



**The Swedish Work Environment
Authority and its initiatives relating
to the work environment in
Swedish forestry**

Uwe Synwoldt



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Akademiska avhandlingen som för vinnande av teknologi doktorsexamen kommer att offentlig försvaras i Undervisningshuset, sal L, SLU, Uppsala, torsdagen den 27 september 2001, kl. 10.00.

Abstract

The purpose of this dissertation is to investigate whether the Swedish Work Environment Authority (SWEA), with its rules, resources and structure, has been able to influence work environment management in Swedish forestry. This end will be achieved by describing the historical development of forestry work and workers' protection in forestry, the works of SWEA today and its initiatives in the forestry sector during the 1990s. The target achievement model is the principal method employed.

The forestry industry's handling of certain rules and initiatives from SWEA is described and evaluated. It was established that the Authority has had a positive impact on the work environment of the forestry sector as regards measures for the prevention of musculoskeletal injuries, information on rules relating to the work environment, the design of forestry machinery and instruction manuals for the same.

Successful work environment management depends on lucid rules conducive to safe and ergonomic design of forest machinery, alternative paths and co-operation procedures for disseminating knowledge of the work environment, targeted inspections relating to certain deficiencies of the work environment, and better systems for reporting occupational injuries.

Keywords: Work Environment Authority, workers' protection, occupational injury, instruction manual, market surveillance.

Distribution:

Department of Forest Management and Products
Faculty of Forestry
SE-750 07 Uppsala

Uppsala 2001
ISSN 1401-6230
ISBN 91-576-6070-0

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*Department of Forest Management and Products
Uppsala*

**Doctoral thesis
Swedish University of Agricultural Sciences
Uppsala 2001**

Acta Universitatis Agriculturae Sueciae

Silvestria 186

ISSN 1401-6230

ISBN 91-576-6070-0

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Tryck: SLU Service/Repro, Uppsala 2001

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Synwoldt, U. 2000. The Swedish Work Environment Authority and its initiatives relating to the work environment in Swedish forestry. Doctoral dissertation.

ISSN 1401-6230, ISBN 91-576-6070-0

The purpose of this dissertation is to investigate whether the Swedish Work Environment Authority (SWEA), with its rules, resources and structure, has been able to influence work environment management in Swedish forestry. This end will be achieved by describing the historical development of forestry work and workers' protection in forestry, the works of SWEA today and its initiatives in the forestry sector during the 1990s. The target achievement model is the principal method employed.

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Papers I – IV

This thesis is based on the following papers.

- I. Synwoldt, U. *Marknadskontroll av tillverkare och importörer. Säkrare maskiner inom skogsbruk, jordbruk och trädgård. (Market surveillance of manufacturers and importers. Safer machines for forestry, agriculture and garden trade)*. Arbetslivsinstitutet. Arbete och Hälsa. Vetenskaplig skriftserie. 1999:11. Referred to here as **Market Surveillance**.
- II. Synwoldt, U. *Instruktionsböcker för skotare och skördare. Bedömning av utvecklingen under en tioårs period. (Instruction manuals for forwarder and harvesters. Estimate of development under a period of ten years)*. Arbetsarkivstyrelsen. Rapport 1999:10. Referred to here as **Safety Instruction**.
- III. Andersson, W., Ekengren, M., Lindbäck, L., Lundmark, L., Olsson, A., Persson, G., Synwoldt, U. *Uppföljning av skogsbrukets projekt – utveckling av arbetsmiljö och produktion. (Follow-up of forestry project – development of work environment and production)*. Arbetsarkivstyrelsen. Rapport 1999:2. Referred to here as **Follow-up**.
- IV. Synwoldt, U., Gellerstedt, S. *Ergonomic initiatives for machine operators by the Swedish logging industry*. Submitted for publication in Applied Ergonomics. Referred to here as **Follow-up**.

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Preface

The present dissertation deals primarily with the evolution of forestry work and the emergence of official regulations governing workers' protection in forestry. This is followed by an examination of the organisation, steering instruments, resources and working procedures of the Swedish Work Environment Authority (SWEA). The third part of the dissertation is an evaluation of the handling by the forestry industry of certain rules and initiatives from SWEA as evidenced by the publications, incorporated in the dissertation.

Market Surveillance was first published as an offprint by SWEA (Synwoldt 1995) and was also presented at an EU conference on Market surveillance (Synwoldt 1997). Prior to the analysis of safety instructions, evaluation criteria were developed in "Content and design of instruction manuals for forestry machinery." (Synwoldt 1990), which was then expanded to include mobile machinery (Synwoldt 1994). This was translated into English (Synwoldt 1998) for the information to manufacturers in other countries. In 2001 these criteria were proposed as an ISO standard (ISO 2000). The analysis of **Safety Instruction** was also published in German by KWF (Synwoldt 2000).

The doctoral studies also include the author's licentiate thesis (Small-scale peat production) in forest engineering, presented in 1995 at the Swedish University of Agricultural Sciences (SLU) and based on Bertilsson, Synwoldt 1994 and Synwoldt 1994b.

The author is a certified engineer (Germany) and Senior Administrative Officer at SWEA and has served since 1988 in the division of the Authority for machinery and personal protective equipment in the context of forestry and agriculture.

Sincere thanks are extended to my tutor, Dr Sten Gellerstedt, of the Department of Forestry Management and Products at the Swedish University of Agricultural Sciences and to my assistant tutor, Principal Administrative Officer, Dr Kristina Kemmlert, SWEA.

Thanks are also due to my colleagues at the Work Environment Authority for helping with the collection of basic data, especially to Weine Andersson, and to colleagues at SWEA head office for useful discussions and constructive criticism. Stig Adolfsson, Gun Fridfelt, Eddie Plevin and Ulf Wahlström deserve special mention in this respect. Moreover, thanks to Roger Tanner, the enterprise Ordvåxling for translating this dissertation in to English. Lastly and most importantly, heartfelt thanks to my wife for allowing this project to make such inroads into our time together.

Summary

The purpose of this dissertation is to investigate whether the Swedish Work Environment Authority (SWEA), with its rules, resources and structure, has been able to influence work environment management in Swedish forestry. This end will be achieved by describing the historical development of forestry work and workers' protection in forestry, the work of SWEA today and its initiatives in the forestry sector during the 1990s.

SWEA's objective is, through regulation and supervision, to facilitate protection of employees' fitness and health. Various procedures of evaluative analysis are available for investigating whether the Authority has succeeded in this. The method used here is the target achievement model. Time series analysis is used for the presentation of occupational injuries.

An historical description shows how the development of forestry technology led to the issue of various rules by SWEA. Occupational injury statistics then make it possible to see whether these new rules have affected the frequency of occupational injuries in forestry. Rules concerning the chain saw, for example, very probably helped to reduce accident rates. SWEA's initiatives with regard to musculoskeletal injuries are less easy to evaluate.

The description of SWEA includes a presentation of the steering instruments which provide SWEA its opportunities but also impose constraints. The dissertation also describes the impact of different working procedures on the target groups, i.e. manufacturers, importers and users of machinery.

It was found that SWEA's information on its Provisions during the second half of the nineties had reached machinery manufacturers and importers on twice the scale it had been doing previously. On the other hand, understanding of the content of the Provisions had declined. Furthermore, during the 1990s SWEA positively induced manufacturers to issue practical instructions concerning the use of forest machinery. The results of the forestry industry's project to combat musculoskeletal injuries, evaluated through SWEA, testify to the success of the working method, viz implementation under the threat of working hours regulation. Some general evaluations of SWEA, also presented in the dissertation, mention among other things that the Authority ought to be more outgoing and

reality-oriented. It is further remarked that socio-economic cost-benefit analyses in connection with the issuing of new rules are often deficient.

Summing up, in its future work vis-à-vis forestry SWEA should bear in mind the following points:

- The forestry sector needs uniform supervision. This in turn calls for new co-operation arrangements between SWEA's districts and head office.
- Continuous co-operation with the forestry industry should be maintained and alternative co-operation procedures developed.
- The Work Environment Act should be expanded so that stipulations can be addressed to contract clients.
- SWEA's initiatives will have a better effect on machine safety if supervision is made to focus primarily on manufacturers and importers instead of the large number of workplaces in the country.
- SWEA's increased funding from 2001 should lead to reinforced supervision of the forestry work environment.
- Provisions should be written more lucidly and plainly. They should be accompanied by manuals and should be more effectively marketed.
- The system for reporting accidents and occupational diseases must be improved, above all where self-employed forest owners and contractors are concerned.
- SWEA should commit heavier resources to EC Directive activities.

1. Introduction

What is expected of the Work Environment Authority?

Society expects initiatives by the Work Environment Authority (SWEA) to lead to a reduction of suffering and expenditure by bringing down the number of work-related fatal accidents, accidents and occupational diseases. Much the same expectations are entertained by both undertakings and individuals. In addition, both expect guidance on work environment issues and the interpretation of rules, so as to be capable of managing the work environment adequately.

“SWEA is tasked by society with ensuring that the work environment meets the requirements formulated in the Work Environment Act and concretised in SWEA’s Provisions. A poor work environment not only causes problems in working life but impacts on other walks of life as well. It is therefore important to ensure that work environment management is as effective and comprehensive as possible” (NBOSH 2000d). The present thesis sets out to study how this endeavour has succeeded in relation to industrial forestry.

History

The Labour Inspectorate (LI) was set up over a century ago, the National Board of Occupational Safety and Health (NBOSH) rather more than 50 years ago. Many organisational changes have occurred since then. Up until 31st December 2000, the Occupational Safety and Health Administration consisted of NBOSH and the LI, the latter being divided into ten districts. On 1st January 2001 the eleven authorities merged to form the Swedish Work Environment Authority (SWEA), divided into Head Office and the Work Environment Inspectorate (WEI). SWEA, reports to the Ministry for Industry, Employment and Communications.

Resources of the Work Environment Authority

It is important to know SWEA’s capabilities for undertaking preventive work in the forestry sector. The Authority’s frames – constraints – are dictated by the way in which it is managed and by the legislation and other rules at the disposal of its personnel. The degree to which SWEA impacts on working life also depends on its organisational structure. The Authority is funded through State allocation and its annual budget has averaged MSEK 370 over the past three years. For 2001 this allocation has been augmented by MSEK 70.

Procedures for the supervision of the work environment have varied. The technology and organisation of forestry work have changed with the passing of time, and SWEA's working methods have had to be altered accordingly. Present-day developments are probably influenced by experience of earlier work environment management. One scientific problem concerns the possibility to demonstrate a connection between work environment legislation and the frequency of occupational injuries.

Initiatives by the Work Environment Authority

The Government Agencies Ordinance (SFS 1995) requires SWEA to carry out an impact assessment before issuing Provisions. Schäfer's scrutiny (1997) of the quality of these assessments revealed among other things that Provisions can be followed up by analysing their use and serviceability. An analysis of this kind is undertaken in **Market Surveillance**, which evaluates compliance with the EC Machinery Directive by manufacturers and importers of machinery. Sweden's accession to the EEA and, subsequently, to the EU entailed certain obligations, including both the modification of existing Provisions and the introduction of completely new ones. One example is the repeal of the Provisions on Machinery and the introduction of the EC Machinery Directive, which among other things applies to forestry machinery. The EC Machinery Directive also requires manufacturers to supply certain information to users of machinery. The question of whether this information is appropriately framed was studied in **Safety Instruction**. As time goes on, regulatory work will come to be increasingly affected by EC Directives.

The development of technology, organisation and working methods can create new problems in the work environment. Harvesters are a case in point. They are very efficient indeed, but they entail a more immobile, repetitive way of working (Gellerstedt 1993). This is one example of development which SWEA will have to keep under observation, and in the mid-1990s SWEA therefore threatened to regulate working hours for this machinery, the purpose of the threat being to prevail on forestry organisations themselves to devise solutions reducing the extent of musculoskeletal injuries to machine operators. This initiative is evaluated in **Follow-up**.

2. Purpose and topics of inquiry

The purpose of this dissertation is to investigate whether the Swedish Work Environment Authority (SWEA), with its rules, resources and structure, has been able to influence work environment management in Swedish forestry. To this end we will:

- Describe and analyse the historical development of forestry work and workers' protection in the forestry sector, in order to answer the following questions:
 - Have the hazards of the work environment and SWEA's working approach changed?
 - Have SWEA's initiatives in the course of history affected occupational injuries in forestry?
 - Has legislation affected technical development?
- Analyse the present-day workings of SWEA, with reference to the following questions:
 - What resources does SWEA have at its disposal, what important work environment legislation exists for forestry?
 - What does SWEA's national and international working procedures look like in relation to the forestry sector?
- Analyse SWEA's initiatives in Swedish forestry during the 1990s. The following are vital questions on this subject:
 - Has SWEA successfully induced manufacturers/importers of machinery to pay heed to the EC Machinery Directive and translate it both into safer machines and good instructions on their use to machine users?
 - Has SWEA successfully induced forestry to integrate work environment management with production?
- Show how SWEA was perceived by those who are affected by its work.

3. Methods

3.1 Definitions and limitations

This dissertation deals with SWEA's initiatives for the work environment of industrial forestry. By industrial forestry is meant all forestry supplying timber to industry, i.e. all timber felled in the course of economic activity. On the other hand it does not include the felling of timber and firewood for the forest owner and neighbours, for very small sawmills and joinery factories or suchlike small-scale recipients.

Users of machinery, for the purposes of this dissertation, comprise machine operators, owners of machinery, service personnel and officials of forestry organisations.

The designation SWEA also includes the former Occupational Safety and Health Administration (NBOSH and LI) before 2001.

Occupational injuries to include both occupational accidents and occupational diseases.

The 1977 Work Environment Act (WEA) had the effect of broadening the definition of "Work Environment". Over and above the traditional prevention of occupational accidents and occupational diseases, WEA now also came to include the work environment's impact on the workers, well-being, job satisfaction, social contacts and personnel development (SFS 1977a). These aspects make wider demands on the evaluation of SWEA initiatives. The present dissertation, however, is mainly confined to occupational injuries.

3.2 Choice of method

An overview of models for the evaluation of public activity is given in "Appraisals in the public sector – problems and solutions" (Vedung 1994) and presented in Figure 1. To evaluate an authority like SWEA, Sandal (1991) recommends an evaluation of effects. Zavisic (1993) explains effect in the following way: "Effect is the difference between what happened as the result of a measure, programme or project and what would have happened in the absence of these things. It is the effect of measures, projects or programmes that is of interest."

From the various evaluation models available (Fig. 1), the target achievement model has been selected in order to evaluate the way in which the forestry sector has handled rules and initiatives from SWEA. Figure 2 shows how the projects **Market Surveillance, Safety Instruction** and **Follow-up** are handled in this model.

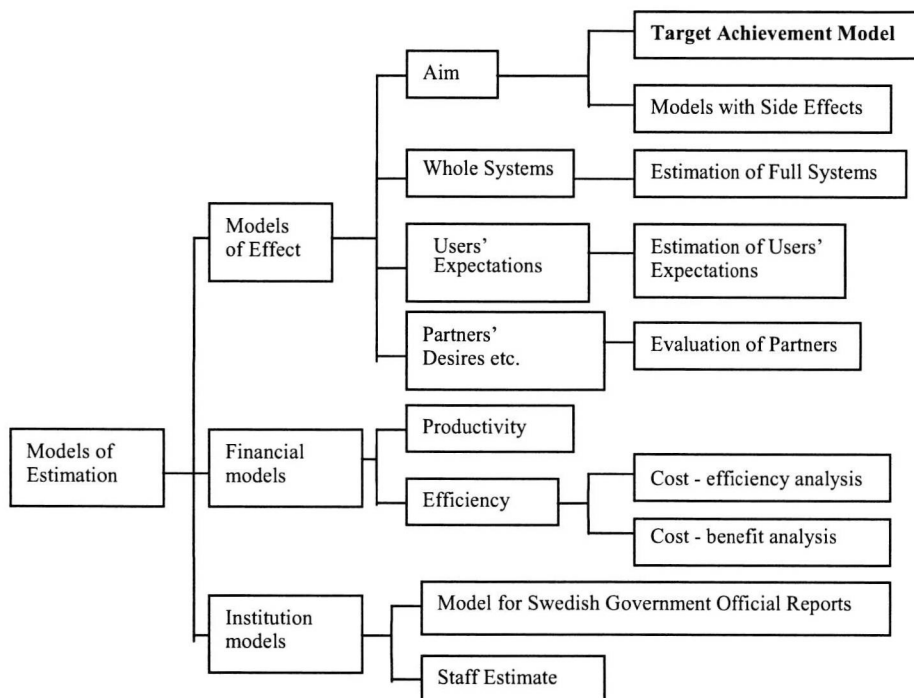
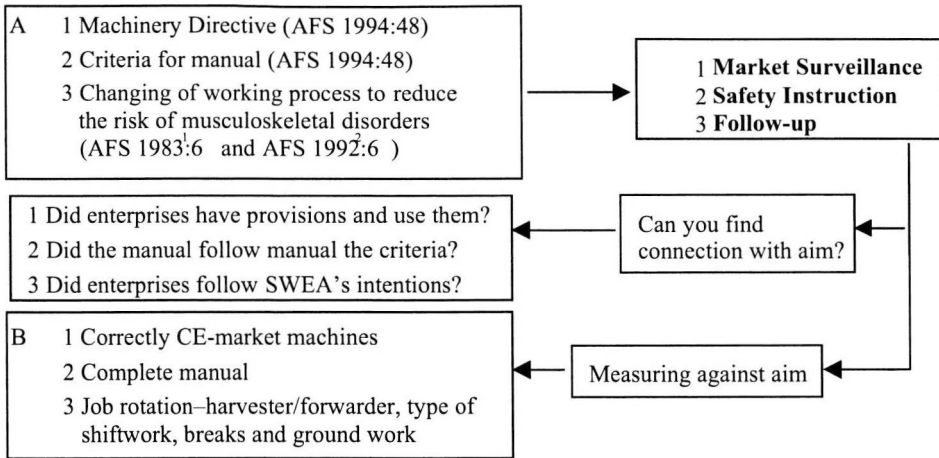


Figure 1. Evaluation models, divided into effect measurements, analytical methods and specific models (Vedung 1994).



1 – Superseded by “Ergonomics for the Prevention of Musculoskeletal Disorders” (AFS 1998:1)
 2 - Superseded by “Systematic Work Environment Management” (AFS 2001:1)

Figure 2. Evaluation of target achievement (B) in relation to intentions (A), by means of **Market Surveillance, Safety Instruction and Follow-up**, as per target achievement model (Vedung 1994).

The target achievement model, according to Vedung (1994), provides a simple indication as to whether the outcome agrees with a project’s target and whether this is due to the input. The targets of the projects themselves are the organising principle. Specific questions are asked as to whether the outcome agrees with pre-defined targets, and an analysis is made to see whether this was due to the input. In the analysis, the evaluator can use SWEA’s Provisions as value criteria.

The weakness of this model, however, is that it does not allow for costs and cannot trace unforeseen effects (Vedung 1994). Various methods are then used to analyse outcome and input in the various projects; see below.

Historical development down to the present-day Work Environment Authority

Technical changes in forestry have entailed changes of working method and organisation, and these in turn have led to changes in accident risks or ergonomic hazards (Welin 1971). For the historical description of developments in forest technology and workers’ protection during the 20th century, literature was selected describing the risks of technology at that time, together with SWEA Provisions then in force. Statistical data were obtained from the SWEA Statistical Division, Statistics Sweden and the National Board of Forestry.

By describing the development of forestry technology and workers' protection during the 20th century, with special emphasis on the past 15 years, it is possible to shed light on the development of SWEA's working methods in relation to industrial forestry.

Using a simple systematic model (Vedung 1994), this dissertation describes the technical and organisational change in forestry which led to changes in accident and health hazards. The effects of these changes reach SWEA through various channels of information. In the light of such information, and following analysis and risk assessment, SWEA may possibly frame new rules and Provisions. The immediate outcome of a Provision may be an intensification of the rules governing the use of machinery. The machine manufacturer alters the machine concept immediately, while machines in operation are only replaced by the new type of machine after a certain passage of time. The final outcome, i.e. a change in the number of occupational accidents occurring, may therefore be delayed for some considerable time. Accordingly, this legislative work can only be evaluated by gathering statistics on the number of occupational injuries over a considerable period of time. It is difficult, however, to perceive connections with SWEA initiatives through time series analysis of these statistics. The outcome of occupational injuries and fatal accidents is affected by the year selected, the group (employees, self-employed persons) selected, the working operations selected and also on economic, social and demographic factors.

SWEA's important legislation, with accompanying Provisions, and its implementation with reference to industrial forestry will be briefly described. The description of SWEA's *modus operandi* during the 1990s and until 2001 is for the most part based on personal experience and acquaintance with the Authority. Some information has been supplied by colleagues (Plevin 1999, Wahlström 1999). The description of SWEA today, in 2001, is an important point of departure for an evaluation and the suggestion of improvements. That description provides an overview of the various steering instruments from which the Authority derives its possibilities and frames (constraints). A description is also given of the way in which different working procedures affect the target groups, i.e. manufacturers, importers and users of machinery. Work environment provisions, sometimes implemented through projects impacting on manufacturers and importers of machinery, have conclusive effects on the work environment above all where machine operators and repair technicians are concerned.

Implementation

Through information campaigns, prior to the project **Safety Instruction** in 1990, prior to **Market Surveillance** in 1993 and 1994, and prior to **Follow-up** in 1995 and 1996, measures were taken, in partnership with the industry, to raise the level of knowledge concerning the work environment, and especially knowledge of the relevant legislation. Conveying information to employers and employees is an important step in SWEA's efforts to reduce occupational injuries.

