

**Distr.**  
GENERAL

TIM/EFC/WP.1/SEM.48/2  
1 November 1999

ENGLISH  
Original: ENGLISH/FRENCH

ECONOMIC COMMISSION FOR EUROPE  
Timber Committee

FOOD AND AGRICULTURE ORGANIZATION  
European Forestry Commission

INTERNATIONAL LABOUR ORGANIZATION

**JOINT FAO/ECE/ILO COMMITTEE ON FOREST TECHNOLOGY,  
MANAGEMENT AND TRAINING**

**Seminar on "Forest Operations of Tomorrow",  
Pessac (France), 20-24 September 1999**

**REPORT  
(as approved by the Seminar)**

**Introduction**

1. The seminar on "Forest Operations of Tomorrow" was held from 20-24 September 1999 at the Condercet Conference Centre in Pessac (France), at the invitation of the Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training. The seminar was organized by the Fédération de la Forêt de Gascogne with the cooperation of AFOCEL and of the regional and national authorities. Participants from the following countries attended: Austria, Canada, Chile, China, Denmark, Finland, France, Germany, Ireland, Luxembourg, Poland, Portugal, Russian Federation, Slovenia, Sweden, South Africa, Switzerland, United Kingdom and the United States of America. The International Union of Forest Research Organizations (IUFRO) was also represented.

**Opening of the seminar**

2. The seminar was opened by Mr. R. Davezac, Chairman of the Gascogne Forestry Association. Based on over 1 million ha of planted forest, Aquitaine is the most important forest producer region in France, harvesting more than 8 million m<sup>3</sup> of timber annually and generating a revenue of 17 billion French francs. The theme of the seminar was very topical for this region which needed to protect and improve its forest resources and at the same time remain competitive. The low levels of knowledge and understanding in the general public concerning the forestry sector and its activity constituted one of the most serious threats for the future. The seminar would also contribute to improve the communication with the public.

3. Mr. H. Höfle (Germany), Chairman of the Joint Committee, placed the seminar within the context of the Committee's programme of work spanning the three subject areas of (i) forest management and silviculture, (ii) forest harvesting and operations, and (iii) training and work safety. The Committee was a unique forum, facilitating exchange and cooperation between forest policy makers, administrators, owners, forest managers, researchers and trainers in Europe and North America. The seminar should help to get a better vision of the future and to pave the way for it.

4. Mr. H. Heinimann (Switzerland) welcomed participants on behalf of the International Union of Forest Research Organisations (IUFRO). In the field of forest operations alone more than 3,000 researchers were affiliated to his organization. He hoped that the seminar would contribute to a more active, forward-looking approach among foresters, who had largely focused on what not to do in the environmental debate that had dominated the last decade.

5. The participants were also welcomed by Mr. Dupiol on behalf of the Conseil Général de la Gironde, Mr. Rousset, mayor of Pessac and Chairman of the Conseil Régional d'Aquitaine as well as Ms. F. Verdier in representation of the Préfet of Aquitaine. All speakers underlined the vital economic and environmental functions of forests for the region and wished the seminar success, reminding participants of a quote from St. Exupéry: "the future cannot be foreseen, it has to be prepared".

**Election of officers** (item 1 of the agenda)

6. Mr. R. Davezac (France) was elected Chairman. The following discussion leaders were appointed:

- |        |                                    |
|--------|------------------------------------|
| Item 3 | Mr. E. Mikkonen (Finland)          |
| Item 4 | Mr. H. Höfle (Germany)             |
| Item 5 | Mr. H. Heinimann (Switzerland)     |
| Item 6 | Mr. D. Guimier (Canada)            |
| Item 7 | Mr. M. Pinho de Almeida (Portugal) |

**Adoption of the agenda** (item 2 of the agenda)

7. The provisional agenda, as set out in TIM/EFC/WP.1/SEM.48/1/Add.1 was adopted.

**General introduction** (item 3)

8. Under the theme "**Forests in an evolving world**" the following papers were presented: Mr. O. Martin de Lagarde (France) on "Forest operations of tomorrow: what is in prospect and what is at stake for French forests"; Mr. J. Sturm (France) on "Environmental and economic conditions for the forest operations of tomorrow: what is at stake for industry"; Mr. J. Heino (Finland) on "The process of sustainable management: efforts of those involved in forestry operations in Finland to take into account thinking on

sustainable management since the Helsinki conference"; and Mr. H. Heinimann (Switzerland) on "Integration of new technologies in forest operations of tomorrow".

9. In the discussion the question was raised whether foresters were playing down the conflicts of interests and objectives in sustainable forest management. The contribution of forestry to employment and to the economic viability for example was often cited as a social benefit when in fact employment levels were declining and would continue to do so due to further rationalization. Mr. Heino agreed that under the new forestry strategy for Finland the overall trend was for further job losses, which would however be slowed down through increases in wood consumption and value-added processing. Particularly for the latter there was good potential. He insisted that participation was a valuable tool for sustainable forest management, even though not all conflicts could be resolved.

10. Mr. Sturm shared this view noting that unless misconceptions in the public about forestry could be overcome, no new employment opportunities would be created at all. He suggested communication and partnerships had been neglected because the forestry sector did not know how to go about it. Mr. Heinimann maintained that forestry needed to involve social sciences more to orient its development and communicate its advances, for example the progress with more environmentally friendly harvesting operations. New technology needed to pass the test not only of engineering, but of social value systems. Further mechanization and automation were not necessarily motivated by attempts to cut labour cost, which no longer represents the lion's share of system cost. It was rather a way of increasing quality and reliability such as in automated bucking decisions.

