



THE JOINT FAO/ECE/ILO COMMITTEE :

FIFTY YEARS OF INTERNATIONAL CO-OPERATION IN FORESTRY

**The evolution and achievements
of the Joint FAO/ECE/ILO Committee on Forest Technology,
Management and Training
from 1954 to 2004**

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Acronyms and abbreviations

BUWAL	Swiss Agency for Environment, Forest and Landscape
C & I	Criteria and indicators
CEEC	Central and Eastern European countries
CFP	Certified forest products
CIS	Commonwealth of Independent States
CO ₂	Carbon dioxide
DDT	Dichloro-diphenyl-trichloro-ethane
EFC	European Forestry Commission (of FAO)
EFTA	European Free Trade Association
EMS	Environmental Management System
ETTS	European Timber Trends and Prospects Study
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GFMC	Global Fire Monitoring Center
IBFRA	International Boreal Forest Research Association (Fire Working Group)
IEA	International Energy Agency
ILO	International Labour Office
ISDR	(United Nations) International Strategy for Disaster Reduction
ISO	International Organization for Standardization
IUCN	World Conservation Union
IUFRO	International Union of Forestry Research Organizations
MCPFE	Ministerial Conference on the Protection of Forests in Europe
m ³	Cubic metre
mt	Metric tonne
NGO	Non-governmental organization
NO _x	Nitrogen oxides
PEFC	Pan-European Forest Certification Scheme
R & D	Research and development
SFM	Sustainable forest management
SO ₂	Sulphur dioxide
UNECE (ECE)	United Nations Economic Commission for Europe
USSR	(Former) Union of Soviet Socialist Republics
USA	United States of America
WHO	World Health Organization

FOREWORD

Even in a long-term activity like forestry, fifty years is a respectable timespan. For some species it represents a complete crop rotation; for others at least half a rotation. In human terms it is equivalent to about two generations. The world of today, in the year 2004, is hardly recognizable compared with 1954, when Europe and other regions were still struggling to recover from the destruction of World War II. Forestry too has changed enormously, indeed faster than at any previous time in history, in response to changing demands on the forest resource and to technological development.

One of the international bodies most closely involved in assisting countries in Europe and North America to develop their forestry sector during these years has been the Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training (the "Joint Committee", originally titled the Joint FAO//ECE/ILO Committee on Forest Working Techniques and Training of Forest Workers). It was appropriate, therefore, that the Joint Committee's Steering Committee decided to mark the 50th anniversary by a number of special events, including the preparation of a publication on the past activities of the Joint Committee and its direction in the future. One intended objective of the publication was to improve the Joint Committee's public image, especially within the forestry community. The celebration, including the presentation of the publication, should take place at the Joint Committee's 25th session, scheduled to be held in the Netherlands in September 2004.

I was privileged to be given the task of preparing the publication, in association with Dick Richards, but I have been greatly assisted by a number of people to whom I wish to express my sincere thanks. In the first place there has been Hanns Höfle, the Chairman of the Joint Committee, who continuously offered his encouragement and support, especially at times when I became discouraged by the turn of events likely to affect the Joint Committee's future. Then there have been the members of the group established to plan the 50th anniversary celebrations, in particular Paul Efthymiou, Martin Büchel, Bernt Strehlke, Johannes Goldammer and from the secretariat Kit Prins, Jorge Najera and Helena Guarin (UNECE), Peter Blombäck and Anna Springfors (ILO) and Joachim Lorbach (FAO), who have provided valuable comments on the draft but who can in no way be blamed for any inadequacies in the final result. Special thanks are due to Helena Guarin for her work on preparing the annexes.

Acknowledgements are also due to the Swiss Agency for Environment, Forest and Landscape (BUWAL) for generously providing the funds to enable the work to be carried out and to the ILO for covering the cost of printing.

It was agreed at the start that full advantage should be taken of the work undertaken in the mid-1980s by E. G. ('Dick') Richards in preparing an account of the establishment and first thirty years of the Joint Committee's activities, which was published in 1987¹. With his kind permission, the main part of his account covering the years 1954 to 1985 forms Part I of the present publication. Only minor modifications have been made.

In Part I Dick Richards provides a valuable account of the development of forest techniques from the post-war situation when traditional felling and extraction techniques mainly involving human and animal muscle-power were still the most common, through the advent of the power saw and tractor to the use of multi-function harvesting equipment. A large part of the Joint Committee's efforts was devoted to helping countries to raise productivity and efficiency in wood harvesting. This included giving close attention to the training and welfare of forest workers, who were often operating in physically stressful and accident-prone conditions and with low pay.

¹ *The development of forest working techniques and the role played by the Joint FAO/ECE/ILO Committee on Forest Working Techniques and Training of Forest Workers*. Timber Bulletin Vo. XXXIX, No. 3. Special Issue. United Nations, Geneva, 1987.

Part II takes up the story of the evolution of the Joint Committee and its activities from the mid-1980s to the present time. Public and political concern for the protection of the environment had been building up since the 1970s, aroused in the case of forestry by such developments as forest loss and degradation in the tropical regions (areas not directly covered by the Joint Committee, whose membership is all European countries, including the former USSR, and North America. In the Joint Committee's member countries there was considerable concern over the widespread forest decline attributed to air pollution, the use of chemicals in forestry and long-term damage to forests caused by the Chernobyl nuclear disaster. But at the same time it was becoming apparent that Europe's forest growing stock was steadily expanding and that the serious shortfall in wood supplies that had been forecast earlier was unlikely to occur. Consequently the pressure to raise wood production began to ease, even if intense competition ensured that the search for higher productivity in harvesting continued.

Another factor was the increasing public demand for non-wood goods and services which, with some exceptions, forest owners and managers were expected to provide free. Revenue from wood production was supposed to pay for the provision of these goods and services. Management had to adapt to changing circumstances, and this provided a new challenge to the Joint Committee. Sustainable forest management (SFM) became the underlying objective of policy, ensuring that a suitable balance was achieved based on the three supports of SFM, namely economic development, environmental conservation and the needs of people. The social aspects of forestry have in recent years emerged as perhaps the ones commanding priority attention at the international level.

These developments, as well as others such as the profound political and economic changes that occurred in the formally centrally planned countries of central and eastern Europe in the early 1990s, have been fully reflected in the changes in the Joint Committee's work programme, as well in its structure and methods of work. It is true to say that the Joint Committee has been highly flexible and responsive to emerging priorities in member countries. Not only has its work programme evolved to take account of the changing needs of member countries, but also its operating methods have changed: member countries have taken up a greatly increased share of the workload involved in organizing Joint Committee activities at the same time that secretariat resources have dwindled. The willingness of many member countries to take on this work has been a testimony to the importance they attach to the Joint Committee's activities.

It is therefore ironic that in recent months (spring 2004) the future existence of the Joint Committee has been put in doubt. A recommendation is under consideration by its parent bodies that the Joint Committee should be discontinued, a principal reason given being that adequate secretariat resources can not be provided in the future to ensure the proper servicing of its activities (more details are given in Part II). It is conceivable, therefore, that the Joint Committee's 25th session will be its last and that this publication, instead of serving its intended purpose as a 50th anniversary celebratory message, will be a kind of obituary.

Whatever happens to the Joint Committee, this publication is dedicated to all those who, over the past fifty years, have served it in one way or another, in particular:

- The members of the Steering Committee (Chairmen, Vice-Chairmen, Rapporteurs, Coordinators);
- The leaders and members of the Team of Specialists and Chairmen, Vice-Chairmen and organizers of the seminars, symposia and workshops and the specialists who have presented papers to them;
- The delegates to the Joint Committee sessions and other meetings held under its auspices and the national contact points;

- The members of the UNECE, FAO and ILO secretariats who have serviced the Joint Committee's work.

The number of people who have contributed directly to the success of the Joint Committee over the past 50 years must run into the thousands. That number could probably be multiplied by ten to include all those who have in one way or another benefited from its work. To take an extreme case, there are probably a number of people who are alive today only because they or their supervisors paid attention to advice passed on through the Joint Committee on safety at work.

To close on a personal note, it was a privilege for me and my good fortune to have been closely involved in the Joint Committee's activities between 1978 and 1993. As a mostly desk-bound forester I was able to learn from the real experts who contributed their know-how to its seminars and teams of specialists about a diversity of forest-related questions ranging from soil compaction by heavy-duty machinery to forest fire prevention, from logging in mountainous terrain to forest decline attributed to air pollution, from the use of chemicals in forestry to safety equipment and clothing, from nursery management to extension training for forest owners, to mention just a few. During those fifteen years I acted as secretary to eight sessions of the Joint Committee, a similar number of meetings of the Steering Committee and numerous seminars in different parts of Europe and North America. Wherever these meetings took place, the participants received a warm welcome from the host authorities and organizers, who spared no effort to share their experiences and discuss possible solutions. Something about these activities generated a feeling of international comradeship and a willingness to share knowledge and experience. For all of us lucky enough to take part, these were enriching experiences. I, like so many others, have much for which to be grateful to the Joint Committee.

Tim Peck
June 2004

PART I

THE FIRST THREE DECADES : 1954 TO 1985

FORESTRY IN POST-WAR EUROPE

Introduction

The first FAO/ECE study of long-term trends and prospects in European forestry and forest products (ETTS I)², published in 1953, forecast a rather modest increase in demand for wood up to 1960 and increasing difficulties for European countries to raise their supplies to meet that demand, leading to an appreciable increase in imports from abroad. It advocated a policy of “dynamic forest management” to raise wood production within Europe and the adoption of two basic principles:

- (a) that forests should be managed and their production organized, both in quantity and quality, with a view to obtaining at least a substantial yield as soon as practicable, giving consideration first to any protective role assigned to the forest;
- (b) that European forests should make a maximum contribution to the welfare of Europe’s people and that this objective would be best achieved if the largest possible amounts of forest products were efficiently used.

Partly in response to the findings of ETTS I, the Timber Committee of UNECE and the European Forestry Commission of FAO together set up in 1954 the Joint FAO/ECE Committee on Forest Working Techniques and Training of Forest Workers (the Joint Committee).

It is through the eyes of the Joint Committee that Part I of this paper endeavours to look at the way in which Europe’s forest policies and practices developed over the three decades since the principles of the first long-term outlook study and the remit of the Joint Committee were drafted.

As a starting point, it is desirable to review briefly the forestry situation in the years immediately following the Second World War, i.e. from 1945 to 1955.

The decade 1945 - 1955

Whatever its negative effects, the war brought some benefits to the forest industries of the UNECE region in the sense that the development of cross-country vehicles – for example the tank and the jeep – had been accelerated. Shortages of manpower on the farm hastened the development of wheeled farm tractors in some countries. And a whole range of ideas (e.g. the diaphragm carburettor so essential to chainsaws) which were brought into the production stage were to be useful in machinery development programmes after the war, although some ideas were exploited only slowly such as the use of four wheel drive exemplified in the highly successful jeep.

At the same time the preponderance of post-war non-military demand was for civil engineering machines, such as the bulldozer, and for farm tractors. The major manufacturers were simply not interested in developing machines specifically for forestry use where the requirements were different and where a successful machine might at best have a potential market measured in only tens a year. Firms that did set out to make forestry tractors modified existing farm tractors or used military chassis and engines. Even in the Soviet Union, where there was early development of special forestry tractors, the basic machines were derivatives of tank chassis or tracked farm tractors. The disadvantages of using tracked vehicles in the forest were well appreciated, but the slow development

² European Timber Trends and Prospects, 1953.

of suitable tyres and transmissions held up the production in quantity of the wheeled tractor designed specifically for forest use until the mid-1960s.

During and immediately after the war there had been overcutting in some countries and some physical loss or damage to forests due to the war itself. However, it was agreed that a dynamic forest policy could raise post-war production in the short term by:

- rendering accessible areas of unexploited forest
- an extension of thinning programmes
- upward revision of cutting programmes on new inventories (the evidence being that the old inventories had almost invariably under-estimated the growing stock and increment)
- reducing losses in harvesting
- utilization of sawmill and other industrial residues
- diverting fuelwood to industrial use.

For the longer run “bold programmes” of reforestation and afforestation were advocated to meet the shortfalls in wood supply in Europe that ETTS I had predicted.

It was realized that these goals would only be reached if there was an adequate, properly trained labour force in the forest supported to an increasing extent by machinery for afforestation and the harvesting, handling and transport of timber.

The extent of change needed in worker training, in tools and working techniques was highlighted by ILO, which pointed out that in the 1930s only three countries had permanent training centres, and in only a few countries was there any effort devoted to the study of forest work (or forest work science).

By 1950 those countries which had devoted research and development time and money to forest worker training, health and safety and to the design and maintenance of tools showed in the productivity of their workers what a large gap there was between them and countries that had relied upon traditional laissez-faire attitudes to forest work. Thus (in 1957) two countries reported to the Joint Committee “the technique of time and motion in forest work is not yet applied in our country” but the time had now come to introduce it to improve the financial rewards to both woodland owners and workers.

One of the countries listed the subjects for time and motion study as thinning in young coniferous stands – manual felling, crosscutting, debarking and loading (with horse extraction from stump to roadside). A neighbouring country with a much smaller forest area was reporting on the achievements of its ten-year-old forest worker training school.

The decade up to 1955 was one in which most forest work was still manual. Around 1955, there was a spectacular increase in the use of chainsaws, due to the great improvement in their design and their being used for debranching as well as felling and crosscutting. One United States logger spoke of “going to the woods without an axe” – change indeed! Horses were widely used, but the farm tractor – sometimes with half-tracks – was being increasingly employed for extraction from stump to roadside.

Within countries there were anomalies – for example fully mechanized forest roadbuilding to open up forest areas for exploitation, followed by manual harvesting with bow saws, horse extraction, and manual loading on to trucks. Primitive, single-wire gravity cableways could be seen alongside highly efficient cable-cranes.

Industry was beginning to put pressure on the rural work force in some countries. The attractions of living in a town and enjoying higher wages than the countryside could offer meant that forestry had to counter the charge that a prime requirement for a logger was “a strong back and a weak mind”.

As the need to mechanize forest operations became greater, so did the desire for an exchange of knowledge on working techniques and training at the international level.

In the following sections, the sociological and technical changes that have taken place since the mid 1950s are discussed for the decades:

1955 – 1965

1965 – 1975

1975 – 1985,

although clearly the changes that have taken place have not always fallen into these arbitrary periods. Sometimes change has been gradual, but often (as with the chainsaw) there have been sharp changes taking place in a relatively brief period of five to ten years, followed by a period of consolidation. Inevitably, the speed and timing of technological and social change has varied considerably between countries and sometimes between regions within countries, so that talk of change at the level of the UNECE region must inevitably refer to general trends and tendencies.

The decade 1955 – 1965

The year 1955 saw the formal establishment of the Joint Committee, and the beginning of thirty years of close international co-operation between the countries of the UNECE region, but it is not to be supposed that at their first meeting all participants saw eye to eye on the way ahead. The ultimate goal was clear – a well paid highly motivated work force using ergonomically well designed machines and carrying out forest operations in conditions of relative comfort and safety. But how to get there?

The extreme views on harvesting were represented on the one hand by the advocates of one and two man teams and on the other by the supporters of the complex brigade. In between were those who favoured team work but using only three or four men in a team. The actual working methods also varied, as did terrain and other factors. For example in the northern coniferous forest, complex brigade work might apply to whole-tree logging and debranching and crosscutting carried out at a central conversion site outside the forest: one-man work might involve felling, crosscutting and debarking at stump with extraction of the finished products (pulpwood, pitprops, sawlogs) by sledge to the roadside.

Countries with large numbers of forest ownerships, often of just a few hectares per owner, had also to bear in mind the special problems of mechanizing such small-scale operations and the difficulties of training men who might spend only a short time in the woods each year or even every three or four years.

The decade has been described as one of semi-mechanization, because there were still many operations that had to be performed by hand or with hand-held equipment. With the great increase in the use of chainsaws and other portable mechanical aids (e.g. debarking machines, brush cutters) the importance of vocational training had become obvious to both workers and employers. Many workers could see advantages in attending courses at vocational training centres rather than relying wholly on on-the-job instruction.

Farm work was changing rapidly. For example in Finland the number of horses used in agriculture fell from around 300,000 to 250,000 between 1955 and 1960, when wheeled tractor numbers increased from 45,000 to 85,000. Despite a steady decline, about 60,000 horses were still being used in forest operations by Finnish farmers in 1960.

The competition for labour between industry and forestry was nowhere more acute than in Eastern Canada and the North Eastern United States. This gave great impetus to the development of tractors designed especially for forestry, rather than the adaptation of farm tractors and civil engineering earth-moving tractors. Wheeled frame-steered tractors equipped with winches for ground skidding or with trailers for carrying wood from stump to roadside were developed from scratch;

further developments included the fitting of shears or chainsaw felling and crosscutting devices on hydraulically controlled arms so that the operator could carry out all these operations from the driving cab. Based on this work in Canada and North Eastern USA, an entirely new generation of forestry machines was beginning to become a practical possibility for Europe where the tree harvester, feller-buncher, multi-functional logging machine and other new devices were beginning to get themselves established.

Important developments were taking place in the USSR where the decade saw the wide introduction of machines in wood harvesting operations – petrol driven chainsaws for felling; skidding tractors for skidding in the “half-loaded” position; heavy duty trucks for carrying tree lengths from forest to landings. Conversion of tree lengths at landings and re-loading were also being mechanized. In many countries the decade also saw the beginning of the building of a forest road network to a standard high enough to bring the truck right into the forest.

Within Europe (excluding the USSR) recorded removals had increased from 294 million m³ underbark in 1950 to 306 million m³ in 1960 and were on their way to 337 million m³ in 1970, an average increase of just over 2 million m³ or 0.7% a year over the two decades (ETTS III³, Table 13/5).

Apart from the increase in demand for wood, several factors were beginning to affect the nature of that demand. New processing plants were being built in some countries where there had been few forest industries. Pulp mills and board mills were increasing in size and there were pressures on them to reduce their inventories and to rely more on regular year-round deliveries of wood rather than on an intensive winter logging effort. This in turn meant more thorough advance planning of harvesting and transport in the forest to give a regular flow of wood month by month – a goal that is not always achievable, especially where forest work is mainly a winter activity for the farmer who has to give priority to the farm in the summer. Mechanization of harvesting – whilst making it possible to step up production and contain rises in costs to acceptable levels – meant change from traditional well-tried methods and introduced for many forest managers new, quite unfamiliar ideas and machines requiring much faster reactions by management to deviations from planned programmes of work. Field supervisors and the workers also had to adapt to new situations. For many it was necessary to change well-established, almost leisurely management styles.

Yet a certain resistance to change was evident in the period up to 1965 – for example in the reluctance sometimes to fell stands that were well beyond economic rotation age, especially in the private sector. The opportunities for owners in a region to co-operate in some form of association that could take advantage of the new harvesting attachments for farm tractors and new logging machines *per se* were generally not seized, except perhaps in the Nordic countries. Long-term “working plans” in public forests were sometimes being followed (e.g. in selection forests) pretty well regardless of cost. Only in a few countries were they being changed to allow for the economic use of the new machines for harvesting and other operations.

A declining trend in the demand for fuelwood and many of the long-established uses for coppice was creating problems for the owners of coppice and coppice-with-standards woodland (e.g. in France and Italy). Often the owners left them unmanaged rather than getting involved in the cost and effort of converting them into high forest. Many owners were becoming less dependent on their forests as a main source of income, either because of the relative prosperity of farming or because they were earning their main living in a town.

Large-scale programmes of afforestation were being carried out in some countries, e.g. the United Kingdom, Ireland, Spain, Portugal. New nursery techniques involving the intensive use of herbicides and fertilizers could be found side by side with little altered traditional methods. In planting bare land, countries tended to use fully mechanized ground preparation techniques (e.g. ploughing and mechanical draining). The re-establishment of woodlands after clear-felling tended to

³ European Timber Trends and Prospects, 1950 to 2000, published in 1976

follow traditional practices. Thinning followed the practices customary for the region, but it was beginning to be so costly to undertake early silvicultural thinnings using conventional methods that new techniques were being tried out, e.g. so-called “line thinnings” or “numerical thinnings” or “re-spacing” (where at a pre-thinning stage trees were cut off at a convenient height and left to rot).

There was in the decade a change in the living conditions and status of the forest worker. What had at the beginning of the decade been a high accident risk business had by the end become a safer occupation with better training possibilities for a much higher proportion of the work force. Where forestry was mainly a seasonal (usually winter) occupation there was less tendency for employers to hire unskilled workers for the season and leave them to get on with the job without any formal training. Training possibilities for the farmer, who regularly worked on his farm woods on a seasonal basis or who took regular employment in logging in the winter, also improved and confirmed their key role in the skilled (though seasonal) work force of several countries, notably in Scandinavia.

The job had altered in the sense that the logger no longer relied almost entirely on his own muscle power but had at his disposal his chainsaw and other mechanical aids. He was undoubtedly better clothed and probably better fed in the sense that his diet was better balanced.

Workers’ productivity had increased, due to the chainsaw primarily but in part due to the better training, clothing and diet. Wages or piece-work earnings had increased in real terms – a necessity if forestry was to get the labour it needed in competition with other occupations.

Many workers had moved from remote houses into villages or country towns and travelled to work; their families were better able to attend schools and to enjoy some social life in the community. Wives could get employment, whole or part-time, and children leaving school could more readily find work without having to leave home.

The decade 1965 – 1975

By the mid-1960s there was a considerable increase in the use of machines in the forest, such as farm tractors with 4-wheeled drive or half tracks, three-quarter tracked forestry tractors and articulated wheeled tractors. Available for the basic tractor units was a range of attachments which improved their usefulness. Radio-controlled winches reduced the time taken by the driver to assemble behind the tractor a load of trees for skidding to roadside from stump; grapple loaders enabled articulated load-carrying tractors (forwarders) to collect and load pulpwood and short sawlogs quickly and easily from the felling site and to act as mobile cranes for loading main-road lorries. Of course, by current (mid-1980s) standards many of these tractor units were rather simple and not too far removed from the farm tractor, but the more advanced of the articulated wheeled tractors had good enough performance for them to revolutionize logging in parts of Europe.

Parallel with this tractor-based development came improvements in cable-crane systems essential in terrain too steep for tractors. Although they employed the same basic principles as earlier cable-cranes, there were significant improvements to the detailed mechanisms so that productivity was increased. The best of the articulated (frame-steered) tractor based units had so improved their performance that they replaced cable systems on some mountain slopes formerly regarded as unworkable by vehicles – it being generally cheaper to skid or forward than to use cable-ways.

By 1970, following the Canadian lead, tractors equipped with tree felling devices were in use in tractorable terrain in coniferous stands and by 1975 tractor mounted machines (processors, harvesters) were being used for felling, limbing (debranching), crosscutting and debarking.

Debarking, which in manual work occupied up to half the working time, was largely, if not fully mechanized by 1975 – usually at the factory, rather than in the forest.

Regional shortages of wood as a raw material for processing led to increased interest in harvesting “a larger part of the biomass”, especially branches and roots, and there were new

developments in stump-removing machines and chippers for chipping whole trees and tops in the forest.

The major changes in machine capability had important and far reaching effects on most aspects of management, training, health and safety. Perhaps the most important impact on management was that choices that now lay between many different machines and systems, and combinations of these, could not be resolved on the back of an envelope on the basis of common sense and practical experience. There was also a choice in some instances between a continuation of floating or the construction of roads to link the forest to the public road network or occasionally to a rail system. In a general way floating lost out to other means of transport – mostly by road, with the truck coming well into the forest on forest roads now capable of carrying main-road vehicles.

Management had also to pay even greater attention to training and safety than it had in the past decade. Expensive, mechanically complicated machines require regular maintenance by skilled mechanics and need to be operated by highly trained personnel if downtime is to be kept at an acceptable level.

Although freed from much of the strenuous hard physical labour which manual logging systems demanded, it became clear during the decade that the operators were being subjected to quite new forms of physical and mental strain (for example shift working with lights during hours of darkness); and that there were new kinds of risks and dangers to operators carrying out routine maintenance to machines – for example, many of the machines of this period were not fitted with adequate steps or handholds for use during routine inspections in the forest.

The ever present high pressure hydraulic hoses presented a constant danger of oil-leaks, damaging the environment; machines could do damage to the soil by compaction and cause physical damage to the roots and stems of remaining trees during thinning or selective felling. In extreme cases the use of tractor-based logging systems had to be abandoned in favour of environmentally more acceptable systems.

In spite of the drawbacks, the increase in productivity made possible by mechanization of felling, limbing, crosscutting, debarking (where applicable) and extraction, meant that in some situations the man-days required per 100 cubic metres had fallen from 60 in 1955 to 30 in 1965 to 10 in 1975. But it has to be emphasized that mechanization on this scale was not achieved, nor could it be achieved, over the UNECE region as a whole. For some countries, e.g. the USSR, the early 1970s represented the start of a second stage in mechanization where in flat country a new generation of machines began to be introduced for felling and bunching, felling and skidding and delimiting.