Market surveillance of machinery

The purpose of **Market Surveillance** was to study whether machinery for agriculture and forestry conformed to administrative requirements, such as CE marking, certificate of conformity¹, instructions for use and warning notices, i.e. whether SWEA achieves its target of inducing machine manufacturers to interpret the EC Machinery Directive and to translate that knowledge into practice. By investigating whether manufacturers/importers satisfy the administrative requirements of the Machinery Directive, it could be established whether the Provision had been complied with.

The following preconditions were investigated to ascertain possible effects of the information campaign:

1. Did the business undertakings have the necessary Provisions?
2. If the undertakings did not use the Provisions, why not?

A comparison was made with a previous project concerning Provisions (NBOSH 1992b).

With assistance from 14 inspectors, 107 undertakings were visited and asked 17 questions. Altogether the visits covered nearly 70% of Sweden's manufacturers and importers of forestry, farming and gardening machinery. During these corporate visits an inquiry was made to see whether the Machinery Directive was known to the manufacturer/importer and whether its implications had been understood by the recipient.

¹ See Glossary.

Safety instructions etc. in instruction manuals for forestry machinery

The target achievement model (Vedung 1994) of before-and-after analysis (Zavistic 1993) was used to judge whether information from NBOSH on the framing of instruction manuals had been apprehended by manufacturers of forestry machinery. In accordance with Zavistic (1993), no control group was used. An investigation was made to see whether the stipulations of the Machinery Directive were satisfied and whether the effect of the scrutiny carried out in 1990 and subsequent information to the manufacturer (Synwoldt 1990) had had any positive impact on the 1998 edition of the instruction manuals for forwarders and harvesters (**Safety Instruction**).

The scrutiny of instruction manuals covered a total of 14 such books accompanying forwarders and single-grip harvesters from six manufacturers, seven published in 1990 and seven in 1998. These forestry machinery manufacturers supply about 85% of the Swedish market. No literature was traceable concerning evaluation of instruction manuals, nor were colleagues at NBOSH, active in other sectors, able to advise on methods for evaluating the quality of instruction manuals. A new method was therefore developed, entitled “content and design of instruction manuals for mobile machinery” (Synwoldt 1994a) and referring above all to **Safety Instruction**. The instruction manuals were examined in 8 sections. The safety instructions were examined in 43 points, i.e. in great detail. The other seven sections of the instruction manuals were examined in general terms only.

Ergonomic initiatives by the forestry industry

Stipulations by SWEA concerning time spent by forestry machine operators in strenuous work postures were communicated to the forestry industry over a period of two years through its own project organisation. Due to failing self-correction, SWEA threatened to regulate working time in detail (NBOSH 1992a). A new working procedure was therefore devised by industrial forestry under a common slogan clearly expressing the objective: “Work environment AND Production”, known as the “the AND project”² (Hagberg, Ronström 1996).

An interview survey (Andersson, Synwoldt et al. 1999) was conducted, to ascertain whether this new working approach on SWEA’s part had any

² See Section 4.3.3

effect. SWEA’s strategy for this project is illustrated in Figure 3. **Follow-up** was intended to pin down the functioning of the “AND process” and what had been achieved compared with conditions before the project started. Information concerning the risks of musculoskeletal injury was used as a criterion of SWEA’s achievement of its intention.

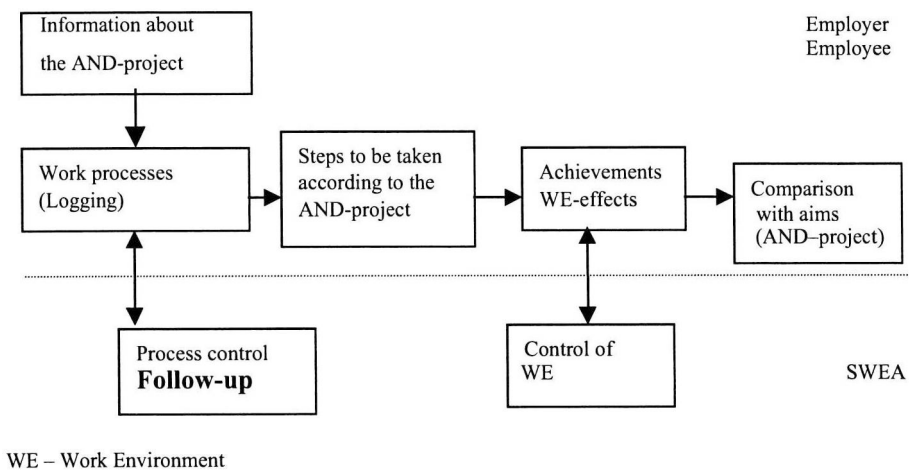


Figure 3. Systematic work environment management as instanced by the AND project (freely adapted from Andersson, Synwoldt et al., 1999).

The follow-up was conducted in 1997/98, with visits to upwards of 400 working teams in the four northernmost Labour Inspection districts in Sweden. More than 1,200 forestry machinery operators were interviewed, i.e. some 25% of all forestry machine operators in Sweden. In **Follow-up**, parameters were examined which were judged capable of reducing the type of risk of musculoskeletal injury. These parameters were: shift system, alternation between harvesters and forwarders, breaks and the extent of non-machinery work. Lastly the machine operators were asked to estimate their own musculoskeletal disorders both for 1994/95 and for the past few weeks. About 70% of the forestry machine operators interviewed also worked on mechanical felling operations in 1994/95.

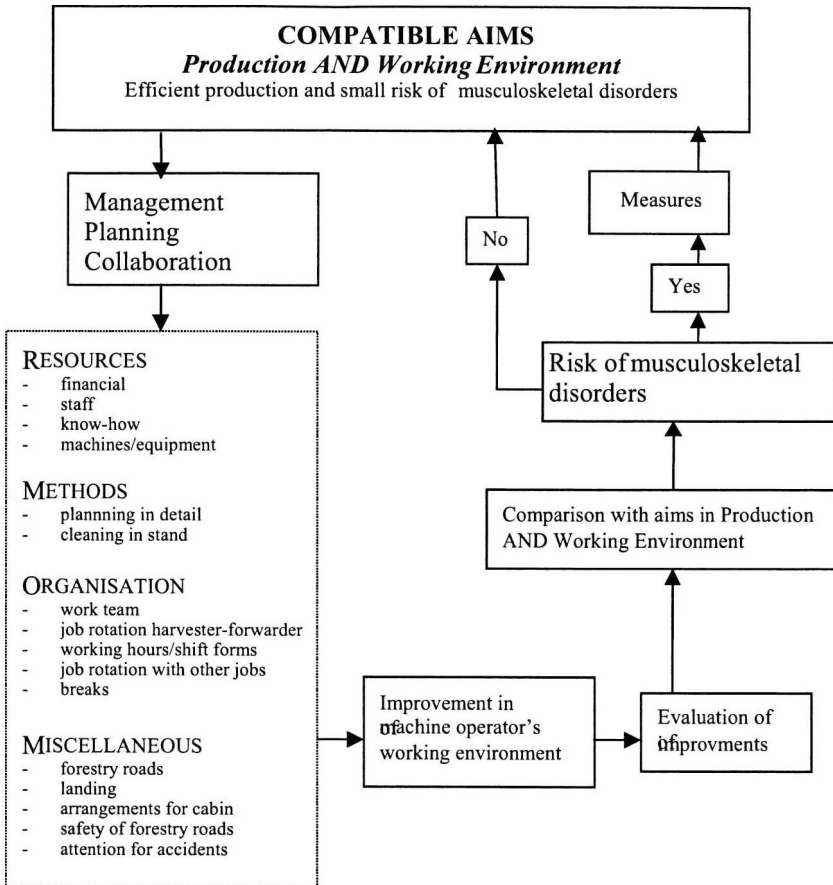


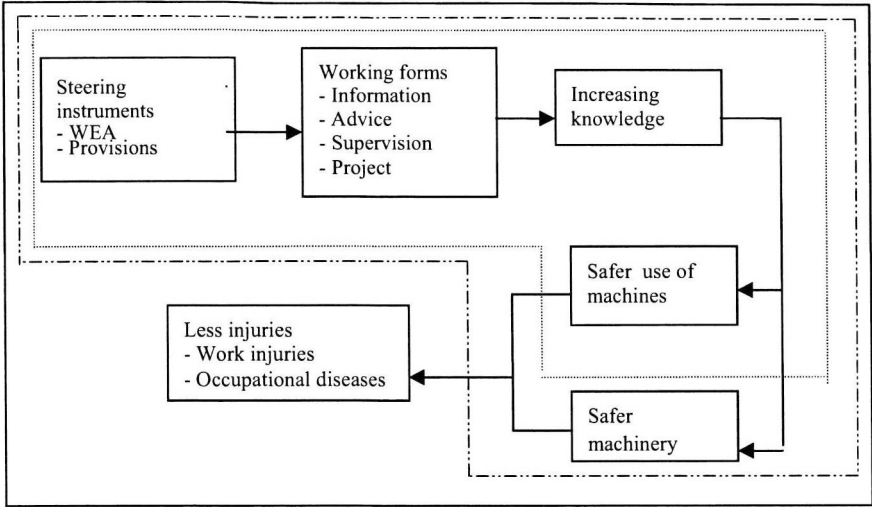
Figure 4. Systematic work environment management in “the AND project”, with concrete suggestions for remedial action (freely adapted from Andersson, Synwoldt et al. 1999).

Analysis through an effect chain

Figure 4 provides an overview of an “effect chain” as revealed by three of the reports included in this dissertation (Zavasic 1993). The Work Environment Act serves as a steering instrument for SWEA’s work. “Machinery and Certain Other Technical Devices” (AFS 1994:48) was used as a touchstone in **Market Surveillance** and the **Safety Instruction** project, while the Provisions “Work Postures and Working Movements” (AFS 1983:6)³ and “Internal Control of the Working Environment” (AFS 1992:6), now superseded by AFS 1996:6⁴ were used in **Follow-up**. All three evaluations were conducted in project form.

³ Superseded by “Ergonomics for the Prevention of Musculoskeletal Disorders” (AFS 1998:1).

⁴ Superseded by “Systematic Work Environment Management” (AFS 2001:1).



Market Surveillance(.....) Safety Instruction(- - - -) Follow-up(———)

Figure 5. Effect chain – targeted information can result in safer use of machines and safer machinery, which can lead to fewer work injuries.

As a result of statistical data on occupational accidents and occupational diseases also being included in this dissertation, the effect chain includes the number of occupational injuries as well as safer machinery and its safer use (Fig. 5).

Other and general evaluations

Special evaluations relatable to forestry include: “Contractors in forestry – internal control of the work environment” (Andersson et al. 1996) and “Accidents in private forestry” (Carlsson, Synwoldt et al. 1998). These employed a descriptive method to show the results of SWEA’s initiatives and how the Authority was perceived by others.

A wider perspective was employed in evaluations of SWEA (RRV 2000), the Labour Inspectorate (Andersson 1995) and NBOSH (NBOSH 1999b). The interviews in the last two reports mentioned were conducted by TEMO and Statistics Sweden respectively, on behalf of NBOSH.

4. Results

4.1 Development of forestry work and workers' protection in the forestry sector

In pre-industrial society, timber from the forest was mainly used for buildings and as fire wood. In addition, the mining industry in certain regions was in great need of wood fuel for firesetting in mines and charcoal in blast furnaces and hammer forges. More people were employed on supplying mines, furnaces and hammer forges with wood and charcoal than in actual mining and iron manufacturing.

During the age of the *bruk* – the distinctively Swedish rural-industrial conglomerate – a patriarchal system prevailed. Workers were at the mercy of their master. “It was the duty of the master to ensure that his workers did not become unemployed without cause, that they helped each other in the event of accidents and illness, and that they were not left destitute when they were too old to work.” (Montelius 1962).

The Workers' Protection Act and the accommodation laws

The closing years of the 19th century brought the first investigations of the work environment and living conditions of forestry workers. The Occupational Hazards (Protection) Act came into force in 1889 (SFS 1889). This in turn entailed the setting up of the Labour Inspectorate, which came under the Board of Trade until 1912. At the beginning of the 20th century the ramshackle timber huts (Fig. 6) in which forestry workers lived during the logging season became a topic of discussion, and the Workers' Protection Act, passed in 1912, also applied to logging and log-driving workers. Legislation on accommodation for these workers came into force in 1920. The following provision now came to apply concerning suitable accommodation: “Forestry huts and forestry stables shall offer sufficient space and adequate protection from cold and precipitation and, having regard to the time and conditions in which they can be expected to be used, shall otherwise correspond to reasonable requirements for temporary lodging” (Welin 1971). The first forestry accommodation inspectors entered into service in 1920, and in 1925 their duties were expanded so as also to include supervision under the Workers' Protection Act, which also meant supervision of logging sites (Welin 1971). The problem of substandard cabins persisted into the 1930s, but eating habits were improved through the addition of a cook to the team (Persson 1993).



Figure 6. Condemned forestry cabin 1940 (photo: Welin).

Early contractor systems

For about a hundred years, from 1850 onwards, a contractor system applied in the forest. The “snigging foreman” (Fig. 9) was in principal charge of all activities connected with logging, including the construction of roads and huts. Timber cutters were hired and paid by him. Work in the forest was highly seasonal and was mainly confined to the winter season. Driving took place in spring/early summer, charcoal wood-cutting and charcoal burning in the autumn. Because there were more forestry workers than there were jobs available for them, and because the scattered locations of their workplaces made it hard for them to organise themselves, they had difficulty in asserting even the most elementary claims on the subject of working conditions (Persson 1993).

Forestry workers and the employers’ organisations began to co-operate in the 1930s. “Råd och anvisningar angående skydd mot yrkesfara vid skogsavverkning” (Recommendations and directions concerning protection against occupational hazards in connection with timber-cutting) was the title of a brochure published in 1932 by the Forestry and Floatways Inspectorate (Skogs- och flottledsinspektionen 1932). That brochure was produced in association with, and distributed through, the organisations of employers and forestry workers.

Safety representatives

The first safety representatives in the forestry sector were elected at the end of the 1930s. The 1949 Workers' Protection act made safety representatives and safety committees mandatory institutions. Safety inspection tours in the forestry sector were carried out by the management, with the senior safety delegate present as the employees' representative. At the beginning of the 1970s, for example, the SCA forestry company carried out two safety inspection tours annually. Any deficiencies of the work environment came to the knowledge of the Labour Inspectorate and NBOOSH through the safety representatives. In 1973 safety representatives were empowered, in cases of imminent danger, to suspend work pending intervention by the Labour Inspectorate. Also that year, the first regional safety representatives were appointed (SFS 1973).

Between 1997 and 2000 the number of safety representatives for the enterprise sector as a whole fell by one-fifth to 87,000 for the entire country (Okumus 2000). In 2000 the agricultural and forestry sector had 385 safety representatives, 53 of them women (NBOOSH 2000a). Recruitment of safety representatives in the forestry sector became increasingly difficult in the 1990s. This has been put down to the logging teams having been slimmed down to such an extent that other team members have difficulty in covering for anyone who is absent on union duties as a safety delegate. This imposes a considerable physical strain on fellow-employees and mental strain on the safety delegate (Johansson 2000).

New authority

During the 1930s, supervision of forestry was transferred from local supervisory bodies to the Forestry and Floatways Inspectorate. Gradual increases in personnel strength enabled the Inspectorate to devote more effort to improving the safety of forestry employment. In 1938 the Inspectorate came under a new authority, with the transfer of the Workers' Protection Division of the National Board of Health and Welfare to the National Social Insurance Board (Welin 1971). The National Board of Occupational Safety and Health, founded in 1949, became the authority in charge of the Labour Inspectorate (Lundberg 1982). At the same time a Forestry Division was set up within NBOOSH, together with two Forestry Inspection Districts. In 1974 these districts were transferred to the Labour Inspectorate (Plevin 1999).

By the end of the 1980s SWEA had about 1,000 employees, but personnel strength diminished by 40% during the 1990s. Until the 1990s NBOSH had an Agriculture and Forestry Section with seven handling officers covering forestry, agriculture and horticulture.

During the 1990s the 19 districts of the Labour Inspectorate were reduced to ten, and by the end of the 1990s the 24 inspectors for these occupations had also acquired many duties outside the original sectors.

New technology calls for new Provisions

Logging at the beginning of the 20th century was done using crosscut saw, felling saw and buck saw (Fig. 7).



Figure 7. A timber-cutter's equipment in the 1940s (photo: Welin).

With the introduction of the motor saw and barking machine (Fig. 8) in the 1950s, accidents changed character. The axe was no longer used for limbing, and the saw chain sometimes inflicted large wounds or even caused mutilation. Risks of musculoskeletal disorders were accentuated by the introduction of the heavy chain saw but, on the other hand, reduced by barking machines, which eliminated the heavy manual work of

barking. Technical progress, then, could both reduce and augment the risks of occupational accidents and musculoskeletal disorders.

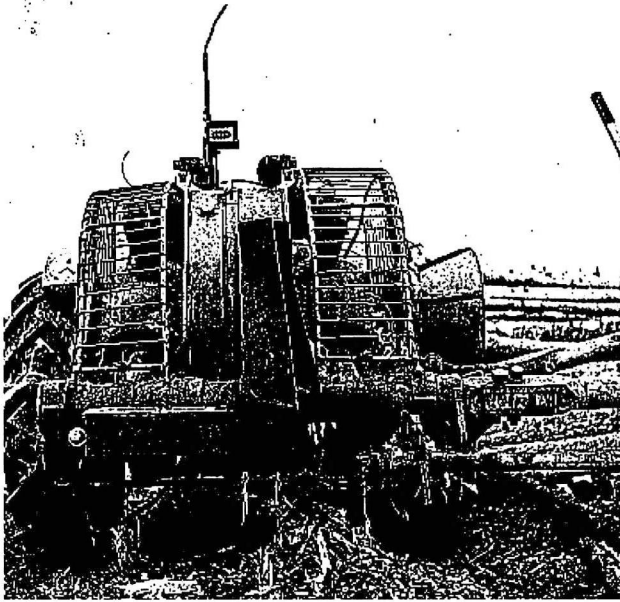


Figure 8. A Cambio barking machine at Wifstavarfs AB in 1956 (photo: Welin).

Forestry workers were usually paid piece rates. Often, owing to stress, this led to accidents and to premature physical decline. A strike in 1975 resulted in the labour market parties agreeing on monthly rates of pay for forestry. A 15% piece rate quota was retained, however, in the southern parts of Sweden (Ager 1991).

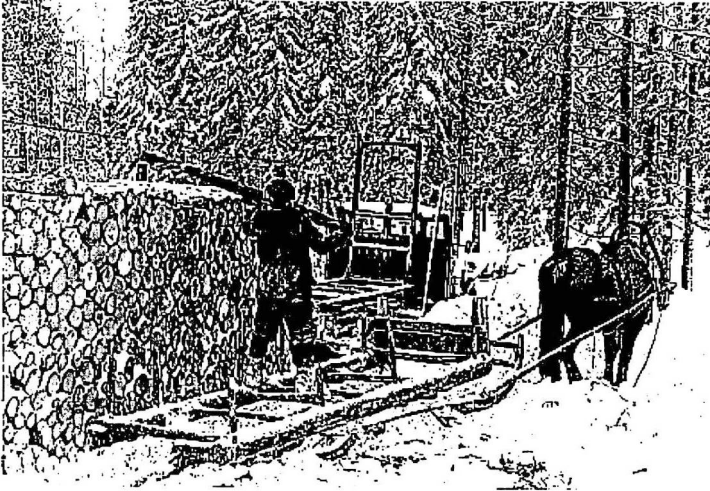


Figure 9. Snigging (photo: Welin).

The decade following the introduction of the motor saw and the barking machine brought further technical changes in timber cutting. Horse-drawn transport (“snigging”) and manual loading (Fig. 9) were superseded in the 1960s by the crane and forwarder (Fig. 10), while barking operations were transferred to industry. Road transport increased and floating diminished.

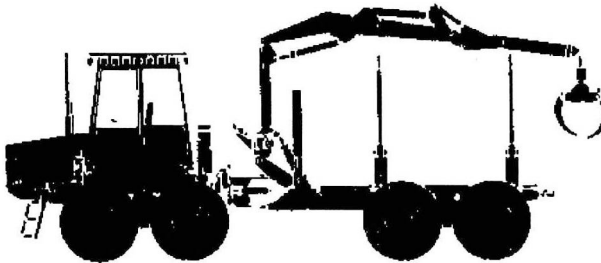


Figure 10. Forwarder (Anläggningsmaskiner 1989).

During the 1970s SWEA observed that forestry workers who had been employed for a number of years on motor-manual felling, i.e. felling by motor saw, were developing white-finger problems (Axelsson 1966). These were attributed to the vibrations in the handles of the chain saw, and new Directions were therefore introduced concerning vibration-proof saws (NBOSH 1962). These stipulations were further refined in 1977 to the effect that the vibration force was not to exceed 40 N (NBOSH 1977). The problem of white fingers then diminished considerably (Folstad 1982).

On the other hand, large numbers of accidents were still occurring in connection with chain saw work. Two-thirds of accidents resulted in leg injuries and a quarter in injuries to one hand – nearly always the left hand (Folstad 1982). Further to this, see under the heading *development of occupational injuries* in the same chapter and Section 4.3.5, Summary of Occupational injuries.

