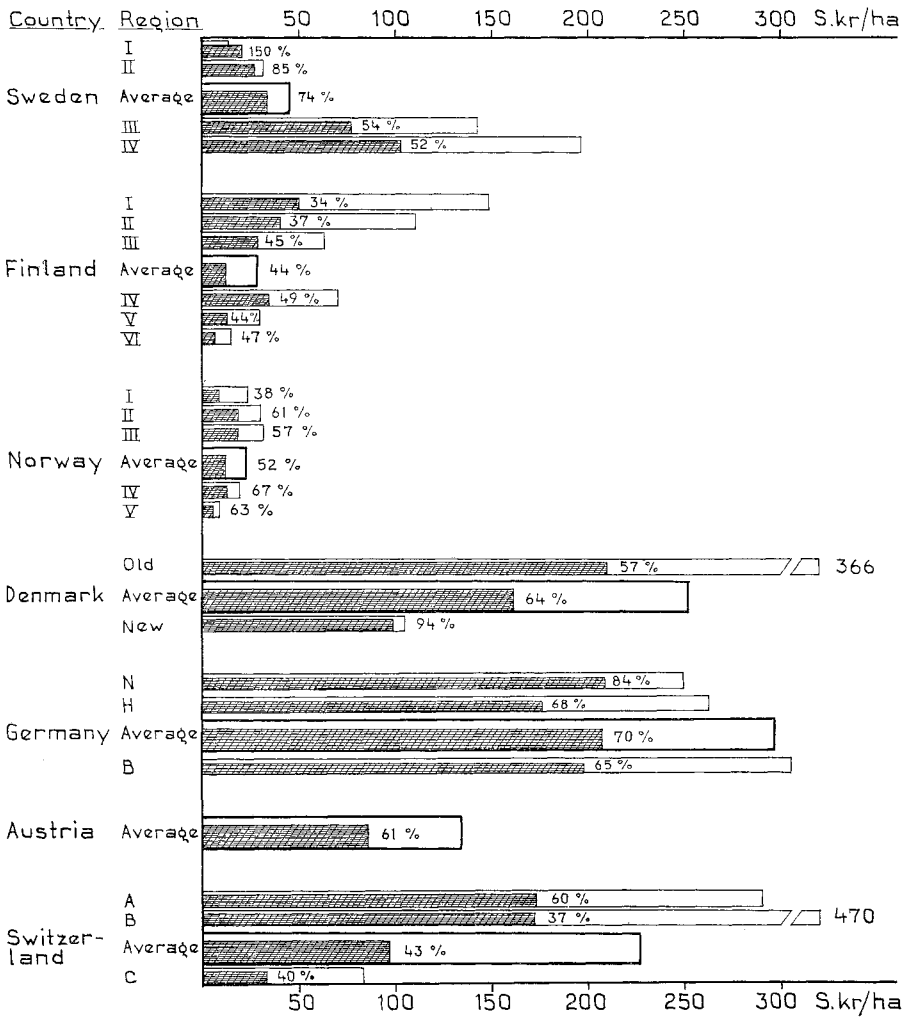


Fig. 10-17. Total Managing Costs compared with Net Conversion Surplus, 1962 S.kr per ha, in Public Forests, by Countries and Regions, 1958-1962

actual conditions are just the reverse and the average timber output per hectare of productive forest land is less than one cubic metre. However, Region I of Sweden is the only area where the timber-growing business is carried on at a loss (7.92 S.kr/$m^3$y and 6.74 S.kr/ha). However, it is interesting that in the Finnish Region VI, which covers a great deal of the sub-arctic forest areas where there is a low timber yield, one has been able to obtain quite a sizeable surplus (7.79 S.kr/$m^3$y and 7.94 S.kr/ha). The public forests in the Swiss Alps also yield a surplus (the equivalent of 32 S.kr/$m^3$y and 50 S.kr/ha), which is very acceptable in comparison with the Scandinavian countries and Finland. One should note that the lower-altitude Region B of Switzerland gives the highest operating surplus within the entire area under survey and probably in the whole of Europe, too.

The fact that Switzerland comes first with financial returns from forestry operations is due to a number of circumstances, of which the relatively high prices of roundwood in the home market and restrictive attitudes towards managing expenditure are of primary importance. Furthermore, the intensive silvicultural system applied in Switzerland seems also to have contributed to the favourable results.

