



Institutionen för skogens produkter och marknader

ErgoWood

Implementation and socio-economic impact of mechanisation in France and Poland

Synthesis

Maryse Bigot, Emmanuel Cuchet, Elisabeth Le Net,
Tadeusz Moskalik, Wieslawa Nowacka,
Piotr Paschalis, Dariusz Zastocki



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Poland: Moskalik Tadeusz, Nowacka Wieslawa,
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| Contact person | France : Maryse Bigot Poland : Prof. dr habil. Piotr Paschalis | |

Abstract.

This part of the Ergowood project (Work Package 1.3) aims at identifying socio-economical problems and possible solutions when introducing mechanisation in regions with recently low level of mechanisation. Two countries have been chosen for a comparative study: France and Poland. A literature survey, special interviews and questionnaires as well as a traditional economic approach have been used.

Results show that even if there are similarities, the general dynamics of the development of mechanisation are different in France and Poland. National policy makers have to anticipate the positive and negative, short and medium term, impacts of these different mechanisation dynamics, on forestry, industry and social issues.

As driving forces have been identified, national multi sector-related strategies may be implemented to limit the potential negative effects on forest manual workers employment. A real and coherent politics is also needed at the national level to ensure favourable conditions to the development of a competitive and sustainable mechanisation in the logging operations (effective training system, pertinent regulations, capacity of investments, job attractiveness...). In addition to the national measures, at the regional and / or local level, operational actions (concerning especially work organisation) can be developed to fit better the specific local difficulties and to improve the working and life operator conditions, still considered tough despite higher safety conditions.

Project coordinator

Dr Sten Gellerstedt
Swedish University of Agricultural Sciences,
Department of Forest Products and Markets,
Box 7060, SE 750 07 Uppsala, Sweden,
Phone +46 18 673818, Fax: +46 18 673800,
e-mail: sten.gellerstedt@spm.slu.se

Authors**France:**

Maryse Bigot
Emmanuel Cuchet
Dr Elisabeth Le-Net
AFOCEL
Domaine de l'Étançon
F-77370 Nangis, France
Phone +33 1 60 67 00 34, Fax: +33 1 60 67 00 27
e-mail: maryse.bigot@afocel.fr

Poland:

Dr habil. Tadeusz Moskalik
Dr Wiesława Ł. Nowacka
Prof. dr habil. Piotr Paschalis
Dr Dariusz Zastocki
Warsaw Agricultural University,
Department of Forest Utilization,
Nowoursynowska Str. 159,
02-776 Warsaw, Poland
Phone +48 22 5938121
e-mail: paschalis@delta.sggw.waw.pl

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SUMMARY

ErgoWood is a three-year project funded by the European Commission (Quality of Life and Management of Living Resources) and its 12 partners to develop guidelines on ergonomic matters for users, buyers and manufacturers of forest machines. The work promotes the development of safe and efficient forest machines, which are easy to use and maintain, as well as the improvement of the human resources' sustainability. Furthermore, the project will contribute to make forest work more attractive to young people.

This report from Work Package 1.3 of the ErgoWood project aims at identifying socio-economical problems and possible solutions when introducing mechanisation in regions with recently low level of mechanisation. Two countries have been chosen for a comparative study: France and Poland.

Literature survey as well as different interviews or questionnaires specially prepared to collect data on this rather little documented topic have been used to get information on the socio-economic contexts and their evolutions, from macro to micro-economic level. A traditional economic approach, based on the analysis of the main variables within the four components that are basic conditions, structures, behaviours and economical results, has been carried out to identify the prime forces behind mechanisation development, respectively in France and Poland, and to be able to compare the national paths.

Results and discussion have been structured according to 4 principal topics:

- Quantification and organisation of the logging mechanisation in France and Poland – consequences on the local community,
- Evolution of the forest workers and machine operators employment – evolution of the jobs,
- Training of forest machine operators,
- Forest machine operator working and life conditions.