In 1969 NBOSH prescribed a traditional protective equipment. Safety helmet, ear protectors, eye protectors and safety boots were to be provided by the employer and that use of them was to be obligatory (Persson 1993). Specific provisions on protective equipment for felling operations were introduced a few years later. These provisions, concerning kick-back protection and chain-brakes for the chain saw (Fig. 11), were introduced in 1971 (NBOSH 1971), while provisions on leg guards for chain saw work followed in 1974 (NBOSH 1974).

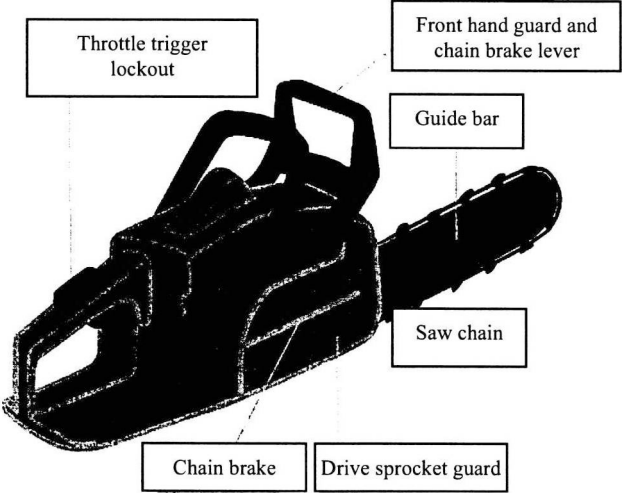


Figure 11. Chain saw (ADI 2001).

To improve the technical standard of chain saws, NBOSH stipulated type approval of them from 1977 onwards (NBOSH 1977). These rules, together with campaigns involving occupational health care services, significantly reduced the number of accidents involving chain saws (Fig. 19).

Hearing protectors and safety helmets came to be used more and more frequently at the end of the 1960s. By that time they were being used by 80% and 65% respectively, and in the 1970s they were accepted by practically all forestry workers in connection with felling operations (Folstad 1982). But timber-cutters' hearing was still being impaired in the mid-1980s by chain saw work (Gellerstedt et al. 1988). It was established that more than a tenth of all forestry workers incurred a hearing impairment resulting in more than a ten per cent reduction of hearing (Folstad 1989). A technical study has shown that hearing protectors do not afford adequate protection, among other things due to wear and tear and lack of fit, and also to the fact that noise from a saw running at full speed is so high that the protection is insufficient (Gellerstedt et al. 1988). Figure 12 shows the personal protective equipment stipulated by SWEA in "Use of Power Chain Saws and Brush Saws" (AFS 2000:2) for motor-manual work.

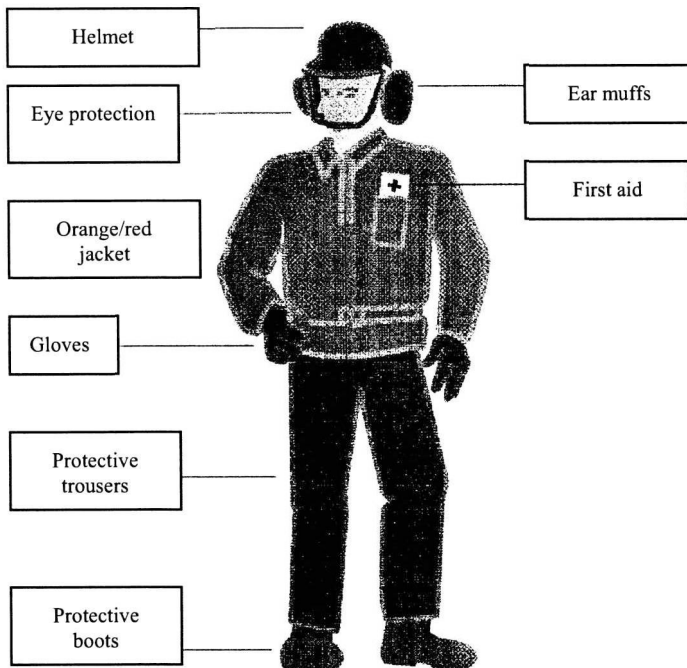


Figure 12. Personal protective equipment stipulated for motor-manual cutting operations (ADI 2001).

Processors came in at the beginning of the 1970s, followed at the end of the decade by the first harvesters. Figure 13 illustrates the development of output capacity in relation to forestry technology between 1950 and 2000. The diagram does not include figures for the investment entailed by machinery/equipment, nor does it give operating, servicing and repair costs.

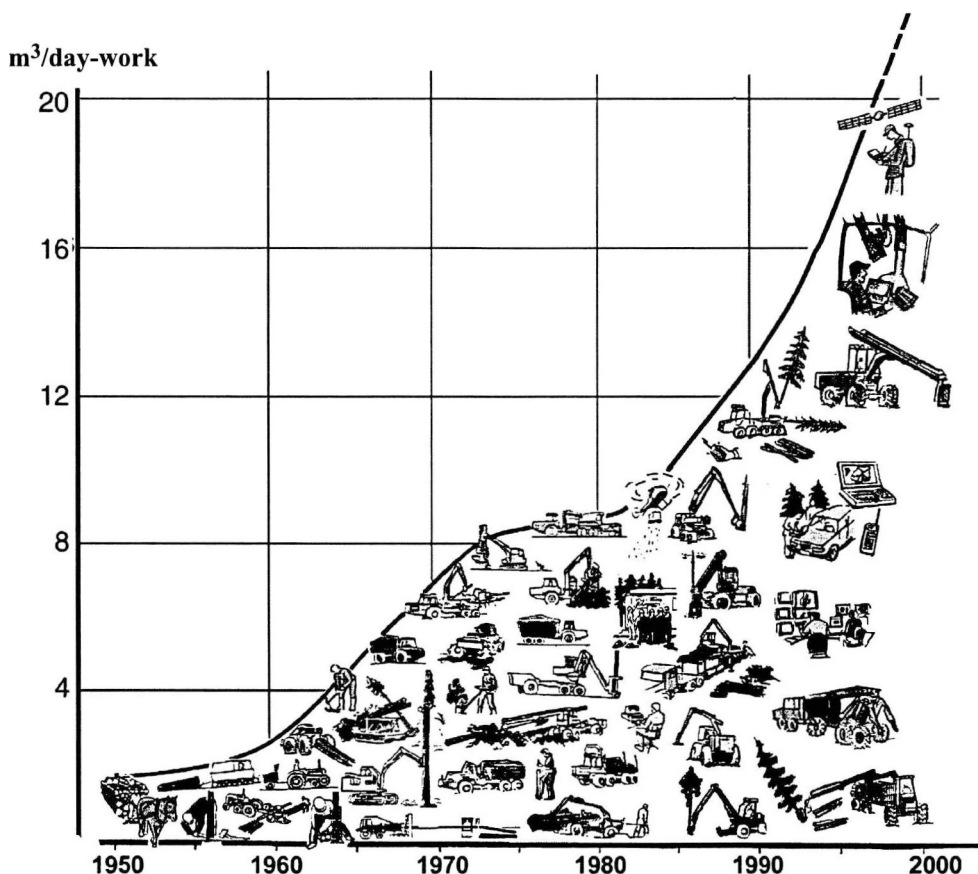


Figure 13. Development of timber production (cubic metres per working day) by workers directly employed on logging (SkogForsk 2000b).

In 1972 NBOSH issued a Notice on technical requirements for forwarders and skidders (Fig. 14) (NBOSH 1972). That Notice was repealed in 1985 and superseded by the Provision “Tractors and Self-propelled Working Machines” (AFS 1985:6), which also included harvesters.

Technical advances in the 1970s resulted in forestry almost completely abandoning the whole-stem system, i.e. transferring entire limbed trees to landings. That method remains common, for example, in North America and Germany. Its abandonment in Sweden meant the disappearance of the skidder, used mainly between 1965 and 1975, in favour of the forwarder (Gellerstedt, Dahlin 1999).



Figure 14. Skidder (Anläggningsmaskiner 1989).

Figure 15 shows the dependence of logging methods on technical progress. At the beginning of the 1970s SCA changed from a manual to a mechanised shortwood system. A shortwood system means limbing and cross-cutting the timber after cutting it at the felling site. With a manual shortwood system, cutting is done manually with a saw, axe or chain saw and the timber transferred to a landing by horse, tractor or forwarder. With a mechanised shortwood system, felling is done by machines such as feller-bunchers, limber-slashers, grapple processors and two-grip (Fig. 16) and single-grip (Fig. 17) harvesters. The timber is nearly always transferred to a landing by a forwarder, sometimes using a farm tractor with a grapple loader wagon or a wire crane. The assortment range is timber cut to certain lengths and pulpwood. As can be seen from Figure 15, it is anticipated that future logging will be done using a combination of harvester and forwarder (driver in Swedish), i.e. a machine which both fells and forwards. Figure 18 shows a prototype of this machine.

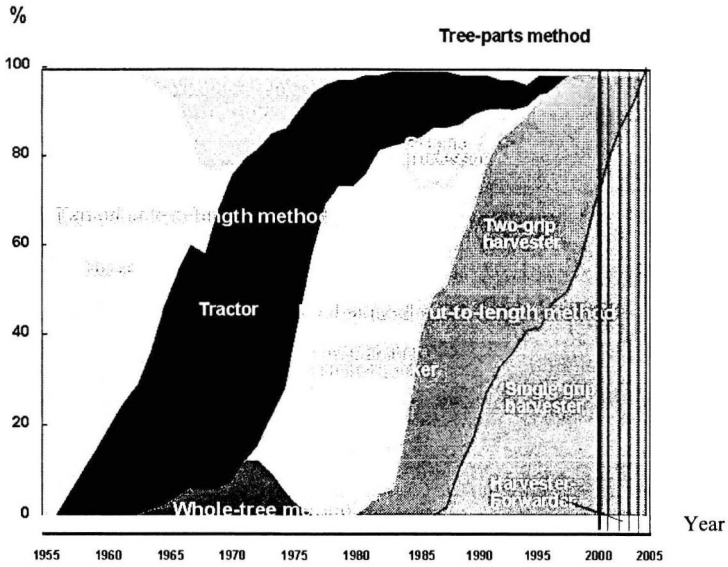


Figure 15. Logging methods in the SCA forestry company, 1955-2005, 2000-2005 forecast (freely adapted from SCA 2000).

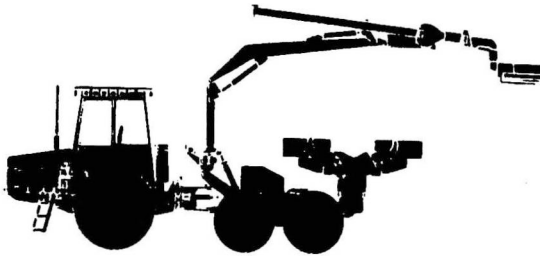


Figure 16. Two-grip harvester (Anläggningsmaskiner 1989).

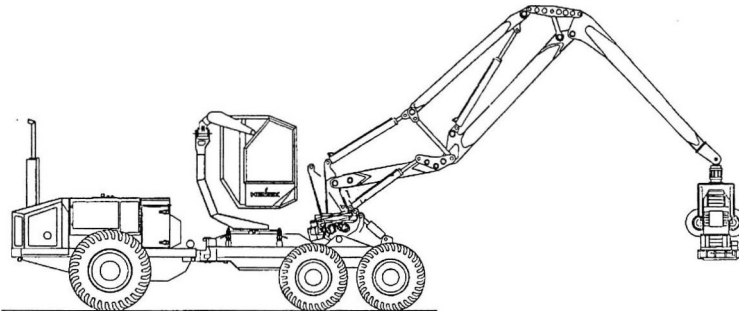


Figure 17. Single-grip harvester with suspended pendulo-cab (HEMEK 1998).

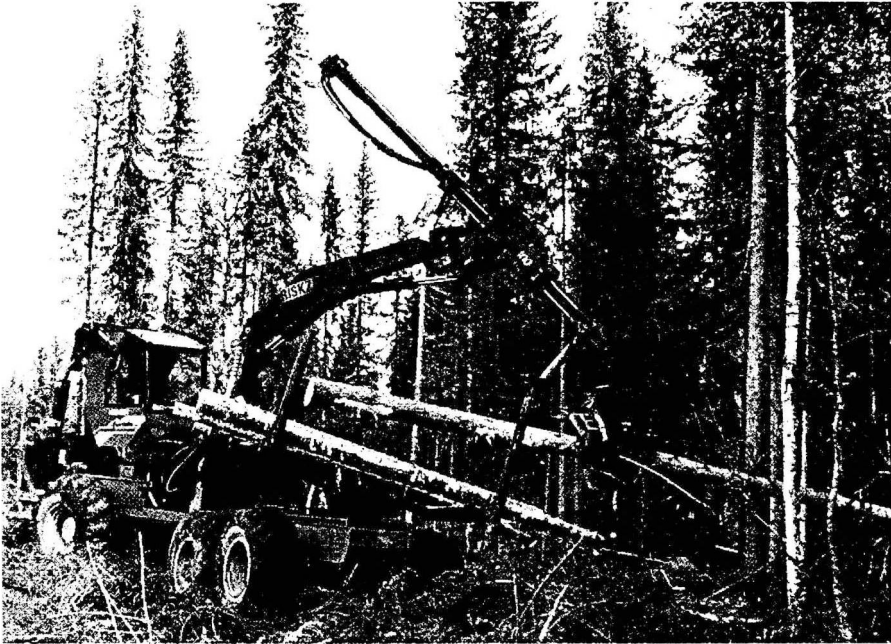


Figure 18. Logging with a combination machine harvester/forwarder – limbing, marking for cross-cutting and loading in a single operation (SkogForsk 2000a).

Physical and psychosocial work environment

“Production techniques and work environment” (Bostrand 1984) sheds light on the work environment in forestry and psychosocial working conditions during the transition between the 1970s and 1980s, describing how vibrations combined with a poorly designed workstation, involving rigid work postures and long working sessions, led to disorders of the back, neck, shoulders, elbows and forearms. This also began to show up in the statistics. The Provisions “Work Postures and Working Movements” (AFS 1983:6) made it possible to act towards the hazards of poorly designed workstations and to create prospects of better ergonomic conditions.

The change from two-grip (Fig. 16) to single-grip harvesters (Fig. 17) took place in the 1980s. Single-grip harvesters then dominated the whole of the 1990s. Compared with manual cutting, mechanised work entailed new health problems, above all in the form of disorders of the neck/shoulders, back and knees, due mainly to one-sidedly repetitive work and lack of job variation (Lidén 1989). New Provisions on Ergonomics for

the Prevention of Musculoskeletal Disorders (AFS 1998:1) covered these mechanised operations more adequately than the old Provisions on Work Postures and Working Movements, and enabled a more effective supervision.

Researchers in 1978 had already issued warnings of work environment problems attending the introduction of more sophisticated forestry machinery. It was believed that problems of this kind could take the form of a hectic working pace, subordination of man to machine, solitary work, depletion of job content and physical inactivity (Ager 1978).

Thus motorised manual felling disappeared from large-scale forestry at the end of the 1990s and in principle was superseded by mechanised methods. This impeded switching to manual work, thus imposing heavier strains on forestry workers who spend the whole of their working time in machines. Machine work, above all when using harvesters, entails one-sided repetitive movements (Attebrant 1995). These fully mechanised felling methods made it more important than ever to develop the ergonomics of forestry machinery. Manufacturers took pains, by means of various mechanical solutions, to adjust the sitting level horizontally in relation to the gradient of the terrain. This adjustment of the workstation to the horizontal plane can be instanced with the suspended pendo-cab (Fig. 17), the wheel adjustment of the Skogsjan harvester and Valmet's hydraulic cab adjustment. The "Sit-right" product is a technical solution whereby only the driving seat is automatically adjusted to the horizontal plane.

"Ergonomic guidelines for forest machines" conveys a picture of how the machinery of today and tomorrow should be designed from an ergonomic viewpoint (Gellerstedt et al. 1998). This publication is based on the ergonomic checklist first published in 1969 (Hansson et al. 1969).

Use of wood residues and peat for fuel increased during the 1980s (Synwoldt 1994b). This compounded problems of dust and mould as well as fire hazards (Bertilsson and Synwoldt 1994). These areas came to be regulated by Provisions on "Measures Against Air Contaminants Prevention of Ill-Health" (AFS 1980:11). At the same time the increased views of food fuel meant an extra task for the harvester driver, in that branches and tops had to be deposited in as few places as possible, so as to facilitate loading or chipping (Gellerstedt et al. 1999).

Development of occupational injuries

Between 1950 and 1980, the number of fatal accidents in agriculture and forestry due to tractors overturning declined from 17 to 0.5 per 100,000 tractors. This was partly due to the introduction of roll-over protection systems in the form of cabs or protective frames. Bengt Springfeldt (1993), former Head of the Labour Inspectorate in Stockholm, has described the positive impact of these provisions on accident figures connected with this kind of machinery.

Figure 19 shows that the number of accidents with chain saws declined by 70 % between 1971 and 1976, even though the number of persons employed and self-employed only diminished by 10 per cent during the same period. For the country as a whole, the number of occupational injuries in forestry was reduced by half between 1971 and 1976 (Fig. 20).

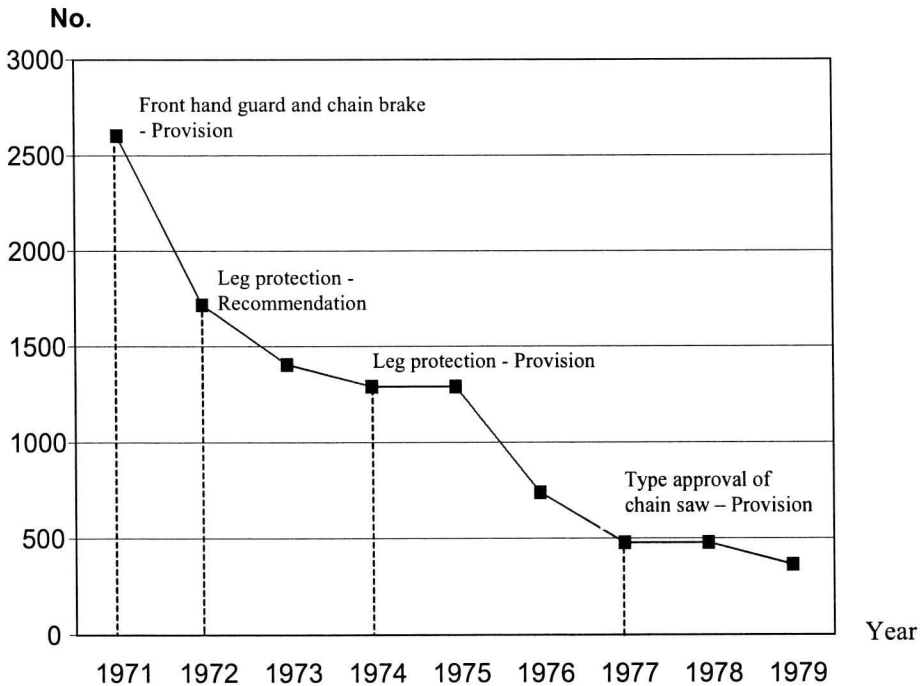


Figure 19. Number of accidents with chain saws 1971-1979 (Folstad 1982) and certain stipulations of NBOSH Provisions during the period.

Occupational accidents
and diseases in forestry
as per 1,000

Gainfully employed
persons in forestry as
per 1,000 (LFS)

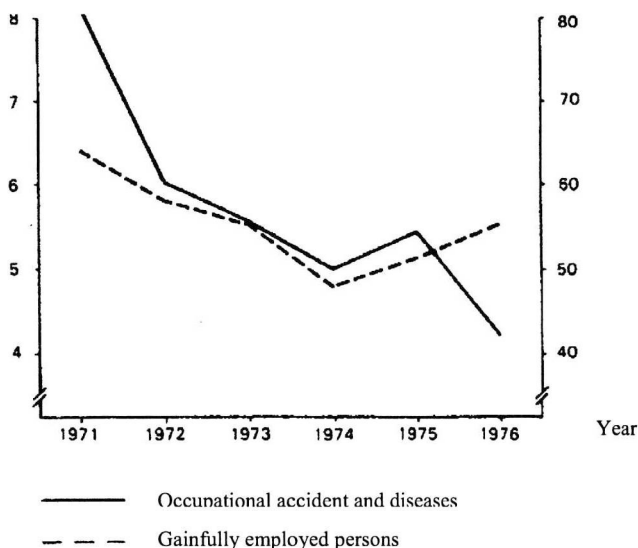


Figure 20. Number of occupational injuries and gainfully employed in forestry, 1971-1976 (Skogsstyrelsen 1976).

Most accidents connected with motorised mechanical logging occurred during ordinary tree-cutting and the dislodgement of hanging trees. When accidents of this kind occur, more often than not the cutter is taken by surprise and is trapped under the tree he is in the process of cutting. Today chain saws are no longer used for felling operations in corporate forests, except for the cutting of individual trees, such as thick spruce or spruce trees with large buttresses. The fatal accident rate has declined with the use of chain saws.

During the past 15 years (1985-2000) the number of fatalities among self-employed forest owners has been far higher than among employed forestry workers (Fig. 21). One reason for this is believed to be that many self-employed foresters work for only short periods of the year with a chain saw and that often they lack both experience and training (Engsås 1993b).