11. Several speakers had emphasized the importance of skill and the question was raised whether the highly qualified workforce available in many European countries was really being used to best advantage. Mr. de Lagarde commented that in France skill levels in the forestry sector were below those in other industries. This was particularly true in forest operations, where the lack of skill compounded by high turnover caused high accident rates. For Finland, Mr. Heino maintained that good use was being made of skills through delegation and a prevalence of teamwork. Even so, there was concern over the lack of interest in forest work and machine operation among the young generation, which could result in shortages of qualified personnel.

12. **"The future of forestry operations"** was explored in the following presentations: Mr. J-L. Martres (France) on "Importance of the creation of cultivated forests in southern Europe for job creation and economic growth"; Mr. R. Ramsauer (Austria) on "The future of forest operations in OBF AG"; Mr. D. Guimier (Canada) on "Forestry operations in the year 2000: a Canadian point of view"; and Mr. K. Munson (United States) on "Evolution of silvicultural and harvesting practices in forest industry: social and political perspectives".

13. Concerning the changes in staffing following the transition of the Austrian State Forest to a share company, Mr. Ramsauer explained that some 200 staff members had taken early retirement, while 70 young employees had been newly recruited with a broad range of skills, many of which from outside

the forestry sector. The most essential factor for successfully making this transition and maintaining staff commitment was the full backing of the owner of the company. Top management had made a point of personally communicating the envisaged changes to all personnel. The analysis providing new directions had been made by company staff with outside consultants only serving as facilitators.

14. Questioned about the prospects for economic survival of a company having to operate in difficult terrain and with many environmental restrictions, Mr. Ramsauer was confident that the company would remain profitable. Harvesting prices would always be twice as high as in Scandinavia, but there were other opportunities to reduce cost, such as in transport through cooperation with industry. Forestry-related businesses using the company's real estate were also very promising. Full privatization of OBF was unlikely, however, because the company represented one of the biggest public assets in Austria.

15. Asked how equipment developers in Canada managed to integrate the various elements of future technologies identified in his paper, Mr. Guimier clarified that the FERIC study was merely a first step aimed at arriving at a shared vision among investors, researchers and manufacturers. He added that the driving forces for future change had been listed in the order of their importance and sequence in time in the paper, i.e. cost > environmental concerns > public pressure. Energy had been noted as a variable in the study but was not considered a dominant factor.

16. Mr. Munson confirmed that the "Sustainable Forestry Initiative" was the basis for environmental policy at International Paper, which had incorporated its requirements into its environmental management system. The company had been one of the first to obtain certification of its environmental management according to ISO 14000.

17. Concerning genetically modified trees Mr. Munson maintained that they were compatible with sustainable forest management as the higher growth rates and income they afforded provided more options for the management of other forest land. He conceded that fast-growing plantations require risk aversion strategies such as diversification. Such plantations were likely to be socially more acceptable in the southern hemisphere than in densely populated areas of Europe or North America.

#### **Multiple-use forestry and ecological standards for forestry operations**

(item 4)

18. Papers under this item were presented by: Mr. U. Eriksson (Sweden) on "Operations at AssiDomän"; Mr. O. Eeronheimo (Finland) on "Environmental and quality management in wood procurement"; Mr. V. Korobov (Russian Federation) on "Forest certification in Russia"; Mr. D. Michaud (France) on "Creation of an environmental management system by the paper and pulp mill suppliers in France"; Mr. B. Petersen (Denmark) on "Multi-functionality and evolution of silvicultural practice in terms of the management unit - from policies to operational practice in Denmark".

19. In the discussion of Mr. Eriksson's presentation, some participants wondered why AssiDomän had sought Forest Stewardship Council (FSC) certification in addition to ISO 14000 as they considered the FSC dominated by environmentalists. Mr. Eriksson stated that the Swedish FSC working group had included a broad representation of economic and social as well as environmental interests. Moreover, the company believed that it was possible to work hand-in-hand with environmental NGOs. Certification had led to an increase in sales, but this might not be a lasting effect as more certified timber becomes available. The forest management scheme directly affected 19% of the company's forest area and 12% of the standing volume, which was left unharvested. As the exclusion of many difficult sites reduced the average cost of operations the loss was not significant. Technological and organizational changes had led to a major decrease of direct employment in the company from 1,200 employees in 1995 to some 800 at present. The remaining jobs were, however, far more interesting and rewarding.

20. Asked to which extent forest owners in Finland were involved in quality and environmental management systems, Mr. Eeronheimo explained that forest owners had been extensively trained in sustainable forest management, in connection with the national forest certification scheme which had recently become operational. They did not play much of a role, however, in the design and implementation of the forest industries QMS and EMS. Physical monitoring of compliance was quite extensive and not restricted to preselected sites. Training inputs required for QMS and EMS were massive and not supported by subsidies. While significant organizational change in the direction of increased teamwork which had taken place parallel to the introduction of the systems, it had probably not been caused by the systems.