Generally speaking, full mechanization of harvesting operations was not achieved for broadleaves and the (large) size of logging machines and their high capital cost made them uneconomic in the numerous forests owned by small-scale forest owners. Even in countries with a high degree of mechanization there were difficulties in applying mechanized harvesting systems in thinning operations, especially in young stands. The use of strip roads and “line” thinning methods that had been introduced in the previous decade were continued, but by 1975 the economic arguments began to favour “no thin” forestry.

The seriousness of damage by machines to tree roots and stems and to the soil through the use of the machines available at that time was now more fully understood and appreciated. In particular, reports of mechanized thinning operations said of winches used for ground skidding “much more damage has been done to trees in winching than was expected”. Changes in machine design were initiated, especially in thinning operations.

The use of wood as a fuel had been dropping due to the competitive price and convenience of alternative fuels, for example the advent of cheap bottled natural gas in some countries; the development of hydro-electric power in others. But the sudden increase in the price of oil in the early 1970s had the effect of reducing the rate of decline in the use of wood as a fuel. A report on

harvesting methods suggested that one way of reducing the relatively high cost of harvesting in low-quality broadleaved forests might be to increase the use of chippers – an example of how new technology might help to re-ignite a traditional demand for wood. In fact the matching of new machine concepts with future wood requirements from specific types of forest was now becoming more of a science than in earlier stages of mechanization.

Few of the changes in harvesting methods would have been possible had the wood specifications of pulp and board mills remained as they had been in the period up to 1965. Many of the established pulping processes had relied on straight billets of uniform length with little tolerance in the specified minimum and maximum diameters and sometimes with the bark completely removed in the forest (as in the French specification “blanc blanc”). Pitprops, once the largest single market for small roundwood in parts of Europe, had to be prepared to a multiplicity of lengths and top diameters and not infrequently free of bark.

Aware that these requirements were pushing up prices as workers' wages had to be increased to compete with those of alternative employment, the pulp and board industries invested heavily in research and development programmes to enable them to adopt much less stringent specifications for their pulpwood and yet at the same time allow them to increase the quality of the pulp, paper and board that they produced (for in this field customer requirements were becoming more stringent and competition increasing). Taking the UNECE region as a whole (Europe, including the USSR, and North America), these efforts were not particularly successful up to about 1970, but thereafter the forest products industries generally found ways of accepting and using successfully less demanding specifications as to lengths, diameters and size of “stubs” left after branch removal. In extreme cases the full tree (tops, branches and needles but not roots) could be chipped and used in particle board manufacture.

The decade 1975 –1985

In certain respects the economic and social environment in which Europe's foresters had to operate during the decade to the mid-1980s was more turbulent than in any period since the Second World War. Already by 1975 the growing wave of public concern for the environment had led to greater awareness amongst legislators and opinion-formers of the importance of forests' contribution to environmental benefits and the need for forest conservation. This concern escalated during the decade with the emergence of the air pollution problem and the growing belief in some link between air pollution and increasing signs of forest decline in parts of Europe, notably in the Federal Republic of Germany and neighbouring countries. At the same time, the annual recurrence of forest fires, almost all caused by people, on hundreds of thousands of hectares in southern Europe, caught the public imagination.

On the economic front, the decade started with the trough of the world recession following the oil price shock of 1973-74. It gradually became apparent in the following years that the economies of most European countries had reached a turning point and that the dynamic growth up to 1973 was unlikely to be experienced again in the foreseeable future. Consumption of forest products, which had reached a record level in Europe in 1973, hesitantly recovered from the 1975 recession to reach a new peak in 1979 but thereafter weakened again and during the first half of the 1980s showed little movement, either up or down.

With the European forest resource continuing to expand steadily, efforts to reduce the increasing backlog in thinnings and the coming into production of plantations established in earlier decades, wood supply was ample and markets in Europe in the early 1980s remained keenly competitive. It was against this background that the fourth of the FAO/UNECE long-term studies was prepared (ETTS IV)⁴. Its findings would have a significant impact on thinking as regards future developments in forestry, not least because they differed in certain important respects from those of earlier long-term studies. For example, whereas the latter had foreseen an increasingly tight supply

⁴ European Timber Trends and Prospects to the Year 2000 and Beyond, published in 1986.

situation, growing dependence on supplies from outside Europe and the likelihood of a rising trend in prices, ETTS IV foresaw a reasonable equilibrium between European supply and demand of forest products, at least up to 2000, and a continuation of competitive conditions with no evidence to suggest that prices would change significantly in real terms – in other words, a continuation of the developments during the 1975-1985 decade.

Other important aspects relating to the past decade were the increasing relative importance of the “non-wood benefits” of the forest, the environmental and social goods and services, including environmental protection, nature conservation, hunting, grazing, water regulation, recreation, landscape and so on. Even if, in the majority of European forests, wood production was (and will) remain the single most important function, forest management was becoming more and more oriented towards multiple use and sensitive to public opinion regarding the role of the forest and the techniques employed to fulfil that role.

For example, public pressure to avoid damaging the soil and spoiling the appearance of the landscape led in some cases to the use of cable systems in place of skidding – skidding is cheaper but has brought “wrath from environmentalists and the public”. Again, selective cutting may be practised where the more economic solution is to clearfell, e.g. in the USSR in environmentally important areas. And it is perhaps fair to claim that pretty well everywhere at the planning stage attention was coming to be paid to the long-term effects on soil productivity of the various alternative harvesting systems being evaluated.

The decade saw many major improvements in forest machinery from the chainsaw to the complex harvesting machine and a huge investment in logging machines. Management was concerned to utilize efficiently this large capital asset, i.e. to maximize the use of machines, taking advantage of the new ability to handle quickly very large amounts of data in computer-based systems, giving the opportunity to analyze all the factors involved, including the cost of the road network. Yet not all harvesting was mechanized, and in extreme cases seminar publications showed that in the 1980s there were still parts of the UNECE region where tools and techniques had not changed all that much from the 1950s (delimiting by axe; manual debarking).

As happened in the decade 1965-1975, there was less change in working methods in predominantly broadleaved woodlands (as opposed to coniferous woods) and in small (e.g. 1 to 10 hectares) ownerships (of broadleaves and conifers) in the southern part of Europe, where the annual removals of a few cubic metres from an individual property could not justify the investment in anything but the most basic machinery, e.g. an attachment to a farm tractor such as a simple winch. Where such operations were mechanized, it was sometimes through the medium of contractors who carried out the work for owners in a region and who could justify the use of the simpler forestry tractors (e.g. skidders, forwarders).

Forest road making was almost everywhere fully mechanized and used many different kinds of machine, e.g. bulldozers, excavators, dump trucks, scrapers, graders, stone-crushers – to name but a few. But road making was decreasing as the opening up of forests neared completion in most, though not all countries. In mountain areas there was growing resistance from ecologists to increasing the road network.

Standards of public roads improved and a new generation of big vehicles was being developed and licensed to use them. Since it was not economic to construct forest roads to the standard of main public highways, the large new trucks could not enter the forest and new questions concerning road transport economics arose.

Hiring of seasonal (e.g. “logging season”) workers was no longer a valid option for the major part of UNECE countries’ harvest of timber, but small-scale owners, especially farmers, worked their woodlands on a part-time basis. However, economic pressure caused a change from directly employed workers to contract labour, which posed new problems and challenges.

Due to the increased use of machines, the need for training of small-scale forest owners and farmers increased as did that of the small logging and general forestry contracting firms. Safety precautions and good health practices were often insufficient or lacking. Training helped to encourage harvesting of unthinned and overstocked forests.

While in the preceding decades training was consolidated in permanent training centres and more and more emphasis was given to the training of young entrants, latterly short refresher courses given at the work site by travelling instructors, some of them forest workers or forest owners, gained importance.

For the operator of a modern timber harvester or processor – now on a salary rather than on a piece-work contract – essential training in control and maintenance of his machine represented a large investment of time and money. When trained, he would be at risk from static work with unfavourable postures and from mental stress as well as from physical accidents. The chainsaw operator would also be at risk from noise unless strict precautions were taken. The risk of vibration-induced white fingers was considerably reduced through improved machine design and required further monitoring. But overall the conditions of work for forest workers improved substantially. The new problems that had arisen led to an increase in the role of ergonomics during the 1980s. Special criteria of working conditions for forest workers and machine design criteria were established in a number of countries. In practice it was difficult to ensure that these criteria were fully and properly observed in the field. Therefore rehabilitation of forest workers became a serious concern in many countries.

Afforestation and reforestation also involved the use of machines – e.g. for ploughing, scarifying, draining, terracing, planting, weeding and cleaning.

In many forest operations, the use of chemicals was found effective: as herbicides, insecticides, fungicides, etc. In some countries, their use expanded considerably over the decade; in others, concern over the negative environmental effects of some chemicals, notably DDT, 2,4,5-T and Lindane, led to restrictions on their use and, in some instances, their complete ban in forests. One aspect to receive increasing attention was the health risks to people, notably to the forest workers handling chemicals. In several countries, measures were introduced to protect the workers, for example by means of instruction, protective clothing and health checks. Research continued into these aspects, as well as silvicultural methods that would reduce or eliminate altogether the use of chemicals. It is a curious reflection on human nature, however, that public opinion seems to be much less sensitive to the use of chemicals in agriculture, where the intensity of use is far higher and where they are more likely to get into the human food-chain, than in forestry. It may be related to the public's perception of forests, even those intensively managed as in Europe, as a 'natural' environment.

One effect of the steep rise in energy prices in 1973/74 and again at the end of the 1970s was to raise interest in alternative sources of energy to fossil fuels. Wood and other forms of biomass appeared attractive because of their renewability and widespread availability, which partly offset such inconveniences as the low value to weight ratio which made them uneconomic to transport over long distances, their sometimes low calorific value, and difficult handling. Nonetheless, the long-term decline in the production and use of fuelwood in Europe and North America was reversed in the latter part of the 1970s, and ETTS IV, on the assumption that oil prices would remain at or above 1985 levels, forecast a steady rise in the use of wood for energy, both by households as well as by forest industries and other bulk users, to the end of the century. The drop in oil prices in 1986 may have brought into question the validity of this outlook, even if, in the long run, supply of oil would become more constrained and the need for alternative energy sources would rise.

In any event, the impact on the forest sector was quite apparent and could become even more so in the future. Although wood accounted for only 2% or so of Europe's total energy consumption, wood used for energy in the 1980s was equivalent to as much as 40% of the region's annual cut, when account was taken of the volumes of fuelwood, industrial wood residues and pulping liquors used. The tendency – marked in some countries – towards full-tree logging gave the possibility of using

branchwood as fuelwood; elsewhere the harvesting of logging residues (lop and top) from conventional logging operations became economic due to technical advances in forest machinery and in boiler design. Even a small change in wood's share of total energy, therefore, could have a marked effect on the volumes used as fuel. Up to the mid-1980s, there was no significant increase in the competition for wood between its use for energy and as an industrial raw material, but this possibility could not be excluded some time in the future. Certain beneficial effects could become apparent, for example, the possibilities to improve the level of management and profitability of small private forests, to increase the volume and profitability of thinning operations which in many areas were long overdue, and the development of special harvesting equipment, in some case associated with the establishment, at least on an experimental basis, of short-rotation energy plantations.

With so much horse-power under his command, the forest manager could ill afford to make wrong decisions either at the macro-planning or local planning levels. The need to give him the latest information and to spread new knowledge on all aspects of forest operations – from stand establishment to harvesting of the final crop – became more urgent at the international and national levels. The more difficult and least effective channels of communication were – and still are - often those at the national level, where the specialist has to translate his expert knowledge into language that the field manager and operator can understand. Internal communications are obviously more difficult in countries where a significant proportion of the forest area is owned by a very large number of private owners – especially where the ownerships are too small to justify the employment of professionally trained forest managers or advisers. The Nordic countries have a long history of successful owner co-operatives, which have gone a long way to overcome this problem; outside the Nordic countries owner co-operatives (or other forms of association) appear not to have the same appeal to owners except as political lobbies.

EVOLUTION OF THE JOINT COMMITTEE ACTIVITIES OVER THE FIRST THIRTY YEARS OF ITS EXISTENCE

Introduction

Over the three decades to the mid-1980s the Joint FAO/ECE/ILO Committee on Forest Working Techniques and Training of Forest Workers (as it was then called) was one of the most active international bodies in the forestry field. During that period the Joint Committee met in plenary session sixteen times and arranged numerous seminars and symposia⁵ and one “special meeting” of the Joint Committee. Over fifty study group meetings were held under its auspices, plus countless informal ad hoc working group meetings.

The Joint Committee issued over ninety publications and special reports⁶; important technical papers presented to its plenary sessions and study groups exceeded 500. The territory of the member countries extended from Vladivostok in the East to Vancouver in the West, from the Northern Coniferous Belt to the Mediterranean Sea.

This brief account of its history over those 30 years seeks to highlight some of the expectations of the Joint Committee's founding bodies; to describe what in the event was achieved and to discuss the lessons that may be drawn from this Committee's work for application to other regions of the world – most particularly the developing countries.

Origins of the Joint Committee

The concept of a Joint Committee originated in Geneva in 1950 when a sub-commission of FAO's European Forestry Commission (EFC) was set up – following a suggestion by a UN Economic

⁵ See annex III.

⁶ See annex II.

Commission for Europe (UNECE) working party on the more rational utilization of wood that there should be international co-operation on logging techniques and worker training.

The sub-commission did not meet on account of FAO's transfer to Rome and the resulting organizational difficulties, but at its fourth session (Rome, October 1951), the EFC set up a Pilot Committee of eight members countries: Austria; Finland; France; Germany, the Federal Republic of; Italy; Sweden; Switzerland; and the United Kingdom.

The International Labour Office (ILO) participated in the work of the Pilot Committee and from the outset helped its work with the provision of scholarships and other awards to assist with travel and training.

At its sixth session in October 1953, the EFC invited the Pilot Committee at its next meeting to submit proposals as to its future status, terms of reference and composition, and invited all member countries of the Commission to send experts to that Pilot Committee meeting. At that session it also had joint meetings with the Timber Committee of the UNECE to consider implementation of the first European Timber Trends Study (ETTS I), published in the same year.

This joint meeting recommended among other things that the Executive Secretary of UNECE and the Director General of FAO should give high priority to the possibilities of improving forest yields through increased logging efficiency, and gave them authority to convene joint FAO/ECE working parties to pursue this aim. Eastern European countries and the USSR were members of the Timber Committee of the UNECE but not of FAO's European Forestry Commission, so the device was used of convening an FAO/ECE Joint Working Party on logging techniques and training of forest workers in June 1954 and in the same week the Pilot Committee of the EFC. The Joint Working Party and the Pilot Committee met separately and then jointly and in the event were each able to recommend to their respective parent bodies the setting up of what became the Joint Committee.

In November 1954 at a joint session of the Timber Committee and the EFC in Geneva it was decided:

- to set up a joint committee of the FAO European Forestry Commission and the UNECE Timber Committee, to meet every year or two years as required;
- to request the joint committee to set up study groups to examine technical questions, which would meet as required and work mainly by correspondence or personal contacts, and also to call on research institutes to study certain specific projects;
- that, if necessary, the joint committee might instruct a small group to draft the general conclusions which it considered that it should draw from the work of the different study groups as a whole;
- that these conclusions, as well as the results achieved by the study groups, should be made available to the UNECE Timber Committee and the FAO European Forestry Commission;
- that the name of the committee should be "Joint FAO/ECE Committee on Forest Working Techniques and Training of Forest Workers";
- that the terms of reference of the Joint Committee should be as follows: "*to foster international collaboration with regard to improvement of forest working techniques and training of forest workers in logging and other forest operations in order to support national efforts aimed at increasing productivity and improving the standard of living of forest workers; special attention to be given to increasing the efficiency of labour, reducing at the same time the efforts required by the workers, prevention of accidents and reduction of waste*".

In addition:

- The Joint Committee was to be convened by the Secretariat, in consultation with its officers. Its main task was to review the activities and reports of the study groups and of the Secretariat on specific questions, to discuss technical matters within its terms of reference, to establish a programme of work for the ensuing period and to appoint study groups or any other working organs needed for the implementation of the programme;
- Between meetings, the chairman and officers of the study groups, together with the Secretariat, were to settle any questions that might arise in connection with the programme of work and preparation of documents.

The first session of the Joint Committee took place at Nogent-sur-Marne (France) in December 1955 and the work which had been undertaken by the Pilot Committee since March 1952 was now to be expanded to cover the needs of all the countries of Europe, the USSR, Canada and the USA.

In recognition of the International Labour Office's strong support of the Committee from the start and its continued financial contributions to its training and safety activities, the title "(in collaboration with the ILO)" formally adopted in 1958, was changed to the "Joint FAO/ECE/ILO Committee" in June 1964.

By the end of 1986 the Joint Committee had met sixteen times in plenary session – in France (twice), USSR, Norway (twice), Czechoslovakia, United Kingdom, Sweden, Poland, Federal Republic of Germany, Hungary, Finland, Bulgaria, Spain, Turkey and the Netherlands.

Working methods of the Joint Committee

This section describes the methods by which the Joint Committee set out to achieve the objectives set for it in its term of reference, and in particular to foster the exchange of information at the international level.

Following of the principles decided on by the Pilot Committee, the Joint Committee decided to undertake its work through the medium of small expert study groups or working parties and also to:

- organize field trips;
- organize international symposia or seminars on subjects which were of major importance at particular times;
- organize international training courses for workers, supervisors and teachers;
- prepare and publish standard procedures for testing tractors and other machinery used in the forest;
- facilitate the exchange of films and other teaching material between countries;
- undertake the preparation of a five language glossary of terms covering the Joint Committee's field of work;
- publish the results of its main studies through the UN Publications Office in Geneva.

The setting up of common standards for testing forest machines (and especially tractors), the attempts to overcome the technical language barrier through multilingual glossaries of terms, the field trips, the exchanges of films and slides and other visual teaching material were all seen as – and in practice turned out to be – important in promoting a better understanding and easier communication within the study groups and helping them in turn to communicate their findings to the plenary sessions and to all member countries. Outside the plenary sessions and study group sessions the main activities were the organization of international symposia, seminars and training courses and field trips with the meetings, symposia and seminars.

The Joint Committee met in plenary session every two years to:

- hear the reports of its study groups and discuss their recommendations on (a) publication of completed studies and (b) future work;
- decide on its programme of work;
- participate in a field trip;
- (from 1964) hold a symposium, seminar or special discussion on a selected topic.

The way in which the Joint Committee plenary sessions worked has varied in detail, but in principle:

- the Secretariat received proposals from countries as to what work should be undertaken by the Joint Committee (either directly or through the Timber Committee or the EFC or via the Steering Committee);
- the Secretariat prepared the agenda for the plenary session;
- the proposals were discussed by the Joint Committee which, with the help of its Rapporteur, made recommendations for the carrying out of studies to its parent bodies in FAO, UNECE and ILO, and recommended how the studies should be carried out (by an expert, or expert group, by an institute, or by a symposium or seminar, etc.);
- the Joint Committee vetted the reports of completed studies and recommended if and how the final report should be published and by whom.

The study groups (1955 to 1978)

The study groups in which the great bulk of the Joint Committee's detailed technical work was undertaken were concerned with:

- methods and organization of forest work;
- mechanization of forest work;
- vocational training and prevention of accidents;
- multilingual glossary of forest work science.

Meetings outside Geneva, including field trips⁷

The Pilot Committee and the Joint Committee broke new ground within the framework of FAO/ECE/ILO in that meetings were regularly held away from Geneva. The early successes of the Joint Committee and the support which its efforts attracted at the meetings of its parent bodies (the Timber Committee and the EFC) and at ILO meetings overcame the bureaucratic resistance that there might have been to so many meetings taking place outside Geneva.

Symposia, seminars or special meetings

These were held outside the plenary session and were a means of giving a large number of delegates –including participants from outside the region – the opportunity to hear and debate with experts on particular subjects. They also served:

- to give guidance as to what measures countries might take to solve problems on the basis of existing knowledge;
- to recommend what further research and development work should be undertaken (e.g. through the activities of the Joint Committee).

⁷ The countries hosting meetings of the Joint Committee (plenaries, seminars, etc.) are listed at the end of Annex III.

Training courses

The Pilot Committee recognized that to meet its terms of reference there was an urgent need to bridge the gap between those few countries that had (in the early 1950s) extensive scientific and practical experience in rationalizing forest operations and techniques and in training forest workers, and that had none or were only beginning to enter this field.

Courses on relevant topics were therefore organized and were open to all member countries; scholarships were awarded by ILO to help countries meet the costs. Exchange control regulations often mitigated against foreign travel at that time and without ILO grants attendance would have been severely restricted. Under Joint Committee auspices 13 international raining courses were held between 1957 and 1971 in Europe (Annex III).

Standardized testing of forest machinery

In 1954 a Study Group on the Testing of Tractors used in Forestry was set up. The pioneering work of this study group was taken over by the Study Group on the Testing of Forest Machinery set up in December 1955, and later by the Study Group on Mechanization of Forest Work. Work on forest machinery testing was subsequently carried out through the International Organization for Standardization (ISO) (see below).

Exchange of teaching materials

One of the main problems which emerged from the early deliberations of the Pilot Committee and the Joint Committee was that of describing a working method used in one country in sufficient detail and with sufficient clarity that it could be copied in another country. This together with the shortage of teaching material in some countries led the Joint Committee to initiate lists of slides and films and other visual aids that countries were willing to give, lend or sell to others.

There is no doubt that the exchange of films particularly enabled work study experts to explain to general administrators and managers just what a world of difference there was between the worst and best working techniques, tools and other equipment and so to obtain funds for training and re-equipment of the work force.

Multilingual Glossary of Forest Work Science

At its first plenary session, the Joint Committee appointed a Study Group on a Multilingual Glossary of Forest Work Science. The glossary was to cover in English, French, German, Russian and Swedish the concepts listed in sections 30 to 37 of the Oxford Decimal Classification, and the study group was to work in close collaboration with IUFRO. In view of the complex nature of this work, it was found that a study group was not the way to cope with it. The study group was therefore disbanded in 1970.

CHANGES IN THE METHOS OF WORK: RE-ORGANIZATION OF THE JOINT COMMITTEE IN 1978

In 1978 the Joint Committee, with the approval of its parent bodies, made some fundamental changes in its structure and methods of work. Its terms of reference were modified somewhat to read as follows:

“to foster international collaboration with regard to improvement of forest working techniques and training of forest workers in logging and other forest operations in order to support national efforts aimed at increasing productivity and improving the standard of living of the forest workers; special attention to be given to increasing the efficiency of labour, reducing at the same time efforts required by the workers, prevention of accidents, reduction

of waste and the establishment of an adequate balance between technical, social and economic requirements and those of the environment” (modification underlined).

The Joint Committee decided that it would divide its work into three main areas:

1. Silvicultural operations and general management
2. Wood harvesting and transport
3. Human aspects of forest operations.⁸

In all aspects of its work the Joint Committee decided to pay attention to the needs of the environment.

Under the new organization the Joint Committee agreed that its activities should be conducted by:

- the **plenary session** of the Joint Committee meeting every two years, as had been its practice in the past;
- a **Steering Committee** meeting annually, i.e. on the occasion of the plenary sessions and once between plenary sessions;
- six **co-ordinators**;
- **teams of specialists**.

The Joint Committee decided that the Steering Committee would consist of the office-holders of the Joint Committee as such (Chairman, Vice-Chairmen, Rapporteur) and the six co-ordinators. For each of the three work areas, two co-ordinators would be chosen for their knowledge of the subjects to be dealt with; an attempt would be made to maintain a balance between different parts of the UNECE region.

The co-ordinators' tasks were to:

- prepare proposals for the development of the programme of work of the principal subjects for which they were responsible;
- arrange the setting up of teams of specialists and provide a link between the teams and the Steering Committee;
- act as advisers to the Joint Committee within their spheres of responsibility.

The teams of specialists, made up of specialists appointed by their Governments and working under a designated team leader, were to work by correspondence and meetings and submit reports to the Joint Committee (or the Steering Committee in years where there was no Joint Committee meeting).

Subjects studied by the teams of specialists, 1978 – 1985

The teams of specialists inherited work from the former study groups and initiated new work:

- a) The teams of specialists covering silvicultural operations and management took over much of the work of the former Study Group on Methods and Organization of Forest Work (e.g. measurement of labour productivity, methods of payment) and items such as the mechanization of stand establishment and silvicultural operations from the Study Group on the Mechanization of Forest Work; they also undertook work on standardization;
- b) The harvesting and transport teams took over much of the work of the Study Group on Mechanization which in practice had devoted most of its efforts to logging;
- c) The “human aspects” teams took over the work of the Study Group on Vocational Training and Prevention of Accidents.