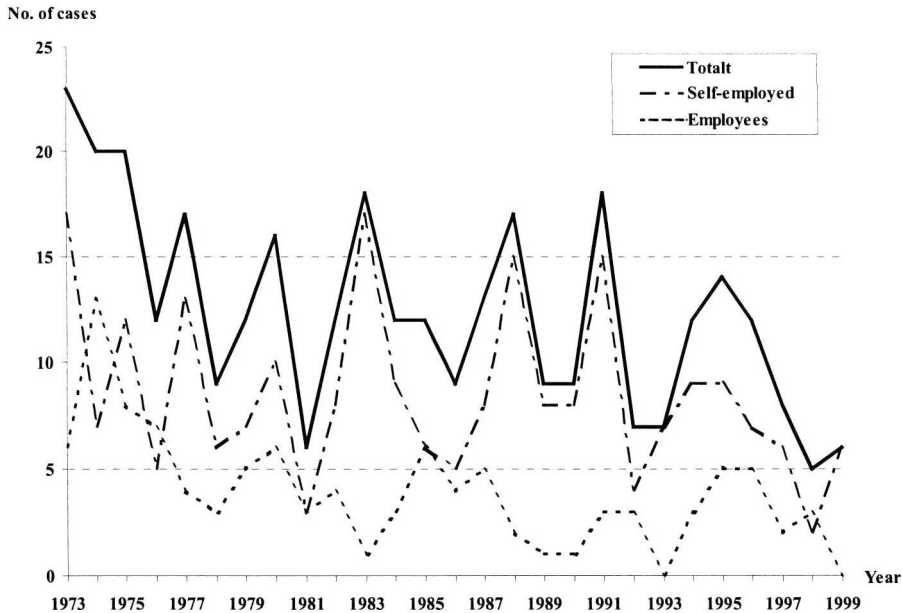


Figure 21. Number of fatal accidents in forestry work, total figures and by employees and self-employed persons (Skogsstyrelsen 1970-2000).

The number of reported occupational diseases for all sectors declined between 1990 and 1997 from 18 to 3 per 1,000 gainfully employed (NBOSH 1999a). The number of reported musculoskeletal diseases among machine operators in forestry fell from about 100 at the beginning of the 1990s to ten or so by the end of that decade (Fig. 22). The high figures for 1993 and the small number of musculoskeletal diseases reported after that year are due to a change in the assessment of diseases qualifying as work-related. The change took place at mid-year 1993.

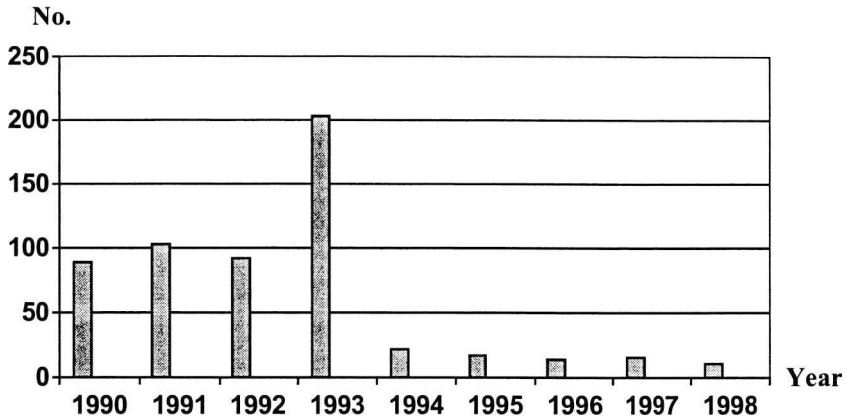


Figure 22. Musculoskeletal diseases reported among forestry machine operators (NBOSH 2000c).

To facilitate the identification of ergonomic hazards and in this way reduce the risk of musculoskeletal injuries, a number of initiatives have been taken by researchers. “Health risks in forest work – a program for action” describes a method for mapping the health status, working conditions and living conditions of forestry employees. The report emphasises that the results of such surveys can be used as a basis for the prioritisation of measures relating to health hazards in forestry work (Pontén 1988). “Arbete och hälsa vid skogsarbete” elaborates a model concerning the impact and strain of work on the individual and the exertion and fatigue which work results in. In this model the machine operator’s subjective view is combined with objective data (Gellerstedt 1993).

Work organisation and Occupational Health Service

During the 1970s and 1980s a comprehensive safety organisation, including Occupational Health Service (OHS), was built up by the large corporations. Smaller firms were able to become directly affiliated to OHS systems. In this way work teams gained access to doctors, physiotherapists and safety engineers.

Access to these resources deteriorated, however, with the disappearance of State support for OHS at the beginning of the 1990s. Another reason for the decline of interest in the work environment was that work environment issues no longer had priority in the operational context, as had usually been the case during the 1980s (Wahlström 1999). As a result

of rigorous rationalisation measures, persons with knowledge relating to the work environment were no longer at hand.

The contractor system returned, in various guises, to forestry in the 1980s, partly through employee-owned machinery, with forest companies, such as the Swedish Forest Service (Domänverket) often underwriting credits for the purchase of machinery. The contractor starting up in business usually had just one machine, either a forwarder or a harvester. Today, in 2001, most contractors have both harvesters and forwarders and employ personnel. Between 50 and 90% of the felling operations of the larger forestry companies are carried out by contractors. These contractors often have long working days, since as a rule they also attend to repairs, book-keeping and planning (Lidén 1995). About 50% of the contractors belong to Forestry Contractors Financially Association (SMF) (Hansson 2000).

Most forestry employees belong to the Swedish Forest Workers' Union. Union membership has declined from about 20,000 (1980) to upwards of 13,000 (1998). In 1999 the Swedish Forest Workers' Union merged with Träfacket to form Skogs- och Träfacket.

Forestry today

Sweden has about 22.5 million hectares of forest, of which 50% is privately owned, 38% belongs to limited companies and 12% is public forest. The total timber reserve amounted to 2,730 million cu. m. forest. Forestry in 1998 employed 17,600 whole-year equivalents (self-employed persons included). Annual gross felling totalled approximately 70 million cu. m. total volume over bark (Skogsstyrelsen 1999). About 90% of the gross volume is now felled annually by some 5,000 machine operators (forwarder and/or harvester operators).

4.2 The Swedish Work Environment Authority today

The description of SWEA which now follows is intended to show the possibilities of directing its activities with reference to the work environment.

4.2.1 Organisation

Up until 31st December 2000, SWEA was organised on the following lines. The 10 Inspection Districts (Fig. 23) and NBOSH constituted 11 autonomous authorities, collectively known as the Occupational Safety

and Health Administration. NBOSH was the authority responsible for the Labour Inspectorate and had four divisions. At the end of 1999 the Director-General of NBOSH was instructed by the Government to investigate the possibility of amalgamating these 11 into one authority. On 1st January 2001 NBOSH and the Labour Inspectorate became a single authority, the Swedish Work Environment Authority, consisting of the Head Office and the Work Environment Inspectorate in ten districts (Fig. 24). The Work Environment Inspectorate is headed by the Work Environment Inspection Division at SWEA.

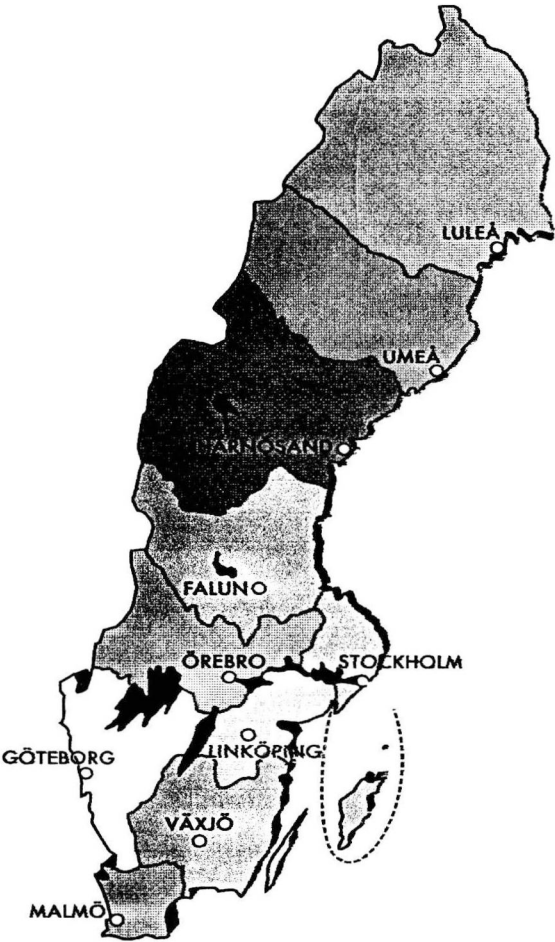


Figure 23. District boundaries of the Work Environment Inspectorate - formerly the Labour Inspectorate (NBOSH 2000e).

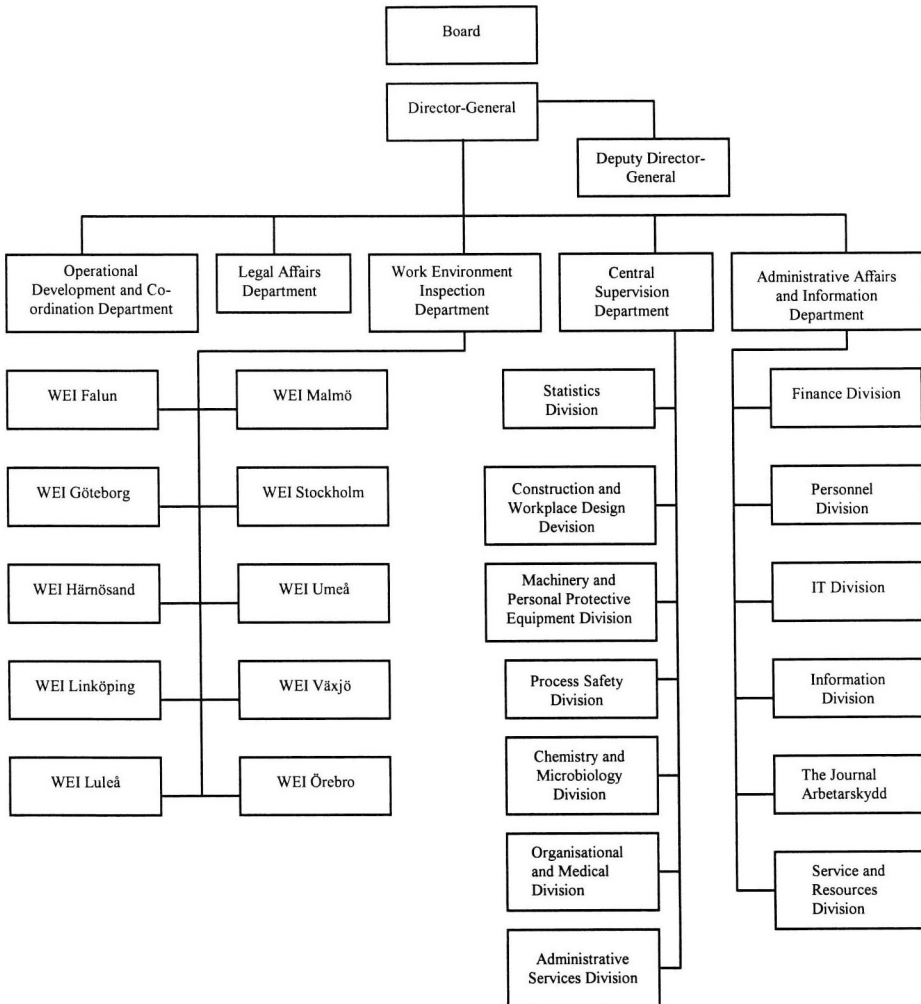


Figure 24. Work Environment Authority organisation chart, 2001 (NBOSH 2000e).

Occupational safety and health issues in the forestry sector come under Central Division, Machinery and Personal Protective Equipment. Two handling officers are among other things responsible for practical issues, which comprise: machinery for silviculture, felling and timber transport, off-road vehicles, chain saws, bush saws and wood-cutting machines. This unit also has sectorial responsibility for agriculture and forestry, including the handling of pesticides and chemical products and hazards connected with dust and mould.

4.2.2 Steering instruments

To function effectively, an authority must have good steering instruments. SWEA's main steering instruments will now be briefly described. For present purposes, steering instruments are the stipulation by which SWEA is governed and those by which it governs its own activities and those of other agents. SWEA's steering and planning process is in relation to the EU, the Riksdag (parliament) and Government described in Figure 25.

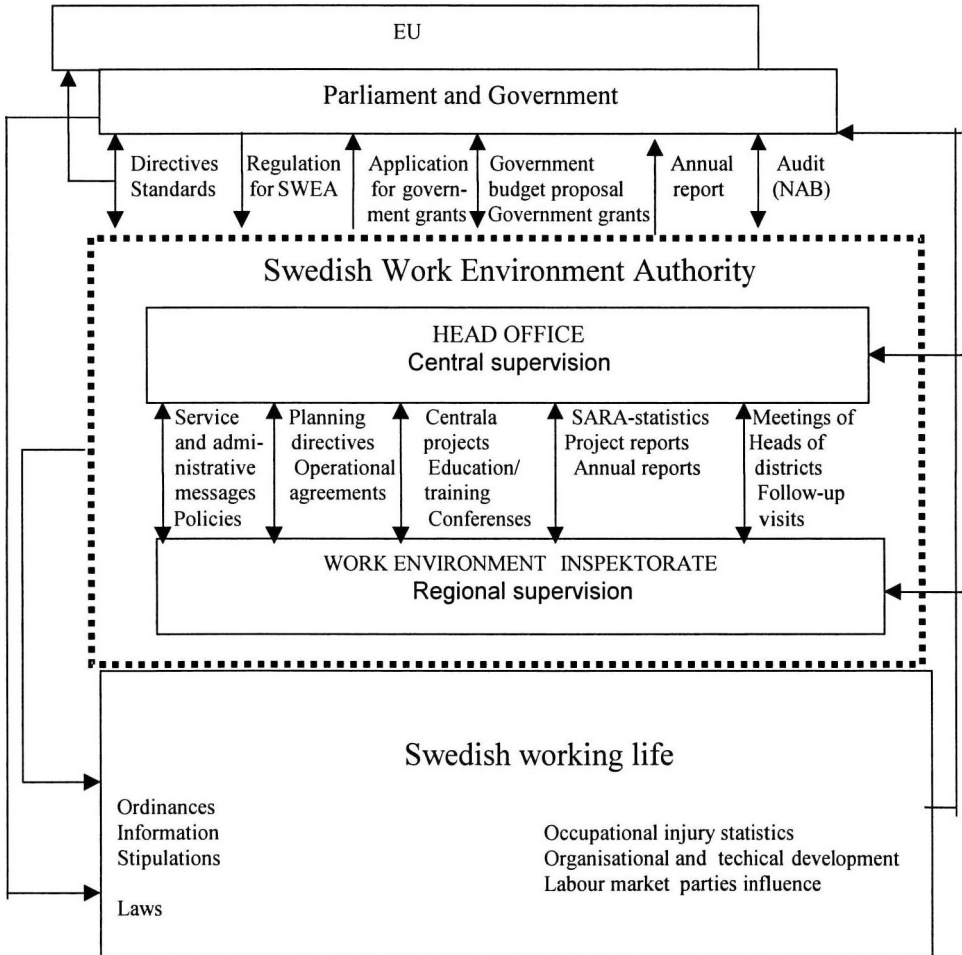


Figure 25. SWEA's steering and planning processes (update of YI 1999).

The European Union

As a result of its accession, first to the EEA and then to the EU, Sweden is committed to implementing the rules of the European Union. Swedish work environment regulations, then, are greatly influenced by the EU.

Within the work environment sector there are two types of EC Directive. One of them, known as the Minimum Standard Directive, leaves each Member State at liberty to have stricter legislation than the EU. Directives of this kind are mainly concerned with the organisation of work and workplaces. The Directives are based on Article 118 A of the Treaty of Rome (EC 1994). Product Directives, the second kind, are intended to facilitate the free movement of goods between EU countries. In principle, all Member States have to have the same legislation, thereby establishing common rules of product safety. Product directives are based on Article 100 A of the Treaty of Rome (EC 1994).

The Council of Ministers is the supreme policy-making body of the EU and as such decides on the adoption of Directives proposed by the European Commission. Through its participation in working groups reporting to the Commission, SWEA is able to influence the framing of new directives. Another possible way of exerting influence is through SWEA's participation in the Machinery Committee which advises the Commission on safety provisions applying to machinery within the EU.

Appropriation warrants

During the past 20 years, the Government has considerably altered the way in which SWEA is controlled. These alterations have moved from a static, detailed control through legislation and other statutory instruments to management by objectives involving remits, follow-up requirements and feed-back reporting. The appropriation warrants (Regering 1978-1999) issued by the Swedish Government define the framework within which SWEA is able to act.

Annual reports and budget allocations were first introduced through the appropriation warrant for 1982/83. Guidelines for the planning of measures during the fiscal year were first introduced in 1991. From 1992 onwards, budget planning was made to cover a three-year period, and appropriation warrants of this kind now define objectives, indicate results to be achieved, define remits and make requirements with regard to feedback reporting. The 1993/94 appropriation warrant called for a strengthening of SWEA's supervisory role. The 1997 appropriation warrant called for feedback reporting to a greater extent than previously,

and these requirements were further accentuated in 1998 (Regering 1978-1999).

Operationally this has meant a focus on more concrete objectives, such as prioritisation of measures to combat musculoskeletal injuries under the operational programme for 2000-2002 (NBOSH 2000d). The 1997 appropriation warrant called for a substantial increase in the proportion of employers with systems of internal control (Regering 1978-1999).

Planning Directives

The operational programme is a three-year planning document setting out SWEA's strategies for the attainment of priority targets. 45% of total working time has to be devoted to areas defined in the operational programme (NBOSH 2000d). The Agencies Agreement, as the annual planning instrument, defines annual targets for divisions and units. In the operational programme for 1997-1999, agriculture and forestry were priority fields, and for operations between 2000 and 2002, the work environment of SMEs and musculoskeletal ergonomics have priority, conjointly with other targets (NBOSH 2000d).

Impact assessment

The Government Agencies Ordinance (SFS 1995) requires NBOSH to carry out an impact assessment before issuing Provisions. This impact assessment has to describe the regulatory change planned, investigate anticipated effects and present cost-benefit calculations for them. In addition, the supportive documentation for the calculation has to be presented, together with the apportionment of costs and benefits, and it also has to be shown that these calculations have been based on consultations between the labour market parties. A brief example of the critical appraisal of an impact assessment will be found in point 4.4.

Provisions and responsibility for the work environment

The framework for SWEA Provisions is defined by the Work Environment Act (SFS 1977a) together with EC Directives. The present Work Environment Act (WEA) was passed by the Parliament in 1977 and by 2000 it had been amended 18 times. A summary of WEA will be found in App. 2.

The introduction of the contractor system has entailed problems regarding the apportionment of work environment responsibility in forestry. The following is a summary of a memorandum on Work Environment Responsibility, issued by the Legal Affairs Unit of NBOSH:

“In the case of persons engaged in forestry work with their own machinery and mainly working for one and the same principal, safety responsibility under the Work Environment Act is construed as follows. A person undertaking work with a forestry machine is normally to be regarded as an employee of the owner of the timber, on condition that he is permanently associated with that owner and has been made part of his operation. The crux is whether the operator/owner, all things considered, has the same position, economically and organisationally speaking, as an employee. One prerequisite is for the work to be done by him personally.

“The absence of case law for the past ten years naturally makes it uncertain how the above mentioned situation would be regarded by a court today. In the absence of judicial decisions, NBOOSH has no call to change its policy” (Ehrenheim 1995).

The provision which, together with WEA, are of importance for forestry are briefly summarised below and presented in App. 2. For forestry enterprises they comprise: “Internal Control of the Working Environment” (AFS 1996:6), superseded as from 2001 by “Systematic Work Environment Management” (AFS 2001:1). The Provisions relating to forestry machinery are: “Ergonomics for the Prevention of Musculoskeletal Disorders” (AFS 1998:1), “Use of Work Equipment” (AFS 1998:4) and “Machinery and Certain Other Technical Devices” (AFS 1994:48). Earlier the Provisions on “Tractors and Self-Propelled Working Machines” (AFS 1985:6) were most important where forest machinery was concerned. Today this last mentioned Provision only applies to tractors. Implementation of the Provisions on “Machinery and Certain Other Technical Devices” (AFS 1994:48) is described, together with the more detailed workings of Market surveillance, in **Market Surveillance**.

The Provisions established the basic preconditions for undertaking the projects **Market Surveillance**, **Safety Instruction** and **Follow-up**, for which reason the following summary is offered.

- Internal control

The Provisions on “Internal control of the working environment” (AFS 1996:6) require employers to organise work environment management properly within the enterprise and to have routines for the work of internal control. Internal control of the working environment is defined as “systematically planning, conducting and following up activities so as to

meet the requirements relating to the work environment.” Those requirements are set out in the Work Environment Act, the Work Environment Ordinance and SWEA Provisions. Further to this topic, see “Entreprenörer i skogsbruket – internkontroll av arbetsmiljö” (Andersson et al. 1996).

- Ergonomics for the prevention of musculoskeletal disorders

The Provisions on “Ergonomics for the prevention of musculoskeletal disorders” (AFS 1998:1), lay down that “work shall be arranged and designed in such a way that risks or health-endangering or unnecessarily fatiguing physical loads are averted. The employer shall see to it that work which is one-sidedly repetitive, closely controlled or restricted does not normally occur.” Work with many forestry machines is distinctly one-sided and repetitive, added to which it frequently involves high standards of precision. The Provisions lay down: “If special circumstances require an employee to carry out work of this kind, the risks of ill-health or accidents resulting from health-endangering or unnecessary fatiguing physical loads shall be averted by job rotation, job diversification, breaks or other measures which enhance the variety of work.”