21. Concerning the pan-European Forest Certification alluded to in the presentation by Mr. Michaud, it was commented that the scheme should be ready for implementation in France in 6-12 months. Access to information and transparency were considered vital for the efficiency and credibility of the scheme. All information was therefore going to be made available on a freely accessible and constantly updated database. While in France environmental NGOs had not participated directly in the working groups which designed the certification systems, the umbrella organization "France Nature-Environnement" had been consulted.

22. Mr. Pedersen clarified that the land for afforestation in Denmark was mostly farmland given up because of a lack of succession or that of absentee owners rather than marginal land. Even though the government budget allocation to subsidize afforestation was substantial, it could not meet all applications following the introduction of a generous income substitution scheme. The regulation of access to nature in Denmark confined entry to private forests to roads and paths, whereas there were few restrictions in public forests. Decisions on management in private forests were entirely made by the owners. The State forest service took political guidance into account in its management.

**New concepts for harvesting equipment and systems (item 5)**

23. The following speakers presented papers under this item: Mr. A. Bailly (France) on "Mechanized harvesting of broad-leaved coppice stands", a paper

co-authored by Mr. X. Bartet; Mr. S. Gellerstedt (Sweden) on "Cut-to-length in the next decade", a paper co-authored by Mr. B. Dahlin; Mr. T. Lynch (Ireland) on "New perspectives as regards thinning softwoods"; Mr. Räsänen (Finland) on "Timber flow information systems".

24. Mr. Bailly clarified in the discussion that the substantial gains in productivity were not the only factor driving mechanization in coppice stands. The safety problems and low income in chainsaw thinning of such stands paid on piece rates made it increasingly difficult to find workers for this operation. He confirmed that the bigger branches were one of the major obstacles for mechanized harvesting in broadleaved stands. Small harvester heads were able to handle multiple coppice from the same stump.

25. Participants pointed out that cut-to-length systems were not only limited by big tree sizes but also by too small ones. Mr. Gellerstedt commented that models of multiple-stem harvesters existed that worked well in small dimension wood for energy but not for other products. The environmental advantage of cut-to-length systems was that skid tracks needed to be planned and used by harvesters and forwarders, whereas skidders affected a much higher proportion of the harvesting area. Cross-cutting in the forest also meant that the gains from optimal assortments were realized by the timber supplier rather than the purchaser. It was observed that machine operators in France were showing fatigue and wanted to quit their job. In Sweden, adapted shift schedules of three hours on the machine followed by other work were being used to combat fatigue during the day and job rotation and job enrichment to maintain motivation and interest over the longer term.

26. Queried over the algorithm underlying the decision support system for thinning developed in Ireland, Mr. Lynch explained that it was based on height vs. diameter functions derived from research data which assigned a mean height to every diameter class. This data was then coupled with information on the taper of trees.

27. Regarding the demands on the accuracy of harvester-mounted global positioning systems, Mr. Räsänen commented that the error was usually under 5m, which was sufficient as this matched the accuracy of the maps. Contractors in Finland did not have a choice in the adoption of information systems as the purchasing companies had made it a condition for continued orders. Many contractors were, however, genuinely interested because the purchase price was affordable and the investment paid off.

#### **Future organization of work (item 6)**

28. In the final and third session of the day, the following persons presented their papers: Mr. R. Davezac (France) on "Changes in the organization of forestry operations and in logistics at Smurfit Comptoir du Pin"; Mr. Mäkinen (Finland) on "Timber procurement into the hands of forestry machine entrepreneurs"; Mr. S. Rzadkowski (Poland) on "Privatization of forest activities in Poland", a paper co-authored by Mr. J. Kocel.

29. Asked whether the contractors working for the wood procurement firm Comptoir du Pin had experienced improvements in their safety record similar to the impressive reduction in accident levels for directly employed forest

workers, Mr. Davezac replied that no data were available to answer the question. He pointed out that the commitment by senior management which had been at the base of improvements in his firm was still lacking among contractors. In his firm advances in work safety had lowered cost as well as satisfied moral concerns and the need to make forestry jobs more attractive. Frustration among staff during the reorganization of his firm had been overcome by relating the new strategy directly to all levels of the organization, by defining new objectives for performance assessments and by the introduction of group work.

30. Mr. Mäkinen supplemented his presentation by noting that the small forestry contractor firms in Finland could easily be played off against each other, keeping price competition intense. Profitability of contractors had picked up in the early 1990s through trickle down from a general forest products boom. Improvements were overstated in statistics, however, because the additional work inputs of contractors had not been taken into account in the data. He confirmed that the average size of contractor firms in Finland was increasing, similarly the incipient trend observed in Aquitaine. He emphasized, however, that the real situation was more complex, as there was a polarization with some firms getting bigger, in particular those in timber hauling, while others remained small and became subcontractors to bigger ones.

31. Concerning the privatization of forestry in Poland, Mr. Rządowski remarked that the Government had recently prepared legislation under which forests will not be restituted, but former private owners would be compensated instead. Government support available for contractors in forest operations which had been largely privatized was deemed insufficient given the small size of the businesses. Very few firms were well equipped and most skidding contractors relied on farm tractors and horses.