⁸ Later retitled « Vocational training, applied ergonomics, safety and health of forest workers ».

The reorganization may be seen not as a change in the subject matter being studied by the Joint Committee so much as the means of organizing and tackling the selected topics more efficiently, of avoiding the overlapping that had previously been encountered by the study groups, and of reducing the number of programming meetings (3 to 4 meetings of the study groups were replaced by one meeting of the Steering Committee).

JOINT COMMITTEE LIAISON WITH OTHER BODIES

The International Union of Forestry Research Organizations – IUFRO

IUFRO has been represented at all the meetings of the plenary session of the Joint Committee – normally by one of the country delegates who was a member of section 32 of IUFRO. In addition, IUFRO has co-operated closely with the work of many of the Joint Committee's study and other subsidiary groups and has co-sponsored a considerable number of seminars and symposia. From 1979 onwards, a coordinator between IUFRO and the Joint Committee represented IUFRO at Joint Committee sessions and vice versa.

The International Organization for Standardization – ISO

In 1975 forest machinery became a separate activity within ISO, and ISO was represented at the eleventh to the sixteenth sessions inclusive of the Joint Committee. For the previous decades, the work of several ISO Technical Committees had an influence on the design, construction and safety features of forest machinery or machines used in the forest (e.g. farm tractors). ISO Technical Committee 23 deals with forest machinery and maintains a number of standardization sub-committees working in fields closely connected with those of the Joint Committee.

The International Energy Agency – IEA

The Joint Committee has included a project on the harvesting of wood for energy purposes in its programme of work since 1978, in response to many countries' interest in this question and related ones, such as the fuller use of the forest biomass and the reduction of harvesting losses. It decided, however, that to avoid the possible risk of duplication of effort and until it identified a particular activity for which it would be the appropriate body, it would rely on the International Energy Agency to keep it informed about relevant international activities, notably those of IEA itself. Accordingly, reports were presented by representatives of IEA's Forestry Energy Programme to the Joint Committee's thirteenth to sixteenth sessions inclusive (1980, 1982, 1984 and 1986).

SUBJECTS DEALT WITH BY THE JOINT COMMITTEE

At any one time the activities of the Joint Committee covered a few main topics and a greater number of related topics. For example, the Joint Committee undertook the task of trying to interest manufacturers in producing a reliable robust wheeled forestry tractor; its main activity being to specify what was required of such a tractor in the way of cross-country performance, manoeuvrability, stability and safety. It was accepted that many refinements would have to be built in later and that ergonomic factors in particular would need to be studied if/when the general concept of the tractor ever reached the prototype production stage.

This chapter selects different subjects (e.g. training, ergonomics, transport) under which to discuss the progress made in meeting the challenge to change methods, machines and attitudes. The choice of subjects is somewhat arbitrary and is made from the generalists' point of view, rather than that of the expert. The subjects chosen are:

Training	Cable-cranes
Health and safety	Conversion of timber
Ergonomics	Mountainous regions
Work study (Performance rating)	Forest fires
Working techniques	Machinery
Afforestation and reforestation	Forest management
Thinning	Transfer of technology
Harvesting	Exchange of information
Transport	Technical tables
Handling	Glossary
Debarking	Bibliography

Training

The first training courses for Time Study Experts in Forest Work were held in Switzerland in 1953 and 1954 on the recommendation of the Pilot Committee. A subsequent course was held in 1957 (126)⁹. As their title implies, the courses were designed to teach specialists how to undertake time and motion studies in forest work. Only a very few countries – and sometimes only one or two individuals in those countries – had until the 1950s regarded time studies as being of any relevance in forestry. One attitude was that they were “all right in a factory but a forest is not a factory”.

ILO, towards the end of 1955, initiated a scholarship scheme to facilitate the exchange of personnel charged with the training of forest workers. The secretariat in Geneva acted as the clearing house, circulating lists of suitable courses being organized in member countries.

By 1959 (Third Session) the Joint Committee noted that because of greater mechanization at the work site and changes in work proper, it was ever more necessary to train foremen and workers and that “it would seem that in each country many new developments have occurred since the last session of the Joint Committee: new schools have been created or itinerant courses, according to the local conditions in each region”.

Cableways or cable-cranes have been used in the Alps for many years. They rank from the simplest gravity cableway on which individual logs are sent shooting down to the valley below to cable-cranes capable of carrying large loads under totally controlled conditions. Several countries wanted to benefit from the experience accumulated in Austria, France, Italy and Switzerland.

In 1957, 1958, 1962 and 1968 courses were organized in those countries to train managers and operators (127, 128, 132, 136).

An international training course in Mechanized Forest Operations was held in Sweden in 1959 (95), and one on Timber Extraction and Forest Roads in the Federal Republic of Germany and France in 1960 (96).

By 1961 the pace of mechanization had increased (use of power chainsaws for felling and replacement of the horse for extraction (skidding) by agricultural tractors, and the need for yet more training was identified. ILO had by now scholarship money to match the demand for scholarships. An international course on the Vocational Training of Forest Workers was held in Sweden in 1961 (131).

The next decade saw the introduction of forestry tractors, equipped with felling, cutting, debarking and loading devices; the training of operators required a rather more sophisticated approach than training them to drive a simple farm tractor. At the 1972 (Ninth) session of the Joint Committee “certain delegations stressed the point that the training of operators on very costly machines exceeded by far economic realities” and proposed the development of simulators for training. Be that as it may,

⁹ Numbers in brackets refer to the publications listed in annex II and the meetings listed in annex III.

the late 1960s saw the end of international training courses as such, and the emphasis shifted to helping countries plan their training schemes in light of general experience among member countries. Thus at the Twelfth Session (1978) the Joint Committee described its vocational training role as to “assist Governments in planning their national vocational training policies”.

Another change of emphasis in training became evident when in 1980 the Joint Committee held a seminar in Norway on Vocational Training and Extension Services for Small-scale Forest Owners and Farmers (63, 160). In this connection the Joint Committee (Thirteenth Session, 1980) supported a suggestion that future preparations for such a seminar could again include a report based on an analysis of countries’ replies to a questionnaire circulated well beforehand. However, the Joint Committee stressed the need “to avoid overburdening countries with enquiries” and suggested that questionnaires should be used only to obtain information that would “significantly add to the results of the seminar”. In this the Joint Committee was echoing a plea that countries had been making about the many and varied questionnaires circulated by the Joint Committee since its inception.

In 1982 a seminar was organized in the United Kingdom on the Management of Forest Worker Training (67, 165), where *inter alia* the value and role of on-the-job training was emphasized, as was the value of training workers to improve safety and safeguard health.

In 1984 the ILO published a new fourth edition of its handbook on The Vocational Training of Forest Workers (74). Earlier editions were published in 1954 (2), 1955 (12) and 1968 (51).

A seminar on Extension Services for Owners of Small Woodlands (woodlots) was organized by the Government of Canada in 1987, with the collaboration of the Joint Committee (179).

One of the difficulties encountered in conducting international training courses is that of simultaneous interpretation. Apart from the cost aspect, one has to reckon with the practical problems encountered in trying to provide instruction in up to three official languages in an actual work situation and to recognize that even then some of the participants would not understand English, French or Russian (the official languages of UNECE). The practical problems were easier to overcome when mainly manual work was being taught, for much could be learnt by demonstration: given the complexity of today’s forest machines such an approach is not practicable.

Health and safety

From its inception the Joint Committee was much concerned with the prevention of accidents in forest work. ILO was at the same time concerned with the high accident rate in forestry on a world-wide basis.

It became evident that the methods of collecting and analysing accident statistics left much to be desired, and they often gave quite misleading information as to the real cause of accidents and therefore of the best ways of reducing them.

The search for a sound methodology for the collection, compilation and analysis of accident statistics involved a considerable joint effort between the Joint Committee and ILO, and resulted in a report (21), which was generally accepted as a big advance on anything hitherto available on this subject.

Questions affecting workers’ health revolved round vibration and noise (especially of power-saws), and the Joint Committee kept in touch with ILO and the World Health Organization (WHO) on these subjects and on the question of the rehabilitation of older workers following injury or illness caused by their occupation.

The Joint Committee also faced up to the new set of questions being posed by the use of sophisticated machines that could impose severe mental stresses (rather than physical stresses) on the operator.

It was suggested that these new questions fully justified the need for continuing international collaboration on health and safety – through, for example, the Joint Committee.

Before leaving this subject it is necessary to refer to the special role of ILO, since nowhere in the work of the Joint FAO/ECE/ILO Committee is that role more prominent than in the field of training, health and safety.

ILO is the international agency with the prime responsibility for these subjects, and it is ILO that has the international expertise in this whole field.

It should be taken as read that throughout the life of the Joint Committee, ILO has supported its work in training, safety and health – for example by the award of fellowships where these were needed to facilitate travel to courses or seminars. ILO has also undertaken the not inconsiderable task of compiling and publishing various training handbooks and manuals and has made freely available its unique body of knowledge based on its world-wide experience.

Ergonomics

Although the Joint Committee had had many discussions on the subject, it was in the 1968-70 programme of work that Ergonomics Applied to Forestry first appeared as a subject in its own right. A symposium was held on this subject in the Federal Republic of Germany in 1969 (54, 147).

Again in 1970-72 we have the Ergonomic Checklist – follow-up of the work of the IUFRO Working Group on Ergonomics by the preparation of a uniform checklist for forestry machines applicable in all European countries.

In the 1972-74 programme, Ergonomics Applied to Forestry became a sub-head of the Study Group on Vocational Training and Prevention of Accidents, and measurement of noise and vibration in machines became an item of study.

By 1978 a team of specialists was working with ISO (ISO/TC.23/SC.17) on ergonomic problems related to portable forest machines (e.g. chainsaws and brushsaws).

A Seminar on Applied Ergonomics (and Health and Safety) was held in Canada in 1981 (66, 164), and one on Ergonomics Applied to Forestry in Austria in 1983 (70, 170).

Work study (Performance rating)

In labour intensive (i.e. mainly manual) forest work the scientific measurement of output per worker for particular jobs as a basis for piece-work payment was not wholly scientific. In layman's language the work study expert had to estimate what physical energy the worker was expending to achieve a given output.

The Pilot Committee and the Joint Committee and their respective study groups working in this field had a number of debates on this subject. The majority view followed that of Section 32 of IUFRO which was cool towards a measurement (rating) that had to be estimated because there was no agreed method of measuring it scientifically (Second Plenary Session, 1957).

The question was discussed on and off over the years, but there were still different approaches as to carrying out and analysing time study – for example, all day observations of the worker by a trained work study observer vis-à-vis sample observations at random times. Micro-computers and electronic data processing helped to facilitate work study and to incorporate ergonomic measurement.

Working techniques

On the assumption that some countries had developed more efficient ways of doing tasks than others, the question arose – how could one be certain that one was in fact comparing like with like when selecting the apparently “best method” of doing a job. A great deal of work was devoted to the question of standardizing methods for studying working techniques culminating in the publication of *Methods for the Study of Working Techniques* (18) and its successor, *The Description of Working Methods in Forest Operations* (33), (“description of” in this context meant how to describe working methods).

In 1964 an analysis of methods of mechanization from the economic point of view was published under the English title of *Economic Assessment of Mechanized Working Methods* (39).

It has to be remembered that, although great emphasis was placed on the importance of films as a means of communication between countries in the 1950s and 1960s, the taking and processing of good quality films was more demanding for the amateur than with more modern “video” systems based on the television camera – and bringing in professional filming crews was expensive.

Afforestation and reforestation

Although in the early decades the whole emphasis of the Joint Committee’s work was on logging – in conformity with the wishes of the European Forestry Commission and the Timber Committee – some countries expressed an interest in other spheres of forest work such as “the planting of young forest trees” (First Session, 1955) and in the testing of machines for forest soil preparation and planting (Third, Session, 1959) and drainage (Fourth Session, 1961). In response, a limited amount of work on afforestation and reforestation was undertaken by the Joint Committee. The European Forestry Commission kept a close watch on these activities, since it was itself also dealing with questions relating to silviculture and forest management.

In 1972, however, the mechanization of forest establishment was recognized as an important field for the Joint Committee to study jointly with IUFRO and a joint symposium was organized in France in 1974 (58, 152).

Other studies included seed collection (38), plant production (71, 168), cultivation of forest soils (35, 44, 45), stand establishment after fire and storm (62, 155) and rehabilitation of low productivity Mediterranean forest (73, 171).

Thinning

The question of thinning was discussed by the Joint Committee since its inception in different contexts and from different points of view. Examples range from one man working with bow saw and axe in stands of spruce (in the 1950s) covering techniques, training and safety to later work on the chipping of whole trees in thinning operations and the use of processors in thinning.

The study on mechanized thinning in young forest stands was first started by the Joint Committee in 1959 and eventually the various studies culminated in a Seminar of the Mechanization and Techniques of Thinning Operations held in Nancy (France) in 1979 (159), followed by a joint IUFRO/Joint Committee Seminar on Silvicultural, Technological, Economic and Other Problems connected with the Mechanization of Thinning Operations held in Eberswalde (German Democratic Republic) in 1983 (72, 169).

Harvesting

Under this head came the great bulk of the Joint Committee discussions and studies carried out during the first three decades, so that the subjects mentioned in this section represent but a small selection of its work on harvesting made on the basis of the titles of publications and reports. Where

harvesting or logging appears in a title the subject matter is included here, as are movement from stump to forest road (e.g. skidding) or loading at forest roadside. “Mountainous regions” studies are dealt with later under that head.

The many other aspects of harvesting (logging) such as training, safety, health, testing of machinery, development of machinery and glossary of terms are dealt with under those heads.

Recognizably specialized logging systems are also dealt with elsewhere – for example cableways and extraction by helicopter.

Among the first tasks of the Joint Committee was the need to inform member countries of the different logging systems in use in Europe, the USSR and North America, and also to help them choose the logging techniques and best methods of work appropriate to their various situations (6). Another early important task was that of mechanizing work that was especially hard and dangerous, such as providing effective alternatives to the manual loading of logs on to trucks (5, 20).

The costs and benefits of the mechanization of extraction by tractor (as opposed to horse and other draught animals) was still a matter for debate up until the mid-1960s. We read in 1957 (Second Session) – “The possibility that the use of heavy machinery might damage the forest floor should not be overlooked”, with the clear implication that in some situations horses must not be replaced by tractors; this possibility is no longer with us in the UNECE region although the question of damage is.

The horse versus tractor study (37) was finalized in 1964, a year in which the concept of full-tree logging was in its seventh year of study by the Joint Committee. This is a good example of the range of interests for which the Joint Committee had to cater.

In 1968 the question of mechanization of harvesting of small-sized wood and logging residues merited a symposium (53, 146), parts of which were a forerunner to the 1983 Joint Committee/IUFRO symposium on thinnings (169).

An example of information on multi-purpose logging machines culminated in 1975 in a symposium in Sweden (59, 153). The findings of a IUFRO symposium on Forest Harvesting, Mechanization and Automation held in Canada in 1974 were made available to the Joint Committee by the IUFRO Section 32 representative on the Joint Committee.

The fact that in 1976, only two years later, there was another symposium on the Harvesting of a Larger Part of the Forest Biomass (61, 154) indicates clearly the pace at which technological change was taking place. Mechanization of harvesting operations of an intensity and scale not dreamt of in the 1950s was now a reality, bringing in its train new problems and increasing the need for close co-operation between countries as the cost of investing in new harvesting machines began to escalate rapidly.

In 1982 it was possible to talk again at a seminar in the USSR of reducing forest biomass losses in harvesting (69, 167), for by now harvesting no longer meant harvesting just the stem but also in some situations tops, branches, foliage and even roots.

Transport

Like harvesting (or logging) the question of timber transport by lorry was discussed from many aspects as a continuing theme during the Joint Committee’s early decades. Other forms of transport that were studied ranged from Timber Transport on Snow and Ice Roads in the USSR (27) to Logging by Helicopter in the USSR (29). Whilst it was still commonly practised, the exchanges of information on the floating of timber were of interest to the Nordic countries, Canada and the USSR, and in 1965 the results of the Joint Committee’s work was published under the title ‘The Application of Machinery to the Floating of Timber’ (40).

In 1963 a Symposium on the Planning of Forest Communication Networks (43, 105) marked the first attempt to bring together existing knowledge on the planning and specifying of forest roads and cableways and their integration with public roads and other transport systems.

Tree length transport on public roads (seventh Session, 1968) and other aspects of the use of special trucks for the transport of sawlogs and pulpwood engaged the Joint Committee's attention from time to time.

A major review of the "Planning and Techniques of Transport and its Relation to Operational Activities in Forestry (68) took place at a seminar in Norway in 1982 organized jointly with IUFRO (166). The seminar dealt with the question of the impact of mechanization on logging and transport systems in difficult mountainous conditions as well as with general principles (e.g. of terrain classification and computer planning of cableways and roads) applicable to easy as well as difficult conditions. The seminar included a discussion on the "Planning of road networks and its relation to forest operational activities in developing countries". The two papers in this section had bibliographies on harvesting and transport of timber in developing countries, including forest road making by appropriate tools and techniques and training and safety.

Handling

When work was mostly manual, pitprops and other pieces of short-length small-diameter timber were often individually piled at roadside or conversion depot, individually loaded on lorry or rail truck and individually unloaded and stacked at the mine or other consumer yard. Even whole shiploads of pitprops were handled manually.

As wage costs rose the use of wire cranes for loading and unloading became more attractive and the search began for an efficient way of making up bundles of short-length (up to 3 metres) roundwood that could be handled as a unit from forest roadside to final destination. This simple idea proved to have a lot of small but important practical snags that had to be overcome. For example, there was then no cheap, effective non-returnable strapping material, and organizing the return of costly wire slings for re-use posed logistic problems.

The use of hydraulic grapple cranes and the development of cheap non-returnable slings eventually solved the question one way or another (11, 16, 42).

Debarking

The efficient removal of bark from large quantities of small-diameter pulpwood and some assortments of pitprops and, to a lesser extent, fencing posts posed one of the main questions of the 1950s and 1960s. Bark removal from sawlogs posed another set of problems. It has to be remembered that when harvesting involved mainly manual work (including manual loading on to lorry) bark removal at the pulpmill or sawmill was not such an attractive alternative as it became later (leaving the bark at stump lightened the subsequent load by 10 to 12%).

As the cost of manual debarking rose, new ideas were tried out and many new ingenious machines appeared on the market. Research into chemical debarking (by poisoning the standing tree so that the bark loosened) was undertaken in Europe and North America and in a few places was adopted as a standard technique.

It was in this sort of situation where the Joint Committee came into its own by acting as a centre for the collection, analysis and evaluation of new methods and machines (17).

The Joint Committee's early work culminated in the 1965 Symposium in Finland on the Mechanical Barking of Timber (49, 143), although the subject came under regular scrutiny after that – for example in connection with the development of mechanical debranching in the forest or at the pulpmill.

Conversion of timber

Studies of the mechanization of timber conversion sites were undertaken (in the 1950s initially) for various reasons. For example:

- to replace manpower with portable or semi-portable machines in factory-like production;
- to reduce transport costs by leaving “waste” (residues) in the forest and transporting a more nearly finished product;
- to reduce the tree to more easily handled assortments to permit hand loading and the use of standard vehicles (road and rail);
- to increase overall efficiency – for example by chipping in the forest branchwood and small-diameter stemwood (30, 48, 140).

In 1967 there was a symposium on the Economic Location of Forests Operations (52, 145). Like other studies in this field it aimed at analysing and presenting alternative choices rather than suggesting preferred solutions.

By the late 1960s multi-purpose logging machines had begun to offer quite new concepts in this field (59, 153).

Mountainous regions

(see also **Transport** above) (43, 68)

The mechanization of forest operations in mountainous terrain poses many more challenges than mechanization on relatively flat terrain readily traversable by tractor. A number of countries with substantial areas of mountain forest found a common identity in the need to tackle this question as a separate but parallel issue to the main stream of the Joint Committee’s work.

Virtually every aspect of the Joint Committee’s programme had been treated in the context of mountainous terrain, and there were long-term specialized projects such as those dealing with cableways and cable-cranes. (The exchange of information on cable-cranes and training courses on their use can be claimed as having been a major factor in greatly increasing their role in the 1960s and 1970s).

The Joint Committee’s activities in logging operations in mountainous regions continued into the mid-1980s with a seminar in the USSR. The seminar proceedings were published in 1987 (76, 173).

Forest fire prevention

The question of forest fires – prevention and the mechanization of fire fighting methods – is of particular interest to countries bordering the Mediterranean and in parts of North America and the USSR (64, 79, 162, 176). It is a continuing activity of the Joint Committee in collaboration with IUFRO and the Joint FAO/ECE Working Party on Forest Economics and Statistics (which deals with the statistics on forest fires).

Machinery

The replacement of muscle power (man and animal) was central to the Joint Committee’s deliberations during its first three decades. One of its first tasks was to tackle the question of the poor design of chainsaws and to make it clear to the manufacturers that poor design affecting workers’ health and safety (excessive vibration and noise, for example) could not be tolerated. Seven of the publications listed in annex II concern power saws (3, 10, 23, 28, 34, 36, 37, 57). Among reports that included relevant up-to-date material on power saws were ‘Ergonomics Applied to Forestry’ (70, 170).

The design, performance, testing and costing of tractors for use in forestry occupied the Joint Committee for many years. The work still continued when the logging tractor gave way to the multi-purpose logging machine (59, 153).

Although accorded a low priority in the first decade of its existence (because the European Forestry Commission was itself active in the field) the Joint Committee dealt with machines for afforestation and other silvicultural operations, road making, fire fighting and indeed with every aspect of forestry. After 1980 the Joint Committee took up the special needs of the Mediterranean area which at one time was a special project of the European Forestry Commission and *Silva Mediterranea*. A team of specialists on equipment and techniques of afforestation under Mediterranean conditions was active during the 1980s.

The costing of powered vehicles and machines, a project initiated by the Pilot Committee led to the publication of a paper on this subject in 1956 (14). Further work on costing by the Joint Committee was undertaken as part of other programmes of work rather than a separate subject.

With the increasing complexity of machines, so their maintenance needs increased. In some countries new machines were being introduced faster than the expansion and improvement of the maintenance facilities. Where small-scale forest ownership was common, owners may well be motivated to carry out maintenance but they may often lack the desirable level of skills, facilities and spare parts service. A seminar on the Maintenance of Forest Machinery in Large- and Small-scale Operations was held in Sweden in 1981 (65, 163).

The use of aircraft in logging has been studied regularly (29, 90), but at the time they were economic only in a few situations.

Forest management

In 1986, the subject of forest management was taken up at the seminar in the Netherlands on Preparation and Implementation of Forest Management Plans (77, 140).

Transfer of technology

A workshop on the Transfer of Basic Technology from the ECE Region to Other Regions (78, 175) was evidence of the Joint Committee's awareness of the need to give developing countries easier access to its accumulated store of knowledge.

Technical tables

In 1967 the Joint Committee published Technical Tables In Logging, Engineering, Forest Work Science and Related Matters (50).

Multilingual glossary of forest work science

The provisional edition (32) of the English, French, German, Russian, Swedish glossary was published in 1962. A great deal of (unpublished) work was subsequently carried out before the study group was disbanded in 1970. This work has been used by a number of institutions active in this field. Latterly, specific glossaries were established on an ad hoc basis for a number of individual meetings.

Exchange of information

The Joint Committee built up, updated and published at intervals a list of organizations engaged in its sphere of interest (1, 26, 46, 60).

Bibliography

A Bibliography on Forest Work Science was published in 1954 (4), but the subject grew to such an extent that it was not possible to keep the bibliography up to date. More recently, computer-based searches have been replacing bibliographies.

CONCLUSIONS ON THE FIRST THREE DECADES

The work of the Joint Committee up to the mid-1980s

In the mid-1980s there seemed to be general agreement amongst countries participating in the Joint Committee's work that it had played a positive, highly successful role in fostering international co-operation and the exchange of information in the fields of forestry working techniques and training of forest workers.

There were many factors which had contributed to the Joint Committee's success. A few of them are discussed below:

- a) The Joint Committee was able to build on the firm foundation laid by the Pilot Committee, which preceded the establishment of the Joint Committee. Very little work on the rationalization and mechanization of forest work had been undertaken before the Second World War. The main exceptions were:
 - (i) work on logging on the West Coast of North America by the University of Washington (State) in the period immediately before the First World War;
 - (ii) individual work from the late 1930s onwards on forest work science in Germany, Norway and Sweden, and on logging by the pulp and paper association of Canada.