- Use of work equipment

The Provisions on “Use of work equipment” (AFS 1998:4) are a transposition of the Council Directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment (EEC 1989b) and the amending Directive (EC 1995) within the scope of the Work Environment Act, and Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations (EC 1998).

The Provisions apply to “every machine, device, tool, implement or installation used in the work, including every activity with the equipment.” The organisational stipulations in App. 2 apply whenever the work equipment is used. Stipulations are made concerning maintenance and concerning special checks following an unusual occurrence. The work equipment shall be used with suitable work postures and working movements, and the employees shall be supplied with information concerning risks which use of the work equipment entails.

- Machinery and Certain Other Technical Devices

The Provisions on “Machinery and Certain Other Technical Devices” (AFS 1994:48) are a transposition of the so-called Machinery Directive (EEC 1989a). Incorporation of the Machinery Directive with the national regulations of the various EEA Member States gives common rules of safety for machinery. These rules have been mandatory for most machines since 1995. AFS 1994:48 defines basic health and safety requirements for products and entails greater stipulations than previously on the manufacturer and concerning his product liability. Among other things this means new requirements concerning in-house documentation and concerning the documentation which accompanies the machine. For every machine manufactured, the manufacturer or importer shall have issued a certificate of conformity in Swedish. A further stipulation is that machines meeting all the health and safety requirements of AFS 1994:48 shall be marked with the letters CE. Some machines, e.g. HTVs, agricultural tractors and forestry tractors, are exempted from AFS 1994:48. Most machines used in Swedish forestry, e.g. forwarders and harvesters, come under AFS 1994:48.

The Provisions on “Power Chain Saws” (AFS 1990:7) and “Brush Saws” (AFS 1983:7), which were superseded in 2000 by “Use of Power Chain Saws And Brush Saws” (AFS 2000:2), “Solitary Work” (AFS 1982:3), “Design of Personal Protective Equipment” (AFS 1996:7) and “Use of Personal Protective Equipment” (AFS 1993:40) are summarised in App. 3.

Official Notices

SWEA’s Official Notices are intended to regulate a certain mode of operation for SWEA personnel, so that a given supervisory activity will be uniformly conducted by all inspectors and handling officers. The Official Notice “Market Surveillance” (NBOSH 1995, AV 2001) is one such example. It explains what market control and market surveillance imply and what measures are to be taken in the event of infringements.

4.2.3 Resources and working procedures

Personnel

SWEA in 1999 had about 600 employees, viz. 400 at the Labour Inspectorate and 200 at NBOSH. Forestry, agriculture and horticulture are covered by 24 inspectors operating in ten districts. As they are responsible

for other branches than forestry, their estimated time for forestry matters would be equivalent to nine full-time inspectors. Three inspectors have forestry qualifications. During the past ten years, one inspector with forestry training has been recruited. The SWEA Head Office staff includes one person devoting about 60% of working time to the forestry work environment.

Given the importance of SWEA personnel maintaining their professional competence, they need to attend relevant conferences in the forestry sector, such as the annual Forestry Week convened by the Swedish Forestry Association and the development conferences organised by SkogForsk. The biennial forestry fairs provide important information on machinery developments in the industry. The standard of technical knowledge is raised by various working groups observing technical development, and one way of disseminating knowledge is through the biennial working conferences for inspectors. At these conferences, results from joint projects are presented, new Provisions are introduced and complicated work environment issues are discussed.

Working procedure

SWEA's basic working procedure in 2000 is described in Figure 26. SWEA implements the regulations through a host of different activities for the achievement of its goals.

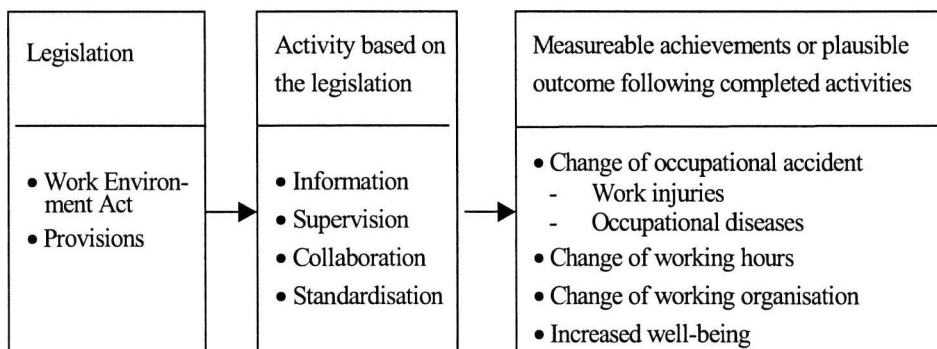


Figure 26. SWEA's basic working approach.

Social and technical developments impact on SWEA's structure, organisation and working procedures. Figure 27 illustrates SWEA's interaction with industrial forestry, a number of forestry-related organisations, the Government and the EU. The main influence on SWEA

comes from business enterprise itself and through its and society's organisations. As mentioned earlier, the Government controls SWEA, for example, through the medium of appropriation warrants and the Government Agencies Ordinance. EU and ILO influence means Sweden having to comply with certain Directives and Conventions, respectively.

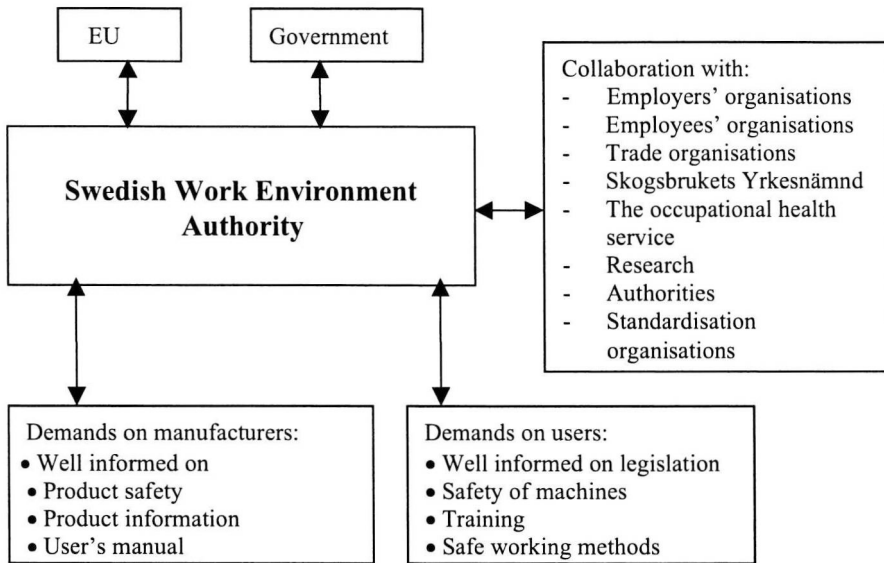


Figure 27. SWEA's interaction with industrial forestry, forestry-related organisations, the Government and the EU.

Supervision

The methodology of supervision is described in “Grundläggande regler för inspektion” (NBOSH 2000b). Supervision includes the issuing of Provisions elucidating the relevant legislation, as well as inspection and information activities. Supervision by SWEA is designed to promote and enforce compliance with the legislation, if necessary by means of injunctions and prohibitions.

SWEA's Head Office exercises central supervision as provided in WEA (SFS 1977a). It is also the task of Head Office to direct, co-ordinate and develop SWEA's activities, which among other things includes issuing planning and follow-up directives and carrying out evaluations. Head Office exercises supervisory powers in relation to manufacturers and importers of machinery.

The supervision conducted by the Authority includes, among other things, verifying the compliance of business undertakings with SWEA's Provisions, their maintenance of viable work environment management and their taking of measures conducive to a good work environment.

During 1997 the inspectors for agriculture and forestry paid 2,651 visits and issued 1,008 inspection notices. They also issued 13 injunctions or prohibitions. In some districts the number of visits in agriculture and forestry during 2000 was down on the previous year (Nilsson 2000, Wistrand 2000).

Accident investigations by the Work Environment Authority

Every year there are many incidents and occupational accidents, some of them fatal. The majority of fatal accidents occur in agriculture and forestry, on construction sites and in connection with truck-driving. The purpose of an accident inquiry conducted by SWEA is to systematically identify and clarify the causal relations underlying serious incidents and accidents and to disseminate this knowledge within the SWEA organisation and outside it (Aldrin, Synwoldt et al. 2000). The accident investigation body consists of a secretariat of five persons and a pool of experts from the whole of the Authority. The investigation body began its work in 2001 by making preparations for investigations to start in the autumn of 2001.

Advisory activities

Employees, employers and the general public turn to SWEA with questions concerning work environment regulations and their implementation. An exceptionally dangerous occurrence may lead SWEA to issue press releases. Following the destruction caused by storms in 1999, it was feared that accident rates in forestry would rise, due to an extensive use of chain saws. In a press release SWEA recommended that forestry machinery be used instead, wherever possible, for dealing with windthrows (App. 4).

Projects

Project activity is a working procedure employed both by SWEA's Work Environment Inspectorate and Head Office. Some projects are conducted on a joint basis, as in the case of "Machinery 88 – a project between NBOSH – LI for safer machinery in agriculture, garden trade and forestry" (NBOSH 1992b), **Market Surveillance** and **Follow-up**.

Campaigns

Campaigns often involve joint activities by SWEA's Head Office and the Work Environment Inspectorate in relation to business enterprise. Every year SWEA mounts a joint campaign in which all inspection districts take part. In the course of such a campaign, all inspectors spend two days paying inspection visits to selected undertakings. The findings are then collated at national level. The various inspection districts also mount local campaigns of their own.

One example of a joint campaign is "Supervision campaign 1996 Market surveillance concerning CE-market", in which 3,000 machines were checked in the course of visits to machine users in all branches of activity. The results showed 14% of the machines to lack CE marking. The certificate of conformity was incorrect or missing where 42% of the machines were concerned and instructions for use were lacking for 24% of them (Ahnström 1996). Similar results were obtained in **Market Surveillance**.

Co-operation

Co-operation with other national authorities, with NGOs or with interest groups is another working procedure. This results in a reciprocal exchange of knowledge about the work environment. Partners in the forestry sector include the National Board of Forestry, County Silviculture Boards, the National Road Administration, OHS (Hälsan Sverige), the Swedish University of Agricultural Sciences (SLU), the National Federation of Swedish Forest Owners' Associations, the Forestry Research Institute of Sweden (SkogForsk), the Swedish Forestry Employment Centre, the National Organisation of Off-Road Driving Instructors (Terränghjulingutbildares Riksorganisation), Trade Unions (the Swedish Forest and Wood Trade Union) and the Confederation of Swedish Enterprise.

Results of this kind of co-operation include, for example, the industrial agreement on off-road vehicles (NBOSH 1991). That agreement lays down technical requirements for the machines, training requirements for operators and instructors and requirements concerning the construction of a training circuit (NBOSH 1991). Another industrial agreement which operated until the Machinery Directive began to be applied in Sweden required harvesters to be fitted with safety windows not less than 12 mm thick (Plevin 1999, Wahlström 1999).

Seminars are another form of co-operation, and an excellent means of conveying a message to a limited group, e.g. manufacturers of forestry machinery. During the spring of 1999 a seminar of this kind was held on the subject of hazards associated with parts of the chain from the saw to a harvester flying off due to a chain break.

It was made clear to manufacturers that it was their responsibility to eliminate risks of such chain fractures occurring and to take other measures to ensure that no one was injured. The most suitable expedient, as always, is for risks to be dealt with primarily at source and in the second instance for protection (safety glass, cab armour) to be reinforced at the same time as the machine user is sufficiently informed to prevent injuries to others (Synwoldt 1999c).

The “Work Environment File” is one example of SWEA’s co-operation with the Swedish University of Agricultural Sciences, forestry companies and forest owner associations, enabling SkogForsk to publish information material on the work environment (SkogForsk 1999). That information material is now also accessible on the Internet. It is annually updated in partnership with the above mentioned organisations, businesses and institutions. Another way for SWEA to communicate and exchange information and experience with working life is through meetings with corporate safety officers. Meetings of this kind are held once or twice annually together with the larger forest companies.

Co-operation with the research community

Up until 1987 NBOSH had its own research department, which was then hived off to form the Institute for Working Life. One of the problems of having a research department within the Board was felt to be that publications from the department were liable to be misinterpreted as policy statements from the Board itself.

Today, however, there is no systematic co-operation between SWEA and the Institute for Working Life. Certain points of contact existed at the beginning of the 1990s, with reference to the ergonomics of operators’ cabs. In 200 the Labour Inspectorate in the north of Sweden established contact with the Institute for Working Life in Umeå to continue the follow-up of the AND project.

SWEA collaborates with other research institutions in searching for the answers to relevant questions. One such example is Follow-up, which included collaboration with SLU Garpenberg, later the Dalarna University

College. In another project, undertaken conjointly with the Industrial and Organisational Psychology Unit, Umeå University, an inspection method (PSI) was devised for systematic work environment management (Strangert and Andersson 1998).

Statistics

SWEA has a statistics division tasked with gathering data on occupational injuries. The division is responsible for the content, development and operation of the Occupational injuries Information System (ISA), encoding occupational accidents and occupational diseases, production of official occupational injury statistics and the retrieval, processing and analysis of occupational injury statistics. Users of the statistics include the Authority's personnel, e.g. with a view to selecting areas or machinery on which to focus their efforts to reduce occupational injuries and occupational diseases. Employers and self-employed persons are duty bound to report occupational injuries to the Social Insurance Office, which in turn forwards the information to ISA. The descriptions of the course of events and likely causes supplied in the occupational injury report form are often deficient. In a survey of 195 occupational injury reports, only 11% contained a description of acceptable information value. A targeted description of measures to prevent the injury being repeated was included in 6% of the occupational injury forms, 64% contained no such description at all (Kemmlert et al. 1989). The ISA statistics do not include all accidents occurring. Reporting is not complete, and dropout varies from 50% to 66% (NBOSH 1999a, Engsås 1993a). Deficiencies of reporting apply mainly to the categories of "self-employed forest owners" and "contractors". Care should therefore be taken not to draw over-extensive conclusions from the statistics where these groups are concerned.

Occupational injury insurance

As mentioned above all occupational injuries, have to be reported (SFS 1977b). Where many injuries are concerned, there is no direct economic incentive for making a report, since for the first fortnight sick pay is provided by the employer (NBOSH 1999a). Between 1997 and 1999 the Social Insurance Office approved only 23% of the musculoskeletal injury claims filed with the Social Insurance Office. The corresponding figure between 1994 and 1996 averaged 37% (NBOSH 2000c). Occupational injury insurance in Sweden is co-ordinated with health insurance, regardless of the duration of sickness absence. Occupational injuries, then, do not qualify for any special form of sickness allowance, but permanent reduction of work capacity can qualify for an annuity out of

occupational injury insurance. This is subject, among other things, to work capacity being reduced by at least one-fifth and to the annual loss of income equalling at least a quarter of the social insurance base amount (RFV 1991). Nowadays only annuity cases are investigated by the Social Insurance Office.

4.2.4 Co-operation with other countries

Co-operation between SWEA and sister authorities in the Nordic area is firmly established, above all through co-operation in the standardisation context. Co-operation is partly co-ordinated through the Nordic Council of Ministers.

Contacts with continental EU countries are less well developed, and those with sister authorities elsewhere in the world are only sporadic. There is considerable scope here for a future streamlining of EU work environment activities through international co-operation. Development of this kind is usually benefited by the high level of proficiency in foreign languages among SWEA personnel. The projects **Market Surveillance** and **Safety Instruction**, for example, entailed contact with foreign manufacturers. Usually these contacts proceed through the importer or the sister authority in the country concerned, but this time direct co-operation was possible in individual instances, in the form of personal contacts with the management of the machine manufacturing company.

In addition, seminars are held where the participants include persons from other countries with a knowledge of work environment affairs. The reference group for “Nordic ergonomic guidelines for forestry machinery” (Gellerstedt et al. 1998) is one such example. Experts from Sweden, Finland, Denmark and Norway took part. These ergonomic guidelines make it possible to classify forestry machinery with reference to tasks and ergonomic requirements. The stipulations of the guidelines exceed the requirements of the Machinery Directive (EEC 1989a).

At international level, co-operation also occurs with the ILO, within which organisation Sweden has for many years funded a post relating to the forestry work environment. An overview of safety work for forestry is contained in “Safety and health in forestry work” (ILO 1998).

Standardisation

Standardisation work within the European Standardisation Committee (CEN) is important, these standards being a direct implementation of the Machinery Directive. More comprehensive standardisation takes place through the International Organization for Standardization (ISO). ISO standards nowadays are often transposed directly to EN standards, thereby constituting an interpretation of the Machinery Directive.

During 2000, standardisation work was in progress with reference to forestry machinery. In these standardisation talks, it takes good arguments to gain acceptance for a safe work environment, because a number of disagreements at ISO level occur mainly between North America and the EU countries. The North Americans, for example, will not agree to lower the entry to the machine from 0.7 m to 0.4 m above ground level or to making the driving seat automatically adjustable in the horizontal plane. Another problem concerns reaching agreement on a complete test for ROPS (Roll Over Protection Structures) for excavators used as harvesters. In 1999, though, Sweden succeeded in getting a draft new ISO standard adopted concerning content and design of instruction manuals for forestry machinery (Synwoldt 1990).

ILO Convention No. 129

Sweden has to meet the requirements of ILO Convention No. 129, ratified in 1970, concerning Labour Inspection in the fields of small-scale forestry and agriculture. That Convention stipulates tasks for the Labour Inspectorate. They include securing the implementation of statutory provisions on working conditions and on the protection of workers at work. Provisions exist on working time, pay, weekly rest and holidays, workers' protection, health and welfare, and the employment of women, children and minors. It is further provided that the Labour Inspectorate shall supply technical information and advice to employers and workers concerning the most effective means of complying with the legal provisions.

Other aims of the Convention are concerned with there being a sufficient number of inspectors in the appropriate geographic locations and with relevant powers, such as the right of intervention as regards defects observed in plant layout or working methods.

SWEA's Work Environment Inspectorate shall be notified of accidents. As far as possible, inspectors shall be associated with any enquiry on the

spot into the causes of the most serious occupational injuries, particularly of those which affect a number of workers or have fatal consequences. Furthermore, in its annual report the central inspection authority (SWEA) shall deal with laws and regulations relevant to their work. Finally the Convention requires the following statistics to be reported: the number of agricultural and forestry undertakings, inspection visits, violations and penalties imposed, occupational accidents and occupational diseases, including their causes (ILO 1969). The Convention is assumed to have influenced the development of SWEA's working procedure.

FSC certification

In Sweden, representatives of the forestry undertakings, the environmentalist movement and trade union have devised a standard within the general framework of the Forest Stewardship Council (FSC). The FSC, formed in 1993 as an international membership organisation, has laid down general principles and criteria for responsible and sustainable use of the world's forests from an environmental, social and economic viewpoint. Members include environmentalist organisations, popular movements, forestry undertakings and timber merchants. One of the FSC's ten principles concerns the rights of employees (Skogsvårdsförbund 1998). The SWEA unit responsible for forestry sees an advantage in the rights of employees with regard to the work environment being strengthened if possible through FSC certification. It is the trade unions that have obtained provision for workers' rights in the FSC standard. SWEA does not really have any possibility of influencing this FSC standard, but it does monitor the standard's compliance with current work environment legislation.

Organisational structures in other countries

The organisation of work environment activities in Sweden is just one of a number of possibilities, as witnessed by the following examples from Norway, Finland and Germany.

Norway has an organisation for work environment supervision resembling Sweden's before 2001 (Engdal 2001). In Finland as in Sweden, work environment supervision is organised on a district basis, but Finland does not have an equivalent of the SWEA Head Office. Instead the tasks of Head Office are directly allocated to the districts and to the Ministry of Health and Social Affairs (Tuomarila 1999). Activities in Norway and Finland, as in Sweden, are funded through the national budget.

Germany has opted for a different form of organisation. The overarching national agency there is a “Board for the control of occupational activity” (Gewerbeaufsichtsamt) in each state, headed by the Ministry of Social Affairs (Hartenbach 1999). A great deal of the direct practical work is done by a “Work Environment Inspectorate” (Berufsgenossenschaft) which at the same time acts as an insurance company. Owners of forest or agricultural land are under a statutory obligation to become affiliated to this insurance company. Activities are funded out of direct charges paid by the affiliated landowners. The charge payable consists of a basic rate and an amount geared to forest acreage.

4.3 Initiatives by the Swedish Work Environment Authority

Effects of SWEA’s initiatives with reference to the forestry work environment are presented below with the aid of the projects **Market Surveillance**, **Safety Instruction** and **Follow-up**. These projects, the methods for which were described in Section 3, shed light on the results of SWEA’s remarks or stipulations vis-à-vis employers, machine users and machine manufacturers.

The Project “Contractors in forestry – internal control of the work environment”, conducted by an inspection district (Andersson et al. 1996), was important for the implementation of the Provisions on Internal Control. The undertakings are themselves responsible for systematic work environment management. If that management is conducted in accordance with the rules, a reduction in occupational injuries should follow.

Up till now, self-employment in private forestry has generated many fatal accidents. To illustrate the measures taken by SWEA, a further project will be described, namely “Accidents in private forestry” (Carlsson, Synwoldt et al. 1998).