Figure 10—18 permits a comparison of the operating surplus (in S.kr/ha) with the average annual cut ($m^3$y/ha) over the five-year period 1958-1962 in the countries under survey. This figure makes it particularly clear how the volume of the timber cut per area unit affects the financial results, although there are the exceptions previously mentioned. One should note here that the greatest volume of timber cut per area unit or the maximum physical production, which can be considered to be the case in the Old Forests of Denmark, does not always yield the highest money return.

If one excludes the extreme cases on the outskirts of forests, both at the arctic and the alpine timber-lines, then the assumption would not seem to be unreasonable that the top management in a forest administration has to a certain extent the possibility of determining the surplus it wants from forestry practice which is run as a going concern. Primarily the decision-makers at the highest administrative level have the possibility of influencing the size of managing expenditures, because usually the monetary outlay for timber-growing operations is determined by managerial decisions and such an outlay is of quite a different nature than expenditures for logging. However, there is a limit to the possibilities owing to the fact that what can be termed as the fixed costs of the welfare state are quite definite and changes can only come about in the long run.

### *10.6.2 Taxes*

Determination of the tax burden on forestry has turned out to be so complicated that not all of the countries participating in this study have been able

to provide the relevant data for their respective countries. Norway and Switzerland in their reports have completely excluded the tax costs and the reason for this has obviously been the difficulty in obtaining the appropriate basic material. It was set out in the Directives that only such taxes which can be regarded as costs shall be entered in this connection. The reason behind

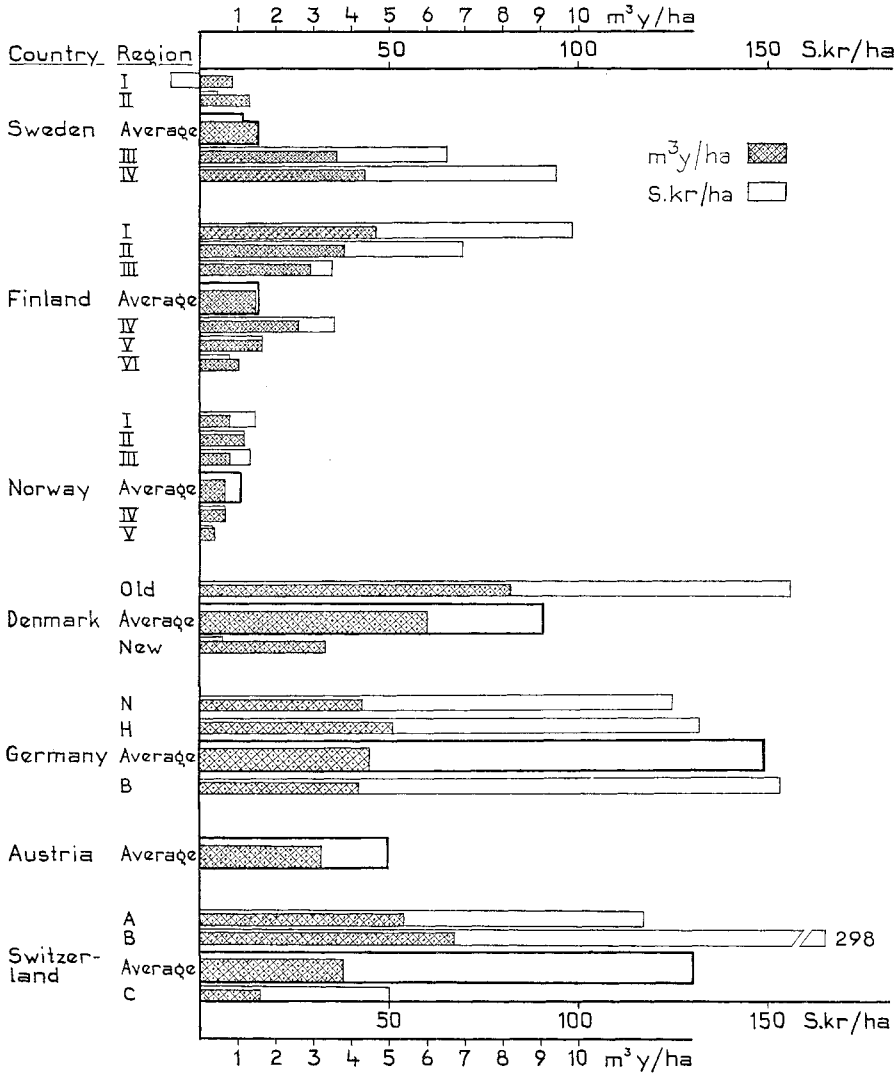


Fig. 10-18. Comparison between Timber Output, $m^3y$ per ha, and Operating Surplus, 1962 S.kr per ha, in Public Forests, by Countries and Regions, Annual Average, 1958-1962