In Europe after the Second World War logging methods could still be found that had changed little in principle over 3,000 years. The Pilot Committee confirmed the need for countries to get together urgently to solve the large backlog of work that needed doing. It provided a means for collaboration between research and development (R & D) institutes and workers in member countries that Governments were willing to fund (e.g. by budgets for extensive and regular travel). This governmental financial support continued when the Joint Committee itself was formed. The small size (8 countries) of the Pilot Committee had enabled it to concentrate its attention on the main issues without the disadvantages of the more time consuming formal procedures of a large body.

Like the Pilot Committee which preceded it, the Joint Committee from its formative years attracted expert delegates of a highly professional standard and personally committed to the improvement of working methods and the status of the forest worker.

ILO's financial aid gave opportunities for travel, study and training which would otherwise not have been possible. The early good reputation of the Joint Committee and the fact that its work had an almost immediate beneficial effect in many member countries meant that Governments gave it ready support and continued to send their leading experts to take part in its activities.

Those countries or individuals with something to give gave freely in the belief that they would be the beneficiary at some other time.

- b) The delegation of the leadership of the technical aspects of the work to expert groups (via Study Group Chairmen, co-ordinators or team leaders) avoided the waste of time inherent in the discussion of highly specialized subjects in plenary session when a majority of participants may be interested only in the overall end result of a discussion, not the details.

- c) A mix of leading research workers and managers responsible for the application of results was beneficial and stimulating for both. Liaison with IUFRO was of great benefit.
- d) The Joint Committee's meetings and study visits in different member countries gave country experts the chance to see methods and machines in actual forest operations at first hand. As one founder member put it, "there were moments of truth" when delegates could see from the examples before them exactly what changes they should introduce in their own countries.
- d) Machinery manufacturers were able to obtain a consensus view as to how their products would have to be improved if they were to find greater acceptance in the market.

The Joint Committee's influence on the development of the chainsaw is the classic example. Manufacturers made the relatively major improvements considered necessary by the Joint Committee, and chainsaw use increased dramatically in the space of a few years.

The Joint Committee also had a decisive role to play in the introduction of forestry tractors. It enabled manufacturers to find out from an authoritative body representing many countries exactly what the needs of the forest industry were and thus to embark on manufacturing programmes with some certainty that the new products would be accepted by the potential customers.

International training courses enabled teachers to catch up with new ideas on working techniques, health and safety (especially in the field of logging).

- e) Although there were proposals under consideration (in the mid-1980s) for further improvement in its communication system, the Joint Committee had always published its main results, making it possible for those not closely associated with it to follow its work. Moreover, many of the publications gave practical guidance on questions with which managers and administrators had to deal in their own daily work; from time to time they dealt with questions (e.g. safety, health) which had policy connotations.
- f) The formal and close links with bodies like ISO took a lot of detailed important work away from the Joint Committee and put it where it belonged, with ISO.

The way ahead (as seen in the mid-1980s)

Regarding the future of the Joint Committee in the UNECE region, issues were raised by the country representatives with whom the subject matter of this paper¹⁰ was discussed. To the question "Does the Joint Committee have a continuing role to play in the UNECE region?", the answer was given that it does have a positive role to play; and that, to maintain its effectiveness, it should concentrate its work on those subjects of high priority at the international level. There is every indication that it will do so, for the Joint Committee has shown flexibility in its approach, reacting to the needs of the industry. Thus in the decade 1975 to 1985 it gave greater weight to the problem created by mechanization than to innovation in the field of machines and methods, which had been taken over by manufacturers and individual countries. Ergonomics, health, safety, training and such questions relating to man and machine have had high priority. As in the past there must be a balance in the composition of the Joint Committee per se between generalists and specialists if it is to steer the right course between research and development and the application of results. The Joint Committee must continue its close liaison with IUFRO and ISO with a primary objective of avoiding duplication of effort.

Many opinions have been expressed about the transfer of technology from developed to developing countries. Inappropriate technology has sometimes been offered in the past. That said, the identification of real needs is crucial and difficult. The Joint Committee has embarked on such an

¹⁰ I.e. the original paper prepared by Mr. E. G. Richards and published in 1986 (op. cit.).

exercise, bearing in mind that in developing countries the degree of mechanization of forest operations varies enormously. (In the 1960s there was a similar situation in Europe when manual methods and the use of horses were on their way out but could still be found alongside simple mechanized systems and the first prototypes of sophisticated harvesting machines).

Developing countries' needs for help from the UNECE region span a wide spectrum of working methods in widely differing terrain and social conditions, and it is indeed fortunate that much of the vast store of knowledge built up by the Joint Committee is relevant to those needs. The Joint Committee has already identified the need for selections from its technical literature to be extracted, adapted, edited and presented in forms relevant to the needs of the developing world.

The Joint Committee has also identified the need for the papers prepared for its seminars to be edited before publication and for its publication procedures to be improved so as to make its work more quickly and more widely available.

The Joint Committee encourages its members to offer fellowships to assist participants from developing countries to attend seminars and study tours of interest to them and to organize for developing countries special courses, seminars and study tours in basic technology in forestry operations.

At its sixteenth session in June 1986 the Joint Committee reviewed and discussed the draft of the paper reproduced in Part I of this publication (Parts II and III in the original paper). The following is an extract from its report (TIM/EFC/WP.1/16), which sets out the Joint Committee's own reaction to the paper, as well as some of the comments made by delegates during the debate.

"In introducing this item, Mr. T. J. Peck, ECE/FAO Agriculture and Timber Division, explained how Joint Committee activities related to those of its parent bodies, the Timber Committee and the European Forestry Commission, and their other joint subsidiary body, the Joint FAO/ECE Working Party on Forest Economics and Statistics. He also outlined the long-term outlook for the European forestry and forest products sector which emerged from the forthcoming study European Timber Trends and Prospects to the Year 2000 and Beyond (ETTS IV, 1986), which had a bearing on the future direction of the Joint Committee's activities.

Mr. E. G. Richards, former Chairman of the Joint Committee, presented, in his capacity as consultant to the secretariat, two reports prepared by himself with the assistance of Mr. S-A. Axelsson, rapporteur: (i) Evolution of the Joint Committee's activities over the past thirty years; (ii) Forestry in post-war Europe (TIM/EFC/WP.1/R.67 and R.68 and their addenda). He pointed out the value of a review of long-term developments of forestry, and the role played in them by the Joint Committee, as a foundation for an assessment of the future direction of the Joint Committee's activities. Together with the list of publications issued under the aegis of the Joint Committee over the past three decades, it could also be of use to developing countries.

During a wide-ranging debate, many delegates warmly welcomed the initiative of the Steering Committee in introducing this item on the agenda and congratulated Mr. Richards and Mr. Axelsson on the most interesting reports. Among the numerous points raised were:

- a) *The economic and technical environment in which the Joint Committee operated today (1986) is very different from the 1950s and in many ways represents a greater challenge for the achievement of progress in technical and social matters;*
- b) *The Joint Committee provides a unique meeting place where forestry administrators, technical experts, practitioners in the field and researchers can discuss matters of common interest;*

- c) *The Joint Committee has created over the years a considerable fund of valuable technical information, the existence of which is known to only a few of those who could make use of it. There is need for far more effective systems of dissemination of documentation to education and training centres as well as to practitioners, in which government agencies, forestry associations, the media and others should play an active role;*
- d) *The transfer of experience to developing countries should continue to be an important function of the Joint Committee, which should be further intensified;*
- e) *The participation of all ECE countries is highly desirable: in the Joint Committee's sessions to ensure that its programme of work corresponds with the interests and priorities of the majority of countries; and in its technical activities (seminars, teams of specialists) to stimulate contacts between forestry people from different parts of the region and the two-way flow of information and experience between them;*
- f) *Efforts should be increased to augment the resources available to countries and the secretariat for carrying out the Joint Committee's programme, with the objective of speeding up the results of its activities, allowing greater depth in its technical work and/or the inclusion of additional projects in the programme;*
- g) *Collaboration with other organizations with similar interests, notably IUFRO and ISO, should be intensified wherever possible;*
- h) *Generally speaking, the present scope and structure of the Joint Committee's programme of work reflects the countries' needs and priorities. The scope and structure have evolved considerably over the years with changing conditions and must in future be kept flexible to meet new challenges. One area to which more attention should be given is forest management and planning." (TIM/EFC/WP.1/16, paras. 32 to 34).*

PART II

MOVING FROM THE 20TH TO THE 21ST CENTURY

FORESTRY UNDER THE INFLUENCE OF INTERNAL AND EXTERNAL FACTORS

Introduction

Part I traced the main lines of development of the forestry sector from the end of World War II to the mid-1980s and the way in which the Joint Committee was established and evolved to meet new challenges and the changes in information needs. In some ways and some regions, the changes were striking, for example from the use of axes and handsaws to multifunctional harvesting machines in some parts of Europe and North America. Elsewhere, where information about new techniques was slow to spread or where investment was not available for new technologies, traditional practices persisted. Varying situations in the labour market were also an important factor determining whether there were inducements to bring in labour-saving methods and machines.

Nearly everywhere wood production was still the principal objective of forestry in the mid-1980s. This was strongly reflected in the programme of work of the Joint Committee, in which a major part of the activities was still concerned with various aspects of wood harvesting. But already there were clear signs that other policy objectives, notably the need to enhance the social and environmental functions of the forest, were gaining ground in many of the countries of the UNECE region. The awareness of the need for better forest protection, for example from forest fires, storms or the apparent threat from air pollutants, and for the conservation of biological diversity, was also increasing strongly during the 1980s. As will be seen in the following pages, these factors would lead to some profound changes in policies and attitudes towards forest management and forest operations in the twenty years spanning the end of the 20th century and the beginning of the 21st.

Part II of this publication follows the pattern of Part I by, first of all, taking a brief look at developments in the forestry sector over the two decades since 1985 and the factors, both internal and external to the sector, that were important influences on those developments; and then discussing the ways in which the Joint Committee reacted to the changes taking place. As will be seen, this necessitated quite fundamental alterations in its structure, programme and mode of operation. At the end of Part II there is a brief discussion on the lessons for the future which may be learnt from past experience.

The decade 1985 – 1995

Although public concern about environmental protection had been building up throughout the 1970s and early 1980s, it was not really until the second half of the 1980s that forest decline in many parts of Europe began to receive the close attention of scientists and politicians. The phenomenon was particularly acute in the coniferous forests of central Europe, and the cause of the problem was initially attributed to the deposition of industrial air pollutants, notably SO₂ and NO_x from the burning of fossil fuels. Defoliation and the discolouring of needles and leaves, and in extreme cases the death of trees, was observed. The acidity of forest soils was also rising. The Federal Republic of Germany, the German Democratic Republic, Czechoslovakia and Poland were the most affected, but few countries were spared. An international monitoring and assessment system was set up under the joint control of the UNECE and the European Union (EU), and governments took measures to reduce the emission of air pollutants from industries, transport vehicles and households. Intensive research was undertaken on ways to mitigate the damage impact on forests.

As more became known about the causes and effects of forest decline, it emerged that, while air pollution was certainly one of the causes, and in some cases the principal cause, there were a

number of factors involved, including climatic effects such as drought and frost, management regimes, including the choice of species and monocultures in plantations, and so on. During the 1990s the problem seemed to ease, although by no means disappearing entirely; an important contribution to this appeared to be the drastic reduction in industrial activity, including the burning of brown coal with its high sulphur content, in the countries of central and eastern Europe that were undergoing transition from centrally planned to market economies (see below).

The scare over forest decline in the northern hemisphere, allied with growing worries about forest loss and degradation in the tropics, brought forests and forestry into the centre of the public debate on environmental conservation. It also drew attention to the importance of the functions of the forest other than wood production. For example forests in decline in mountain regions were less able to fulfil their protective functions against avalanches, soil erosion and flooding and to provide social services such as recreational and leisure opportunities and non-wood products (mushrooms, berries, etc.). In this connection, studies such as ETTS IV (1986) were showing that the importance of the non-wood production functions of forests was increasing in both absolute terms and relatively compared to wood production virtually everywhere in Europe, even if they were often difficult to measure in quantitative terms, and wood production remained the single most important function. Forest services and forest owners, in both the public and private sector, sought to adapt management practices to meet these changing conditions, but were hampered by the fact that, with certain exceptions such as hunting, the provision of non-wood goods and services generated little or no revenue. Wood production remained the main source of income and was often expected to 'subsidize' the provision of other goods and services.

National forest inventories undertaken in the 1980s were also revealing another important development. In earlier decades governments had been making strenuous efforts to rebuild their forest stock after the depletions during and immediately the Second World War, and the success of these policies was now becoming apparent. Increment was increasing steadily and was in fact proving to be higher, sometimes considerably higher, than the volumes of wood being harvested. The result was that the growing stock volume was expanding virtually everywhere in Europe. In some countries the result of the post-war programmes of afforestation and reforestation was that many young forests were reaching thinning age in the 1980s, but because of rising costs and difficulties in finding markets for the potential volumes of small-sized wood, backlogs in thinnings often occurred. This, coupled with stagnation in the demand for fuelwood, particularly affected the volume of harvesting of broadleaved species harvested in some countries, including those with large areas of coppice stands.

Demand for forest products continued to rise in Europe, at least in the first half of the decade 1985 to 1995. In the second half, however, the initial period of the transition of the economies of the countries of central and eastern Europe saw a sharp decline in industrial activity and in the production and consumption of forest products in those countries. Many of the industries there had been operating with obsolete equipment and there were difficulties in finding investment for their modernization. Consequently, some of them had to be closed, temporarily or permanently, with consequent drops in demand for wood raw material and job losses, both in industry and in the forest.

In several of the countries of central and eastern Europe in transition, steps were started towards the privatization or restitution of property, which had been brought under State control by the former regimes. This movement included forest land, and the early 1990s saw the beginning of the expansion of private forest ownership, the pace of which varied from country to country. This often created special problems because these owners generally had no knowledge or experience of forest management. In some cases they sought to take advantage of the new situation by cutting their reserves of timber, often without authorization and without consideration of the principles of sustained yield and environmental conservation.

A major environmental disaster occurred in 1986 when the Chernobyl nuclear power station in the Ukraine exploded spreading radio-active pollution over many parts of Europe, with areas of Belarus, the USSR as well as the Ukraine worst affected. In addition to the tragic human deaths, illnesses and misery caused, the impact on forests was also considerable, with large areas having to be

closed off from all forestry activity, including harvesting, for the indefinite future. Apart from the contamination of forest soils, trees, animals, mushrooms, etc., the disaster also raised questions about the overall environmental safety of nuclear power as well as its use as an alternative energy source to fossil fuels in the long term.

Forest protection became an increasingly important preoccupation of policy makers during the decade, not only because of air pollution and Chernobyl, but also because of the regular occurrence of forest fires, especially in southern Europe, and major damage by storms on a scale not experienced previously. Partly with a view to coordinating national responses to such disasters, the first Ministerial Conference on the Protection of Forests in Europe (MCPFE) was organized by the French Government in 1990, in co-operation with the Finnish Government, in Strasbourg. Among the resolutions adopted were ones concerned with forest fires, monitoring of forest ecosystems, conservation of forest genetic resources, and management of mountain forests.

The second MCPFE, held in Helsinki in 1993, adopted resolutions concerned with sustainable forest management, conservation of forest biodiversity, adaptation of European forests to climate change and forestry co-operation with countries with economies in transition.

The Helsinki Conference took up at the regional level some of the issues raised at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, in particular policies relating to sustainable forest management (SFM). UNCED had given considerable attention to forestry matters, not only in the Statement of Forestry Principles¹¹, but also in Agenda 21, intended as a blueprint for action by governments, aid agencies and others concerned with environmental and development issues, a General Declaration, and Framework Conventions on Biological Diversity (biodiversity) and Climate Change.

Among the initiatives following on from UNCED, the Helsinki Conference marked the beginning of the work on developing criteria and indicators (C & I) for sustainable forest management by the 38 European countries that took part in the Conference. Parallel to that, the Montreal Process began similar work involving 12 temperate and boreal countries that were not, apart from the Russian Federation, already included in the Helsinki Process, among them Canada and the USA. This work moved ahead despite the fact that no universally accepted definition of SFM existed. In a resolution adopted by the Helsinki Ministerial Conference, however, the following definition was used: *“Sustainable management means the stewardship and use of forests and forest lands in such a way, and at a rate, that maintains their biological diversity, productivity, regenerative capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems”*.

During the decade 1985 to 1995 some profound changes took place in the attitudes of governments and international agencies towards the management and use of forests. This can be seen by comparing what has been written above with the corresponding sections in Part I covering the earlier decades. The latter gave strong emphasis to the wood-producing function of the forest and to the harvesting of wood. After 1985 concerns with the environment and sustainability came more and more to the fore, which is not to say that the wood-producing function of the forest was ignored – far from it. But it would probably be true to say that the environmental and social aspects began to attract increasing attention, both at the national and international levels, rather than the purely technological aspects (machinery improvements, new techniques, etc.).

Developments in forestry after 1995

The debates at the international level during the previous decade were accompanied and followed up by numerous developments at the national level, such as moves to adjust forest laws and policies, as well as practices, to take fuller account of concerns for sustainability, biodiversity and

¹¹ Full title : *Non-legally binding authoritative statement for a global consensus on the management, conservation and sustainable development of all types of forests.*

nature conservation. This involved seeking to find a better balance between the ‘traditional’ wood-producing function and other functions, in other words systems and practices to achieve multi-function forestry. Of course, the latter was by no means a new concept in European forestry, but, given the ever-increasing importance of the non-wood functions, adjustments needed to be made to forest laws and management practices.

Whereas in the previous decade particular emphasis had been given to the environmental dimensions of SFM, more recently attention has shifted to the social dimensions. The safety, health and the social standing of forest workers had long been given great importance, but other more recent concerns have included the possibilities for the employment of women in forestry, combating the unsatisfactory age-class structure of forest workers (the average age has been rising and the recruitment of younger and skilled workers often insufficient), problems associated with the use of immigrant labour and the scope for the employment of contractors, especially in the private sector.

Another set of concerns is related to the interface between forestry and the general public, including the need for foresters at all levels to improve their two-way communication with the public, e.g. in understanding public concerns about forestry planning and practices and in explaining the reasons for taking a particular action or using a particular technique or technology. The need to involve the public, including special interest groups, and to gain its support and confidence in the decision-making process, has also become more evident, and has required the development of skills, often unfamiliar to foresters, in setting up and operating partnerships and stimulating stakeholder participation.

Many of these social issues were addressed at the third Ministerial Conference on the Protection of Forests in Europe, held in Lisbon in 1998. One of the resolutions adopted at the Conference called for further development of human resources through such measures as increased dialogue with the public, education and training, and the involvement of women in forest-related activities. The resolution was largely based on a study carried out by the Joint Committee Team of Specialists on Social Aspects of Sustainable Forest Management¹².

Another Lisbon resolution followed up work initiated at the Helsinki Conference by adopting a set of pan-European criteria and indicators for SFM and endorsing the operational-level guidelines for SFM. Six criteria and 20 quantitative indicators were chosen, the criteria being:

1. Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles;
2. Maintenance of forest ecosystem health and vitality;
3. Maintenance and encouragement of productive functions (wood and non-wood) of forests;
4. Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems;
5. Maintenance and appropriate enhancement of protective functions in forest management (notably soil and water);
6. Maintenance of other socio-economic functions and conditions.

At about the same time that governments were developing criteria and indicators for SFM, and the means for monitoring countries’ progress towards achieving SFM, through the MCPFE and Montreal processes, initiatives to introduce forest certification were being made. Certification is a process by which forest owners voluntarily submit their forests to inspection by an independent body to determine whether the management meets clearly defined standards, particularly with regard to SFM. It may also include certification of wood products along the chain-of-custody from the forest to the ultimate customer. The intention is that the customer is given assurance that the forest of origin is being managed according to the principles of sustainable management and that the wood has been processed in such a way as to minimize possible negative environmental and social impacts. The principal objectives of certification have been stated to be: to improve the environmental, social and

¹² People, Forests and Sustainability : Social Elements of Sustainable Forest Management in Europe, 1997.

economic quality of forest management; and to ensure market access for certified products, particularly in markets with high sensitivity to environmental concerns.

The application of certification has proved to be a complex process, often surrounded by controversy. As FAO put it in 1997: “Certification and the associated issue of labelling is one of the most topical and controversial subjects in forestry at the present time. Certification seeks to link trade in forest products, particularly international trade, to the sustainable management of the forest resource, enabling those who so wish to purchase products coming from sustainably managed forests”.¹³

An early initiative on certification was the establishment of the Forest Stewardship Council (FSC) in 1993, and another, specifically European, initiative was the Pan-European Forest Certification scheme (PEFC), seen by many forest owners, especially small-scale owners, as a viable alternative to FSC. There have also been a number of certification initiatives launched at the national level, including Finland, Canada, USA and the United Kingdom. Following a somewhat different approach, the International Organization for Standardization created ISO 14001 EMS (Environmental Management System), which is not sector-specific. This requires an audit of management systems against the specifications of the standard.

Despite a slow start in developing markets for certified forest products (CFPs), forest owners and wood-processing industries have been committing themselves in increasing numbers to certification in the belief that it may help them to gain access to new markets, promote their company’s environmental image, gain credibility in communicating with customers, and build strategic marketing networks. It is still too early to judge whether and when certification will become widely accepted in the forest sector. There is not much expectation that it will bring a premium to the prices for CFPs. The enthusiasm with which CFPs have been accepted in the marketplace has varied considerably from country to country. Most progress has been made in Germany, the Netherlands and the United Kingdom among the importing countries, as well as in the Nordic countries and Poland.

After expanding from nine member countries to twelve during the 1980s (accession of Greece in 1981 and Portugal and Spain in 1986), the European Union experienced a further major expansion to fifteen in 1995 with the accession of Austria, Finland and Sweden. This was particularly important from the forestry point of view, since all three are major producers and exporters of forest products. Their accession virtually doubled the area of forest in the EU and brought its exports of forest products more nearly into line with its imports: previously it had been a massive net importer. They also considerably strengthened the ‘voice’ of forestry within the EU and helped to ensure that forestry and forest industry matters were given due weight in the EU’s deliberations and policy making, despite the fact that forestry did not figure at all in the original Treaty of Rome.

The far-reaching changes in the countries of central and eastern Europe after 1989, which initially led to sharp production decreases, also in the forestry and wood industries sector, were followed in the course of the 1990s and thereafter by political and economic stabilization and recovery, the pace varying from country to country according to the policies and strategies adopted. In forestry, the privatization and restitution of forest land continued in the later 1990s in most countries, though in some, including the Russian Federation, the decision was taken to keep such land under State ownership. Whether on public or private forests, however, the problem of illegal fellings emerged as a quite serious one in several countries, partly because under the new administrative structures, law enforcement was difficult to carry out. Inadequate enforcement, as well as lack of experience among the new owners of forests, also led to some environmental abuses. On the other hand, steps were taken in most countries of central and eastern Europe, as well as elsewhere in the UNECE region, to extend the areas of nature reserves and parks where commercial activities were banned or strictly controlled.

¹³ State of the World’s Forests, 1997.

A particular instance of the withdrawal of forests from commercial logging came about in the northwestern states of the USA, where harvesting was stopped in large areas of publicly owned natural coniferous forests that were the habitat of the northern spotted owl as a result of intense lobbying by environmental NGOs. This led to a considerable number of job losses and hardship in the logging communities in the region as well as the closure of many wood-processing industries. The centre of gravity of the wood-processing industries shifted from the northwest to the south of the country.

Environmental pressure also led to some important changes in industry structure and operations in British Columbia (BC), Canada. BC was at the forefront in the development of codes of practice in forestry, an initiative which was followed up, partly through the exposure gained through the Joint Committee, at both the national level, e.g. in Ireland, and international level, e.g. FAO's 'Model of Good Forest Practice'.

Although continuing to be surrounded by doubts and controversy, evidence has been accumulating, together with greenhouse gas concentrations in the atmosphere, that global climate change is taking place. Average temperatures have been gradually rising, and weather patterns becoming more unstable, including increasing incidence of storms and droughts. Consequent damage to forests has been of increasing concern, including wind damage and forest fires. Among the measures that have been considered to slow down or halt the rise in the atmospheric level of greenhouse gases, notably CO₂, has been the expansion of the growing stock, notably through afforestation, to act as a carbon sink. To have an impact, this would have to be carried out on a very large scale, and there are not many areas in the UNECE region where sufficient land could be found for such a programme, certainly not in Europe. Perhaps there would be such areas in the USA and the Russian Federation. Another constraint would be the investment involved. Anyway, in the period under review the process has not gone beyond discussion, although on the other hand it should be noted that the growing stock – and the quantity of carbon in it – in virtually all parts of the UNECE region has continued to expand because the drain (fellings, losses from fire, etc.) has remained below the increment. The forests in the UNECE region have thus been making a positive contribution to the carbon cycle: without that, the accumulation of atmospheric CO₂ would have been greater.