The summary of occupational injuries below illustrates whether these initiatives can be linked to a reduction in the number of occupational injuries or fatal accidents. The summary shows the change in the number of occupational injuries over time (Fig. 29) and the issuing of Provisions in chronological sequence (Fig. 30).

4.3.1 Market surveillance of machinery

The SWEA Provisions on “Machinery and Certain Other Technical Devices” (AFS 1994:48) and their implementation were evaluated through the project **Market Surveillance**. The purpose of these provisions is for manufacturers to build safe machines which can be used without causing occupational injuries. The project focused on manufacturers and importers of new machinery for forestry, agriculture and horticulture. **Market Surveillance** was concerned with verifying compliance with the health and safety requirements of the Machinery Directive. The manufacturer documents this compliance with a “certificate of conformity” and CE marking. A check was also made of machine type labelling and warning labels, and also to see whether an instruction manual was provided. In the course of the project, questions were asked concerning the manufacturer’s compliance with the Provisions “Machinery and Certain Other Technical Devices” (AFS 1994:48), whether the Provisions were available and whether the “safety message” had been comprehended. Control of equipment was dispensed with in this supervisory initiative, owing to the large number and variety of machines involved. Instead a check was made later, through an initiative targeting the groups of machines presenting the greatest work environment hazards according to the available ISA statistics. During 1999, for example, a project was in progress to check the safety of farm tractors (Synwoldt 1999d) and in 2000 another concerning agricultural machinery driven from the power take-off of a tractor (Synwoldt 2000b).

The **Market Surveillance** project required an input of 100 working days by 14 inspectors and a handling officer, including 15 days’ training before the project started. Inspection visits occupied 50 days, compilation of the results took 20 days and project evaluation required 15 days.

In addition to constructing appropriate and functional machinery, the manufacturers also have to meet the safety requirements of the Machinery Provisions. Knowledge of the rules issued by SWEA is an important prerequisite for this. In the **Market Surveillance** project, it was established that, following information measures addressed to undertakings, the number in possession of the relevant rules had doubled to 88%, compared with the “Machine 88” project undertaken previously (NBOSH 1992b).

Information can also be difficult for manufacturers/importers to understand and use. Of the 100 undertakings visited, 63 had the Provisions on “Machinery and Certain Other Technical Devices” (AFS 1994:48). The Provisions were used by 48 undertakings, but half of these reported difficulties in interpreting the rules. The main reasons were as follows. Twelve undertakings stated that AFS 1994:48 was difficult to read, seven had specific problems of interpretation and four, believing that they could not interpret the Provisions at all, engaged consultants. One general cause of these problems was that the Provisions were not written in good Swedish, added to which the Swedish translation presented a number of inaccuracies. The results of **Market Surveillance** can be compared with “Machine 88”, in which a lower proportion, 33% of 100 undertakings, using the Provisions reported difficulty interpreting the precursors of the Machinery Directive which were included in that survey (NBOSH 1992b).

In **Market Surveillance** it was asked whether ignorance of the rules and difficulties of interpretation could account for certificates of conformity with the health and safety requirements of the Machinery Directive being absent from over one-third of the machines, or barely a quarter being CE marked and for more than one-fifth being unaccompanied by instructions for use. Although instructions were already stipulated in earlier Provisions, 94 of the 433 machines checked did not have them. NBOSH took the view that this deficiency would have to be remedied, and requested the undertakings to compile the instruction manuals that were lacking. Just over a year after the commencement of the project, it was established that all machinery included in the project was accompanied by instructions in Swedish.

In the evaluation of the project, the inspector reported that the great majority of undertakings had responded favourably to the visits and that contacts with the undertakings had been good or very good. The undertakings for their part appreciated receiving direct information from SWEA.

During the European Conference on Market Surveillance, in Stockholm in 1997, it emerged that the other EU countries did not have any documentation concerning previous Market surveillance of machinery. On the subject of personal protective equipment, Spain was able to give an account of how its manufacturers/importers complied with the certification requirements of the Machinery Directive (Bahima 1997).

4.3.2 Instruction manuals for forestry machinery

As mentioned earlier, forestry in the past 20 years has moved from corporate employment to logging by contract. This means that knowledge of the work environment has to be communicated to a large number of people working independently and not, as a rule, having any safety organisation at their disposal. The importance of having a complete instruction manual for the avoidance of accidents and musculoskeletal injuries has correspondingly increased.

To facilitate a scrutiny of instruction manuals, a Swedish guide was compiled, entitled in translation “Content and design of instruction manuals for forestry machinery” (Synwoldt 1990). These recommendations were intended to assist manufacturers and importers with the writing of instructions. In order to reach a wider circle of users, the manual was subsequently enlarged so as to include all mobile machinery (Synwoldt 1994a, 1998). In the **Safety Instruction** project, a check was above all made of safety provisions, in view of their fundamental importance for the safe handling of forestry machinery. Following the scrutiny of instruction manuals for seven different forestry machines in 1990, the deficiencies were conveyed to the seven manufacturers/importers, who were called upon to review their instruction manuals. At the same time the guide was also distributed to all the other manufacturers/importers.

In **Safety Instruction**, the number of missing or inadequate safety instructions in the instruction manuals from 1990 was found to be between 13 and 32 per book. In the 1998 instruction manuals, the corresponding figures were four and 15 per book respectively. In the analysis of the safety instructions, the following factors were identifiable as possible causes of the deficiencies: the manufacturers had not understood the requirements of the rules; there was no good quantitative method for showing that the requirements of the Provisions were satisfied; the manufacturer believed the information to be an organisational matter to be resolved by employers/machine users; machine manufacturers do not realise that increased performance can also mean added risks; and particulars of recommended use were not rated sufficiently important, or else, were considered self-evident.

In **Safety Instruction** it was shown that the quality of the various sections of the instruction manuals (Tab. 1) had improved between 1990 and 1998.

The improvement was estimated at between 0.4 and 1.3 units on a five-point scale, with 1 implying that no data are available and 5 that the minimum requirements defined by NBOSH are satisfied. In particular, data concerning technical systems, maintenance and care and starting and running instructions have greatly improved. Even so, there are great differences between individual manufacturers. It was found that most manufacturers were using the report “Content and design of instruction manuals for mobile machinery” (Synwoldt 1994b) when writing the instructions for their forestry machinery. This was clearly apparent from the second check in 1998 (Synwoldt 1999a). The **Safety Instruction** project, with data for scrutiny included, occupied one handling officer at NBOSH for 100 working days.

Table 1: Qualitative development of the instruction manuals, 1990-1998 (Synwoldt 1999a)

Year	1998	variation	1990	variation
Technical data	4.1	(3 - 5)	3.4	(1 - 5)
Safety instructions	3.3	(3 - 4)	2.4	(2 - 3)
Technical systems	4.3	(4 - 5)	3.4	(2 - 5)
Fire-fighting systems	3.7	(1 - 5)	2.4	(1 - 5)
Other equipment	3.1	(3 - 4)	2.3	(1 - 5)
Care and maintenance	4.6	(4 - 5)	4.0	(3 - 5)
Starting and running instructions	4.3	(4 - 5)	3.6	(3 - 4)
Fault location routines	2.0	(2)	1.6	(1 - 2)

5 – Minimum SWEA requirements satisfied, 4 – Minor deficiencies, 3 – Deficiencies,

2 – Major deficiencies, 1 – No data

() lowest and highest assessment values

Thus the initiative taken by NBOSH at the beginning of the 1990s yielded positive results in the form of better instruction manuals. This is shown by the 1998 scrutiny, there in all sections is a better result compared with 1990 (Tab. 1). After contacting the manufacturers, the NBOSH handling officers established that they had remedied the deficiencies or lack of safety instructions in the 1998 instruction manuals. The undertakings took a very positive view of the scrutiny, and after the project had ended, three of them – Valmet, Gremo and Rottne – asked for their new instruction manuals to be examined before publication.

4.3.3 Ergonomic initiatives in forestry

Musculoskeletal disorders (especially pain in the neck and shoulders) have long been known to exist among machine operators in Swedish forestry

(Bostrand 1984, Lidén 1989 and Axelsson and Pontén 1990). In 1994 representatives of the forestry industry noted “Now it’s for real!” when NBOSH proposed regulating working time with forestry machinery in detail by issuing a contractor with an injunction. They realised that vigorous action would have to be taken to deal with musculoskeletal injuries, but in their opinion strict regulation of working hours would not solve the problem. It would also impede the development of Swedish forestry. NBOSH then agreed to shelve the matter for two years, pending a solution by the industry itself (Hagberg and Ronström 1996).

The forestry industry responded: “We must bank on developing the work environment AND production.” This was the origin of the so-called AND project, the purpose of which was to support a process of development aimed at solving the problem of musculoskeletal injuries by making the work environment an integral part of line activities. Work planning, appropriate shift systems and a work schedule including a suitable number of breaks are some of the measures providing variation at work. Management by objectives, co-operation and collective responsibility for the work environment of one’s own employees and of contractors engaged were among the key words in the project manifesto.

The measures taken in the **Follow-up** project were addressed to machine operators and aimed at the avoidance of risks leading to musculoskeletal disorders or occupational accidents. **Follow-up** describes the results achieved with an arrangement whereby information for the forestry industry was managed by its own project group. In addition to evaluating the forestry industry’s AND project, the follow-up was concerned with keeping the AND process alive and developing the work environment through discussions with working teams and management. The resource requirements of the **Follow-up** project totalled 600 working days for six inspectors and a handling officer from NBOSH. Preparation of the project took 100 working days, visits to undertakings (working teams and managements) took 300, compilation of the material took 150 and evaluation of the project in the forestry undertakings took 50 days.

After the interviews the inspectors noted, on the part of both employers and employees, a higher level of awareness concerning risks of

musculoskeletal disorders than during the visits paid at the beginning of the 1990s (Persson, Andersson 1998). The visits were appreciated by working teams and managements.

In the follow-up of the AND project, about 20 questions were answered in interview form with reference to a checklist covering musculoskeletal disorders, working hours, ergonomics, job satisfaction, planning and accident preparedness. The questions covered a wide span and were supplemented by detailed questions in a personal questionnaire. The detailed questions had a response rate of between 25% and 50% each, which made the results difficult to evaluate and use in the evaluation of the project.

Follow-up yielded the following results:

The proportion of forestry machine operators reporting musculoskeletal disorders was 40% (n=794) in 1994/95 and 34% (n=1099) in 1997/98. On both occasions 18% of the forestry machine operators reported being so fatigued by work that it encroached on their leisure between once a week and daily.

Disorders of the neck and shoulders were commonest, accounting respectively for 34% and 26% of those reporting musculoskeletal disorders in 1997/98. In a survey of 1,174 machine operators in the end of the 1980s, 50% reported musculoskeletal disorders of the neck/shoulder (Axelsson and Pontén 1990). These studies are hard to compare, however, since they were based on different methods.

Working methods and work organisation with scope for independent planning, favourable shift arrangements, more job variation and breaks are considered to reduce the risk of musculoskeletal disorders (Pontén 1988, Hagberg and Ronström 1996). Questions on this subject were therefore included in the project (Andersson, Synwoldt et al. 1999). Work other than with forestry machinery for at least two hours daily increased somewhat between 1994/95 and 1997/98, and job alternation between harvester and forwarder increased by upwards of 10 percentage units during the same period (Fig. 28).

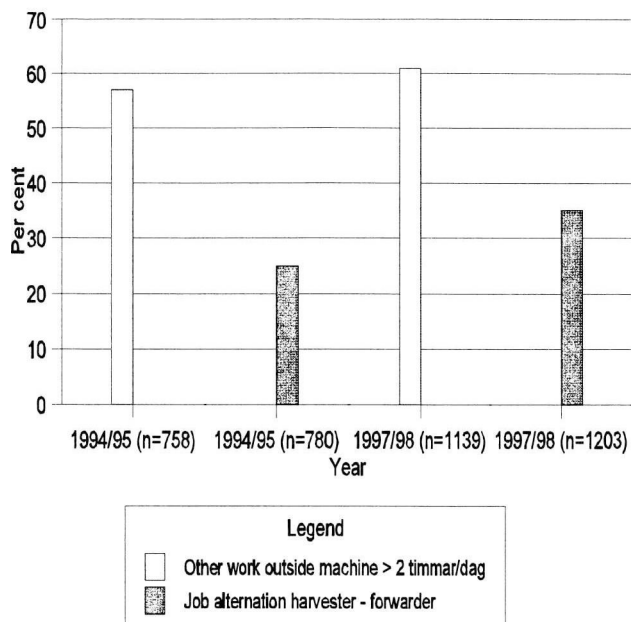


Figure 28. Number of forestry machine operators with more than 2 hours' other work outside machine daily and with job alternatio between harvester and forwarder, 1994/95 and 1997/98 (Synwoldt,Gellerstedt 2000).

To facilitate at least two hours' other work and, accordingly, job variation daily, access is needed to other duties, such as grading, cleaning, environmental certification and extra service jobs. Job alternation is only made possible by 3+3+3 (3 hours' machine work, 3 hours' other work including a meal break, 3 hours' machine work) and "other shift systems" (Tab. 2). About 90% of the forestry company employees and slightly above 40% of the contractors used these shift systems, as became evident in **Follow-up**.

Table 2. Percentage breakdown of forestry machine operators between different types of shift work (after Andersson, Synwoldt et al. 1999).

Type of shiftwork, %	Forestry company employees		Contractors with employees	
	1994/95 (n=235)	1997/98 (n=329)	1994/95 (n=556)	1997/98 (n=824)
8-hour day	3	2	11	12
More than 8-hour day	1	2	14	8
8-hour double shift	6	6	28	27
Overlapping 3+3+3+6* hours shift	89	87	41	43
Other form of shiftwork	1	3	6	10
<i>Total</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>
Night work (24 – 05)	13	1	9	5

* 3 hours (h) machine, 3 h ground work (meal break included), 3 h machine, 6 h straight evening shift

Grading and cleaning mean working outside the machine. In **Follow-up** in 1997/98, 47% of the forestry machine operators interviewed stated that they could do grading work on snow-free ground, while 45% stated that they did cleaning work in stands with dense undergrowth. Half the total number of machine operators were able to find meaningful tasks to vary their work. In addition, cleaning simplifies cutting operations for the harvester operator.

4.3.4 Systematic work environment management

The Provisions “Internal Control of Work Environment” (AFS 1996:6)⁵ were above all aimed at using systematic work environment management, conducted by employers in partnership with employees, as a means of reducing occupational injury risks. Through training and information the Umeå Inspection district wanted to give forestry contractors a better chance of complying with the requirements of these Provisions. Upwards

⁵ Superseded by “Systematic Work Environment Management” (AFS 2001:1)

of 80 undertakings with between two and ten employees each received written and verbal information about the Provisions.

Supervision of work environment conditions was then carried out with the aid of project-based systematic inspection (PSI) (Strangert and Andersson 1998) of 28 randomly chosen contracting enterprises, and also on the basis of reports by the contractors themselves. The PSI method includes several different activities, systematic inspection being the most essential of them. The main focus is on the inspection of control processes. Supportive structures of internal control and observations of the work environment are also included. A follow-up of the effects of these information measures showed the greater part of the forestry contractors to have integrated the work environment relatively well with their operation and to command a fairly good overall view of things. Co-operation with employees was predominantly good. Routines existed for mapping problems and knowledge gaps, and for remedial planning, follow-up included. Difficulties were encountered, however, in reconciling work environment considerations with the exigencies of production, in co-ordinating resources and in maintaining good working methods and good organisation (Andersson et al. 1996). Summing up, the results of the follow-up show these initiatives to have contributed towards a positive development of internal controls.

4.3.5 Private forestry

The relatively high accident rate of private forestry prompted “the Accidents Project in Private Forestry”, in which the silviculture organisation, the forest owners’ movement, SWEA, the Occupational Health Agency for Forestry and Agriculture and SLU collaborated (Carlsson, Synwoldt et al. 1998). There were 35 fatalities in forestry work between 1995 and 1997, including 23 self-employed forest owners. Most of the fatal accidents (20) occurred in connection with chain saw work, the second largest number were associated with machinery – harvesters, forwarders, grapple loader wagons or timber lorries. A total of eight fatalities were associated with work using this kind of machinery during the period in question (NBOSH 1998).

Co-operation with the County Silviculture Board, the Occupational Health Agency for Agriculture and Forestry and the Labour Inspectorate, e.g. at Forest Days, has made it possible to develop a methodology of advisory

activity and marketing which focuses on self-employed foresters. Cooperation with implement manufacturers and equipment dealers, as well as insurance companies and adult education associations, has distinctly augmented the number of channels available for transmitting the “safety message”. Initiatives at trade fairs, e.g. at Skogs-Elmia in Jönköping in 1997, where the East Götaland Silvicultural Board, SWEA and the Occupational Health Agency for Agriculture and Forestry showed how modern technology can improve the safety of solitary work in forestry, have reached 6,000 persons. Information has been similarly provided at public forestry days. Both fatal accidents (Fig. 21) and other occupational accidents (Fig. 29) declined at the end of the 1990s.

4.3.6 Summary of occupational injuries

Statistical follow-up is one way of measuring the effects of measures taken previously. The drawback is that one cannot segregate the effects of different factors. In addition to SWEA’s initiatives, for example, the injury rate is also affected by technical developments, the economic situation, changes in working methods and the level of education. More concisely, though, the statistics can to some extent mirror the efficacy of SWEA’s work. Figure 29 shows reported occupational accidents in Sweden between 1980 and 1998. Figure 30 shows the Provisions important for forestry issued by SWEA from 1980 to the beginning of 2001. One notes that the accident rate declined during this period. Stipulations issued during the 1970s on the subject of power chain saws were presented in Figure 19.

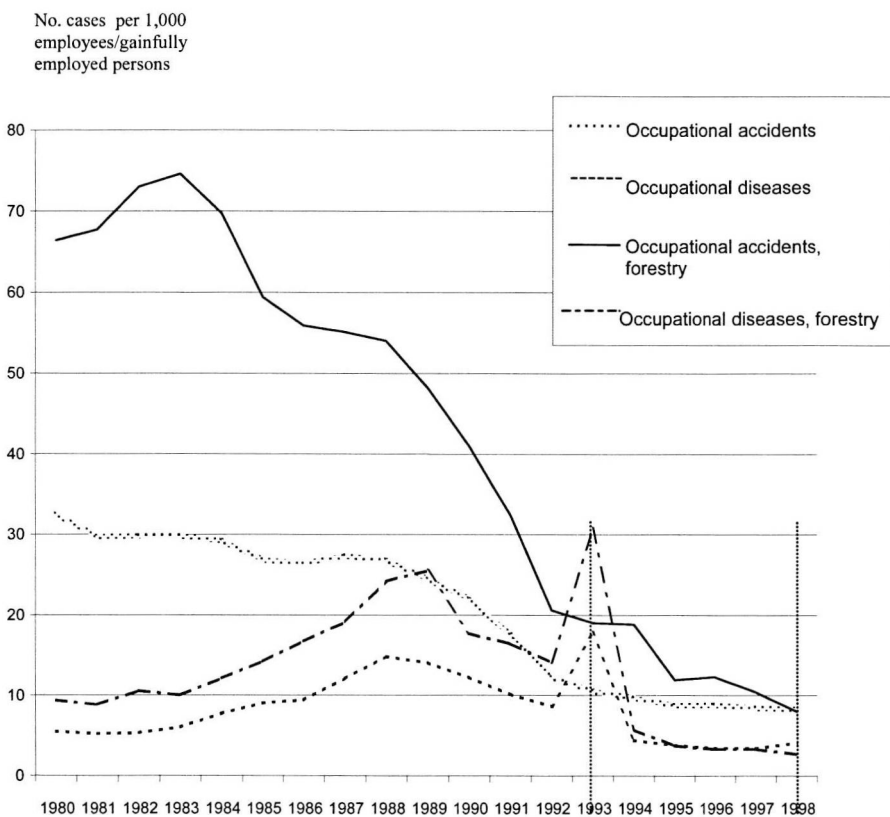


Figure 29. Comparison of occupational accidents reported per 1,000 employees 1980-1992 and per 1,000 gainfully employed (employees and self-employed persons) 1993-1998 for Sweden as a whole and for forestry (ISA).

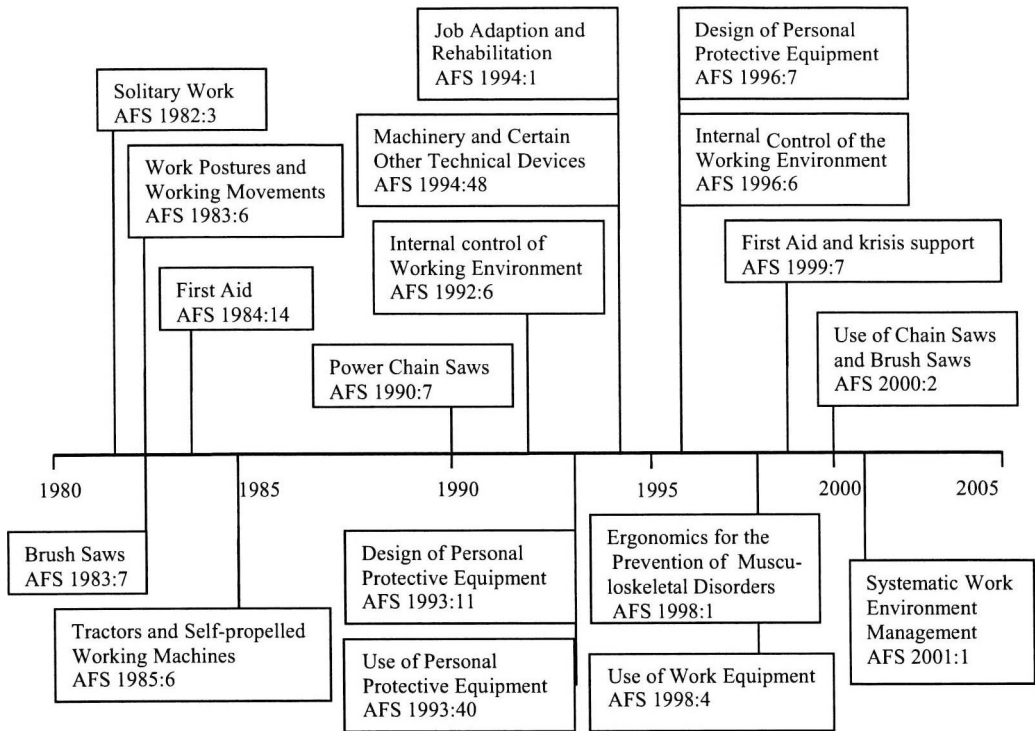


Figure 30. Provisions of importance for forestry issued by NBOOSH, 1980-2000.