Even though similar general phenomena can be observed in France and Poland, the general dynamics (the driving forces) of the development of mechanisation in the logging operations are different. Until now in France, mechanisation has rather been a follower (a consequence) than a national objective for which coordinated politics and means had been dedicated to. This is probably one of the explanations of the low rate of mechanisation in this country, together with the predominance of the broadleaves in the French forest. In Poland, mechanisation is at the starting point but depending on the strategy that will be used (at the macro as at the microeconomic level), the pace of mechanisation development may be more or less fast.

National policy makers have to be aware that the understanding of the dynamics of mechanisation is fundamental to be able to anticipate the positive and negative, short and medium term, impacts of mechanisation on forestry, industry and social issues. National multi sector- related strategies may be implemented to limit the potential negative effects on forest manual workers employment. A real and coherent politics is also needed at the national level to ensure favourable conditions to the development of a competitive and sustainable mechanisation in the logging operations (effective training system, pertinent regulations, capacity of investments, job attractiveness...).

In addition to the national measures, at the regional and / or local level, operational actions (concerning especially work organisation) have to be developed to fit better the specific local difficulties and to improve the working and life operator conditions, still considered tough despite a better safety standard. These local solutions can be inspired from national or international experiences. In such a process, operators' motivation and expectations for the work and life that have been collected within the ErgoWood project can also be a useful base for the elaboration of proactive recommendations.

1. INTRODUCTION

ErgoWood is a three-year project (2003-2005) funded by the European Commission and the participating partners from 6 countries (France, Germany, Norway, Poland, Sweden, UK) to develop guidelines on ergonomic matters for European users, buyers and manufacturers of forest machines. The general aim is to give the European logging industry a better competitiveness through the development of safe and efficient forest machines, which are easy to use and maintain, as well as the improvement of the human resources' sustainability. The project should also contribute to make forest work more attractive to young people.

Basically, the project is based on a large data collection "in the field" concerning socio-economical and health issues as well as technical matters. It also involves the investigation of different ways of organising forest work and the sharing of good examples of work-crew building, work-shift scheduling, job rotation and work enlargement in logging operations. The measured effects (output) are analysed in terms of economic, social and health criteria to make easier the understanding of the benefits of ergonomic investments.

This report from Work Package 1.3 of the ErgoWood project aims at **identifying socio-economical problems and possible solutions when introducing mechanisation in regions with recently low level of mechanisation**. A very positive result of the mechanisation of forest work is the reduction of serious accidents and injuries. However, a discord in the use of machines is the neck/shoulder health problems among the operators as well as long working days and shift work. Another aspect is the reduction of labour through the mechanisation.

Two countries with recent and low level of mechanisation have been chosen for the study carried out in Work Package 1.3: France and Poland.

- As a country from Western Europe, France has not undergone specific evolution concerning the general political and economical context. In forestry, contract labour has largely replaced directly employed workers and mechanization plays an ever-increasing role in the logging operations. However, while the Nordic countries have been the pioneers and are the leader of mechanization, France lags behind, partly because of the specificities of the French forest.
- As far as Poland is concerned, the mid-nineties of the twentieth century have been characterized, on the one hand, by an intensive restructuring of the economic system with a transition from the centralized economy to the market economy and, on the other hand, the keeping of a consolidated structure, the State Forests, capable of securing basic environmental and safety for the entire country. Existing political, social and economic unrest had a great impact on forests and forestry in the country. Mechanization is just starting.

More precisely, the results of the study should serve to manage more attractive circumstances for future labour, through providing basic information concerning work conditions, quality of operators and their family's life as well as the earnings in mechanised logging. Moreover, elements of response to questions concerning the socio-economic impact of mechanisation should be provided: technology replacing labour, what happens with the manual workers (seasonal, farmers), the supervisors and the forestry management? Can the local/regional labour market assimilate redundant workers? How have the vocational schools reacted (a reduced number of seats, less teachers with new competence, new curricula)? Are there changes in the sawmill industry due to harvester technology, will that reduce labour at the sawmill? Does the new technical knowledge, brought with mechanisation, have any impact on the local society? Can other activities in the local community gain from the new technology?