While global and national issues such as climate change, biodiversity and nature conservation have been attracting increasing attention from forest policy makers, at the other end of the scale such issues as the plight of small-scale forest owners, the forest workforce and local communities dependent on the forest have also been a growing source of concern. In most parts of the UNECE region, revenue generated by forestry activities, principally wood production, has remained stable or even declined in recent times, and profitability has fallen. Prices for roundwood have generally remained rather constant (apart from cyclical fluctuations), while production costs have continued to rise. This has been a disincentive to the proper maintenance of silvicultural operations and to harvesting. Solutions that have been tried, with greater or lesser success, have included cooperative arrangements between forest owners to achieve greater economies of scale and the use of contractors.

Other social problems that have come more to the fore have included the increasing incidence of absentee ownership – forest owners who live and earn their livelihood in the cities away from their forests – and the use of migrant workers, who often lack the necessary skills, are more than average at risk of accidents (and may lack any kind of health and accident insurance) and are often employed under inadequate social and working conditions.

Still on the question of social aspects, at the end of the 20th century and the beginning of the 21st foresters, not only those responsible for publicly owned forests but also private ones, have had to provide for the ever-increasing numbers of visitors to their forests, who come in pursuit of leisure and recreation of many different kinds and require the facilities that go with them (carparks, trails, visitor centres, etc.). This is an essential social service that forests have to provide, but the financial and human resource means of providing it are often difficult to find.

The possibility to handle large quantities of data has allowed forest managers to greatly increase the use of computers in all aspects of their work, including planning, preparation and

execution of forest working plans, forest inventory, mapping, yield calculations and forecasting, modelling, accounting, calculation of wages, and so on. The use of hand-held computers and developments in telecommunications, such as mobile telephones, have improved efficiency through closer two-way communications and allowing decentralization of work organization. While computers have contributed to boosting productivity and efficiency, their successful introduction has depended on a number of factors being taken into account, such as the need to clearly identify and take into account the needs of individual users at the design stage, to provide sufficient training, and to recognize that new information systems may require different types of information to be collected.

One of the most important impacts on the forest sector over the past decade, and particularly on harvesting, transport and marketing of wood and on forest planning and management, has been the development of computer technology. On-board computers in harvesting equipment and machines assist the operators to make decisions – or even make decisions for them – on felling and extraction schedules, dimensions to be cut, etc., on the basis of real time information received about mills' or other customers' needs for raw material. Information flows in both directions between the operation in the forest, head office and customer, allowing stocks to be kept to a minimum, the optimum allocation of the wood being cut, the reduction of waste, and the continuing processing and storage of information on the operation. While operations employing large, expensive equipment have particularly benefited from computerization, smaller-scale or more traditional operations have also been able to raise productivity, for example through the use of hand-held computers for measuring and sorting logs and recording the information for processing back at the office.

SUBJECTS DEALT WITH BY THE JOINT COMMITTEE SINCE 1985

In Part I a list was drawn up of twenty-two subjects, which had been dealt with by the Joint Committee during the thirty years between 1955 and 1985. A comparable listing for the twenty following years is given below and is based largely on a paper presented by the current Chairman, Hanns Höfle, to the joint session of the FAO European Forestry Commission and the UNECE Timber Committee in Rome in 2000¹⁴. It is divided into the three subject areas: silviculture and management; technology, harvesting and wood transport; and vocational training, applied ergonomics and other social aspects, but it is evident that there is often some blurring of the boundaries, for example where management issues are also technological ones or social ones. In fact, this seems to have become more common in the last twenty years than it was before.

The type of project is indicated by initials: S for seminars; W for workshops; ToS for teams of specialists; and ST for special topics at plenary sessions. The numbers refer to the publications listed in annex II and to the meetings listed in annex III.

Silviculture and forest management

- Multiple use forestry (ToS, 114)
- Preparation and implementation of forest management plans (S, Netherlands, 174)
- Information systems (W, Sweden, Finland; ST, 103, 190, 201)
- Acute forest damage (S, Germany; ST, 93,178)
- Forest damage manual (ToS, 106)
- Forest fires and prevention of forest fires (S, Finland, Greece, Poland, Russian Federation, Spain; ToS, 102, 121, 124, 176, 188, 196, 210)
- Biodiversity (W, Sweden)
- Forest site conservation and improvement for sustained yield (S, Germany, 185)
- Use of pesticides in forestry (ToS; S, United Kingdom, 100, 186)
- Exploring multiple use and ecosystem management: from policy to operational practice (S, Canada; ST, 105, 194)

¹⁴ Sustainable Forest Management : the work of the Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training. Unpublished, 2000.

- Problems in forestry and forest industry sector arising from radiation contamination (ToS)
- Harvesting of wood and non-wood forest products in the Mediterranean region (S, Greece, Turkey, 115, 202)
- Forest operations of tomorrow (S, France, 112, 200)
- Afforestation in the context of sustainable forest management (S, Ireland, 120, 207)
- Close to nature forestry (S, Slovenia, 122, 209)

Technology, wood harvesting and transport

- Road construction (S, Norway, ToS, 107)
- Environmentally sound forest roads and wood transport (S, Romania, 107, 195)
- Harvesting in mountainous areas (S, Russian Federation, Turkey, 173, 184)
- Multifunctional machinery in logging operations (S, Russian Federation, 191)
- Machines for small scale forestry (S, Sweden, 92, 177)
- New trends in wood harvesting with cable systems for sustainable management in the mountains (W, Austria, 117, 204)
- Silvicultural, technological, economic and other problems connected with the mechanization of thinning operations (S, Denmark, former German Democratic Republic, 101, 187)
- Increase of productivity of forest operations (S, Slovakia, 111)
- Environmental impacts of forest operations (S, Belgium; W, Germany; ToS, 98, 99, 183)
- Techniques for the rehabilitation of low-productivity forests (S, Turkey, 73, 171)
- Reforestation methods after harvesting (S, former German Democratic Republic, 95, 180)
- Transfer of basic technology from the ECE region to other regions (W, Austria, Germany, Switzerland, 175)

Vocational training, applied ergonomics and other social aspects of forestry

- Management of forest worker training (S, United Kingdom, 67, 165)
- Training of professional forest workers (S, Finland, 97, 182)
- Training and further education of people that are hard to reach (S, France, 110, 198)
- The future of the forestry workforce (S, USA, 189)
- Employment of contractors in forest work (S, France, 96, 181)
- Ergonomics applied to forestry (W, Austria, 170)
- Safety is feasible (S, Switzerland, 108, 197)
- Occupational health and rehabilitation of forest workers (S, Finland, 75, 172)
- Personal protective equipment (S, Finland, 104, 192)
- Extension activities for owners of small forest woodlots (S, Canada, 94, 179)
- Socio-economic aspects of forestry (ToS)
- Role of women in the forestry sector in Europe and North America (S, Portugal, 116, 203)
- Forestry meets the public (S, Switzerland, ToS, 109, 118, 125, 205)
- People, forests and sustainability (ToS, 109)
- Partnerships in forestry (S, Belgium; ToS, 119, 206)
- Public participation in forestry (ToS)

In addition a number of workshops catering for the special needs of countries with economies in transition have been organized:

- Organization and management of forestry under market economy conditions (W, Hungary)
- Commercial, economic and technical aspects of wood raw material supply in a market economy (W, Bulgaria)
- New trends in thinnings (W, Slovakia)
- Emerging issues in forest harvesting (W, Croatia)
- Administrative structures in forestry (W, Austria)
- Forest operations improvements in farm forests (W, Slovenia).

In the first subject area, silviculture and forest management, attention given to various aspects of forest fire prevention and control has if anything intensified in the past twenty years compared with earlier decades. This has particularly benefited the countries of the Mediterranean region. The Joint Committee's pioneering work on forest fires through its seminars and team of specialists linked up with other international initiatives, including the UN International Strategy for Disaster Reduction (ISDR), The World Bank Disaster Management Facility, the World Conservation Union (IUCN), the International Boreal Forest Research Association (IBFRA) Fire Working Group and IUFRO, as well as a number of national agencies in activities of mutual interest, including the preparation of the biannual International Forest Fire News (IFFN), whose editor, Johannes Goldammer, has been the leader of the team of specialists since its early days. This has been an outstanding example of the collaboration between the Joint Committee, through one of its sub-groups, and other agencies and of the possibilities for expertise from the UNECE region being disseminated worldwide.

Another project also directed at the Mediterranean countries, as well as others, was the harvesting of non-wood forest products. Various aspects of reforestation and afforestation continued to receive attention, with the subject matter broadening from the purely technical aspects to include such questions as their context within sustainable forest management and in the aftermath of storm or pollution damage. A manual on storm damage was prepared by a team of specialists which provided guidance on all aspects of the problem, including clearance after a storm, safety of workers on storm-damaged sites, preservation of cleared timber, reforestation and measures to prevent recurrence.

In several projects measures to be taken to improve sustainable forest management were explored, reflecting in a practical way the strong emphasis given to SFM at the policy making level, including UNCED and MCPFE. The use of computers and information technology in forestry also received attention at a number of events.

In the second subject area, technology, wood harvesting and transport, many of the activities between 1985 and the present time covered similar fields to those in the earlier years, but of course dealing with the most recent trends and developments. This was the case in such areas as multifunctional logging machinery, harvesting in mountainous areas including cable systems, wood transport and road construction, machines for small scale forestry, and transfer of technology to other regions. However, there was frequently a change in emphasis, with special attention being given to ways and means to reduce adverse impact of the use of harvesting and other forest equipment on the environment and the relation between harvesting systems and SFM.

It was in the third subject area, vocational training, applied ergonomics and other social aspects of forestry, that the activities of the Joint Committee evolved the most in the last twenty years. Attention continued to be paid to the 'traditional' topics of training, safety and health of forest workers. But there was increasing effort to direct this work to specific target groups such as contractors, small scale forest owners and other groups that are 'hard to reach'. Furthermore, ways to attract more women into forestry were explored, as well as the broader question of creating conditions in forestry that would make it a more attractive profession for men and women alike in the future. In addition, the interface between foresters and forestry on the one hand and the general public on the other, including questions of public participation and partnerships with stakeholders was treated both at seminars and by a team of specialists, reflecting the importance attached to such matters at the policy making level.

Finally, a special effort was made to provide guidance and assistance in a range of forestry fields to the countries of central and eastern Europe which began the process in the 1990s of transferring to forms of market economy. The form chosen for this work was workshops attended by experts from both those countries and from western Europe.

FURTHER ADJUSTMENT OF THE JOINT COMMITTEE'S STRUCTURE AND METHODS OF WORK TO MEET CHANGING CIRCUMSTANCES

One reason for the Joint Committee's continuing success has been its flexibility and its willingness and ability to adapt not only its programme but also its structure and methods of work to changing situations. We saw in Part I how in 1978 it altered its structure from the rather rigid system of Study Groups to one using teams of specialists engaged on specific tasks and organizing seminars. But at the same time it maintained three main work areas: silvicultural operations and general management; wood harvesting and transport; and human aspects of forest operations (vocational training, applied ergonomics, safety and health of forest workers). The Joint Committee agreed that in all aspects of its work, environmental matters should receive due attention. Structurally, the work would be guided by the Steering Committee, including co-ordinators covering each of the three work areas.

Strengthening the teams of specialists and the role of the co-ordinators

The new system worked fairly well, but after a few years the Joint Committee felt that there was room for further improvement. It invited Arthur Sutton (United Kingdom), one of the Vice-Chairmen, to draw up proposals, which he submitted on behalf of the Steering Committee to the 15th session in 1984¹⁵. It had been felt by the Steering Committee that the system of using teams of specialists was not operating as effectively as it might. For example, there had been cases of overlapping of work between teams, and some of them had had difficulty in completing their tasks in the allotted time. The proposals covered the setting up of teams, their work in progress, and the reporting of their results. With regard to the setting up of new teams it was felt that the terms of reference, objective, scope and expected results of the project should be more clearly defined before the project started; that the teams be kept relatively small; that particular care be taken over the selection of the team leader; and to make it clear that the team leader had been invested by the Joint Committee with the authority to ensure that the work was carried out expeditiously and effectively.

Even if the terms of reference had been carefully drafted, it could happen that, once the team had started work, it might find it necessary or desirable to change the terms of reference or to look into the topic in more detail, thus extending the time-scale allotted. The need was seen for better monitoring of the work in progress, and this should be done by the co-ordinator responsible for the work area in question, assisted as necessary by one of the vice-chairmen. The co-ordinator should be vested by the Joint Committee with the power to adjust the terms of reference of the team, provided they did not alter the original purpose of the project and did not lead to overlap with work being done elsewhere. Brief progress reports should be prepared for the Joint Committee's or Steering Committee's attention.

A final report should be prepared by each team at the end of its activities, which should be submitted either to a specially convened seminar or to the Joint Committee itself, as specified in the programme of work. Once approved, the report would be published either as an entity in itself or as part of a seminar's proceedings.

In brief, the object of these reforms was to provide the basis for the more efficient functioning of the teams of specialists by providing clear terms of reference and by tightening up the system of monitoring and guidance of work in progress. In this, the more active participation of members of the Steering Committee, notably the co-ordinators, would play a major role.

The co-ordinators were in fact called on to expand their original role by acting in an advisory capacity to the Joint Committee and the secretariat on the carrying out of projects within their respective subject areas; preparing terms of reference for new teams of specialists and arranging the setting up of the team; and providing a link between the teams and the Steering Committee.

¹⁵ Proposal on the general tasks of the Vice-Chairmen, Co-ordinators and Team Leaders, TIM/EFC/WP.1/R.62/Add.1, March 1984.

Changes to the Joint Committee's title and terms of reference

The evolution in the Joint Committee's activities in response to countries' needs resulted, not only in greater emphasis being given to environmental concerns, but also to forest management techniques and their application. Accordingly, its parent bodies felt that it would be advisable to modify its name to more accurately reflect the scope of its activities. As a result, in 1988 the 17th session of the Joint Committee proposed that its title should be **Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training** (formerly Joint FAO/ECE/ILO Committee on Forest Working Techniques and Training of Forest Workers). This proposal was endorsed by the parent bodies.

Four years later, in 1992, the Joint Committee proposed changes to its terms of reference to reflect the increased emphasis on forest management questions, but also other shifts in its priorities, including the relevance of its activities to sustainable development and to the need for international assistance to the countries of central and eastern Europe in their transition from central planning towards forms of market economies. The new terms of reference were:

“The Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training is to assist countries, in particular those which its parent bodies may identify at any time as requiring priority attention, to develop their forestry activities within the context of sustainable development. This is achieved by fostering international cooperation on technical, economic and organizational aspects of forest management and forest working techniques and of the training of forest workers in logging and forest operations. Special attention is given to the development and implementation of forest use planning and general management aspects; increasing the efficiency of labour, the reduction of the physical efforts of the worker and prevention of accidents; the reduction of waste; and the establishment of an adequate balance between technical, social and economic requirements and protection of the environment”.

Task Force review of the Joint Committee and recommendations for changes

As part of the on-going process of evaluating and adapting the Joint Committee's work, a Task Force was set up in the early 1990s under the leadership of Norma Burlington (Canada), then a Vice-Chairman of the Joint Committee. Its mandate was, in brief, to examine whether there was a need to make changes to its structure and methods of work, and if so, to draw up proposals for submission to the Steering Committee. The report on its findings was published in early 1994¹⁶.

It seems worthwhile to reproduce below some of the main findings from the Executive Summary of the report:

“Over the years, the Joint Committee has undergone some fundamental changes in its structure and methods of work in direct response to changing conditions and member country needs and priorities..... This modification and a re-orientation of both mandate and activities were precursors to what is called in the 1990s “sustainable development”. This kind of change has, over the Joint Committee's history, consistently demonstrated its responsiveness to member country needs and its promotion of leading-edge sustainable development practices and techniques”.

“The members of the Task Force carried out a survey of member countries in order to obtain their views and opinions on the mandate, activities and usefulness of the Joint Committee. The survey, which enjoyed an extraordinary response rate of 80 percent, clearly indicated the uniqueness and relevance of the Committee's practical work”.

“Key among the recommendations are improved planning and evaluation of activities; the use of more modern communications tools to improve dissemination of information and general communication;

¹⁶ Task Force Report to the Steering Committee of the Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training, January 1994. Published by Natural Resources Canada, Canadian Forest Service.

and the idea that the Joint Committee incorporate an advocacy role as part of its ongoing functions, in order to promote the use of 'best practices', and to set these in motion through guidelines and codes of practice, as appropriate, in the Committee's areas of activity".

"The Task Force also reviewed other international bodies that deal with forestry work and issues, to determine if there exists any overlap or duplication of effort. This review ascertained that the Joint Committee remains unique, in that its activities are oriented to promoting best-practice forestry management, techniques, practices and training. In instances where topics or titles of seminars or teams of specialists suggest some overlap (for example with IUFRO), closer examination reveals that the Joint Committee's work is still unparalleled. the Joint Committee liaises with other bodies that deal with forestry to continually ensure there is no duplication or overlap of efforts, and that scarce resources are wisely used for the benefit of all member countries".

"The Task Force's review concludes that the Joint Committee is continuing to fulfil a useful function for member countries, and that its mandate and activities remain essential and relevant for promoting 'best practice' sustainable forestry".

In presenting its recommendations, the Task Force observed that *"the Joint Committee would appear to play a unique role among international forestry bodies, in that its activities are geared to current priorities in member countries and are practical, results-oriented and focused on the practitioner"*. However, it felt that some improvements were needed to ensure its mandate and activities were better focused and adapted to changing international requirements. Its nine detailed recommendations are paraphrased below:

1. There should be some streamlining of the Steering Committee, so that it should be as small, responsive and efficient as possible;
2. The Joint Committee's three main subject areas should be realigned to focus on (i) forest management; (ii) operations, including silviculture, wood harvesting and transport; and (iii) education and training, including vocational training, applied ergonomics, and occupational safety and health;
3. The Joint Committee should actively recruit private sector (industry and labour) practitioners and research institutions to participate fully in its activities (the Task Force had noted that an overwhelming number of participants came from governments);
4. There should be fewer but well-prepared seminars, focusing on important topics of general interest. These could be complemented by more sharply focused workshops (usually one language only) and teams of specialists;
5. When planning activities or events, specific goals or objectives should be established by those in charge of teams of specialists, seminars or workshops, and feedback obtained from participants and member countries as to the benefits derived from participation;
6. Practical measures should be taken to improve advance information about future events; and cooperation should be sought by the Joint Committee with the newly established (in 1993) FAO/ECE Team of Public Relations Specialists to work on improving the Joint Committee's communications systems and public relations;
7. Liaison and coordination should be strengthened with other organizations to ensure there is no overlap or duplication;
8. The Joint Committee should expand its role as an advocate to member countries' governments on the implementation of "best practice forestry";
9. While non-UNECE countries should continue to be encouraged to participate in Joint Committee activities, its present membership of UNECE countries should not be expanded.

In conclusion, the Task Force considered that the Joint Committee remained unique and would continue to play a vital role in promoting best-practice forestry management, techniques, practices and training in the challenging years ahead.

In welcoming the report of the Task Force, the Joint Committee gave its approval to its recommendations, with only minor changes, and added a further one in which the secretariat was requested to explore with the Commission of the European Communities and other research organizations and funding bodies modalities for making available knowledge and experience accumulated over time by the Joint Committee.

Strategic reviews of the work programmes of the Joint Committee's parent bodies

Generally speaking during the earlier decades of the Joint Committee's existence, the stimulus for change to its structure and methods of work had come from the Joint Committee itself, leading to proposals subsequently endorsed by its parent bodies. Recently, this has become modified as a result of the carrying out of periodic strategic reviews by the UNECE Timber Committee and the FAO European Forestry Commission of their joint overall programmes, with the programme of the Joint Committee incorporated in the reviews. The first such strategic review, in 2000/2001, praised the Joint Committee's work for its quality and relevance, but classified it as having lower priority on the grounds that, in accordance with the UNECE's guidelines for carrying out the strategic review, at least one work area had to be shown as being of low priority. One practical outcome of this was that the secretariat resources allotted to the Joint Committee had to be reduced.

At its 15th session in 2001, the Joint Committee's Steering Committee "*voiced its surprise and disappointment at the decisions that had been taken*"¹⁷. Amongst measures taken to have the decisions reconsidered, it presented its position in a written statement to the members of the extended bureaux of the Timber Committee and the European Forestry Commission. In it the Steering Committee expressed "*its deep concern, major surprise and unanimous disagreement with the proposed priority rating and resource allocation. The outcome of the assessment [in the Strategic Review] contradicted other statements and indicators for the relevance of the programme and the level of priority attached to it by Member States*" (op. cit., annex I).

Among other points made in its letter, the Steering Committee noted that the Joint Committee had been "*the first body to thoroughly review and streamline its organizational structure and resource allocation. Most of its current work agenda addresses issues raised in resolutions adopted by the Pan-European Ministerial Conferences and have been included in the programme of work for implementation. The inputs to the last Ministerial Conference [in Lisbon] and the recent report on Participation in Forestry had been praised for their relevance and quality*". It pointed out that the Joint Committee had "*the highest levels of support from member countries in the form of extra-budgetary contributions to its work..... Attendance at Joint Committee seminars has been consistently high both in the number of actively participating delegates and in the number of countries represented. This reflects the success and the appreciation by Member States of the Joint Committee's work programme. Thanks to the growing support of member countries, the Joint Committee over the past decade has already reduced its needs for UNECE/FAO secretarial support by more than half. It has a highly decentralized, flexible and cost effective structure and work methodology. The further cuts proposed would adversely affect the ability of the secretariat to successfully cooperate and provide essential support to the countries implementing the programme*". In brief, "*the re-allocations proposed by the extended bureaux represented a deep and damaging cut into a programme that was widely appreciated for its relevance and quality*".

It is interesting to observe the differences in position taken by those directly involved in the work of the Joint Committee, as represented by its Steering Committee, and those viewing it 'from the outside', as represented by the extended bureaux of the Timber Committee and the European Forestry Commission. These bodies are obliged to look at the Joint Committee within the context of their overall programmes and resources. While there was unanimous agreement on the "quality and relevance" of the Joint Committee's activities, the key difference lay in the level of secretariat support felt necessary to ensure that its programme could continue to be carried out efficiently. Another aspect has been the increasing emphasis given by the parent bodies in their programmes to matters of

¹⁷ Report of the Steering Committee, TIM/EFC/WP.1/AC.1/2001/2.

concern to policy makers and their advisers, whereas the Joint Committee's activities have continued to be largely, but by no means entirely, directed towards assistance to forestry practitioners. The Joint Committee has in fact also contributed to the policy debate, for example in the report of its Team of Specialists on Social Aspects of Sustainable Forest Management¹⁸, which formed the basis for one of the Resolutions adopted by the Lisbon Ministerial Conference on the Protection of Forest in Europe in 1998.

Despite the secretariat's resource constraints, the Joint Committee has been able to carry out a major part of its programme of work up to the present time (spring 2004) according to plan. However, the preparation of the present publication, intended as part of the celebrations of its fifty years of activity, coincided with the second strategic review carried out by its parent bodies. A meeting of the extended bureaux of the parent bodies was held in April 2004 to review and make recommendations about the strategic direction of the UNECE/FAO integrated programme of work on forests and timber. With regard to work area 4: Technology, Management and Training, which is the one under the guidance of the Joint Committee, recommended to the Timber Committee and European Forestry Commission that it should be replaced by a new work area titled "Social and Cultural Aspects of Forestry" and that the Joint Committee should be discontinued. Its 25th session in September 2004, which would be its last, should be asked which of its activities were sufficiently advanced to be implemented and to make suggestions for possible future activities in the area of social and cultural aspects of forestry. The extended bureaux considered that forest fires were of major importance and should be continued under another work area.

The arguments behind the extended bureaux's recommendation were given as:

- In recent years, all three secretariats (UNECE, FAO and ILO) had experienced difficulties in servicing a permanent statutory body such as the Joint Committee, because of restructuring and resource limitations;
- Technology and management were issues which no longer needed permanent surveillance and cooperation at the international level;
- Social aspects, however, were still of the greatest importance and should remain a separate work area in the integrated programme.