this was that the tax costs which recur annually despite the changes in volume of the timber output (e.g. property tax) can be regarded as part of the managing costs. However, on a matter of principle it was not the intention that, for example, income tax for forest owners should be included where it is a question of comparisons of operational results. The main reason for this was that, as a rule, public forests are not subject to property tax and, consequently, it would be considerably more difficult to make a comparison with private forests where the tax burden for the owners is very heterogeneous and of varied nature.

The material presented in the reports of the various countries and given in column 12 in Tables 10:18 and 10:19 does not refer to exactly the same tax items where public forests are concerned, because taxation regulations vary from country to country. However, the tables show how the taxes, accounted for in the operational statistics of the State forests (as well as the estimated values for certain private forests in Denmark and Austria) differ when they are calculated in terms of unit volume of the timber output and the area unit of forest land. Figure 10—19 shows graphically the taxes per cubic metre of the timber cut and the operating surplus. It can be mentioned that in one of the cases tax has to be paid on forestry which is run at a loss from the very outset, namely, Sweden, Region I. Denmark's New Forests provide a case where the payment of taxes turns an operating surplus into a negative net result.

### *10.6.3 Net Profit*

The concept of net profit used here is the operating surplus less tax costs, though as has been indicated above the latter does not include income tax. This concept of profit has been deliberately chosen for the purpose of measuring the success of timber-growing operations. Here the decisive consideration has been the fact that the average costs—and on the basis of such the profit—incurring only the actual outlay of money and balance in cash, are most suitable for the purpose of comparison between different forestry conditions. Theoretically, for the purpose of determining net profit, as accepted in general financial accounting, the element of return on the forest capital must be included in such a calculation. However, this was considered to be unnecessary when agreement was reached on the Directives, and considering the fact that there is no possibility of determining interest on the use of capital involved in forestry enterprises. One almost gets the impression from the material presented that the imputed interest would have confused rather than clarified the profit situation in forestry practice.

Column 13 of Table 10:18 sets out the net profit on the basis of the volume of timber output (in S.kr/m$^3$y) and column 13 of Table 10:19 provides the corresponding data calculated on an area basis (in S.kr/ha). Figure 10—19