#### **Human factors (item 7)**

32. Papers were presented under this item by the following persons: Mr. J. Garland (United States) on "Trajectories of development for individuals, firms and the sector in a country"; Mr. J. Morat (Germany) on "Without forest workers? Does forestry lose its function as working place in rural areas in Germany?"; Mr. G. Odgaard (Denmark) on "Life-long learning"; Mr. W. Warkotsch (Germany) on "The future of forest work in Europe"; Mr. E. Kastenholz (Germany) on "Partially autonomous groups in forest work in Germany", a paper co-authored by Ms. E. Lidén; Mr. U. Synwoldt (Sweden) on "Experiences of Swedish forest corporate initiatives in ergonomics", a paper co-authored by Mr. S. Gellerstedt; Mr. F. Pasquier (France) on "Legal status and qualifications of forest work contractors".

33. The importance of visualizing each individual trajectory of development and possibilities was emphasized by Mr. Garland during the discussion. Trajectories have many dimensions, which are not often visible. Therefore, it is of great importance for the individual, the firm and the forestry sector to measure and to set targets for the future. Asked how to motivate and make progress with low-skilled workers, Mr. Garland underlined that managers in the forest sector are in charge and that they have to enable workers to project their trajectories. In order to motivate contractors who lack a training culture, initial training should be designed to generate immediate benefits.

34. Like in other European countries, the number of forest workers in Germany has declined substantially over recent years. Mr. Morat underlined the heavy impact on rural areas and also mentioned a project subsidized by public funding. It was questioned by the audience whether subsidized forest work was sustainable. As a way of attracting young people into forest work, Mr. Morat mentioned the use of apprenticeships and stressed the importance of utilizing all possibilities, including non-wood products for rural areas with high unemployment rates.

35. Mr. Odgaard pointed out that a need for supervision often is a sign of poor management.

36. Success depends on human factors and Mr. Warkotsch therefore called for initiatives to also establish sustainable management of people. A paradigm shift may be needed to break trends such as announcements of lay-offs in order to increase share values. He clarified that his scenario two, emphasizing environmentally sound and sustainable forestry, would lead to an increase in the number of harvesters as harvesting volumes would rise. Doubts were expressed in the audience concerning this hypothesis.

37. Mr. Kastenholz mentioned information and communication as two very important factors to motivate forest workers to change working methods. However, changes always take time and the time factor should not be played down. The ability of forest workers is often underestimated and enterprises therefore tend not to make the most out of it.

38. As regards working hours, Messrs. Synwoldt and Gellerstedt underlined that the Swedish authorities could introduce legislation on the reduction of working hours for machine operators unless the frequency of complaints on shoulder and neck pain goes down. The variety of preferences within a machine operator team mostly enabled them to shift the working hours among the team members, but this was best determined by the operators concerned.

39. Mr. Pasquier informed that negotiations are under way to reinforce the fiscal status of French contractors. However, the process is long and active lobbying from the agricultural side against the proposed status slows down the process. There is also a lack of support from other enterprises in the forestry sector, including the workers' compensation.

**Implementation: working group discussion (item 8)**

40. The following working groups were established:

Group 1: Multiple-use and environmental standards for forest operations

Group 2: Technology

Group 3: Work organization and human factors

The findings of the groups were presented in a plenary session. Summaries are contained in annex I of this report.



**Other business** (item 9)

**Study visits**

41. Study visits took place on Tuesday, 21 September, for a full day and on Thursday, 23 September, in the afternoon. The main observations are summarized in annex II of this report.

42. The Chairman of the Joint Committee, Mr. Höfle, warmly thanked the organizers on behalf of the Committee and of participants for the generous hospitality and careful organization. The seminar had generated enormous interest and attracted the largest number of participants ever to a Joint Committee seminar in Europe.

**Conclusions and recommendations** (item 10)

**Conclusions**

43. According to St. Exupéry "the future is not to be foreseen, it is to be built". Unfortunately, forestry is at the receiving end of many changes, which means that its future and that of forest operations is largely determined by others. The forestry sector in Europe and North America is part of a world market for raw material and products. It has to develop economically in production and consumption patterns in which consumers, owners and shareholders follow a logic of "more, cheaper, and faster". It is unclear whether and how this could change. Present patterns may ultimately prove unsustainable, which would mean that current efforts to practise sustainable forestry take place in an unsustainable context. In any case, these patterns are likely to prevail for a foreseeable future and dictate the economic rules for operations.

44. The world population is growing rapidly which, coupled with moderate increases in per capita consumption, will lead to a rise in the demand for wood, while the global forest area is shrinking. Plantations and more intensive management of some forests will mean, however, that there will be no wood shortages in the medium term.

45. Another statement that is proving true more and more, and in fact in new ways, is Westoby's "Forestry is not about trees, it is about people". It applies both to people as part of the public and as personnel within forestry firms. Society makes ever increasing demands on the environmental performance of forestry and on non-wood goods and services. This may not only impose constraints on forest operations, but also provide new business opportunities, for example in tourism.

46. Forestry has responded to changing economic, environmental and social demands. The changes required to adapt to the sustainable development goal as formulated during and after the Rio Conference in 1992 vary between countries and enterprises. For forest management and planning in much of Europe they translated into a mere shift of emphasis from traditional timber production to more recognition of other forest products and services as well as cultural values. Major gains in productivity in forest operations contributed significantly to preserving or regaining competitiveness.

47. Gains have been particularly impressive, where machine and information technologies have been integrated and used in adapted forms of work organization. The latter are oriented at the flow of material and information and combine central information collection and processing with access to such information to teams which carry out the work with less and less supervision.