A further meeting of the extended bureaux on 7 May 2004 reiterated that the Joint Committee had done an excellent and innovative work while adapting its methods of work, but decided that:

- The decision taken at the previous extended bureaux meeting to discontinue the Joint Committee as a permanent subsidiary body should be maintained;
- The participants in the Joint Committee should be invited to form a Network (exact title to be determined) and to indicate in what way the new Network could contribute to the implementation of the integrated programme;
- Work methods should be agreed which enabled the Network to contribute effectively to the integrated programme of work, while minimizing the requirements for secretariat resources and allowing the bureaux and the secretariat to maintain full responsibility for the content and quality of the outputs;
- The Joint Committee Steering Committee should be requested to make proposals on the methods and activities of the new Network before the summer break. A joint meeting of the Bureaux on the occasion of the Joint Committee session in Groningen (in September 2004) should agree on a format, for approval by the joint session of the parent bodies in October 2003.

Thus, the Joint Committee will have the opportunity to debate this matter further and to make its views known to its parent bodies. It appears unlikely, however, that the basic recommendation of the extended bureaux – that the Joint Committee itself be discontinued - will be overturned. The days

¹⁸ *People, Forests and Sustainability : Social Elements of Sustainable Forest Management in Europe*, ILO, SAP 2.63/WP 113, 1997.

of the Joint Committee may be numbered, even if means can be found for some activities to be carried on in one way or another.

CONCLUSIONS

Drawing up a balance

No institution can claim a one hundred percent success record, and the Joint Committee is no exception. In order to attempt an assessment of its performance over the past fifty years, it is necessary to draw up a list of pluses and minuses that emerge from the preceding account.

On the positive side, the Joint Committee has been successful in:

- Engaging cooperation among high-level experts at the international level in dealing with a wide range of problems in the field of forest technology, management and training;
- Adapting its activities over time to the changing needs of the member countries, initially concentrating on harvesting technology and training of forest workers, then moving into other forest operations and management, then integrating the need for environmental protection and promoting sustainable forest management into all its activities, and more recently taking up many of the social problems associated with forestry;
- Remaining virtually unique in terms of its programme of work;
- Attracting the active participation of high-level experts from most of the countries in the UNECE region and often from other regions by creating a workmanlike, constructive and flexible framework in which to cooperate;
- Providing a forum where forest practitioners, administrators, researchers and teachers, as well as professionals from other disciplines and from other intergovernmental and non-governmental organizations could bring their different viewpoints and experiences to deal with a common problem;
- Making the results of its work available through publications, notably the proceedings of seminars, symposia and workshops and the reports of teams of specialists, and more recently through its homepage on the internet and CD-Rom;
- Drawing up conclusions and recommendations at its seminars, etc., and in its team of specialists reports and communicating them to the attention of its parent bodies, member countries and other international and national institutions¹⁹. Seminar recommendations were targeted to three main 'audiences': the Joint Committee itself and through it to its parent bodies; to member countries; and to IUFRO and other research institutions. Increasingly in recent years, efforts have been made to provide guidance to policy makers and their advisers, for example the Ministerial Conferences on the Protection of Forests in Europe;
- Undertaking, at the behest of its parent bodies, special studies to assist in policy-making processes, for example by the Ministerial Conference on the Protection of Forests in Europe;
- Helping to provide a link between policy makers and those on the ground who have to apply those policies. This is a two-way process: on the one hand passing practical advice on the

¹⁹ A summary of the conclusions of recommendations of Joint Committee seminars and workshops held between 1995 and 2002 is given in Annex V.

alternatives and possibilities for implementation of policies to the policy makers; and on the other hand assisting practitioners to implement the policies;

- Adapting its structure and methods of work to changing conditions, notably by shifting a large part of the workload from the secretariat to the member countries, as secretariat resources became increasingly limited. The result has been the maintenance of an amazingly high level of output, in terms of both quality and quantity, even whilst the amount of 'direct', i.e. secretariat, resources has declined;
- Cooperating with other organizations in areas of mutual interest, thereby avoiding unnecessary duplication of effort and optimizing the use of resources.

On the negative side, it has to be said that the Joint Committee has:

- Not been as successful as it might have been in communicating the results of its work to all those who could benefit from it. There have been a number of factors involved: problems of getting the information into the hands of people in ministries, forest services, forest owner associations, etc. responsible for passing it on to practitioners and others who could use it; problems of distribution within member countries; problems with language (documents limited to the three official UNECE languages and sometimes only one language). In this connection, its efforts to establish a system of national contact points, who would act as two-way transmitters of information and in particular pass on information about future Joint Committee events, circulate the results of those events and encourage participation in its activities, met only limited success;
- Sometimes failed to produce and circulate the results of its work in forms that were readily 'digestible' by those who could put them to use, e.g. as guidelines or codes of practice;
- Found difficulty on some occasions in ensuring that the input of material, for example papers by national experts for seminars, was of a uniformly high standard;
- Not found it possible to standardize the presentation of results, that is in having a uniform series of publications that became widely recognizable, because of the need for budgetary reasons to depend on the host countries to issue the proceedings of seminars, etc. A notable exception has been the UNECE/FAO International Forest Fire News; although appearing irregularly, the FAO Harvesting Bulletin and ILO Forworknet Updates may also be mentioned in this respect;
- Not been sufficiently successful in persuading its parent bodies and member countries of the importance of its work in the context of their overall programmes. This has been felt in two ways: the inability of some countries, especially many of those that could have most benefited from its work, such as the countries of southern Europe and those of central and eastern Europe with economies in transition, to allocate enough funds for their experts to participate in its activities; and the erosion of the resources provided by the secretariat to service its activities;
- Not been able to forge partnerships with international organizations, such as the EU, which could have been in a position to contribute funds for specific projects;
- Not paid enough attention to public relations and to the promotion of its work in order to bring it to the attention of a wider audience of potential beneficiaries.

Each observer's perspective is different and each will come to a different conclusion as to how the pluses and minuses balance out. Lacking precise tools for evaluation, the assessment is bound to be to a large extent subjective. Those who have been directly involved in the Joint Committee's work

seem, for the vast majority, to be positive about its usefulness and the relevance of its programme to countries' needs. Others, less directly involved, have sometimes given a more nuanced approval rating.

From the authors' perspective, the pluses heavily outweigh the minuses. Over the years the Joint Committee has generated and circulated a staggering volume of information, which has reached many people who could put it to good use. Direct exchange of know-how and experience between participants at seminars and workshops and between members of teams of specialists has probably been the most effective means of communication. Where problems have arisen has been in getting the information generated during Joint Committee activities more widely distributed. This weakness lay partly within the Joint Committee itself and partly with those people in member countries responsible for its dissemination. And it can be largely attributed to a lack of adequate funding for information distribution and insufficient support from the higher levels of administration for such activities.

Responses to past surveys as well as to the most recent one carried out as part of the parent bodies' latest strategic review have shown a very large measure of support for the Joint Committee and a wish that its activities should be continued more or less along the same lines as in the past.

Which direction in the future?

At the time of writing (May 2004) uncertainty still hangs over the future of the Joint Committee, which will not be finally settled until its parent bodies meet in joint session in October 2004. It is pointless to speculate at this time, therefore, on whether it will survive in its present form or some new form and what its mandate will be. If it is decided to discontinue the Joint Committee itself, the question remains which of its activities will be retained within the integrated work programmes of its parent bodies and in what way, which of them might be transferred to other bodies and which would cease. There are a large number of possibilities. What is clear, however, is that there are many activities that would fall within the Joint Committee's present mandate, which would be worthwhile to pursue at the international level in the future, and it may be useful to consider some of these.

Before doing so, let us look briefly at the outlook for the European forest and forest industries sector as a whole. UNECE and FAO are in the process of finalizing the sixth of their European timber trends and prospects studies, and the final report should be available before autumn 2004. Some preliminary indications of the outlook to 2020 can, however, be summarized. It should be borne in mind that the study concentrates on the demand and supply of wood and its products, although it does so in the context of the wider role of forests in providing environmental and social services as well as wood and non-wood products.

Projections show the following changes in the consumption of the main forest products groups in 2020 compared with 2000 for the three sub-regions of Europe – the 15 countries of the EU (pre-May 2004) plus EFTA countries (Iceland, Norway, Switzerland), the countries of central and eastern Europe (CEEC) and the Russian Federation and other westerly states of the CIS (Belarus, Moldova, Ukraine):

	<u>EU15/EFTA</u>	<u>CEEC</u>	<u>CIS</u>
	(percent change 2000 to 2020)		
Sawnwood	+ 18%	+ 59%	+ 158%
Wood-based panels	+ 41%	+ 110%	+ 250%
Paper & paperboard	+ 56%	+ 178%	+ 225%

The projected increase over 20 years in sawnwood consumption in the EU15/EFTA sub-region is equivalent to well below 1% per annum and is much slower than in the CEEC countries and

especially in the CIS countries. Although projected growth rates for wood-based panels and paper and paperboard are higher in all three sub-regions, the pattern is the same, indicating the likely convergence in the CEEC and CIS towards (but not reaching) *per capita* consumption levels in EU15/EFTA.

In terms of roundwood equivalent or the quantity of wood raw material and fibre (including wood residues and recovered paper) needed, the share of consumption of forest products taken by paper and paperboard and wood-based panels could rise from around half to around three quarters, and that of sawnwood shrink correspondingly. This does not mean that the use of pulpwood will grow proportionately, because much of the increased use of raw material and fibre needed for paper, paperboard and panels will be in the form of industrial residues and recovered paper. In fact the recovery rate of paper (volume of paper recovered for recycling as percentage of paper consumption) in Europe is expected to rise from about 36% in 2000 to 46% in 2020. The implication is that the markets for small diameter roundwood, e.g. from thinnings and short rotation plantations, will remain very competitive. It appears likely that the increase in demand for industrial roundwood in Europe as a whole by 2020 can be met mainly from the existing European forest resource without compromising the principle of sustainability, even if the present sizeable gap between fellings and net annual increment in many countries will narrow.

Future policy changes and market developments that could not be taken fully into account in the explanatory variables used for modelling the consumption and production projections could bring about shifts in the projected trendlines either upwards or downwards. To take a number of possibilities:

- (1) public pressure to increase the area of parks and conservation areas and to protect biodiversity could reduce the area of forest available for wood supply and hence the volume of fellings. There could also be moves (indeed there already are) towards 'closer to nature' forestry, such as continuous cover systems and the greater use of indigenous broadleaved species, that might inhibit availability;
- (2) developments in the energy field could stimulate the demand for alternative (non-fossil) energy, including renewable energy from woody biomass. This could raise overall demand for small-sized roundwood, with greater competition between energy users and pulpwood users, with an impact on prices;
- (3) policies to mitigate climate change could include programmes to expand afforestation and changes to silvicultural practices, such as longer rotations, to enhance the use of forests as carbon sinks. For the same reason they might also seek to encourage greater use of wood products in long-lasting forms of utilization, such as construction.

North America and Japan (not covered in the European study) are, like western Europe, mature markets for forest products, and trends there might be fairly similar to those in western Europe. The most dynamic area in terms of forest products markets is likely to be China, as it has been in the last decade or so, with India also likely to emerge as a major market. Both are poorly endowed with forests and will depend on imports to meet most of their growth in consumption. This will have an impact on the pattern of international trade in forest products. Russia is likely to see its exports to China continue to grow strongly. And the EU15, despite production costs tending to be on the high side, has been rather successful in overseas markets largely on the basis of quality and specification, notably of paper and paperboard, and this situation may continue provided resources are available and internal markets do not absorb all the output.

Trade in forest products in Europe as a whole is likely to remain more or less in balance: the EU15/EFTA sub-region will continue to be a net importer and the Russian Federation a net exporter. Production surplus to domestic needs and consumption in excess of domestic production possibilities will, as in the past, be covered by a large volume of intra-European trading, with the Nordic countries,

Russia and the Baltic States the main net exporters and western European countries the main net importers. North America is a net exporter but the bulk of its trade is intra-regional, between Canada and the USA, and this situation is not expected to change significantly in the coming years. Competition in international markets is likely to remain keen, meaning that, other things being equal, there may not be much scope for price increases for forest products. The pressure will remain on forest owners and managers to continue to improve harvesting efficiency and productivity and the profitability of forestry, while respecting the principles of sustainable forest management, including the environmental and social elements, and also providing more non-wood goods and services.

Continuing competitive pressure suggests that forest practitioners will continue to seek help, as they have done in the past, to find solutions to their technical, managerial and human resource problems. And also as in the past, this will include looking to see how other countries are dealing with them.

At the international level, this raises a number of questions. Firstly, what are the problems that can most effectively be dealt with through cooperation between countries? Secondly, what would be the most efficient mechanisms for doing so? And thirdly, who are the target groups most urgently needing assistance? The first and third questions are closely related and may be considered together. Among the key target groups and difficult problems are:

- (1) The profitability of forest operations. Lack of profitability is a disincentive to practise good forestry and to undertake harvesting operations. Generally speaking, the smaller the forest holding and the more difficult the terrain, the less profitable forestry is likely to be. There remains tremendous scope for adapting equipment and systems for harvesting and other operations to such situations. Nearly all small scale forests are in private hands, and there are millions of such owners in Europe. It is particularly in these forests and other forests that are difficult of access that, for lack of profitability and/or motivation, there is a shortfall in wood production compared with the potential. Greater cooperation between owners, for example in sharing equipment, and the greater use of contractors would help to improve the situation.
- (2) Nature conservation and biodiversity. Forest owners, private as well as public, will be expected by the general public, policy makers and special interest groups to manage their forests in such a way as to preserve or restore biodiversity, for example in nature reserves and natural parks, and to ensure that the production function of the forest is met without harming the environmental ones. Demand for protection areas where wood production is either banned or limited will continue to increase. In many case the problem is compounded by the fact that non-production functions are expected to be provided without any provision being made for the costs of doing so. Help is needed in identifying ways of making the non-production functions pay both in the public and private sector.
- (3) Protection of the forest. Forest fire remains a major scourge around the Mediterranean and in parts of the boreal region, and other forms of damage, for example from wind, insects and disease remain a constant threat. It has been suggested that the impact of global warming could be to increase the risk of forest damage. Forest services and managers of public and private forests need help in cooperating to prevent and combat such threats and restoring damaged areas.
- (4) The forestry workforce. The number of people employed in forestry will continue to decline. A continuous effort needs to be made to make forestry more attractive in terms of wages, health and safety and social conditions for the workers and their families. Increasingly sophisticated equipment and forest operations will require well trained young entrants into the workforce. Training and extension services, financed both from public and private funds, would greatly benefit from the international exchange of teaching material and skills. Special attention would need to be given to ensure that qualified machine operators are employed as or by contractors in mechanized harvesting.

- (5) Leisure, recreation and landscape. More and more people are visiting the forest to indulge in a wide variety of leisure pursuits, and forest managers are expected provide facilities for them. Besides the extra costs involved, this often requires public relations skills and some adaptation of management and silvicultural practices. It also involves cooperation with other land use managers in order to create an integrated approach to land use and landscape planning, given that forests are nearly everywhere an important element of the landscape.
- (6) Energy and biomass. Although there have been several false dawns, sooner or later the search for alternatives to fossil fuels as sources of energy will get serious, and biomass, notably woody biomass, will be expected to increase its present small share of total energy supply. At present energy from wood is often not price competitive without being subsidized, although this could change if present (spring 2004) oil prices persist. International cooperation could help countries to find technical and organizational solutions to making wood more convenient and competitive as an energy source, and to ensuring adequate supply from both large and small scale holdings, both for energy and as an industrial raw material.
- (7) Countries with economies in transition. While there has been considerable progress in the countries of central and eastern Europe in the process of transition from planned to forms of market economy, there is still a long way to go in several of them. Some have recently joined the EU and are having to adapt their forest laws and practices to EU legislation, involving also problems of enforcement. The privatization or restitution of forest land, formerly under State management, has also raised some delicate issues, such as how state administrations can influence the new or restored private owners to practise good, i.e. sustainable, management. International exchange of know-how and experience can continue to be helpful in this process.
- (8) Illegal or illicit harvesting and trade. In some countries there is need to strengthen the enforcement of regulations relating to the harvesting of wood and its sale for domestic processing or export. These practices may not only jeopardize the principles of sustained wood yield (and SFM) but may also create unfair competition in international trade. Forest administrations and others responsible for monitoring and enforcement can benefit from international cooperation and exchange of experience.
- (9) Sustainable forest management. In all of the issues raised above sustainable forest management is the underlying principle adopted by all countries and incorporated in the latest versions of their forest laws. Laws may be easier to create than to enforce in practice, and there is scope for international cooperation in resolving the practical problems involved in applying the principles of SFM. Forest certification is an important tool in supporting SFM, although as yet applied to only a small proportion of the European forest. International cooperation would be helpful in extending its introduction and application and in harmonizing the different systems being used.

It is evident that each of the above nine problem areas covers a broad field and that, in identifying topics that would be fruitful for international cooperation, it would be necessary to be much more specific. Individual countries' needs for information and assistance vary, and to be effective, there must be a matching of these needs with the possibilities and means of meeting them. This brings us to the second question raised above – what are the most efficient mechanisms for cooperation ?

From the review of the Joint Committee's activities in this paper it may be concluded that it has been successful in the past in identifying countries' needs for information and selecting appropriate means for transmitting it, for example through seminars, workshops or teams of specialists. On the other hand, it has been less successful in passing on the information which it has generated to all the people in member countries and others who could benefit from it. Partly this has been due to some

countries not sending their experts to participate in these activities, usually due to lack of funds, and partly to failure within countries to circulate the information emanating from them to their experts. Proceedings of most meetings, containing the expert papers presented to them and the conclusions and recommendations of the meetings, have been circulated to countries, but because of language difficulties or other reasons may not have been distributed to potential users. The Joint Committee has been aware of these problems, but it has been difficult to address them for lack of resources, both in the secretariat and in the countries.

What of the future? There continues to be considerable need for the international exchange of information and cooperation within the UNECE area on many specific problems in the forestry field. In fact, the demand probably exceeds the potential supply, and the first requirement is to select the topics for priority attention, something which the Joint Committee has been good at in the past. However, at the time of writing, the future of the Joint Committee is in doubt: either it will be discontinued by its parent bodies or, if it is maintained, it is likely to be in a form that will require a minimum of secretariat support. Its programme would therefore have to be further streamlined. In either case it may be necessary to consider other possibilities for certain activities to be continued. This is due to be taken up at the 25th session of the Joint Committee in September 2004.

The Steering Committee of the Joint Committee has played an effective role in bringing together proposals for future activities, selecting the most promising ones, choosing a suitable means for undertaking them and monitoring progress. Whether under the aegis of FAO/UNECE/ILO or under some other banner, this system of having a small group of leading experts appointed by member countries to advise on and direct the work should be continued. In addition to the present role of the Steering Committee, however, such a group will need to give careful attention to the problems of communication and dissemination of information, including means for enabling participation in events by experts from the countries which could most benefit from it. One way of doing this might be to organize smaller expert meetings in targeted countries intended to benefit them and their neighbours (to minimize travel and participation costs and ease the language problem), which would concentrate on a very specific problem. For example, instead of treating forest fire problems as a whole, it might be better to deal with one aspect at a time, for example the role of local communities in preventing and combating fires.

By concentrating on more specific topics this would also allow the findings of meetings or teams of experts to be more succinct and targeted, and would hopefully make it easier for them to be disseminated much more widely, including translations of them into the appropriate languages.

These are just a few ideas among many possibilities. Whether the Joint Committee continues or not, it is very important that the institutional know-how it has built up is not lost and that the valuable work it has been carrying out is continued in some form or another. As a first step it could be useful to establish a small Task Force, along the lines of the Burlington Task Force in 1993, to look into the alternatives for the work of the Joint Committee to be carried on, under what body's or bodies' authority it should be placed, what should be the priority tasks and how the work should be planned, supervised and carried out. Whatever is decided, it seems essential that there must be a 'central authority' within whose own programme the activities are included, in order to give them the necessary credibility and through which the outcomes, in the form of recommendations and guidelines, can be channelled.

It is hoped that this publication has fulfilled its task of presenting the "evolution and achievements" (as stated in its sub-title) of the Joint Committee over the past fifty years in a positive and constructive way and has shown that it has served its member countries well. It is also hoped that it has inspired all those keen to see its activities being pursued in the future to search for ways to overcome the barriers threatening to curtail its activities.

ANNEXES

ANNEX I

**LIST OF CHAIRMEN, VICE-CHAIRMEN, RAPPORTEURS, COORDINATORS
AND LEADERS OF TEAMS OF SPECIALISTS OF THE JOINT COMMITTEE**

Period	Name	Country
<i>Chairmen</i>		
1955-1957	Mr. H. Winkelmann	Switzerland
1957-1966	Mr. E.G. Richards	United Kingdom
1966-1972	Mr. K.I. Voronitsin	USSR
1972-1974	Mr. K. Zaremba-Czereyski	Poland
1974-1978	Mr. R. Brunet	France
1978-1982	Mr. M. Kantola	Finland
1982-1986	Mr. A.P. Livanov	USSR
1986-1990	Mr. E. Lammerts van Bueren	Netherlands
1990-1994	Mr. S.A. Axelsson	Sweden
1994-1998	Mr. Paul N. Efthymiou	Greece
1998-....	Mr. H.H. Höfle	Germany
<i>Vice-Chairmen</i>		
1955-1957	Mr. L. Kostron	Czechoslovakia
1955-1959	Mr. E. Gläser	Federal Republic of Germany
1957-1961	Mr. I.I. Sudnitsin	USSR
1957-1960	Mr. J.M. Venet	France
1961-1966	Mr. L.V. Roos	USSR
1966-1972	Mr. K. Zaremba-Czereyski	Poland
1966-1972	Mr. U. Sundberg	Sweden
1970-1974	Mr. R. Brunet	France
1972-1978	Mr. M. Kantola	Finland
1972-1982	Mr. A. Mateev	Bulgaria
1974-1980	Mr. F. Rydbo	Sweden
1978-1982	Mr. A.P. Livanov	USSR
1980-1984	Mr. M. Navarro	Spain
1982-1984	Mr. A. Sutton	United Kingdom
1984-1986	Mr. E. Lammerts van Bueren	Netherlands
1984-1986	Mr. E. Dönmez	Turkey
1986-1990	Mr. S.A. Axelsson	Sweden
1986-1990	Mr. J. Gadant	France
1990-1994	Mr. Paul N. Efthymiou	Greece
1990-2002	Mr. V. Korobov	Russian Federation
1994-1998	Mr. H.H. Höfle	Germany
1998-....	Mr. D. McAree	Ireland
2002-....	Mr. M. Büchel	Switzerland

Rapporteurs

1955-1957	Mr. E.G. Richards	United Kingdom
1957-1959	Mr. S. Jackson	United States
1959-1961	Mr. X. de Mégille	France
1961-1970	Mr. R. Wettstein	Switzerland
1970-1972	Mr. M. Bol	Netherlands
1972-1976	Mr. S.A. Rechsteiner	Switzerland
1976-1982	Mr. E. Grieder	Switzerland
1985-1986	Mr. S.A. Axelsson	Sweden
1988-1994	Mr. F. Gereley	Hungary

Coordinators

Subject area 1

1978-1980	Mr. B. Strehlke	Federal Republic of Germany
1978-1984	Mr. J. Rybczynski	Poland
1980-1984	Mr. E. Lammerts van Bueren	Netherlands
1984-1988	Mr. R. Velez	Spain
1984-1994	Mr. H.H. Höfle	Germany
1988-1990	Mr. V. Korobov	USSR
1990-1994	Mr. M. Büchel	Switzerland
1994-1996	Mr. S. Rzadkowski	Poland
1996-1998	Mr. T. Kotimäki	Finland
1998-2002	Mr. J. Suoheimo	Finland
2002-....	Mr. J. De Sousa Teixeira	Portugal

Subject area 2

1978-1982	Mr. R. Croisé	France
1978-1988	Mr. P. Abol	USSR
1982-1986	Mr. B. Akre	Norway
1986-1994	Mr. T. Opheim	Norway
1988-1990	Mr. P. Efthymiou	Greece
1990-1992	Mr. E. Dönmez	Turkey
1992-1994	Mr. Y. Cochelin	France
1994-1996	Mr. B. Akre	Norway
1996-2002	Mr. S. Rzadkowski	Poland
2002-....	Mr. J. Begus	Slovenia

Subject area 3

1978-1984	Mr. S.A. Axelsson	Sweden
1984-1986	Mr. M. Luknar	Czechoslovakia
1984-1990	Mr. P. Harstela	Finland
1986-1992	Mr. D. Bardy	United Kingdom
1990-1994	Mr. J. Komorowski	Poland
1992-1994	Mr. H. Schipper	Netherlands
1994-2002	Mr. M. Buechel	Switzerland
2002-....	Mr. C. Salvignol	France

Special coordinators

The Joint FAO/ECE/ILO Committee

1980-1984	Mr. I. Astorga (southern European regions)	Spain
1994-1998	Ms. N. Burlington (North America, UNCED follow up, evaluation procedures)	Canada
1994-....	Ms. E. Horvathne Sandor (countries in transition, women in forestry)	Hungary
1998-....	Mr. J. Ilavský (Liaison Timber Committee, EFC)	Slovakia