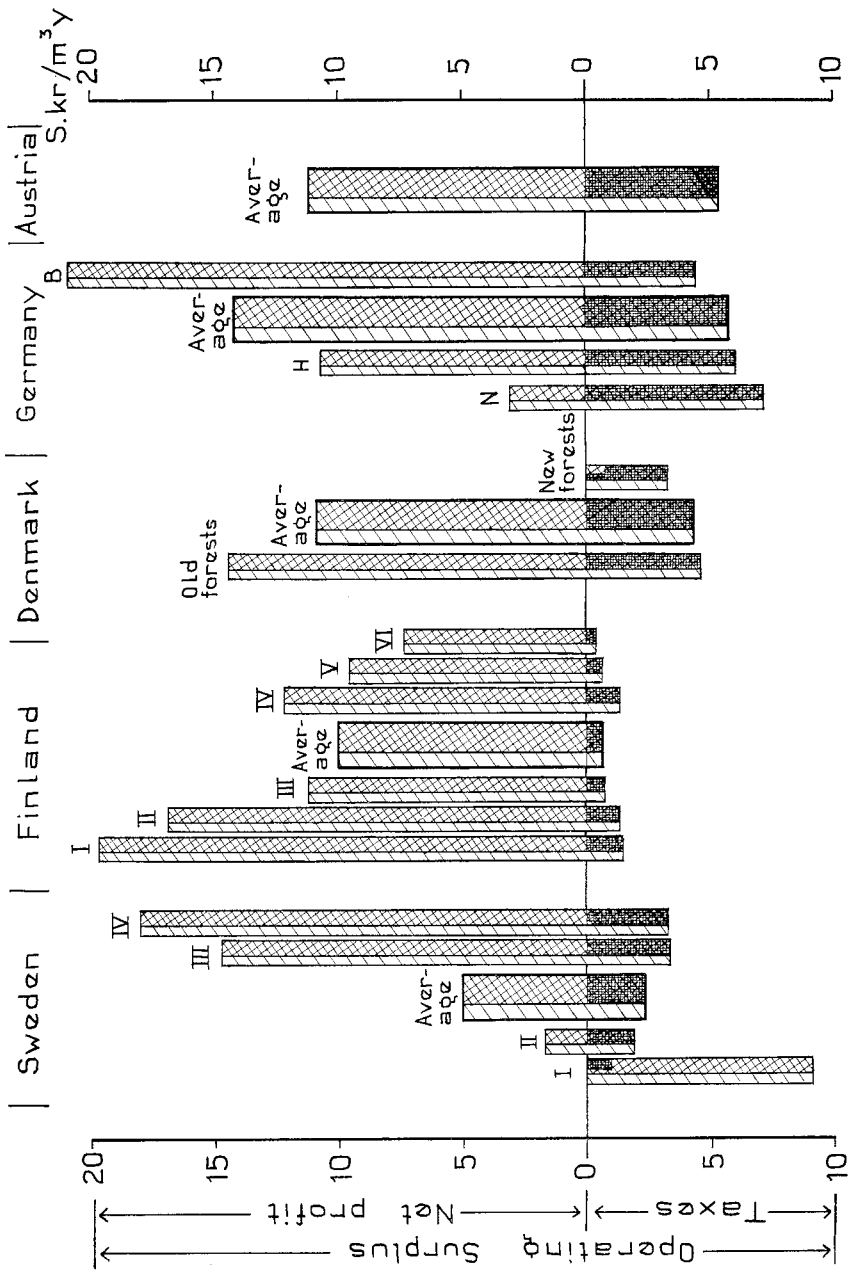


Fig. 10-19. Operating Surplus, Taxes and Net Profit, 1962 S.kr per $m^3y$, in Public Forests, by Countries and Regions, Annual Average, 1958-1962

presents the net profit more clearly and particularly how it is obtained from the operating surplus in the case of certain countries. One can note here that the State forests in Bavaria and in southern Finland, Region I, yield the highest net profit per volume unit of the timber cut (21 S.kr/m³y and 20 S.kr/m³y, respectively). One must not overlook the fact that Switzerland is not included in this table, and there would be reason to assume that the lower-altitude Region B of Switzerland would yield the largest surplus even after the deduction of taxes from the operating surplus.

## 10.7 Summary of Conclusions

### *10.7.1 Differences in Prices for Forest Products*

The prices paid in the large importing countries for processed forest products have a great effect on the general level of prices in the forestry sector in both the importing and exporting countries. The United Kingdom and Germany are the two countries in our field of survey having a decisive influence on the prices for the finished products. Both these countries are great importers of all kinds of forest products originating from all corners of the world. Consequently, the prices here resulting from international competition —despite certain factors restricting the competitive element—can be regarded as world market prices.

The United Kingdom should be included in those importing countries where the home production is of little significance and where consequently the world market prices are completely unaffected by the home supply. On the other hand, in the German Federal Republic the home production of forest products constitutes an important part of the amount consumed. This gives rise to keen competition between the home producers and the foreign sellers. In order to give the German producers a definite advantage in facing foreign competition for certain processed forest products (paper, fibreboard, etc.) and to ensure that German production provides for a certain share of German consumption, Germany put up tariff barriers at an early stage. These tariff barriers will be subjected to certain changes under the E.E.C. agreement, but they will be maintained in principle in the common external tariff for the European Common Market.

Theoretically the prices for industrial roundwood in both importing and exporting countries are determined by the prices of the final products in the world market. Thus a higher level of prices for roundwood should come about in the E.E.C. countries, while the differences would be accounted for by the freight costs involved and the extent of the tariffs on the final products. The material presented and especially that concerning pulpwood prices in Germany and Sweden clearly shows that this is so. The further the wood-processing

industry is from the importing country and particularly from the centres of consumption the less it pays the producer of roundwood. It should be added that the differences in the home selling prices for processed forest products in the exporting and importing countries do not correspond to the tariff amounts. On the other hand, where sales of final products to consumers are concerned there seems to be a rather remarkable levelling out of prices between the importing and exporting countries, despite the fact that it is just the final products that are subjected to high import duties. However, the forces which bring about such a pattern in the price formation have not been gone into in more detail in this connection. Only with a closer study would it be possible to draw any far-reaching conclusions concerning the price formation for the final forest products, and such a study can only be carried out on the basis of more detailed information about the wood-processing industry and its price policy. One has to be content, therefore, with indications of a general nature as detailed research has not been done in this case.