48. Thanks to these systems, just-in-time delivery has become possible and raw material is pulled through the supply chain by the processing units, rather than pushed by the supplier. The notion of customer orientation has been introduced also within enterprises, where it applies to the next element in the supply chain. New and effective forms of work organization often require cooperation across firms as well as with other firms along the wood supply chain as well as massive investments in human resources. Major wood processing firms have been in the vanguard of these developments and play an increasing role in mobilizing timber.

49. Much more attention is being paid today to the environmental impact of forest operations. Better planning of operations, the use of more adapted equipment and trained personnel has helped to reduce negative impacts. Environmental management systems have been introduced successfully to identify, monitor and minimize such impacts.

50. People are also the decisive factor within the forestry sector. High-tech operations have a far higher human content than is often recognized. In spite of advanced automation, much information during harvester operations is still gathered and processed by the operators themselves. The full benefit of modern equipment can therefore only be reaped with highly qualified and motivated personnel as operators and managers. This leads to much higher education requirements. The potential of staff tends to be underestimated and therefore underutilized, particularly in countries and firms where highly skilled workers and technicians are available.

51. In the future, the systems that have been developed over the last decade are likely to spread. The share of the cut-to-length method in wood harvesting looks set to increase, because of its environmental advantages, the value-added from sorting in the forest, and the dynamism of developers. As the hardware of harvester technology is considered mature, most future improvement will come from the integration of information technology and work organization. The importance of information technology will rise quickly and pervasively. This includes the use of geographical information and positioning systems, mobile data processing, transmission and retrieval as well as the Internet. Information systems will not only play a growing role in handling data for recording purposes, but also in decision support systems, training and communication.

52. The substantial progress in forest operations notwithstanding, many open questions and deficits can be identified. Communication with the general public is insufficient. The forestry sector has not been able to improve its image and get recognition for environmental improvements and as the producer of an environmentally friendly raw material and products.

53. There is a lack of clear objectives and measurable indicators for the environmental impact of operations for day-to-day planning and monitoring. There are similar gaps of knowledge concerning the effects of forest management and operations on biodiversity.

54. The continued high human content in forest operations also shows in the risk of overload through stress and repetitive strain injuries which can become permanent impairments or provoke the drop-out of an operator after some years of work.

55. The expectation that mechanization per se would make forestry work more attractive is not borne out in hindsight. The present workforce is ageing and there are difficulties to attract and retain suitable operators in a number of countries. This shortage is all the more alarming, if one considers the rapid decline of the number of persons employed in the forestry sector due to rationalization. This loss of employment is bound to continue, except where there are major increases in the consumption of forest products and marketable services. Where massive job losses occur, they are one of the biggest flaws of the current development model as forestry is less and less able to contribute to the economic survival of rural communities.

56. Contractors play an ever bigger role in forest operations, but remain the stepchildren of the sector. While growing demands are placed on their productivity and environmental performance, on investments and capacity, they are faced with numerous constraints. Most contractor enterprises are small, lack capital and are not very profitable. In this context, the emergence of organizations representing contractors and forest workers becomes an urgent need. Contractors are also in a poor bargaining position vis-à-vis their clients. Structural change to larger, better equipped and more professional contractor firms has been very slow and limited. Contractors get little or no support from other actors in the forestry sector to improve the situation.

57. In the above and in other cases, the forestry sector is not making use of the benefits of cooperation and partnerships that have proven successful in the development and implementation of some of the most promising new operational methods.

#### **Recommendations addressed to the Joint Committee**

58. There is a need to develop new communication and education strategies for forestry. The participants strongly support the Joint Committee seminar on "Forestry meets the public - public relations and environmental education in forestry" planned in Switzerland in October 2001. The Joint Committee should define the conditions under which participants from other sectors can be involved in its activities, while ensuring their representativeness.

59. The forthcoming workshop on "Information systems in forestry" in Finland, May 2000, should also address the cognitive aspects of machine operations and discuss ways to reduce the mental workload of the operators.

60. Small forest owners are a large part of the forestry community, but receive very little attention. A seminar should be organized that focuses on

solutions for the well known problems of small forest owners including: organization, economic viability and motivation, adapted management systems, technology, effective extension and training.

61. The development of forestry contractors remains an unresolved problem in the majority of member countries. The Joint Committee should collect information on the status and trends through a survey and organize a seminar focusing on ways to resolve the problems identified.

62. The impact of the technical and organizational changes taking place in forestry is poorly understood. This should be the object of a seminar, which should discuss means of attracting sufficient new talent to the forestry sector and retaining qualified staff.

63. The conclusions and recommendations of the seminar on the future of forest operations have major implications for vocational training in forestry and the Joint Committee should communicate these findings to forestry training institutions.

#### **Recommendations addressed to member countries**

64. If the forestry sector is to keep its "licence to operate" more and more effective communication is one of the top priorities. Merely repeating the traditional messages about the benefits of forestry more often and louder is unlikely to be helpful. Foresters and the forestry sector as a whole need to acquire social and political skills and to seek dialogue with the public.

65. Social and communication skills should also be applied to promote closer cooperation within the forestry sector and to build partnerships with related industries and institutions. Ideally, a clear forest policy and strategy should be adopted and implemented. These strategies differentiate between the quest for least-cost in the short-term and long-term objectives. They should be based on communication with all relevant stakeholders and widely supported by the forestry sector, thus qualifying for solid political backing.