Leaders of Teams of Specialists (from 1978) / Study Groups (1959 -1978)

Methods and organization of forest work

1959-1972	Mr. J. Jindra	Czechoslovakia
1972-1978	Mr. G.K. Vinogorov	USSR

Manual and mechanized forest operations

1959-1966	Mr. I. Samset	Norway
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Forest machinery development

1959-1966	Mr. X. de Mégille	France
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Vocational training and prevention of accidents in forest work

1959-1972	Mr. H. Frølund	Denmark
1972-1978	Mr. B. Strehlke	Federal Republic of Germany

Multilingual glossary on the forest work science

1959-1970	Mr. U. Sundberg	Sweden
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Mechanization of forest work

1962-1968	Mr. I. Samset	Norway
1968-1972	Mr. R. Wettstein	Switzerland
1972-1978	Mr. F. Rydbo	Sweden

Vocational rehabilitations of forest workers

1978-1982	Mr. B. Frykman	Sweden
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Ergonomic problems related to chain saws and brush saws

1978-1980	Mr. S.A. Axelsson	Sweden
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Methods of measurement of labour productivity

1978-1980	Mr. A. Staaf	Sweden
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Terrain classification from the wood harvesting point of view

1978-1986	Mr. H.D. Löffler	Germany
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Compatibility of harvesting methods and equipment with silviculture and the environment

1978-1985	Mr. J.-M. Niérat	France
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Location and methods of primary roundwood conversion

1982-1984	Mr. B. Akre	Norway
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Extension services for small-scale forest owners and farmers		
1980-1982	Mr. F.K. Brevig	Norway
Methods and equipment for silvicultural operations in the Mediterranean countries		
1980-1982	Mr. N. Garnica	Spain
1982-1984	Mr. J. Molina	Spain
1984-1990	Mr. J.L. Montero de Burgos	Spain
Harvesting of wood for energy purposes		
1980-1986	Mr. P.O. Nilsson	International Energy Agency
Chemicals in forestry: health hazards and protection		
1982-1984	Mr. S.A. Axelsson	Sweden
1984-1988	Mr. P. Patosaari	Finland
Model forest damage manual		
1986-1988	Mr. E. Andersson	ILO
1992-1994	Mr. Th. Grunfelder	Switzerland
Site damage risks		
1990-1994	Mr. P. Abeels	Belgium
Afforestation techniques on agricultural land		
1992-1994	Mr. J. Zajackowski	Poland
Multiple use forestry		
1993-1996	Mr. G. Nordanstig	Sweden
Environmentally sound forest roads and wood transport		
1994-1996	Mr. I. Cretu	Romania
Team of specialists on forest fire		
1982-1986	Mr. T. Karlikowski	Poland
1988-1990	Mr. G. Calabri	Italy
1990-....	Mr. Johann G. Goldammer	Germany
Socio-economic aspects of sustainable forest management		
1997	Mr. Pierre Muhlemann	Switzerland
Team of specialists on participation in forestry		
1998-....	Mr. Miles Wenner	United Kingdom
Best practices in forest contracting <i>SUBJECT TO ENDORSEMENT OF PARENT BODIES</i> (2003 to 2005) To be appointed		
Gender and forestry <i>SUBJECT TO ENDORSEMENT OF PARENT BODIES</i> (2003 to 2005) To be appointed		

ANNEX II

LIST OF PUBLICATIONS, INCLUDING PROCEEDINGS OF SYMPOSIA, SEMINARS AND WORKSHOPS HELD UNDER THE AUSPICES OF THE JOINT COMMITTEE

The number of documents issued in connection with the Joint Committee's activities over the past fifty years runs into the thousands. The list below is therefore selective and highly condensed. For example, the proceedings of symposia and seminars consist of the papers prepared by experts, and therefore one entry in the list may cover from 10 to 50 separate papers. Spare copies of many of the documents listed are no longer available for distribution from the Geneva secretariat, mostly those issued before the late 1970s. There are a number of national institutions, however, such as the Oxford Forestry Institute Library, United Kingdom, that hold a virtually complete set of Joint Committee documents.

Publications 1953 - 1987

	<u>Title</u>	<u>Symbol</u>	<u>Language</u> <u>20</u>
1.	A European Directory of Research and Training Institutes concerned with the Rationalization of Forestry Work in the Field of Felling, Logging and Transport of Timber, (Geneva, 1953)	FAO/EFC/LOG/14 Rev.1	(E.F.)
2.	Vocational Training of Forestry Workers, (ILO, Geneva, 1954)	FAO/EFC/LOG/15 Rev.1	(E.F.)
3.	The Use of Power Saws in Forestry Operations. U. Sundberg, Sweden, (Geneva, 1953)	FAO/EFC/LOG/19	(E.F.)
4.	Bibliography on Work Science in Forests, H. Glaser, Federal Republic of Germany, (Geneva, 1954)	MEFAO/3/54	(E/F) 2 volumes
5.	The Loading of Coniferous Sawlogs on Trucks. M. Kantola, Finland, (Geneva, 1954), 166 pp, Bibliography [Manual and mechanized loading in Finland and Nordic countries between 1947 & 1953]	FAO/EFC/LOG/20	(E.F.)
6.	Criteria for Correct Logging Techniques and Best Methods of Work in European Countries, H. Glaser, Federal Republic of Germany, (Germany, 1954)	FAO/EFC/LOG/23 TIM/LOG/2	(E.F.)
7.	International Performance Comparison in the Field of Logging, H. Hilf, Federal Republic of Germany, (Geneva, 1954)	FAO/EFC/LOG/31 TIM/LOG/10	(E.F.)
	<u>Title</u>	<u>Symbol</u>	<u>Language</u>

²⁰ English, French, Russian, Spanish, Swedish, German; Full stops between the letters (e.g. E.F.) mean documents issued in separate language versions; obliques (e.g. E/F/R) that the document is multilingual.

Fifty years of international co-operation in forestry

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|-----|---|---|----------|
| 8. | Choosing Tractors for Logging, X. de Mégille, France, (Geneva, 1954) | MEFAO/7/54 | (E) |
| 9. | Forestry Criteria and Equipment of Tractors (2nd report), X. de Mégille, France, (Geneva, 1955), 74 pp | FAO/EFC/LOG/28/Re
v.1
TIM/LOG/7/Rev.1 | (E.F.R.) |
| 10. | The Use of Power Saws in Forest Operations (2nd report), U. Sundberg , (Geneva, 1955), 95 pp
[What is available. Desirable design features] | FAO/EFC/LOG/45
TIM/LOG/23 | (E.F.R.) |
| 11. | The Bundling of Small-sized Timber, X. de Mégille, France, (Geneva, 1955), 25 pp | FAO/EFC/LOG/52
TIM/LOG/30 | (E.F.R.) |
| 12. | The Vocational Training of Forest Workers (2nd report), ILO, (Geneva, 1955), 77 pp | FAO/EFC/LOG/54
TIM/LOG/32 | (E.F.R.) |
| 13. | One-man Work in Mixed Stands of Beech, Spruce and Fir, H.J. Steinlin, Switzerland, (Geneva, 1957), 70 pp | FAO/EFC/LOG/55
TIM/LOG/33 | (E.F.R.) |
| 14. | The Costing of Powered Vehicles and Machines | FAO/EFC/LOG/58
TIM/LOG/36 | (E.F.R.) |
| 15. | Tractors for Logging, X. de Mégille, France, (Rome, 1956)
"Guidance in the choice of tractors for logging (timber hauling)"
[Covers wheeled and tracked tractors and their ancillary equipment] | FAO Forestry
Development Paper
No. 1 | (E.F.) |
| 16. | The Handling and Transport of Timber in Mountainous Regions, (Geneva, 1957), 94 pp | FAO/EFC/LOG/65
TIM/LOG/43 A and B | (E/F/R) |
| 17. | The Mechanical Barking of Timber, U. Sundberg, Sweden, (Geneva, 1957), 115 pp
[Characteristic of bark. Barking machine design principles. Catalogue and descriptions of barking machines from many countries. Bibliography] | FAO/EFC/LOG/66
TIM/LOG/44 | (E.F.R.) |
| 18. | Method for the Study of Working Techniques in Forest Operations, J.H. Venet & H. Duteil, France, (Geneva, 1957), 250 pp
[To enable working methods to be described in sufficient detail that they may be reproduced elsewhere] | FAO/EFC/LOG/61
TIM/LOG/45 | (E.F.R.) |

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	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
19.	Le débardage des bois à la traîne, K. Kay, Switzerland, (Geneva, 1957)	FAO/ECE/LOG/14	(F, summary in E.R.)
20.	The Mechanical Loading of Timber on Trucks, M. Kantola, Finland, (Geneva, 1958), 70 pp [Updates earlier study and covers more European countries]	FAO/BCB/LOG/28	(E, summary in F.R.)
21.	The Collection, Compilation and Analysis of Forest Accident Statistics, (Geneva, 1958), 75 pp	FAO/ECE/LOG/29	(E.F.)
22.	Ground Winch Skidding in Clear and Selective Felling, K.I. Voronitsin, V.I. Aliabiev & H.A. Perfilov, USSR, (Geneva, 1959), 22 pp [Covers USSR]	FAO/ECE/LOG/37	(E.F.)
23.	The Use of Power Saws in Forest Operations (3rd report), J. Jindra, Czechoslovakia, (Geneva, 1959), 53 pp	FAO/ECE/LOG/57	(E.F.R.)
24.	Timber Skidding by Tractor in the USSR, K.I. Voronitsin, P.A. Lepentsov & H.A. Perfilov, USSR, (Geneva, 1959), 33 pp	FAO/ECE/LOG/59	(E.F.R.)
25.	Logging Cableways, G. Giordano, Italy, (Geneva, 1959), 145 pp [Comprehensive guide to choice, installation and use of logging cableways]	FAO/ECE/LOG/60	(E)
26.	A Directory of Organizations concerned with Forest Workers' Safety, (Geneva, 1960)	FAO/ECE/LOG/70	(E.F.R.)
27.	Timber Transport on Snow and Ice Roads, (Geneva, 1960), 9 pp	FAO/ECE/LOG/72	(E.F.R.)
28.	Improvements to Petrol Driven Power Saws in the USSR, (Geneva, 1960), 9 pp	FAO/ECE/LOG/73	(E.F.R.)
29.	Logging-by-helicopter Trials in the USSR, (Geneva, 1961), 6 pp	FAO/ECE/LOG/96	(E.F.R.)
30.	Portable and Semi-portable Wood Chipping Machines - Part 1: Uses of chipping machines and wood chips - V.J. Heiskanen, Finland, (Geneva, 1962), 57 pp	FAO/ECE/LOG/98	(E, summary in F.R.)

Fifty years of international co-operation in forestry

	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
31.	Technological Study of Wheeled Tractors, V. Gorbachevsky, USSR, (Geneva, 1962), 7 pp	FAO/ECE/LOG/99	(E.F.R.)
32.	Multilingual Glossary of Forest Work Science (provisional edition), Vol. I: English Vol. II: French Vol. III: Russian Vol. IV: German Vol. V: Swedish	FAO/ECE/LOG/100	(E.F.R.G.S w.)
33.	The Description of Working Methods in Forest Operations, J. Venet, France, (Geneva, 1962), 56 pp	FAO/ECE/LOG/104	(E.F.R.)
34.	Noise, Vibration and Escape of Exhaust Gases in Power Saws, K.I. Voronitsin, A.P. Polischuk & V.S. Kretov, USSR, (Geneva, 1962), 19 pp	FAO/ECE/LOG/105	(E.F.R.)
35.	Culture mécanique du sol forestier, S. Matusz, Poland, (Geneva, 1963), 40 pp, 80 figures	FAO/ECE/LOG/112	(F)
36.	Direct Drive in Power Saws, L. Czajkowski & Z. Patalas, Poland, (Geneva, 1964), 34 pp, 12 figures	FAO/ECE/LOG/113	(E.F.R.)
37.	Skidding by Horse and by Tractor, K. Czereyski, Poland. (Geneva, 1964), 68 pp, 39 figures	FAO/ECE/LOG/143	(E.F.R.)
38.	Collection of Seeds from Standing Trees, S. Matusz, Poland, (Geneva, 1964), 25 pp, 37 figures	FAO/ECE/LOG/144	(E.F.R.)
39.	Economic Assessment of Mechanized Working Methods, H.J. Loycke, Federal Republic of Germany & J. Jindra, Czechoslovakia, (Geneva, 1964), 20 pp	FAO/ECE/LOG/145	(E.F.R.)
40.	The Application of Machinery to the Floating of Bundled Timber, K. Putkisto, Finland, (Geneva, 1965), 20 pp, 27 figures	FAO/ECE/LOG/146	(E.F.R.)
41.	Short Distance Skidding with Tractor Mounted Winches, K. Putkisto, Finland, (Geneva, 1965). 40 PP. 36 figures	FAO/ECE/LOG/147	(E.F.R.)
42.	The Bundling of Small-sized Timber, X. de Mégille. France, (Geneva, 1965), 18 pp	FAO/ECE/LOG/148	(E.F.R.)

	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
43.	Symposium on the Planning of Forest Communication Networks (Roads and Cables), Proceedings (pub. UN/ECE, Geneva, 1965), 6 vol.. 918 pp [Some 45 individual papers covering economic evaluation of forest transport networks in general and road networks in particular; planning and design of transport networks; financing a transport network; special problems in steep mountainous regions]	FAO/ECE/LOG/149	(E/F/R)
44.	Rationalization of Ploughing Operations for Drainage, E.H. Macmillan, United Kingdom, (Geneva, 1965).56 pp	FAO/ECE/LOG/157	(E.F.R.)
45.	Rationalization of Stump Extraction, K. Czereyski & J. Galinska, Poland and H. Robel, German Democratic Republic, (Geneva, 1965), 59 pp	FAO/ECE/LOG/158	(E.F.)
46.	Exchange of Information - List of Organizations Engaged in Forest Working Techniques, (Geneva. 1965), 86 pp	FAO/ECE/LOG/159	(E.F.R.)
47.	Mechanization of Timber Conversion Sites, W. Jacob, German Democratic Republic and E. Kubasak, Czechoslovakia, (Geneva, 1965), 46 pp	FAO/ECE/LOG/160	(E.F.R.)
48.	Portable and Semi-portable Wood Chipping Machines - Part II: Information on chipping and the yield and cost of chipping - V.J. Heiskanen, Finland, (Geneva. 1965). 37 pp	FAO/ECE/LOG/161	(E.F.R.)
49.	Symposium on Mechanical Barking of Timber, Proceedings (pub. UN/ECE. Geneva. 1966), 3 vol., 500 pp	FAO/ECE/LOG/162	(E/F/R)
50.	Technical Tables in Logging. Engineering, Forest Work Science and Related Matters, (Geneva. 1967)	LOG/WP.7/9	(E.F.)
51.	The Vocational Training of Forest Workers (prepared by ILO), (Geneva, 1968)	FAO/ECE/LOG/226 ILO symbol D.13.1968	(E.F.R.)
52.	Symposium on the Economic Location of Forest Operations (Geneva, June 1967), Proceedings (pub. UN/ECE, Geneva, 1968, Parts I and II [Analysis of various types of logging systems employed; technology, economics and organization of timber operations; location of primary conversion site; methodological problems]	FAO/ECE/LOG/229	(E/F/R)

	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
53.	Symposium on the Mechanization of Harvesting of Small-sized Wood and Logging Residues. Proceedings (pub. UN/ECE. Geneva, 1970), 4 vol. [Utilization of small-sized wood and logging residues; mechanization of thinning and of harvesting coppice and logging residues]	FAO/ECE/LOG/233	(E.F.R.)
54.	Symposium on Ergonomics Applied to Forestry, Proceedings, Vol. I, 1971 - Vol. II, 1972 [Anthropological. physiological and safety aspects of forest work; environmental occupational health aspects; construction of machines and tools; clothing and protective equipment; problems pertaining to developing countries; education and training]	FAO/ECE/LOG/243	(E.F.R. G.)
55.	Work Study in Forestry (Forestry Commission United Kingdom. 1971) 100 pp. Paper produced for JC course on Work Study in Forestry, 1973	-	(E)
56.	Symposium on Forest Operations in Mountainous Regions. Technical report (pub. UN/ECE. Geneva. 1973). 90 pp [Classification of terrain; environment, erosion, silviculture; planning road networks; technical computation of cable systems; cables and auxiliary equipment; tractors in steep terrain; health and safety]	TIM/EFC/WP.1/1	(E.R.)
57.	Report of the Meeting of Experts on Ergonomics Applied to Power Chainsaws, J. Folstad. Sweden. 5 vol., 427 pp [Covering comprehensively occupational hazards (including medical aspects e.g. on noise and vibration); preventive measures; working techniques; establishment of standards for measurements e.g. of noise and vibration]	-	(E)
58.	Symposium on Stand Establishment (joint IUFRO and Joint Committee Symposium), Proceedings (pub. IUFRO. 1975) [Planting material; land clearing, weed control and soil preparation; planting and seeding; ergonomics of planting machines; stand establishment; spacing and treatment of young stands]	-	(E.F.R. G.)

	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
59.	Symposium on Multi-Purpose Logging Machines (MPLM). Technical report (pub. Sweden, 1976). 79 pp [Covering the development of machines in the forest to present uses and experiences of MPLM; the future role of MPLM; ergonomic aspects; accident prevention; training]	-	(E.F.R.)
60.	Exchange of Information - List of Organizations Engaged in Forest Working Techniques, Mechanization and Environmental Problems Related to Forestry (Geneva, 1977)	TIM/EFC/WP.1/6	(E.F.R.)
61.	Symposium on the Harvesting of a Larger Part of the Forest Biomass, Proceedings (pub. UN/ECE, Geneva, 1977), 2 Vol., 295 pp [Harvesting, transporting, processing (e.g. chipping) and storing of branch- wood, of stump wood and of whole trees. Use of fuller forest biomass in forest industries. Effect on growth of next rotation]	TIM/EFC/WP.1/SEM.3 /3	(E/F/R)
62.	Seminar on Reforestation of Forests Destroyed by Storm and Fire, Proceedings (pub. UN/ECE, Geneva, 1977)	TIM/EFC/WP.1/GE.3/ SEK.1/1	(E/F/R)
63.	Seminar on Vocational Training and Extension Services for Small-scale Forest Owners and Farmers, proceedings (pub. Norway, 1981), 275 pp [Evaluation of training and extension services in various countries of Europe; models and methods; implementation of training programmes; follow-up action]	-	(E/F)
64.	Seminar on Forest Fire Prevention and Control (Poland, May 1981). (Published by Martinus Nijhof)	-	(E/F)
65.	Seminar on the Maintenance of Forest Machines in Large- and Small-scale Forest Operations, Proceedings (pub. Sweden, 1982), 200 pp	-	(E/F)
66.	Seminar on Occupational Health and Safety and Applied Ergonomics in Highly Mechanized Logging Operations, Proceedings (pub. Environment Canada Distribution Centre, Hull, P.Q.J8Z 1T4), 1982, 580 pp [Papers presented; unedited transcript of discussions]	-	(E/F/R)

	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
67.	Seminar on the Management of Forest Worker Training, Proceedings (pub. United Kingdom, Forestry Commission, 1982), 2 vol. [Effectiveness and efficiency of training in forestry; principles and practice of training course design; selection for training - criteria and procedures; job rotation; training of operators for silvicultural operations; training and further education for workers and supervisors]	-	(E/F/R)
68.	The Planning and Techniques of Transport and its Relation to Operational Activities in Forestry, (pub. Norwegian Forest Research Institute), 300 pp. Available from Min. of Ag., P.O.Box 8007, ; N - 0030 Oslo 1 [Terrain classification; planning of forest roads; computer planning of cable and road networks; tractor operations in steep terrain; forest operations and long distance transport]	-	(E/F/R)
69.	Seminar on Reducing Forest Biomass Losses in Logging Operations, Proceedings (pub. USSR. 1985), 385 pp	-	(E/F/RIS)
70.	Ergonomics Applied to Forestry (Austria, October 1983). (Pub. by Forstliche Bundesvesuchsanstalt. A-1131 Vienna), 256 pp. [Ergonomic research; training in ergonomics; forest accident and accident prevention; occupational health; clothing and personal protective equipment]	-	(E/G)
71.	Seminar on Machines and Techniques for Forest Plant Production, Proceedings (pub. Czechoslovakia, 1984), 2 vol., 435 pp	-	(E/F/R)
72.	Seminar on Silvicultural, Technological, Economic and Other Problems Connected with the Mechanization of Thinning Operations. (In conjunction with IUFRO) Proceedings (pub. German Democratic Republic, 1984), 343 pp and appendices. [Papers from Finland, France, German Democratic Republic, Federal Republic of Germany, Norway, Spain, Sweden, United Kingdom, USSR]	-	(E/F/R/G)

	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
73.	Seminar on Techniques and Machines for the Rehabilitation of Low-productivity Forest, Proceedings (pub. Ministry of Forestry, Turkey, 1985), 310 pp [Overview: Economic and ecological aspects; land clearance and soil preparation; planting techniques and equipment; maintenance and protection of young stands; preparation and utilization of woody material from land clearance; training]	-	(E/F/R)
74.	The Vocational Training of Forest Workers (prepared by ILO, Geneva, 1984)	TIM/EFC/WP.1/R.37/R ev.1	(E.F.R.)
75.	Seminar on Occupational Health and Rehabilitation of Forest Workers, Proceedings, (prepared by ILO, Geneva; published by Finnish Government-printing Centre, 1986), 281 pp	-	(E)
76.	Seminar on the Technology and Mechanization of Logging Operations in Mountainous Regions and related environmental problems. Proceedings (published in USSR in 1987)	-	(E/F/R)
77.	Seminar on the Preparation and Implementation of Forest Management Plans. Proceedings (published by the National Forest Service of the Netherlands in 1987) approx. 400 pp	-	(E/F/R)
78.	Workshop on the Transfer of Basic Technology from the ECE Region to Other Regions. Proceedings (prepared and published by ILO, Geneva, 1987)	-	(E)
79.	Seminar on Methods and Equipment for the Prevention of Forest Fires. Proceedings (published by ICONA, Spain in 1987)	-	(E/F/R/S)

There are many useful individual papers presented to Symposia or Seminars held under the auspices of the Joint Committee (some in connection with its Plenary Sessions) which have not been brought together into one edited set. These include the undernoted papers, which are available in some libraries (e.g. at the Oxford Forestry Institute Library).