A comparison of fatal accidents to forestry employees and self-employed forest owners in the Nordic countries (Nordic Council of Ministers 1994) between 1980 and 1989 showed Norway to have the highest fatality rate, 33 deaths per 100,000 gainfully employed. Denmark had 25, Finland 15.4 and Sweden, with 13 fatal accidents per 100,000 gainfully employed, has the lowest rate of all. The Finnish statistics, however, do not include self-employed forest owners, and accordingly are not comparable with the figures for the other countries.

Another way of gauging the extent of fatal accidents in forestry is to calculate the number of fatalities in forestry per 1 million forest cubic metres of timber felled. Thus 134 forestry workers died between 1980 and 1990 in Sweden in connection with the felling of 620 million forest cubic metres. Compared with other countries, Sweden comes lowest, with 0.2 fatalities/1 million forest cubic metres, as against 0.4 in Canada, 0.8 in Norway, 1.3 in Switzerland, 2.7 Austria and 6.6 in Malaysia (Axelsson 1995).

4.4 General evaluations and evaluation of Provisions

Perceptions of SWEA are presented in reports concerning the Labour Inspectorate (Andersson, A. 1995), NBOSH (NBOSH 1999b) and the Occupational Safety and Health Administration (RRV 2000). SWEA's own evaluations of the impact of new rules are presented with the aid of a few examples (Eriksson 1995, Schäfer 1997 and Eriksson 1998).

The Labour Inspectorate

The purpose of investigating the work of the Labour Inspectorate (LI) (Andersson, A. 1995) was to ascertain the attitudes of undertakings/managements to LI's activities and whether LI was perceived as a professional organisation. Evaluative questions were therefore asked. The survey covered a sample of 460 workplaces where visits by the Labour Inspectorate had resulted in inspection notices, injunctions or prohibitions. At each undertaking one employer and a safety delegate were interviewed, making a total of 399 and 383 persons respectively. The survey covered both the private and the public sector. The summary states: "The consistent and dominant result concerning the inspectors' professionalism is highly positive. Replies from the great majority convey an image of objectivity, competence, clarity and practical relations with very little sign of conflict. The majority of both employers and employees note that it pays to consult LI on matters relating to the work environment" (Andersson, A. 1995).

A survey by Kemmlert (1994) showed how visits by LI to undertakings which had reported musculoskeletal occupational injuries yielded results in the form of improved working conditions for fellow-employees in cases where the employers were issued with inspection notices.

The National Board of Occupational Safety and Health

A survey (NBOSH 1999b) was conducted to find out how NBOSH was perceived by other agents concerned, partly or wholly, with work environment issues or having reason to entertain viewpoints on the subject. The results of the survey were intended to provide supportive data for NBOSH's next operational programme, comprising an analysis of future prospects and for the operational environment. The target group for the survey comprised ministries, national authorities, labour market parties, business organisations, undertakings, municipal and county council authorities and other organisations. The sample was drawn from the NBOSH record of transactions.

482 telephone interviews were conducted, with a response rate of 95%, and 18 in-depth interviews. Concerning NBOSH it is remarked: "Summing up, the results point to an organisation whose personnel are regarded as co-operative, competent and impartial. In the quantitative study NBOSH receives especially good marks for response, knowledgability and correct, objective information... As mentioned earlier, information from NBOSH scores high marks for content and objectivity, but many feel that new content, new design and new forms of distribution are needed. NBOSH needs to become more outgoing and realistically oriented. Many respondents suggest increased contacts with business undertakings and also with education providers" (NBOSH 1999b).

The Occupational Safety and Health Administration

During 1999 the National Audit Board examined the management and operational follow-up of the Occupational Safety and Health Administration, the intention being to carry out a survey which would improve the National Audit Board's own knowledge of the Administration and also to assess parts of the Administration's steering and follow-up activities, indicating how the Administration itself views the importance of those activities. The Administration's system of financial planning and follow-up has not been examined. The National Audit Board's report, which is based on information from interviews with a number of persons in leading positions within the Occupational Safety and Health Administration and on studies of a sample of the Administration's planning and follow-up documents, gives the following assessment of the Occupational Safety and Health Administration (RRV 2000): "The Occupational Safety and Health Administration should carry out follow-up of the activities planned. Operational follow-up should be designed according to the management's information needs. The present organisation of NBOSH, as the authority in charge of the Labour Inspectorate, is an organisational problem which reduces the possibilities of the authority conducting its activities efficiently."

Evaluation of Provisions

In the mid-1980s SWEA began to evaluate effects/events. Above all, various new Provisions were evaluated, including those on power transmission shafts and work with wheels and tyres. Evaluation above all concerned the way in which information about the Provisions was distributed and whether they were read and understood by the recipient (Eriksson 1995).

It is proposed that evaluations of the future impact of Provisions from NBOOSH on society be conducted in the form of impact assessments (Eriksson 1998, Schäfer 1997).

The impact assessment of Provisions “Job adaptation and rehabilitation” (AFS 1994:1) is one such example. To illuminate the effects of these Provisions, and following contacts with the Labour Inspectorate, five undertakings with between 90 and 1,000 employees were selected in a number of districts. They were selected so as to reflect, as closely as possible, conditions in variously sized private undertakings and in public administration. Schäfer (1997) reports that the requirements of the criteria – description, documentation and communication – are satisfied, but on the other hand not those of cost investigation (Eriksson 1998, Schäfer 1997). The following problems and deficiencies are mentioned:

- Lack of quantitative data (corporate reports to the Social Insurance Office were inadequately documented; for example, it was difficult to carry out searches of the Social Insurance Office data system and to compile data at workplace level).
- Evaluation processes were poorly described (in principle, an initial and problem analysis is required in order to find the regulatory structure, as well as a summary of the implementation requirements).
- Participation by external agents contributed very little indeed to this study.
- Cost-benefit comparisons were deficient, i.e. comparisons between social, commercial and physical assessments were incomplete.

The following possible measures were suggested for improving impact analyses:

- Clarification of the difference between actual states and objectives.
- Review of possible regulation opportunities and use of consultation procedure.
- Implementation costs viewed in relation to socio-economic analyses.

- Planning of follow-up/evaluation from the very commencement of a regulatory project.

Eriksson (1998) points out that cost-benefit analyses can be expensive, which is a likely reason for their absence or inadequacy in several NBOSH impact assessments.

5 Discussion

In the present aggregation, four important findings corroborate the possibility of SWEA having a positive impact on forestry:

1. Accident rates connected with chain saw rates declined noticeably following the introduction of certain Provisions in the 1970s.
2. Forestry machinery manufacturers complied with NBOSH stipulations and recommendations concerning safety instructions.
3. A large number of manufacturers had NBOSH's Provisions available, and the majority complied with them.
4. NBOSH, acting through the forestry organisations, was able to inaugurate a discussion among machinery users concerning a change in working procedure for the prevention of musculoskeletal injuries and to bring about certain behavioural changes.

I am certain that these results are dependable, given that a large quantity of data was analysed, that the survey included forestry machinery manufacturers and importers controlling a large share of the Swedish market, that personal visits were paid to undertakings, and that a large number of machine operators were interviewed.

Still more positive results would have been achieved if the qualitative development of the instruction books in the survey had also included their user-friendliness, and if the follow-up of the And project had also included topics permitting comparisons to be made with previous surveys of musculoskeletal injuries.

As the projects progressed, discussions between SWEA personnel and machine manufactures/importers and users led to very good contacts and a growth of corporate understanding where work environment management was concerned. The possibility of inspection personnel starting to accept shortcomings because the firm is financially stretched cannot be excluded, any more than the possibility of friendly relations leading to a more lenient assessment.

5.1 Method

The author has tried to be objective, but certain subjective viewpoints cannot be excluded, given that he is employed by the organisation, though on the other hand this confers the advantage of access to a great deal of information which is not available to outsiders.

Historical description down to the present-day Work Environment Authority

For the historical description, literature was chosen describing the development of technology and workers' protection in forestry companies, accidents and ill-health and the issue of SWEA Provisions at different points in time. The author has linked these factors together with the realisation that other factors have also impacted on the work environment.

The historical description can be undertaken in a variety of ways, and a number of different variables can be included in the argument. Unemployment, economical boom periods or windthrows, all of which probably affect the frequency of accidents in forestry work, are hard to distinguish from SWEA initiatives. A qualitative description of the development of technology, working method and organisation also impinges on changes in the hazards of forestry work. Simultaneous efforts by SWEA to pin down those hazards present an opportunity of logically connecting objectives with outcomes. The degree of success can be read off from frequency and number of occupational injuries, with reservation for other conditioning factors.

No attempt was made to use sophisticated statistical methods, because the quality of several statistical data, e.g. descriptions of accidents and occupational injury frequency, was judged too low for this, added to which, several important factors were too difficult or expensive to collect. Comprehensive data material and data collection at different points in time were difficult to achieve with the Authority's own personnel. Evaluation of this kind would have been appreciably more time-consuming. The time input for Follow-up, however, was still very heavy, due to visits being paid to 400 working teams scattered over half of Sweden. In these projects, questions concerning targets and outcomes on one or two occasions proved to afford sufficient accuracy.

The projects Market Surveillance of Machinery, Instruction Manuals for Forestry Machinery and Ergonomic Initiatives in Forestry

These projects were aimed at investigating whether SWEA had succeeded in inducing machinery manufacturers/importers to comply with the safety instruction criteria of the EC Machinery Directive and whether users of forestry machinery had been reached concerning the prevention of musculoskeletal injuries. For SWEA initiatives, personnel from the Authority served as informants, data gatherers and evaluators. They had the knowledge necessary in order to carry out such measures without any very great training inputs being needed. The disadvantage of using the same persons for all stages is that the personnel evaluate their own inputs.

The target achievement model was filled with various methods for the collection and valuation of data and relations, but it could have been supplemented with a description of side-effects observed (Vedung 1994). In **Market Surveillance**, side-effects were found which could not have been foreseen. One manufacturer, for example, closed down prematurely on account of new rules for the manufacture of machinery. In the case of **Follow-up**, studies of side-effects would have meant, for example, asking questions about the personal consequences to a family or to leisure activity of changes in shift systems. In the case of **Safety Instruction**, it could have been asked, for example, what had been the consequences for the forestry machine operator and the owner of the machinery of an alarm device being stipulated.

Follow-up also includes what Vedung (1994) terms a user-oriented evaluation, since machine operators there make an assessment of the success of the AND project. **Market Surveillance** could also have been conducted among machine users, as was done with the Market surveillance campaign (Ahnström 1996). Checking upwards of 400 machines held by 100 manufacturers/importers, however, was less time-consuming than visiting the individual machine users, and so this was the strategy adopted. For the **Safety Instruction** project it was decided only to check the content of the instruction manuals against predetermined criteria. After the project, one may ask whether the evaluation would have been made more complete by also asking the user about the usefulness of the instruction manuals.

The control experiments recommended (Zavistic 1993) for effect analysis were dispensed with, because they require a control group. SWEA has no possibility, for example, of applying legislation in parts of Sweden only.

But it would have been possible to evaluate implementation in different districts, and it would, for example, have been very interesting to investigate different ways of informing machine users and forestry workers.

Any increase in knowledge relating to the work environment could also have been presented with the aid of a results analysis (Sandahl 1991). The National Audit Board (RRV 1983) defines result analysis as follows: “A systematic processing of available information, making possible a better understanding of what has been done (performance), the effects this has had and the relations between resource inputs, performance and effects”. This method could have been used if the resources had been available, in which case a cost analysis would also have been needed. Evaluations of this kind ought to be undertaken in future. SWEA has been criticised by RRV (2000) for carrying out too few follow-ups of planned activity.

General evaluations

The evaluation of attitudes to NBOSH (NBOSH 1999b) had a high response rate, and in the evaluation of attitudes of the Labour Inspectorate (Andersson 1995) replies were obtained from a large number of interviewees. The persons interviewed had had personal experience of contact with representatives of the authority. This makes for a high level of reliability. The questions asked were judged to be relevant. In addition, the consultants had had a great deal of experience of similar studies.

5.2 Initiatives by the Occupational Safety and Health Administration in recent decades

Management and organisation of the Occupational Safety and Health Administration

SWEA's working approach in the 1970s was emphatically demand-driven. In his dissertation on the work of the Labour Inspectorate, Lundberg (1982) describes this as a “safety valve strategy” – being available should anything happen, not being a force for change but relieving the pressure when the tolerance threshold is exceeded. This has been changed as a result of SWEA, since the passing of the new WEA (SFS 1977a), working more preventively. Its provisions on “Ergonomics for the Prevention of Musculoskeletal Disorders” (AFS 1998:1) and “Systematic Work Environment Management” (AFS 2001:1) are cases in point.

Whereas SWEA expanded until the end of the 1980s, during the 1990s personnel strength was reduced from 1,000 to 600. Surveillance of the work environment was further impaired in the 90s, for the following reasons:

- occupational health services were weakened,
- there was a decline in the number of safety representatives,
- duties relating to the work environment were not taken as seriously as other tasks in the production line,
- collection of accident statistics deteriorated by comparison with the 1970s and 1980s, due partly to the discontinuation of statistical collection by the Forestry Vocational Board (SYN) and SLU.

Society's downgrading of work environment surveillance can be said to have been premature and excessive, given that systematic work environment management in enterprise has yet to become fully operational, but a trend inflection came in 2001, when a funding increase enabled SWEA to recruit more inspectors and handling officers. This funding ought as a natural consequence to benefit also the supervision of forestry work.

The working approach of SWEA's personnel has changed in a variety of directions over the past 15 years. The effects of spending cuts usually become apparent some time after the event, and since 1997 occupational injuries have shown a rising tendency. It is essential that this increase should now be countered through targeted measures by SWEA, and so it is perfectly correct to augment SWEA's budget so that these inputs can also be augmented. Forestry enterprises are growing larger as a result of mergers, and as a rule they span several districts and countries. There was one obvious problem connected with **Market Surveillance** and **Follow-up**: not all inspection districts took part, even though the project management at SWEA considered it necessary for them to do so. The non-participation of some districts can be taken to mean that they did not have sufficient resources and that they gave priority to other tasks. Perhaps it is time now for a more uniform supervision of forestry, as used to be exercised through the Forestry Labour Inspectorate. An improvement was made possible in 2001, with the amalgamation of 11 supervisory authorities into a single Work Environment Authority. Under SWEA's direction, this co-ordination can be taken further through a common supervisory structure for the forestry sector.

Information

Important prerequisites for a successful reduction of occupational injuries are the existence of knowledge for their prevention, a relevant target group and an adaptation of the message to the target group.

Parallel to SWEA starting to write new Provisions, the implementation of the regulations should be planned in outline, so as to make employers, employees and work environment inspectors thoroughly acquainted with them. The work environment inspectors must be trained in time, before the Provisions come into force. It is they who have to explain the Provisions to employers/employees, and so they need to be closely familiar with the regulations. Implementation of Provisions should be conducted in such a way that they are spread properly and their meaning perceived by recipients, e.g. through the distribution of information to employers/employees at regional level in seminar form. Unions and employer organisations have an important part to play in the spreading of information.

It has grown more difficult for SWEA to reach groups at risk in the forestry sector. This applies above all to contractors and their employees – for whom musculoskeletal diseases are the biggest problem – and to self-employed forest owners, who meet with numerous accidents, many of them fatal. At least 80% of logging is done by machinery contractors spread out between something like a thousand different firms. Hence, it is far more demanding nowadays to distribute information to 1,000 undertakings than to 20 big forestry companies with in-house work environment officers, as was the situation in the 1970s and 1980s. The 100,000 or so self-employed forest owners have always been hard to reach with the message of safer working conditions in the forest. This requires greater resources and special forms of co-operation, e.g. with National Board of Forestry, the Federation of Swedish Farmers (LRF), associations of forest owners, trade fair organisations, in order for SWEA to be able to reach these groups.

In the **Market Surveillance**, **Safety Instruction** and **Follow-up** projects, the conclusion is that the right target group was informed. It is the manufacturer who can bring about the construction of a machine in keeping with safety requirements. In the case of imported machinery it is the importer who passes on the information to the manufacturer. In addition, the owner and user of the machine have to be informed about using forest machinery in such a way as to minimise the risks of occupational injuries. The owner of the machine must put the conditions

in place for the machine operator to be able to work without risk. The machine user must be informed so as to understand the connection between risks and certain ways of working. In the three projects referred to, SWEA intervened at all these levels.

The **Market Surveillance** and **Safety Instruction** projects clearly show that machine manufacturers do not always understand the rules. SWEA's regulatory instruments must be made clearer and more easily readable, which seems a difficult aim to achieve. Since Provisions for the most part nowadays are implementation of EC Directives, SWEA has to abide strictly by the EC text. Added to this, the Provisions have to meet certain legal requirements, which sometimes stands in the way of readability and simplicity. Writing specific completing booklets is perhaps one way of simplifying implementation of the Provisions.

Apart from inspection, SWEA also relied on information by visiting 400 working teams, i.e. a quarter of the machine operator teams active in the forestry sector (Andersson, Synwoldt et al. 1999). Through these personal visits, information about the Government's resolution that operators of logging machinery must have two hours' non-machine work daily was communicated to machine users. Discussions between machine operators, employers and inspectors were important as a means of making machine operators realise the importance of the decision. Continuous official surveillance of compliance with the decision being prodigal of resources, SWEA committed the bulk of resources to visits aimed at convincing people of the need for job alternation. In view of the large number of visits paid, SWEA counts on only a small number of inspections being necessary in future.

Regulatory instruments

Eriksson (1995) opines: "Given the large number of rules that are issued, the inauguration of more studies of the effects of the rules issued would be vitally important. SWEA could also take the initiative in getting external evaluators to examine other aspects of supervisory performance, e.g. the way in which centrally co-ordinated projects are planned and conducted." One cannot but agree with this, and the present dissertation is an expression in that direction.

But the evaluation of initiatives for the prevention of accidents or disease always entails problems. How is one to value conditions which perhaps never materialise? Avoidance estimates may here be appropriate (Lanoie and Tavernas 1996, Riel and Imbeau 1997) in order, for example, to rate

the benefit of a particular Provision. Measuring differences of well-being and job satisfaction before and after the introduction of a new Provision can be another way, but this involves considerable problems of method. WEA, however, stresses these aspects, and evaluation of them is likely to be a vital concern.

The tools at the disposal of SWEA personnel – Provisions relevant to the supervision of forestry – exist and are designed in such a way that, if they are used properly, injuries can be avoided. One drawback is that SWEA has no possibility of also applying these Provisions against the owner of the timber. Another drawback is that Provisions are not always applied by those concerned, possibly because their meaning has not been understood, or, quite simply, because people do not want to comply with them.

Supervision

SWEA's supervisory priorities vary from one period of activity to another. Between 1997 and 1999, forestry and agriculture were mentioned as a priority field, while for the period between 2000 and 2002 other targets apply. Discussions with work environment inspectors revealed among other things that certain districts take the operational programme to imply that very few activities indeed are to be undertaken in fields which are not mentioned. For agriculture and forestry this means that a number of districts had a very low level of activity in these fields during 2000, i.e. the year after the field had been given priority, in spite of a high fatal accident rate. The SWEA management should evaluate the importance of continuity in work relating to such an industry.

In SWEA's regulatory instruments, responsibility for a good work environment is placed with the employer. Heads of companies and personnel must, however, have adequate training in order to be able to understand and meet the requirements posed by the rules relating to the work environment. SWEA must of course maintain a controlling function but must also be able to advise business undertakings. This calls for a high level of competence and expertise on the part of SWEA personnel. One cannot get very far by having just a few Provisions in one's back pocket. SWEA personnel have to keep abreast of new developments in forestry, so as to be capable of identifying new hazards of the work environment and pleading for their avoidance. It is also important that SWEA personnel should have the knowledge to be able to argue the profitability of work environment management in economic terms, e.g. by pointing to the extra cost to the undertaking of training and introducing a

new harvester operator to replace one who has sustained a occupational injury.

Co-operation

It is impossible for SWEA personnel to exercise supervision by inspecting/visiting every forestry enterprise. This being so, it is important, not only for systematic work environment management to be operated effectively in undertakings, but also for the work environment message to be conveyed through various business organisations. SWEA personnel have to play the part of catalysts.