66. The national forest policies and strategies should pay particular attention to the interests of the forestry workforce, to the development of forestry contractors of their organizations and of rural communities, as well as to employment opportunities in the sector. This should include the definition of skill requirements and agreements on curricula for training as well as measures to provide incentives for training and to ensure access for all groups, in particular contractors and their workers. In view of the speed of change and the diversity of skills required, training and education systems have to be geared for life-long-learning. Major investments in human resources are needed, to utilize the potential of new systems for forest operations.

67. The forestry sector as a whole and individual firms have to find ways to ensure that they are able to recruit enough young talent. Increased publicity will only be effective, if the jobs offer attractive conditions and career prospects.

68. Further dissemination of existing technology and forms of work organization and the development of new ones are necessary for the economic survival of forest firms. They should also be used to reduce the impact on the general environment and to improve the working environment and job satisfaction. Human factors should be a parameter in the design of new technology and work organization from the very beginning. Involving all concerned employees and contractors in the design and implementation is one of the most effective ways of achieving this. This should not only apply to operational aspects like the design of shift schedules that reduce the continuous time of machine operation, but also in case of a pervasive reorganization and restructuring of firms.

69. In machine design and purchasing, more use should be made of ergonomic guidelines. In order to prevent fatigue and drop-out of machine operators, manufacturers should find, jointly with machine users, ways to relieve the operator from much of the routine decision-making through the use of sensors and information technology.

70. The evaluation of machines and systems based on engineering criteria should be supplemented by technology assessment methods developed in the social sciences.

**Recommendations addressed to national research institutions and to IUFRO**

71. There is a lack of empirical data on the economic, environmental and social aspects of sustainable forest management.

72. Research is needed on:

- Parameter allowing to predict and assess the environmental impact of operations during planning and monitoring under field conditions in day-to-day operations;
- The impact of intensive management of site-adapted, native tree species on biodiversity;
- The effectiveness of certification and environmental management systems to protect environmental social and economic interests; and
- Attitudes, job satisfaction and on the safety and health situation of all echelons of the workforce, i.e. managers, technicians, operators and contractors.

73. Develop an Internet-based clearing house of knowledge on forest operations.

**Adoption of the report (item 11)**

74. The seminar adopted the conclusions and recommendations prepared by the secretariat with a number of modifications. It approved the other parts of the report with the provision that the secretariat would incorporate changes communicated by participants. The latter are reflected in the above text.

## Annex I

### WORKING GROUPS

#### **Group 1: Multiple-use and environmental standards for forest operations**

It is important to bear in mind that multiple-use is a concept, whereas environmental standards are the tools to implement components of that concept. The multiple-use concept encompasses as uses both timber and a range of non-wood goods and services. Users or beneficiaries may be geographically remote from the forest.

#### **Future changes that are likely or required include:**

Optimizing the mix of uses and prioritizing where trade-offs exist;  
Transparency costs/benefits, how provided, by whom;  
Better communication and management vision.

#### **Contentious developments/Obstacles to positive change:**

Stakeholder resistance;  
Economic constraints, extra costs, competition;  
Harmonizing interests;  
NGOs and Government organizations.

#### **How to effect positive change:**

Research is needed to assess and quantify costs and benefits;  
Better communication, in particular with the public;  
Decision-making procedure;  
Training;  
Pay for benefits that generate cost but no income for forest owners/operators;  
Solve tenure issues.

#### **Foreseeable and necessary changes concerning Environmental Standards:**

Globally, growing pressures on the environment, increased public concern and attention to be given to the environmental roles played by forests;  
Need for international agreements and cooperation;  
Need for commonly agreed definitions and local implementation.

**Obstacles to desirable changes are:**

Economic constraints;

Political constraints (developing countries);

Lack of scientific data and experience:

- What is an environmentally-friendly technique?
- What are the long-term effects of new technologies?

Motivation of stakeholders (heavy process, unpredictable benefits).

**How to put desirable changes into effect?**

Develop information, technology transfer, training;

Identify key environmental factors and their associated indicators  
(thanks to better scientific knowledge);

Establish practical/simple methods to measure and monitor the results;

Reward progress.

**Group 2: Technology**

The components and aspects of technology development and application from the forest stand to the mill can be divided into the following groups:

(1) **Process technology**

More development work is needed to overcome the current limitations for cost-effective and environmentally benign mechanization in: young stands, thinnings, hardwoods, small-scale forestry, and steep terrain.

(2) **"Soft" technology**

Development of sensors and control algorithms.

(3) **Management**

Flow, cost, time, quality.

(4) **Impacts**

Social impacts: income distribution, external cost, taxation models;

Environmental impacts.

The working group presented a partial overview of activities in the following Joint Committee sub-regions:

### Northern Europe

#### Ongoing projects:

- Dynamic yield modelling;
- Stand inventory, wood quality (product forecasting).

#### Planned projects:

- Information gathering using a harvester data.

#### New projects:

- Electronic scaling, stand properties;
- Mechanization of silvicultural operations;
- Influence of decreasing machine number on training.

### Central Europe

#### Need for information:

- Equipment available in other countries (site preparation, etc.).

#### Ongoing projects:

- Code of forest practices;
- Logistics;
- Interface silvicultural operations;
- Product forecasting;
- Environmental impacts (bio fuels, soils, water).