	<u>Title</u>	<u>Year</u>	<u>Symbol</u>
80.	Length of pulpwood to give minimum cost from stump to the preparation of chips in the pulpmill	1964	FAO/ECE/LOG/139/Add.1
81.	The forest worker and his environment		FAO/ECE/LOG/139/Add.2
82.	The influence on forest yield of (1) the width and spacing of forest roads including strip roads and tractor tracks and (2) line thinning		FAO/ECE/LOG/139/Add.3
83.	The use of tractors in logging	1966	LOG/WP.7/10
84.	Forest road construction and maintenance techniques	1972	LOG/SYMP.6/45
85.	Man/machine productivity	1977	TIM/EFC/WP.1/SEM.4/1
86.	Techniques and mechanization of reforestation in mountainous areas	1978	TIM/EFC/WP.1/SEM.5/2
87.	Accidents in forest operations	1978	
88.	Mechanization and techniques of thinning operations	1978	TIM/EFC/WP.1/SEM.7/2
89.	Afforestation and reforestation machines and techniques	1980	TIM/EFC/WP.1/SEM.9/1
90.	The use of different types of aircraft in forest operations	1984	TIM/EFC/WP.1/R.56 and Addenda
91.	Chemicals in forestry	1986	TIM/EFC/WP.1/R.65 and Addenda

Publications since 1987

	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
92.	Seminar on small-scale logging operations and machines. Proceedings, Garpenberg, Sweden, 1987, 209 p.	-	(E)
93.	Seminar on the impact of acute forest damage on harvesting and silvicultural operations. Proceedings published by the Federal Ministry of Food, Agriculture and Forestry, Federal Republic of Germany, Bonn, 1988, 258 p.	-	(E/F/G)
94.	Seminar on extension activities for owners of small woodlands (woodlots). Proceedings, published by Canadian Forestry Service, Fredericton, N.B. 1988, 212 p.	-	(E/F)
95.	Seminar on reforestation methods after harvesting, in particular artificial regeneration. Proceedings, German Democratic Republic, Eberswalde, 1988, 322 p.	-	(E/F/G/R)
96.	Seminar on the employment of contractors in forest work. Proceedings, published by French Ministry of Agriculture and Forest, 1988, 294 p.	-	(E/F)
97.	Seminar on the training of professional forest workers. Proceedings, published by Finish government, Helsinki, 1989, 262p.	-	(E/F/R)
98.	Seminar on the impact of mechanization of forest operations on the soil. Proceedings, published by the Ministry of Agriculture, Brussels, 1989, 373 p.	-	(E/F/R)
99.	Seminar on forest site conservation and improvement for sustained yield. Proceedings published by the Federal Ministry of Food, Agriculture and Forestry, Federal Republic of Germany, Bonn, 1991, 272 p.	-	(E/F/G/R)
100.	Seminar on the use of pesticides in forestry. Proceedings, published by the Forestry Commission of Great Britain, Edinburgh, 1991, 340 p.	-	(E/F)
101.	Seminar on thinning operations. Proceedings, published by Ministry of Agriculture, Denmark, Copenhagen, 1992, 245p.	-	(E/F/R)
102.	Seminar on forest fire prevention, land use and people. Proceedings, published by Ministry of Agriculture, Secretariat General for Forests and Natural Environment, Greece, Athens, 1992, 287 p.	-	(E/F/R)

	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
103.	Seminar on the use of information systems in forest management. Proceedings, Sweden, Garpenberg, 1992, 205 p.	-	(E)
104.	Seminar on clothing and safety equipment in forestry. Proceedings, published by Kuopio University Printing Office, Finland, Kuopio, 1994, 291p.	-	(E/F/R)
105.	Seminar on exploring multiple use and ecosystem management: from policy to operational practice. Proceedings, published by Canadian Forest Service, British Columbia, Canada, 1995, 372 p.	-	(E/F/R)
106.	Manual on Acute Forest Damage – Managing the impact of sudden and severe forest damage. Report of the FAO/ECE/ILO Joint Committee team of specialists on acute forest damage manual, team leader Mr. Thomas Grünenfelder. United Nations, Geneva, 1996, 102 p.	ECE/TIM/DP/7	(E)
107.	Seminar on environmentally sound forest roads and wood transport, Romania, 1996. Proceedings, published by FAO, Rome, 1998, 424 p.	-	(E)
108.	Seminar on safety and health in forestry are feasible. Proceedings, published by Swiss Forest Agency, Switzerland, Berne, 1997, 409 p.	-	(E/F/R)
109.	People, Forests and Sustainability – Social elements of sustainable forest management in Europe. Report of the FAO/ECE/ILO Joint Committee team of specialists on socio-economic aspects of sustainable forest management, team leader Mr. Pierre Muhlemann. Published by Industrial Activities Branch, International Labour Office, Geneva, 1997, 216 p.	SAP 2.63/WP.113	(E)
110.	Seminar on forestry training for target groups that are hard to reach. Proceedings, published by Centre forestier de la Région Provence Alpes Côte d'Azur, France, 1999, 424 p.	-	(E/F/R)
111.	Seminar on improving working conditions and increasing productivity in forestry. Proceedings, published by Forest Research Institute, Slovakia, Zvolen, 1999, 296 p.	-	(E/F/R)

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	<u>Title</u>	<u>Symbol</u>	<u>Language</u>
112.	Seminar on forest operations of tomorrow. Proceedings, published by AFOCEL Sud-Ouest, France, 1999, 471 p.	-	(E/F/R)
113.	Public participation in forestry in Europe and North America. Report of the FAO/ECE/ILO Joint Committee team of specialists on participation in forestry, team leader Miles Wenner. Published by Sectorial Activities Department, International Labour Office, Geneva, 2000, 138 p.	WP. 163	(E)
114.	Multiple Use Forestry. Report of the FAO/ECE/ILO Joint Committee team of specialists on multiple use forestry, team leader Mr. Gunnar Nordanstig. Published by the United Nations, Geneva, 2000, 41 p.	ECE/TIM/DP/18	(E)
115.	Seminar on harvesting of non-wood forest products. Proceedings, published by Ministry of Forestry of Turkey, Ankara, 2001, 432 p.	-	(E/F/R)
116.	Seminar on the role of women in the forestry sector in Europe and North America. Proceedings, published by Direcçao-General das Florestas, Portugal, Lisbon, 2001, 388 p.	-	(E/F/R)
117.	Workshop on new trends in wood harvesting with cable systems for sustainable forest management in the mountains. Proceedings, Austria, Ossiach, 2001, 366 p.	-	(E/F/R)
118.	Seminar on forestry meets the public. Proceedings, published by Swiss Forest Agency, Bern, 2002, 352 p.	-	(E/F/G/R)
119.	Seminar on partnerships in forestry. Proceedings, published by the Ministry of the Flemish Community, Belgium, Brussels, 2002, 273 p.	-	(E/F/R)
120.	Seminar on afforestation in the context of sustainable forest management. Proceedings, to be published by Forest Service of Ireland, available in electronic format on the Joint Committee website, 319 p.	-	(E/F/R)
121.	Forest Fire Newsletter/International Forest Fire News. Two issues per year, published by UNECE/FAO. First volume published in January 1988, the latest in June 2003.	ECE/TIM/IFFN/..	(E)

	<u>Title</u>	<u>Symbol</u>	<u>Language</u> (E/F/R)
122.	Seminar on close to nature forestry. Proceedings, published by Slovak Forest Research Institute, Zvolen, 2003, 177 p.	-	
123.	Workshop on forest operations improvements in farm forests, Slovenia, 2003. Proceedings, to be published.		
124.	Conference on forest fire management and international cooperation in fire emergencies in the eastern Mediterranean, Balkans and adjoining regions of the near east and central Asia. Proceedings, to be published.		
125.	Building bridges between people and forests: the changing roles and modes of operation of National Forest Services. Proceedings, to be published.		

ANNEX III

LIST OF TRAINING COURSES, SYMPOSIA, SEMINARS AND WORKSHOPS HELD UNDER THE AUSPICES OF THE JOINT COMMITTEE

A. International training courses. etc. (TC)

	<u>Year</u>	<u>Subject</u>	<u>Place</u>
126.	1957	TC for experts in work studies	Switzerland
127.	1957	TC for cable operators	Austria
128.	1958	TC for cable operators	Italy & Switzerland
129.	1959	TC on mechanized forest operations	Sweden
130.	1960	TC on timber extraction by forest roads (including road construction)	Federal Republic of Germany & France
131.	1961	International course on vocational training of forest workers	Sweden
132.	1962	Cours international de câblage	France
133.	1963	TC on the transport of timber by tractor and preparation of work sites	Czechoslovakia
134.	1964	TC for instructors or inspectors concerned with work safety and accident prevention	Federal Republic of Germany
135.	1965	The organization and methods of forest worker training	Denmark
136.	1968	Long-distance cable-cranes (a) Installation and operation of cable-cranes (b) Planning of long-distance cable-cranes	Switzerland
137.	1969	Forest worker training for highly mechanized forestry operations	Finland
138.	1971	Work study course	United Kingdom

B. Symposia and seminars

	<u>Year</u>	<u>Subject</u>	<u>Place</u>
139.	1963	Planning of forest communication networks (roads and cables)	Geneva, Switzerland
140.	1964	Length of pulpwood to give minimum cost from stump to the preparation of chips in the pulpmill ^{1/}	Edinburgh, United Kingdom
141.	1964	The forest worker and his environment ^{1/}	Ditto
142.	1964	The influence on forest yield of (1) the width and spacing of roads including strip roads and tractor tracks and (2) line thinning ^{1/}	Ditto
143.	1965	Mechanical barking of timber	Helsinki, Finland
144.	1966	Use of tractors in logging ^{1/}	Stockholm, Sweden
145.	1967	Economic location of forest operations	Geneva, Switzerland
146.	1968	Mechanization of harvesting of small-sized wood and logging residues	Warsaw, Poland
147.	1969	Ergonomics applied to forestry	Reinbek, Federal Republic of Germany
148.	1971	Forest operations in mountainous regions	Krasnodar, USSR
149.	1972	Techniques of constructing and maintaining forest roads for use by motor vehicles ^{1/}	Sopron, Hungary
150.	1973	Ergonomics applied to forest work ^{1/}	Münchehof, Federal Republic of Germany and Eefde, Netherlands
151.	1974	Pedagogic and organizational problems of forest worker training ^{1/}	Zollikofen, Switzerland
152.	1974	Stand establishment	Paris, France
153.	1975	Multi-purpose logging machines	Jönköping and Stockholm, Sweden
154.	1976	Harvesting of a larger part of the forest biomass	Hyvinkää, Finland
155.	1977	Reforestation of forests destroyed by storm and fire	Federal Republic of Germany & Netherlands
156.	1978	Man/machine productivity ^{1/}	Garpenberg, Sweden
157.	1978	Techniques and mechanization of reforestation in mountainous regions ^{1/}	Sofia, Bulgaria

^{1/} Documentation prepared for these seminars was not issued as proceedings and therefore does not figure in annex II.

	<u>Year</u>	<u>Subject</u>	<u>Place</u>
158.	1978	Accidents in forest operations ^{1/}	Sekocin, Poland
159.	1979	Mechanization and techniques of thinning operations ^{1/}	Nancy, France
160.	1980	Vocational training and extension services for small-scale forest owners and farmers	Honne, Biri, Norway
161.	1980	Afforestation and reforestation machines and techniques ^{1/}	Madrid, Spain
162.	1981	Forest fire prevention and control	Warsaw, Poland
163.	1981	Maintenance of forest machinery in large- and small-scale forest operations	Garpenberg, Sweden
164.	1981	Occupational health and safety and applied ergonomics in highly mechanized logging operations	Ottawa, Canada
165.	1982	Management of forest worker training	Dumfries, United Kingdom
166.	1982	Planning and techniques of transport and its relation to operational activities in forestry	Sandefjord, Norway
167.	1982	Reducing forest biomass losses in logging operations	Moscow, USSR
168.	1983	Machines and techniques for forest plant production	Tatranska Lomnica, Czechoslovakia
169.	1983	Silvicultural, technological, economic, and other problems connected with the mechanization of thinning operations	Eberswalde, German Democratic Republic
170.	1983	Ergonomics applied to forestry in cooperation with the Joint Committee and IUFRO	Vienna and Ossiach, Austria
171.	1984	Techniques and machines for the rehabilitation of low-productivity forest	Cesme, Izmir, Turkey
172.	1985	Occupational health and rehabilitation of forest workers	Kuopio, Finland
173.	1985	Technology and mechanization of logging operations in mountainous regions and related environmental problems	Krasnodar, USSR
174.	1986	Preparation and implementation of forest management plans	Oosterbeek, Netherlands
175.	1986	Transfer of basic technology from the ECE region to other regions (Workshop)	Austria, Federal Republic of Germany & Switzerland

Fifty years of international co-operation in forestry

	<u>Year</u>	<u>Subject</u>	<u>Place</u>
176.	1986	Methods and equipment for the prevention of forest fires	Valencia, Spain
177.	1987	Small-scale logging operations and machines	Garpenberg, Sweden
178.	1987	The impact of acute forest damage on harvesting and silvicultural operations	Bönn-Röttgen, Federal Republic of Germany
179.	1987	Extension activities for owners of small woodlands (woodlots)	Fredericton, Canada
180.	1988	Reforestation methods after harvesting in particular artificial regeneration	Eberswalde-Finow, German Democratic Republic
181.	1988	Employment of contractors in forest work	Loubières, France
182.	1989	Training of professional forest workers	Jämsänkoski, Finland
183.	1989	Impact of mechanization of forest operations on the soil	Louvain-la-Neuve, Belgium
184.	1989	Mechanization of harvesting operations in mountainous terrain	Antalya, Turkey
185.	1990	Forest site conservation and improvement for sustained yield	Munich, Federal Republic of Germany
186.	1990	Use of pesticides in forestry	Sparsholt, the United Kingdom
187.	1991	Thinning operations	Nodebo, Denmark
188.	1991	Forest fire prevention, land use and people	Athens, Greece
189.	1992	Future of the forestry workforce	Corvallis, the USA
190.	1992	Use of information systems in forest management	Garpenberg, Sweden
191.	1993	Use of multifunctional machinery and equipment in logging operations	Olenino, the Russian Federation
192.	1994	Clothing and safety equipment in forestry	Kuopio, Finland
193.	1994	Harvesting and silviculture of degraded and coppice forests in the Mediterranean region	Thessaloniki, Greece
194.	1995	Exploring multiple use and ecosystem management: from policy to operational practice	Prince George, Canada
195.	1996	Environmentally sound forest roads and wood transport	Sinaia, Romania
196.	1996	Forest, fire and global change	Shushenskoe, Russian Federation
197.	1996	Safety and health in forestry are feasible	Emmental, Switzerland

	<u>Year</u>	<u>Subject</u>	<u>Place</u>
198.	1998	Forestry training for target groups that are hard to reach	La Bastide-des-Jourdans, France
199.	1999	Improving working conditions and increasing productivity in forestry	Banska Stiavnica, Slovakia
200.	1999	Forest operations of tomorrow	Pessac, France
201.	2000	Forestry information systems (Workshop)	Hyytiälä, Finland
202.	2000	Harvesting of non-wood forest products	Menemen-Izmir, Turkey
203.	2001	Role of women in the forestry sector in Europe and North America	Viseu, Portugal
204.	2001	New trends in wood harvesting with cable systems for sustainable forest management in the mountains (Workshop)	Ossiach, Austria
205.	2001	Forestry meets the public	Rütthubelbad, Switzerland
206.	2002	Partnerships in forestry	Brussels, Belgium
207.	2002	Afforestation in the context of sustainable forest management	Ennis, Ireland
208.	2003	Forest operations improvements in farm forests (Workshop)	Logarska dolina, Slovenia
209.	2003	Close to nature forestry	Zvolen, Slovakia
210.	2004	Forest fire management and international cooperation in fire emergencies in the eastern Mediterranean, Balkans and adjoining regions of the near east and central Asia	Antalya, Turkey
211.	2004	Building bridges between people and forests: changing roles of State Forest Services	Groningen, Netherlands

COUNTRIES WHICH HAVE HOSTED MEETINGS OF THE JOINT COMMITTEE
(PLENARY SESSIONS, SEMINARS, SYMPOSIA AND TRAINING COURSES)

<u>Country</u>	<u>No. of meetings</u> ²¹
Austria	4
Belgium	2
Bulgaria	2
Canada	2
(Former) Czechoslovakia	3
Denmark	2
Finland	8
Federal Republic of Germany	10
France	7
(Former) German Democratic Republic	2
Greece	3
Hungary	2
Ireland	2
Italy	2
Netherlands	4
Norway	4
Poland	4
Portugal	1
Romania	2
Russian Federation	2
Slovakia	3
Slovenia	1
Spain	3
Sweden	8
Switzerland ²²	10
Turkey	5
(Former) USSR	4
United Kingdom	5
United States of America	1

²¹ In some cases seminars were combined with plenary sessions, therefore double-counting.

²² Including meetings held at United Nations, Geneva

ANNEX IV

INDEX OF JOINT COMMITTEE PUBLICATIONS AND MEETINGS BY SUBJECT²³

A. Silviculture and forest management

Management (including sustainable forest management)

- Management plans 77, 174
- Information systems 103, 190, 201
- Multiple use forestry 105, 114, 194
- Site conservation 99, 185
- Close to nature forestry 122, 209
- Farm forests 123, 208

Forest operations

- General 18, 33, 56, 76, 112, 173, 200, 208
- Productivity 85, 111, 156, 199
- Environmental impacts 98, 99, 107, 183, 185, 195

Afforestation and reforestation

- General 62, 86, 89, 95, 120, 155, 157, 161, 180, 207
- Seed collection 38
- Plant production 71, 168
- Cultivation of forest soils 35, 44
- Stand establishment 58, 152
- Rehabilitation 73, 171

Forest damage

- General 93, 178
- Forest fires 64, 79, 102, 121, 124, 162, 176, 188, 196, 210
- Pesticides/chemicals 91, 100, 186
- Manual 106

B. Technology, wood harvesting and transport

Wood harvesting

- General 6, 61, 76, 83, 129, 173, 193
- Transport stump to forest road 19, 22, 24, 37, 41, 80, 133
- Bundling of timber 11, 42
- Small-scale logging 92, 177
- Thinning operations 72, 88, 101, 142, 159, 169, 187
- Loading onto road transport 5, 20
- Forest residues/biomass 53, 61, 69, 146, 154, 167
- Stump extraction 45
- Non-wood forest products 115, 202

²³ Numbers refer to the publications listed in Annex II and training courses, symposia and seminars listed in Annex III. Some numbers may appear more than once.

Transport

- Planning transport networks 43, 68, 139, 166
- Forest roads 82, 84, 107, 130, 142, 149, 195
- Snow and ice roads 27
- Floating 40
- Aircraft/helicopters 29, 90

Conversion of timber

- General 47
- Debarking 17, 49, 143
- Chipping 30, 48, 140
- Location of forest operations 52, 145

Machinery

- General 53
- Tractors 8, 9, 15, 31, 83, 144
- Power saws (chainsaws) 3, 10, 23, 28, 34, 36, 57
- Costing 14
- Multi-purpose logging 59, 153, 191
- Maintenance 65, 163

Mountainous regions

- General 25, 173, 184
- Forest operations 56, 68, 76, 86, 148, 157, 173
- Handling and transport 16, 19
- Cable systems 25, 117, 127, 128, 132, 136, 204

C. Vocational training, applied ergonomics and other social aspects of forestry

Training (including vocational)

- General 67, 110, 151, 165, 198
- Of forest workers 2, 12, 51, 74, 97, 131, 135, 137, 182
- Of small scale forest owners 63, 94, 160, 179

Health and safety

- General 26, 66, 75, 81, 91, 108, 141, 164, 172, 197
- Accidents 21, 87, 104, 134, 158, 192
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Ergonomics

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Work study (Performance rating)

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Working techniques

- Methods of studying 18, 33
- One man 13
- Economic assessment of 39

Socio-economic aspects

- General 113, 118, 125, 189
- Forestry and the public 109, 118, 119, 205, 206, 211
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- Transfer of technology 78, 175
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- Bibliography of work science 4

ANNEX V

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS OF JOINT COMMITTEE SEMINARS AND WORKSHOPS HELD BETWEEN 1995 AND 2002

The main method of work of the Joint Committee is the organization of seminars and workshops on topics falling within its mandate. This annex contains the summary prepared by the secretariat of the recommendations made by seminars and workshops held between 1995-2002, under main headings and is not an exhaustive analysis of all recommendations made. Recommendations made at individual seminars may be found in the seminar's official report, they are set out at the website:

<http://www.unece.org/trade/timber/joint-committee/seminars.htm>

The following seminars and workshops were held between 1995-2002:

Seminar on exploring Multiple Use and Ecosystem Management: from policy to operational practice	Price George (Canada)	September 1995	TIM/EFC/WP.1/SEM.42/2
Seminar on environmentally sound forest roads and wood transport	Sinaia (Romania),	June 1996	TIM/EFC/WP.1/SEM.43/2
Seminar on forest, fire and global change	Shushenskoe (Russian Federation)	August 1996	TIM/EFC/WP.1/SEM.44/2
Seminar on safety and health in forestry are feasible	Emmental (Switzerland)	October 1996	TIM/EFC/WP.1/SEM.45/2
Seminar on forestry training for target groups that are hard to reach	La Bastide-des Jourdans (France)	April 1998	TIM/EFC/WP.1/SEM.46/2
Seminar on Improving working conditions and increasing productivity in forestry	Banska Stiavnica (Slovakia)	September 1998	TIM/EFC/WP.1/SEM.47/2
Seminar on forest operations of tomorrow,	Pessac (France)	September 1999	TIM/EFC/WP.1/SEM.48/2
Workshop on Forestry Information Systems 2000	Hyytiala (Finland)	May 2000	TIM/EFC/WP.1/AC.1/2000/
Harvesting of non-wood forest products	Menemen-Izmir (Turkey)	October 2000	TIM/EFC/WP.1/SEM.49/2
Seminar on the role of women in the forestry sector in Europe and North America	Viseu (Portugal)	April 2001	TIM/EFC/WP.1/ SEM.50/2
Workshop on new trends in the wood harvesting with cable systems for sustainable forest management in the mountains	Ossiach (Austria)	June 2001	TIM/EFC/WP.1/SEM.51/2
Seminar on forestry meets the public	Rüttihubelbad (Switzerland)	October 2001	TIM/EFC/WP.1/ SEM.52/2
Seminar on partnerships in forestry	Brussels (Belgium)	June 2002	TIM/EFC/WP.1/SEM.53/20
Seminar on afforestation in the context of sustainable forest management	Ennis Co. Clare (Ireland),	September 2002	TIM/EFC/WP.1/SEM.54/20

Selected conclusions and recommendations of the meetings mentioned above have been grouped under the following headings:

1. Management objectives and strategies;
2. Legislation;
3. Forest protection and conservation;
4. Information exchange; public relations;
5. International harmonization ;
6. Economic and social implications of forestry practices;
7. Employment; training;

1. Management objectives and strategies

Starting with the seminar in Prince George, Canada 1995 much attention has been given to the development of criteria and indicators for sustainable forest management (SFM) as a basis for policy formulation and strategies. Codes of best practice have also been recognized as an effective instrument to advance performance on the ground. The concept of codes of practice has been promoted in several seminars focusing on a wide range of issues such as road construction, afforestation, contractors, occupational safety and health and participatory forest management. Another trend is that social aspects have increasingly been acknowledged as an integral part of sustainable forest management objectives. This includes participation of stakeholders, societal values including employment, human rights, cultural and spiritual values. More recently there has also been a stronger emphasis on the gender dimension of SFM. For example it has been recommended that gender aspects should be considered in the certification of forest management. There are also a number of recommendations focusing on problems associated with the transition from planned to market economy, including economic viability of small businesses, safety and health standards, human resource development.

2. Legislation

Codes of practice have been mentioned as an alternative or supplement to existing legislations. Special regulatory provisions for harvesting on steep slopes have been made. Calls to improve national legislation related to non-wood forest products have also been made. Furthermore, Governments have been recommended to review and reinforce, where necessary, legislation promoting equality in the sector. In relation to afforestation, recommendations to State Forest Agencies to use incentives rather than over-regulations have been made.

3. Forest protection and conservation

Conservation of biodiversity is the object of several recommendations. Furthermore, it has also been stressed that silviculture should consider environmental, economic and social aspects. In connection with afforestation it is recommended that biological control methods should be favoured and that all forest reproductive material used in afforestation programmes should be traceable back to the source.

4. Information exchange; public relations

There is a call for safety programmes to be developed through a broad based dialogue and participation in the design and implementation of measures and regulations. An effort should be made to collect comparable statistics from different companies, countries, etc. to be used for prevention purposes. Several recommendations point out that the forestry sector must improve its communication with other groups, such as the public. This gives an opportunity to disseminate a positive message on

forest and forestry and to change attitudes based on stereotypes and preconceived ideas, for example gender aspects. Public participation and dialogue with the public should be used more widely. Partnerships are also mentioned as an effective way of coping with the complexity of sustainable forest management, the diversity of interest and the large number of stakeholders. It is recognised that afforestation programmes should adapt to the changing expectations and requirements of society.

5. International harmonization

The codes of practice differ widely. Therefore, a non-binding set of guidelines for codes of practice is required. It is mentioned that for wildland fires, the similarities of problems throughout the world is evident and coordination of resources at the international/global level could help dealing more effectively with negative impacts. This could be done for example, by creating a global statistical fire database and a website collecting and making available information on wildfires. A need for international harmonization on non-wood forest products and cable harvesting was also stressed.

6. Economic and social implications of forestry practices

Recommendations that insurance premiums should be linked to company safety have been made. Occupational safety and health and working conditions are identified to be social aspects of sustainable forest management and should be part of the criteria and indicators to assess and monitor sustainability. Human factors should be a parameter in designing new technologies.

7. Employment; training

An adequate workforce with the relevant competence has been identified as a key factor to improve productivity in forest operations. Major investments in human resources are needed to ensure training opportunities for all interested groups, including contractors. It is important to ensure that skills acquired in training can be transformed into increased competency when trainees rejoin their enterprises. Minimum requirements for the competence of forest workers should be defined, tested and certified. It is stressed that access for women to forest-related information, training and education should be encouraged. Measures aiming to help make work and family responsibilities compatible are needed. Social sciences subjects and methods are relevant for meaningful communication, needs assessment and participation. Forest-related environmental education should also be integrated in the core curriculum at schools. It has been recommended that foresters should acquire skills in communication. Furthermore, calls for management training in occupational safety and health aspects to develop managers' capacities within overall management have been made. Recommendations that manufacturers of personal protective equipment should cooperate more closely with forest industries in order to improve their products were made. It is stated that improved working conditions and competitive wages must be provided to attract and retain more entrants into forestry work.