### *10.7.2 Differences in Managing Costs*

Unfavourable development in the price/cost relationship is characteristic to forestry in post-war Europe. One can say that in the forestry sector the prices for products are almost stationary or are showing a downward trend, while there are constantly rising costs on account of wage increases and rising social charges. However, it cannot be denied that there are certain opportunities for cost reduction—a conclusion that can be inferred from the comparative tables of forestry costs in different countries. It is not only timber harvesting that shows great cost variations but also the management of forest land where the same result is often achieved by quite different means and resources.

It is generally known that governments proceed to further forest management by various means and even go as far as to subsidise private forestry. State subsidies can take another form when in an effort to maintain or increase forest production on public land the State systematically pays out more money than comes back, i.e. cost exceeds revenue over a lengthy period. The United Kingdom provides a good example of this. That country has consistently carried out a long-term development programme for forestry despite the forestry operations being run at a deficit, which can be seen clearly from the material presented for the period under survey, and this will continue for several decades to come before the balance between cost and revenue is achieved. Here the costs involved are of the nature of an investment, the purpose of which is to create a progressive type of sustained-yield forestry.

Another example is the Swedish Crown forests in the mountainous and sub-arctic areas in the northern parts of Sweden. The statistics show that even here forestry has been carried on at a deficit. In other countries, namely, Finland and Norway, and in Switzerland, too, where in certain areas the

growth conditions and accessibility do not differ very much from those prevailing in the sub-arctic regions of Sweden, it has been possible to keep costs within the limit set by revenue.

For the inland forests of northern Sweden it is doubtful whether it can be assumed that an increase in the value of the forests with the progressive type of sustained-yield forestry will correspond to the deficit arising. Comparisons with previous timber inventories appended to working plans do not indicate that there has been any improvement in the condition of the forests to the extent which would be necessary to regard the deficits arising as profitable investment costs.

It would seem evident that in all geographical regions there are small areas where forestry operations are run at a loss because of the poor productive capacity of the land and unfavourable accessibility. However, in the average figures for the forestry operations compiled for the larger geographical area this deficiency will disappear and the region as a whole will show an operating surplus. Nevertheless, in northern Sweden the area of Crown forests cover more than one million hectares, and this must be regarded as being rather great in European circumstances.

It seems obvious that timber-growing operations in such a deficiency area can hardly be maintained independently in actual practice but must be run as part of a larger enterprise, providing that the present management system remains unchanged and the current price and cost relationship persist. The deficit in the "zero areas" is eliminated when such become part of a larger management unit by the greater surplus in the more favourable regions, i.e. the enterprise as a whole shows a smaller surplus. It seems obvious too that only the State can practise an intensive management system, which to a large extent is based on artificial planting on these marginal lands. Private forest owners here would be obliged to bring their costs in line with revenue and adapt their measures accordingly. However, the Swedish State as a forest owner must take social matters into consideration, and for this reason the State must maintain timber production even in areas where forestry would actually be abandoned if private enterprise standards of profit calculation were to apply.

There is every indication that we have here a deficiency area where conventional forestry practice on the sustained-yield basis cannot be carried on unless government subsidies are granted. Consequently, there can be no question of any comparative advantage for these sub-arctic regions concerning primary forest production.

### *10.7.3 Implications for European Economic Co-operation*

One of the purposes of this study has been to examine more closely the conditions of competition in the forestry sector in order to obtain a better

basis for likely deliberations on economic policy. The primary consideration behind this was the possible applications to join the European Common Market by the timber-exporting countries of Europe and the mutual interdependence of such countries in the trade with forest products. It has proved that more far-reaching conclusions concerning the comparative advantages in international trade with forest products can be drawn on the condition that the relationship between revenue and costs in the entire forestry sector of the economy has been examined or, in other words, if the wood-processing industry is included in this survey. However, this has not been the case and thus it is not possible to go into the matter of the competitive conditions for processed forest products in the market of western Europe, and particularly where the E.E.C. customs policy is involved.

Nevertheless, it is permissible to make certain comments on the cost situation in the primary forest production, which will be involved when countries, making losses in forestry practice, apply to join the European Common Market.