### Eastern Europe

#### Need for information:

- Flow of information about relevant research in other regions, e.g. home page of Swedish forest research organization "www.skogforsk.se".

#### Ongoing projects:

- Management;
- Genetics (bank).



Planned projects:

- Level of mechanization;
- Organization of work.

New projects:

- Code of forest practice;
- Support technology development and application;
- Interface forestry - industry.

North America

Need for information:

- Internet link, e.g. "www.feric.ca".

Ongoing projects:

- Lubricants, hydraulics;
- Transportation;
- Central tire inflation;
- Fuels (low temperatures);
- Tending;
- PMS, roads in general.

New projects:

- Riparian zones.

The following priorities were identified in relation to technology in the future:

- Understanding and influencing technologies both "hard" and "soft" technology;
- Automation of measurement;
- Technology measurement;
- Technology assessment;
- Cost (incl. external cost);
- "Social cost";

- Environmentally friendly technology (overview);
- Management of "process-networks" (from stump to ...);
- Product information on the stand level;
- Small-scale forest technology;
- Social impact assessment (regional context);
- Relation mechanization - income distribution;
- Models for taxation (labour taxes vs. capital/resource taxes);
- Silvicultural standards vs. mechanization (options);
- Difficult terrain (limits, feasibility) and broad-leaved trees.

**Group 3: Work organization and human factors**

**1. Future changes required:**

New operating modes brought about as a result of new ways of organizing work which bring the forest into the production process;

Tasks and roles, from the forest owner to the industrialist, must be redefined with more emphasis on technical knowledge and skills;

New occupations, including a new function - managing change - must be created;

Growing activity by contractors will lead to new, broader skills;

Forestry industry workers must be prepared for a varied career path;

Improved safety and occupational health will remain constant goals;

Different quality expectations will have to be more precisely defined.

**2. Obstacles to change:**

**Trade globalization leading to cut-throat competition:**

Mechanization, leading to alarming job losses with the concomitant social, economic and professional problems;

Low economic return on industrial investment;

Cyclic activity, making planning for the medium term hard and operators' prospects more uncertain;

Conflicts of interest and a lack of political commitment, making it hard to bring real order to the industry;

Increased public expectations which the community does not pay for;

International mobility of forestry workers, which may disrupt local activity here and there;

Desertification of the countryside and its consequences;

Fragmentation of land-holdings, making for higher costs;

Environmental hazards (forest fires, pollution, parasites etc.) which cost the community dear and penalize professionals;

Insufficient independent research, and insufficient systematic use of such research.

**Obstacles more specifically related to the forestry profession:**

Difficulties in attracting and retaining labour;

The uncertain future for forestry workers: wage-earners or entrepreneurs?

Concentration of tasks, making a redefinition of technicians' role necessary;

Demotivating repetitiveness of tasks;

Loss of skills through non-use.

**3. How to effect positive change?**

Define a strategy that reconciles globalization with job conservation while preparing workers for possible change in professional sectors;

Standardize professional forestry practices Europe-wide;

Encourage the development of effective professional organizations and the spread of the notion of cross-occupational work within an expanded industry.

Official recognition of contractor status, where necessary, and investment by industrialists in helping contractors progress will create an economic setting favorable to the growth of contractors as a professional category, and to individual and general improvements in relations with clients.

The policy of resisting illegal labour must be maintained. Working conditions could with advantage be improved, making for better economic returns.

Account must be taken of social considerations. The overarching concept of time management could be used.

Physical and other investment (e.g. training) will be closely linked.

Training needs will be identified.

Complementary functions for training centres and professionals will become the rule, so that abilities acquired during training can be turned into on-the-job skills (tutorial role). Training centres must be provided with suitable teaching facilities (simulators, computer equipment etc.).

## ANNEX II

### STUDY VISITS

#### Field visit - Tuesday, 21 September 1999

During the whole day excursion, the following operations were observed:

- (i) Logistics of wood supply to forest industries;
- (ii) Mechanized forest harvesting;
- (iii) AFOCEL activities in genetic improvement and silviculture of *Pinus pinaster*;
- (iv) Motor-manual forest harvesting; training, safety and environment;
- (v) Reforestation techniques.

#### 1. Logistics of wood supply to forest industries

Mr. Sutter (AFOCEL), Mr. D. Menaut (Gascogne Forest Federation) and Mr. A. Kiffer (SMURFIT), explained the use of Geographic Information System to improve wood transport performances to industry which was presently being tested in a pilot study. The new system permitted to manage large amounts of information related on location of wood stocks, volumes, qualities and availability of transportation, optimizing the flow of wood from the forests to the mills. It is expected that 5-10% savings in transport costs could be achieved.

#### 2. Mechanized forest harvesting

Mr. J.-M. Boulay (SMURFIT) provided a brief overview on the SMURFIT wood industry's group, which consisted of paper and wood-based panel, as well as manufacturing sawmills with a turnover of FF 700 million and a roundwood intake of 2.5 million tons per year. Participants were shown a mechanized clear-cutting operation in a 50-year-old *Pinus pinaster* stand. A tracked harvester was used in combination with a forwarder producing cut-to-length logs. The daily average production amounted to 250 tons. Three assortments were produced: sawn timber for panels and for pallets, as well as pulpwood. Presently, 40% of timber harvesting was mechanized. The cost of mechanized harvesting operations was 30% lower than the traditional methods.