Adequate work environment training can be included in forestry education through SYN. Personal membership of SYN has enabled the author to influence this matter. Employers are represented in the group through forestry companies, forest owner associations and contractors and employees, through the Swedish Forest and Wood Trade Union and through the Association of Management and Professional Staff (LEDARNA). Earlier, SYN played a leading part in implementing the AND project.

SYN could highlight the work environment management of the forestry sector through annual conferences resembling those which were held during the 1980s and those organised today in the agricultural sector by the Agricultural Work Environment Committee. Co-operation with entrepreneurs, and above all with SMF, must be deepened. Only half of all contractors, however, are reached through SMF, and the organisation's resources for work environment management are very limited.

Better co-operation with sister authorities in the other EU countries would do a great deal to make the supervision of machine manufacturers more efficient. If authorities were to keep one another informed about risks in machines, this would save supervisory efforts in several countries.

Technical advances

It is not so easy to say whether SWEA has influenced the development of technology. Conceivably, of course, Provisions may have obstructed technical progress. I have not come across any such instance, but there are examples of positive impact. Most often, one or a few manufacturers already had products with technical solutions which improved safety. SWEA then prescribed that the corresponding level of safety was to be attained by all products manufactured in future, with the result that a safer product came to be adopted by all users at an earlier stage of things. The

legislation on power chain saw safety (NBOSH 1971) and leg guards (NBOSH 1974) is one such example. It is a basic principle of the EC Machinery Directive that machine safety shall be included in the design of the machine – risks shall be tackled at source. If this is not possible, protective equipment shall be used and information supplied on the avoidance of injury. Chain links from the felling unit of single grip harvesters are liable to come loose and fly off at speeds of up to 600 m/s (Synwoldt 1999c). To take another example, information to machine users about this risk was compiled on SWEA's initiative through the Forestry Research Institute of Sweden (SkogsForsk 2000). The machine operator is shielded by safety glass 12 mm thick. The protective capacity of this glass can be questioned, especially when the chain velocity exceeds 40 mps. In order for the operator to be safe in the cab, the protective capacity of the safety glass must be increased by improving its quality or increasing its thickness. It is also important that manufacturers should develop saw chains of higher quality, so as to reduce the incidence of chain failures. The risk of a flying chain hitting anyone is eliminated if the chain is captured by the unit. If manufacturers succeed in this, the Provisions will probably have been effective.

The manufacturer has to be made aware that it can be worthwhile exceeding the requirements posed by the Machinery Directive and advising the owner/operator to choose a machine with a good ergonomic profile, for the prevention of musculoskeletal injuries. This in turn reduces the cost of sickness absence and improves the continuity of output.

Through the introduction of protective frames for tractors or cabs, in the form of ROPS devices, and with the introduction of certain stipulations concerning power chain saws and personal protective equipment, accident rates declined noticeable during the 1960s and 1970s (Fig. 18). The number of accidents is no longer so very high, and so a possible further reduction is bound to be less noticeable.

During the 1980s, on average, the reported accident rate in forestry was six times higher than the incidence of occupational diseases. Towards the end of the 1990s the accident rate converges with the rate, which on occupational diseases average has remained constant during the period in question. With the substitution of mechanical felling by harvester for motorised manual felling, the risks entailed by forestry work were again transformed, viz. the risk of accidents diminished, while the risk of occupational diseases remained unaltered.

Statistics

Statistical analyses of the occupational injuries reported to the Social Insurance Office and ISA can lead to new Provisions or projects. The reduction of the frequency of occupational accidents and occupational diseases in forestry has probably been due, to some extent, to the initiatives taken by SWEA in terms of Provisions, supervision and projects. The ISA statistics are based on branches of economic activity, and the occupational injury reports include, among other things, particulars of the injured person's occupation, the machinery/materials used, the type of injury, duration of absence, course of events, probable cause of the injury and particulars of measures taken to prevent the injury recurring. Very often the information provided in these descriptions is substandard (Kemmlert et al., 1989), and so for the most part WEI has to contact the informant immediately to request further particulars. If the type of machine were always stated, this would make it easier for SWEA to take action against machine manufacturers whose equipment is involved in accidents. Classification of the causes of accidents is often excessively rough and ready. Subheadings are really needed in order to obtain clearer information as to, for example, the meaning of "contact with a moving object". Sometimes information about certain groups of undertakings is unobtainable from the ISA statistics. In the collective AMF-t labour market insurance scheme, on the other hand, it is possible to identify occupations, duties, activities and machines connected with serious occupational injuries (Gellerstedt et al., 1999). The occupational injury report form is currently being revised.

It is impossible to obtain relevant occupational injury figures from the present occupational injury forms, because particulars of productive time and output quantity are not included in the data collected. These figures are indispensable to comparisons of accident rates, but the collection of production output data is not now included among the duties of the Social Insurance Office or SWEA.

The frequency of fatal accidents in Swedish forestry is low by international standards, due to Sweden's very high level of mechanisation. Although the number of fatal accidents in connection with chain saw work fell by half during a 20-year period, until the mid-1990s self-employed forest owners had a high fatality rate compared with fatal occupational

accidents in other branches of employment in Sweden. Accidents of this kind involving self-employed forest owners declined, however, at the end of the 1990s, due in part, possibly, to the high level of economic activity leaving fewer small forest owners the choice of other than forestry work.

Market surveillance of machinery

The results from **Market Surveillance** have a high level of reliability, due to the data material having been collected by skilled inspectors through visits to undertakings, with direct interviews in no fewer than 100 firms.

Part of the reason why not all undertakings complied with the stipulations of the EC Machinery Directive was that the regulations were unclear. Deficiencies of the Provisions may be due to personnel resources having been insufficient when they were drafted through SWEA. In certain cases the Authority failed to get manufacturers and importers interested in the information, the reason being that SWEA failed to communicate the information to them. But it is also the duty of undertakings to keep themselves informed of current regulations applying to their activities.

Market Surveillance was processed centrally, but without electronic storage of the data collected. Processing of this kind would greatly have simplified new analyses based on the same material.

Instruction manuals for forest machinery

The quality of instruction manuals underwent a notable improvement in the 1990s, but no survey has been made of the way in which machine users perceive the information contained in instruction manuals and how useful that information is to them. A study of this kind would be desirable.

Ergonomic initiatives by the forestry industry

SWEA's initiatives in association with the forestry industry have led to a renewed attempt to make the work environment an integral part of production. Evaluation of the AND project has shown machine operators' awareness of musculoskeletal disorders to have increased compared with observations during visits a few years earlier, but continuing efforts are needed in order to motivate machine users for improving the situation.

The number of reported occupational diseases among forestry machine operators has declined in recent years, above all, probably, because the occupational injury criteria were amended in 1993. Moreover, at the

beginning of the 1990s the forestry sector was in recession and a large number of machine operators left it. Higher unemployment may also have helped to reduce the number of reports, because fear of losing their jobs makes workers less inclined to report occupational injuries. It is likely that many of those who stopped working as machine operators had musculoskeletal disorders. Lidén in 1989 reported that 54% of the operators who owned their machines were seriously contemplating leaving the industry, for health reasons.

The results of the follow-up of musculoskeletal disorders among forestry machine operators in the Örebro district (Fredander et al., 1999) yielded prevalence rates which were less than half of those for the four northernmost inspection districts. These differences can be partly put down to the questions possibly having been differently framed, with the result that disorders were registered to differing extents. This shows that the projects ought to have been better co-ordinated and the inspectors better trained. The participation of several districts, it is true, provided a broader picture, but the compilation of results for **Follow-up** in different districts can have meant a number of sources of error, distorting or diluting the results. As an example the possibility of climatic influence has not been investigated. The data material was not stored electronically, which means that further calculations cannot readily be made without difficulty.

Reliability on the subject of musculoskeletal disorders in **Follow-up** is not so high, due to the method used not being validated or comparable with other studies, e.g. Pontén (1988). Added to this, only about 70% of those interviewed in 1997/98 were working with forestry machinery in 1994/95, and unfortunately not many of the interviewees replied to the in-depth questions. **Follow-up** employed the dubious method of asking, in one and the same interview, about health status during the past year and two years previously. How clearly can people remember whether they experienced any musculoskeletal disorders two years earlier. Presumably they forget a great deal, or else perhaps they magnify individual occurrences.

In order for contractors to have a possibility of creating a good work environment for themselves and their employees, there are economic and organisational requirements which have to be met. These are to a great extent decided in the writing of the contract between the contractor and the owner of the timber. If demands are made solely on the contractor, then probably many contractors will be put out of the labour market. SWEA's supervision of the forestry industry would be more effective if

stipulations could be addressed to the client as well as to the contractor. Today this is only possible in the case of clients who are to be regarded as the machine owner's/operator's employer. The client is regarded as an employer if the contractor works for him for at least 75% or so of his (the contractor's) working time and does the work himself (Ehrenheim 1995). This interpretation, however, is not uniform to all districts. Some districts take the view that the contractor is always to be regarded as the employer. As yet there have been no judicial decisions on this point.

Visits during the autumn of 2000 showed that opportunities of job alternation had increased in a number of forestry companies (Persson 2000). Interviews with managements and machine operators (both employees and contractors) showed that opportunities of grading and cleaning could be increased, but on the other hand it was still considered difficult to realise job alternation between machine and ground work during one and the same working day. In most cases the area to be graded and cleaned is not at the felling site. Some companies therefore prefer operators to do ground work at intervals of as much as four weeks. Job alternation of this kind, which is inadequate from a physiological point of view, can only be accepted by SWEA if compensation is provided during the day in the form of regular short breaks, regular job alternation between harvester and forwarder and service duties midway through the working session.

*Points in common between **Market Surveillance**, **Safety Instruction** and **Follow-up***

The effects produced by SWEA's work can be shown through these three projects. **Market Surveillance** shows that the majority of manufacturing or importing firms had relevant Provisions. Too many machines lacked instruction manuals. Evaluation of the **Safety Instruction** project showed the majority of manufactures to be complying with SWEA stipulations. Through **Follow-up**, SWEA succeeded, by threatening to regulate working hours, in starting a process in the forestry sector whereby different possibilities were discussed for improving the work environment. Primarily this meant measures to reduce the prevalence of musculoskeletal disorders among forestry machine operators.

The question of how SWEA's work was perceived by those affected can be answered in positive terms. In **Market Surveillance** and **Follow-up**, this was clearly apparent from the project evaluations. Another indication of the same kind can be seen in the employers' organisation in the north of Sweden approaching WEI on the subject of further work with **Follow-**

up. The **Safety Instruction** project too met with an exclusively positive response from forestry undertakings. After the project ended, three firms asked to have their future instruction manuals inspected.

The projects jointly undertaken by SWEA, namely **Market Surveillance** and **Follow-up**, helped to improve the competence of the personnel from the Authority taking part. Competence was appreciably enhanced through joint preparations for these projects, in the form of checklist compilations, training days and practical implementation of the theoretical knowledge acquired through visits to companies.

6. Measures to improve the efficiency of preventive work environment management

The purpose of this dissertation has been to judge whether SWEA initiatives relating to occupational safety and health in the forestry sector have been effective in Sweden. Given the positive effects which could be shown, SWEA's initiatives could produce even better effects if the following proposals were to be acted on:

- ❑ A reinforcement of work environment surveillance in the forestry sector. SWEA's funding increment for 2001 onwards should make this possible. New initiatives are needed to prevent a resurgence of occupational injuries in forestry.
- ❑ The possibility of also addressing work environment stipulations to the owner of the timber. To this end, an expansion of the Work Environment Act would be desirable.
- ❑ An effective implementation of the new Provisions on Systematic Work Environment Management in such a way that employers will live up to their preventive responsibility.
- ❑ Earlier and greater commitment of SWEA resources to the drafting of EC Directives, which define the framework of Provisions.
- ❑ The writing of Provisions in clearer, simpler language, and their supplementation by manuals and improved marketing.
- ❑ A larger proportion of control of the safety of new machinery on the premises of manufacturers or importers, so as to prevent duplication of inspections at different undertakings in different work environment districts.
- ❑ Improvements to the system for recording accidents and occupational diseases, especially among self-employed forest owners and contractors. The need for clear descriptions of the course of accidents must also be addressed, as well as the identifiability of the type of machine, type of activity etc.

- Additional constructive solutions for co-operation between different AI districts and between the AI districts and SWEA Head Office, so as to achieve uniformity of supervision for the forestry sector.
- Establishment of continuous further training for SWEA personnel with regard to safety details, technical knowledge, organisation, ergonomics and economics, so as to promote the qualitative improvement of regulations drafting and supervisory activity.
- Development of alternative forms of co-operation with other organisations connected with forestry, with a view to the more effective dissemination of knowledge relating to the forestry work environment.

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Appendix 1. Glossary of terms and abbreviations

Glossary of terms

General Recommendations	General Recommendations have a different legal status from Provisions. They are explanatory, not peremptory.
Directions	Directions can contain Provisions and/or General Recommendations.
CE mark	An emblem showing that the machine meets the basic health and safety requirements set forth in App. 1 of AFS 1994:48 and, where applicable, in other Provisions based on EC Directives.
Certification procedure	Comprises the compilation of documentation, the issue of a certificate of conformity with AFS 1994:48 and the application of a CE mark. For machinery involving special risks - contact with a certified body (storage or examination of documentation or type inspection).
Prohibition	A prohibition means, for example, that a machine may not be used until a certain measure has been taken.
Provisions	Provisions are binding rules which national authorities may issue as empowered by the Government and Riksdag (parliament).
Injunction	An injunction means that if the employer does not comply with the inspection notice, the SWEA can insist on certain measures being taken.

Certification of conformity	A document in which the manufacturer or his representative within the EEA certifies that the machine placed on the market meets all the basic health and safety requirements applying to it.
Market Surveillance	Market Surveillance is a combination of market control and measures to deal with infringements of current Provisions. In the present dissertation, market surveillance means inspection of machinery with the aid of the NBOSH Provisions (AFS 1994:48) on Machinery and Certain Other Technical Devices (Machinery Directive).
Market control	Verification of compliance with rules issued by SWEA.
Notices	Notices can contain Provisions and/or General Recommendations

Abbreviations

ADI	Direct information from the National Board of Occupational Safety and Health
AFS	Statute Book of the National Board of Occupational Safety and Health
AMF-t	The Swedish abbreviation for labour market insurance - employer=s no-fault liability insurance
AV	The Swedish abbreviation for the Work Environment Authority
NBOSH	The National Board of Occupational Safety and Health
SWEA	The Swedish Work Environment Authority
CD	Compact Disc
CE	Communautés Européennes - the European Communities
CEN	Comité Européen de Normalisation - The European Standardisation Committee
EC	The European Communities
EEA	The European Economic Area
EEC	The European Economic Communities
EEG	The Swedish abbreviation for the European Economic Communities
EG	The European Union
EN	European Norm
EU	The European Union
SMF	The Swedish abbreviation for the Forestry Contractors' Financial Association
FSC	Forest Stewardship Council
HTV	Haulage Terrain Vehicle
ISA	The Swedish abbreviation for the Swedish Occupational Injuries Information System
ILO	International Labour Organisation
ISA	The Swedish database for occupational injuries and work-related diseases
ISO	International Organisation for Standardisation
KWF	Kuratorium für Waldarbeit und Forsttechnik
LFS	Labour Force Survey
LI	The Labour Inspectorate
N	Newton
NAB	The National Audit Board
NGO	Non-governmental organisation
OHS	Occupational Health Service
PSI	Project-supported systematic inspection

RFV	The Swedish abbreviation for the National Social Insurance Board
RRV	The Swedish abbreviation for the National Audit Board
ROPS	Roll-Over Protection Structures
SARA	The Swedish abbreviation for the Co-ordinated Workplace Register for SWEA
SFS	The Swedish abbreviation for the Swedish Statute Book
SkogForsk	The Swedish abbreviation for the Forestry Research Institute of Sweden
SLU	The Swedish abbreviation for the Swedish University of Agricultural Sciences
SME	Small- and Medium sized Enterprises
SMS	The Swedish Materials & Mechanical Standard
SYN	The Swedish abbreviation for the Forestry Vocational Board
WE	Work Environment
WEA	Work Environment Act
WEI	Work Environment Inspectorate
YI	The Swedish abbreviation for the Labour Inspectorate

Appendix 2. Summary of the Work Environment Act

(1 January 2001)

Chapter 1 states the purpose and scope of the Act, the basic idea of which is to prevent ill-health and accidents at work and generally to achieve a good working environment. The Act applies to all work, with few exceptions. Above all it applies to employees, but in part it is also applicable to persons working on their common account, and also to self-employed persons and family undertakings.

Chapter 2 deals with the nature of the work environment. The Work Environment Act being what is termed a framework enactment, the provisions of this chapter are couched in fairly general terms.

Chapter 3 deals with general obligations. The main responsibility for the work environment devolves on the employer, whose duty is to systematically plan, direct and inspect activities. The employer shall inform employees of the hazards of the work and must show due regard for the individual's particular aptitudes for the work. The employees also incur responsibility with regard to the work environment and shall assist in work relating to the working environment and take part in the implementation of the measures needed in order to achieve a good working environment. It is further stipulated that all parties engaged in activities at a common worksite shall consult and co-operate with each other with a view to achieving safe working conditions. This chapter lays down that any person manufacturing, importing, selling or renting out technical equipment shall ensure that it affords adequate security against ill-health and accidents. These requirements also apply to the delivery of used machinery. In addition, a supplier shall see to it that the product information necessary from a work environment viewpoint accompanies the machine when it is delivered. Product information means, for example, marking, instructions for use and warning signs.

Chapter 4 defines statutory powers. In this chapter the Riksdag has extensively empowered the Government to issue Provisions on the work environment. These powers have subsequently been delegated by the Government to SWEA, through the Work Environment Ordinance. Some 180 Provisions and General Recommendations issued by SWEA are currently in force.

Chapter 5 contains Provisions on Minors.

Chapter 6 deals with co-operation between employers and employees and with the activities of safety representatives.

Chapter 7 contains the basic rules on enforcement. The supervisory authority is SWEA. Other provisions of this chapter deal with the powers of the national authorities, e.g. the power of issuing injunctions and prohibitions.

Chapter 8 defines sanctions in the form of penalties and contingent fines, as well as forfeiture and sanction charges.

Chapter 9 deals with the right of appeal. Decisions by SWEA are contested by appeal to the Government and, in certain cases, to the County Administrative Court.

Appendix 3. Solitary work, power chain saw, brush saw and personal protective equipment

Solitary work in forestry

The Provisions on “Solitary Work” (AFS 1982:3) define solitary work in the physical sense as a situation where the person doing the work can only contact other persons by using a technical aid to communication. If this solitary work implies a palpable risk of accidental physical injury, it shall be arranged in such a way that the employee can obtain rapid assistance in an emergency. If acceptable security is not attainable by any other means, the work may not be done without another person being present in addition to the employee.

Forest machinery is usually equipped with communication radio and/or a mobile phone. Most accidents, however, occur outside the cab during boarding and alighting and in connection with repairs. For improved safety, the communication and alarm facility needs to accompany the driver when he leaves the cab.

Power chain saws and brush saws and personal protective equipment

The Provisions on “Power Chain Saws” (AFS 1990:7) stipulate that a person employed on tree-felling with a chain saw shall have knowledge and experience of working with a chain saw. Special rules apply to tree-felling and to the processing of windthrows. In tree-felling with a chain saw, the following protective equipment has to be used: ear protectors, a safety helmet, eye protectors, safety boots and leg guards. There are special Provisions on the Use of Personal Protective Equipment (AFS 1993:40). The design of personal protective equipment is regulated in the Provisions on “Design of Personal Protective Equipment” (AFS 1996:7). The Provisions on “Brush Saws” (AFS 1983:7) contain certain safety regulations concerning the use of the saw, skill requirements, instruction and practice, maintenance and the use of personal protective equipment. The Provisions “Use of Power Chain Saws and Brush Saws” (AFS 2000:2) entered into force on 1st January 2001, superseding AFS 1990:7 and AFS 1983:7. No great changes have been made where ordinary logging work is concerned. New rules have been introduced on the use of power chain saws for pruning, in construction activity and in rescue activity/fire-fighting.

Appendix 4. Example of a press release

1999/12/10

Serious accident risks when dealing with storm-damaged forest

Every year people lose their lives in connection with forestry work. The risks are now increasing. The storms at the end of November and beginning of December are estimated to have brought down 5 million cubic metres of forest. Disposing of these windthrows is a very dangerous job. Those doing the job are in serious danger of being crushed to death.

The Labour Inspectorate is disturbed by the prospect. The risks entailed by windthrow clearance are often underestimated. This is one of Sweden's most dangerous jobs. It is a job for which, primarily, forestry machines must be used. Only in exceptional cases must this work be done manually, using a chain saw.

“We know there are going to be accidents,” says Uwe Synwoldt of the National Board of Occupational Safety and Health. “People will be risking their lives. We know from experience of previous windthrow occurrences that there are liable to be many serious accidents, and so we want to draw attention to the major hazards which we already know to exist.”

Working manually with a chain saw is very hazardous. Only personnel with great skill and fresh experience of chain saw work must be engaged. In the event of log jams, manual work must be avoided. There must be a high level of preparedness for accidents and direct contact between fellow-workers.

The National Board of Occupational Safety and Health has issued rules for tree-felling. The Work Environment Act stipulates that people are not to be injured or made ill by work. The Provisions of the National Board of Occupational Safety and Health on Power Chain Saws, AFS 1990:7.

For further information, do not hesitate to contact the Labour Inspectorate.

It is located in Stockholm, Malmö, Växjö, Göteborg, Linköping, Örebro, Falun, Härnösand, Umeå and Luleå.