Articles 92-94 of the Treaty of Rome, which was ratified on 25 March 1957, involve in principle a prohibition of such government support which favours a certain sector of the economy or certain enterprises and thus would distort competition in trade between the member countries. The question which may be put is: Do these regulations apply even to measures intended to support forestry? The regulations have been interpreted in such a way that only such support which has a detrimental effect on the competitive possibilities of other member states is prohibited. However, this is probably not the case with forestry subsidies, the purpose of which is to bring forest land again into a productive condition. Furthermore, a newly planted forest can hardly have any effect on the competitive conditions in the timber market either now or for several decades to come, because it will take an entire period of rotation before the major part of the timber produced by such newly established stands will be marketable. Any suggestion of distortion of competitive conditions by such subsidies must therefore be rejected most definitely.

Another question which may be put is whether the direct costs of timber harvesting could exceed the gross revenue or, in other words, where the net conversion surplus is negative, should the government subsidise such logging operations which are run at a loss? Such a method of procedure would be in conflict with the stipulations of the Treaty of Rome. Such situations can naturally arise in certain areas and especially for certain assortments (e.g. fuelwood), particularly with sudden falls in prices. However, as a rule, this occurs only in isolated years. In fact, from the average figures in the submitted statistical material such conditions are not seen in any of the eight countries.

The competitive conditions of intentional forestry practice carried on in certain border areas has been discussed above. One can draw the conclusion that those countries which have relatively large forests in the vicinities of

alpine or arctic timber-line must run their forestry operations at a more extensive level than those countries which enjoy more optimum conditions, both from the natural and economic points of view.

However, as the contribution of those countries to the raw material supply for the wood-processing industries of western Europe is of great importance, and especially in the light of the theory of mutual interdependence, it would be wrong to exclude completely the present "zero areas" in the north of Europe from the task of producing industrial roundwood. What is necessary is to increase the prices for roundwood and reduce certain of the expenses connected with the intensity of forest management.

However, it does not seem unreasonable that this could come about without a general fall in the prices for forest products within the European Common Market, and this is feared by certain of the forest owners in those countries.

In connection with the above-mentioned social considerations of the State concerning the practice of forestry it should be emphasised here that other factors in the nature of non-market benefits can also play an important role.

The emphasis in this study has been placed on the economic aspects of forestry, while non-market benefits associated with multiple use of forests have been touched upon only now and again. However, it is not possible to ignore the full implications of the comparative advantage of non-market benefits, even though at present there is no measuring stick for these values which cannot be put on a cost-revenue basis. Obviously, this fact limits the power of assertion in this study as to the comparative advantage of multiple-use forestry in different parts of Europe.

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# Appendix

**Exchange Rates**
*(Swedish kronor per Unit of National Currency)*
Annual Average 1953—1963
*(selling rates in Stockholm)*

| Countries | | Currency | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sweden ..... | 100 | Svensk krona (S.kr.) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Austria ..... | 100 | Schilling (Sch.) | 20.00 | 20.00 | 20.00 | 20.00 | 19.98 | 20.01 | 20.05 | 19.96 | 19.99 | 20.03 | 20.15 |
| Denmark ..... | 100 | Dansk krone (D.kr.) | 74.97 | 75.00 | 74.98 | 75.01 | 74.86 | 75.07 | 75.24 | 75.15 | 75.03 | 74.88 | 75.33 |
| Germany Fed. Rep. | 100 | Deutsche Mark (DM) | 123.66 | 123.98 | 123.57 | 123.85 | 123.57 | 123.81 | 124.00 | 124.12 | 128.83 | 129.17 | 130.37 |
| Finland ..... | 100 | Finnish Mark (Fmk) | 227.00 | 277.00 | 227.00 | 227.00 | 208.00 | 164.00 | 163.00 | 163.00 | 162.00 | 162.00 | 161.51 |
| Norway..... | 100 | Norsk krone (N.kr) | 72.55 | 72.76 | 72.56 | 72.61 | 72.62 | 72.58 | 72.77 | 72.63 | 72.54 | 72.41 | 72.76 |
| Switzerland..... | 100 | Suisse Franc (Sw.Fr.) | 118.81 | 119.09 | 118.67 | 118.64 | 118.48 | 118.62 | 119.98 | 119.89 | 119.98 | 119.47 | 120.29 |
| United Kingdom | 1 | Pound sterling (£) | 14.52 | 14.54 | 14.49 | 14.49 | 14.49 | 14.50 | 14.55 | 14.53 | 14.49 | 14.49 | 14.54 |

*Source: Sveriges Riksbank.* 1960 and 1963