The safety record for directly employed forest workers was very good, the frequency rate of accidents was 1.4 as compared to an average of 12 for the profession in France. This low rate had been achieved through intensive training. Machine operators were trained in a specialized training centre on simulators and machines followed up by an instructor training in the field. With reference to a query on soil compaction, it was pointed out that tracked harvesters and forwarders with wide tyres had a low impact on the soil.

3. AFOCEL activities in genetic improvement and silviculture of *Pinus pinaster*

AFOCEL was founded in 1962 as a private research organization with the aim to increase wood supply to the pulp and paper industries. Mr. Alazard informed about the Maritime Pine breeding programme which started in 1960 with the selection of 380 prime trees improving wood volume increment, straightness and frost resistance. Seed orchards have been established (first generation, 1965-1990: 240 ha) and (second generation, 1986-1995: 180 ha). The "Sore" seed orchard visited was planted between 1967 and 1978 with a total area of 100 ha and some 2,000 families of elite trees, further improvement through careful directed thinnings. It was suggested that from the first seed orchard generation volume and straightness will improve by 15% whereas from the second generation it will improve by 30%. All seeds sown in 1999 (10 million plants) were collected in the second generation seed orchards. It was pointed out that forest owners were interested to buy seedlings raised from improved seeds. Ten years ago, 10% improved seeds have been used, now it was 50%. In the future tree breeding programme, it was important to improve wood quality, branches, fibre density and resin content.

4. Forest harvesting training safety and environment

Information was provided on the accident prevention programme in forest work carried out by the Mutuelle Sociale Agricole which provides social security cover in agriculture and forestry, including workman's compensation. The programme had started in the Pyrénées, where experienced tree cutters equipped with a mobile safety van provided training on site for forest workers. Training was tailor-made and lasted for a full day, explaining and demonstrating improved felling and bucking techniques. During the training, videos were produced and analysed with the forest operator. The trainers also promoted felling aids and equipment like safety clothing, felling wedges and a weight to pull up a rope for pruning or directional felling.

Regarding the frequency of upgrading training and its impact, it was explained that operations were visited once a year. While impact was not being formally monitored, there was evidence that accident rates had decreased and productivity increased.

The National Forest Office has developed an Environmental Training Programme raising the awareness of forest work for environmental issues related to forest operations. A well-illustrated document had been prepared for trainers to improve safety and quality in forestry work. The Forest Owners Association of Gascogne provided information and training to private forest owners on the classification of wood and optimum bucking and sorting. Different assortments, mostly determined by wood qualities, were shown at the demonstration site. Sawn timber could cost FF 200/m<sup>3</sup> whereas for pulpwood only FF 50/m<sup>3</sup> could be received. The training of forest workers in log grading was also considered to be of high importance. Three hundred and fifty workers were trained per year to optimize values of logs as required by the industry.

5. Reforestation techniques

Information was provided on "CAFSA", its activities related to forest nurseries, soil preparation and planting. At the demonstration site,

participants could observe a selected number of hard- and softwood seedlings from some 100 different species produced by "Planfor". Seven to ten seedlings were planted every year. Participants were able to see an agricultural tractor with a plough making ditches of 40 cm depth and an agricultural tractor equipped with a disc-plough for soil preparation. A special machine, developed for soil treatment on sites where stumps had been left in the ground, was also demonstrated to the participants.

Workers planted seedlings raised on trays using the tube method. In general, in the Aquitaine region 1,200 to 1,500 seedlings of pine were planted per ha. One worker could plant 1,500 seedlings per day. The average costs for the reforestation, including maintenance cost for five years (soil preparation, reforestation, phyto-sanitary control, weeding and soil treatment between lines) would amount to FF 6,000-7,000 per ha. Seedlings were exported to Spain, Portugal and Denmark. It was also reported that some damage in reforestation was caused by rabbits and deer, as well as raw deer.

**Field visit - Thursday, 23 September 1999**

6. Charter for sustainable management of Landes de Gascogne Forest

Ms. A. Castro informed participants about a new initiative by forest owners' associations and forest industries organizations in the region which started a project on the evaluation of sustainable forest management of the maritime pine forest stands. With about 1.7 million ha of forest land, Aquitaine was the most important forest region in France. This initiative led to the signing of the "Charter for sustainable management of the Landes de Gascogne Forest", which is the starting point for the creation of a "Regional Observatory for Forest Management". The area visited was covered by hardwood species. They generally grow naturally, close to rivers and as an under-storey in maritime pine stands. Questions were related to indicators and criteria to maintain the biodiversity, the use of hardwood forests which in the past were a source of fuelwood and were managed on a coppice basis. The forest area visited had also a nature teaching trail and was a great attraction for tourists.

7. Beynel - Manustock sawmill

Mr. Vierge informed participants about the sawmill which has been established in 1992. The average yearly roundwood intake was 340,000 m<sup>3</sup> producing some 3.5 million pallets and a turnover of FF 260 million. The sawmill provided employment for 200 people. The conversion factor was below 50%. Chips were sold to the SMURFIT paper company, sawn dust to a nearby particle board factory and bark to enterprises producing compost and for decoration purposes. In general, the wood was delivered and sawn timber in the mill within one week after felling. The average daily roundwood intake was about 1,200 m<sup>3</sup>. The storage area had a capacity of nine work days production. The organization, the production of sawn timber and its quality was of a very high standard.

-----