As the scope of the study is very large, the results of the deep investigations carried out in France and Poland are presented in details respectively in Appendix 1 and Appendix 2 while the main figures are the object of the present report, and presented in a comparative manner (France / Poland). Beside is also a working paper specially dedicated to “training of machine operators for mechanized wood harvesting” elaborated by the ILO within the Ergowood project too (Strehlke & Warngren, 2004).

2. METHODOLOGY

Different tools have been used to make possible the collection of a wide range of data sources and hereafter the combination of the data in coherent manner:

- Official national statistics,
- Literature survey,
- Structured interviews and questionnaires prepared together with the other partners within the Ergowood project,
- Structured questionnaire prepared especially for Forestry Districts in Poland (“Questionnaire-Privatisation_Mechanisation PM”),
- Structured questionnaire prepared especially for private firms in Poland (contractors, sawmills, wood processing firms, etc.) (“Questionnaire ZUL-M”),
- Structured interviews specially prepared for French logging company managers with at least 8 years of experience in mechanized operations,
- Traditional economic approach embedded in Industrial Organisation (Basic conditions / Structures / Behaviours / Results),
- Open discussions with national experts.

Details on these tools can be found in the core or in the bibliography list of the appendices of this report but also in other reports produced within the Ergowood project.

Information have been collected on 8 main topics:

1. Forest and forestry characteristics,
2. Organization of mechanised logging (management, contractors, machine systems, working hours, work-shift organisation and scheduling),
3. Maintenance systems, machine utilisation, technico-economical performance,
4. Recruitment of operators and mechanics, education and professional profile, skill profile, training,
5. Kind of employment, earning and standard of living, labour costs, efficiency characteristics,
6. Operators motivation and expectations for future work and life,
7. Health and safety rules and habits, health disorders, work fatigue,
8. Prime forces behind mechanisation.

3. RESULTS AND DISCUSSION

31. General background of forestry and timber harvesting mechanization

Forest, wood supply and demand

| | France | Poland |
|--|--|----------------------------------|
| Surface (millions ha) | 15 | 9 |
| % land area | 27 | 28,6 |
| Coniferous/hardwoods | 37% / 63% | 77% / 23% |
| Main species | Spruce, maritime pine, Douglas Oak, beech, poplars | Scots pine, spruce Oak, birch |
| Total annual increment (millions m ³) | 88 | 47 |
| Average volume per ha | 200 | 188 |
| Ownership: private/public | 74% / 26% | 18% / 82% |
| Average private size (ha/private owner) | 2.9 | 1 |
| Total merchantable removals (millions m ³) (<i>overbark</i>) | 37-38 | 24-29 |
| Final cuts (%) | 20 | 24 |
| Selective cuts (%) | 80 | 76 |
| Estimation of self-consumption (firewood, ...) (millions m ³) | 10 | 2 |
| Domestic industrial wood demand (millions m ³) | 33 | 35 |

Source: Lanly, 2002; IFN (national forest statistics); Annual report 2000-2004 (State Forest Enterprise official papers, web page of SFH).

Poland and France are both forest countries. The removal rate is similar (about 60%) but the structure of ownership is opposite. However, the size of yards in private forest is rather small in both countries. In France, this fragmentation is considered the first factor of the specific evolution of the wood chain structure and professions. In Poland, the private forest stands are very much dispersed, mainly linear shaped and less productive than state owned ones.

Forest harvesting mechanisation

| | France (2003) | Poland (2002) |
|-----------------------------------|---------------|---------------|
| Skidders | | |
| • Introduction | 1960s | 1960s |
| • Numbers | 1400 | 740 |
| Forwarders | | |
| • Introduction | 1970s | 1980s |
| • Numbers | 1200 | 50 |
| Harvesters | | |
| • Introduction | 1980s | 1980s |
| • Numbers | 550 | 13 |
| Coniferous mechanised harvest (%) | 44 | 1 |
| Hardwoods mechanised harvest (%) | 2-3 | Occasionally |

Source: Laurier & Baraton, 2004; Bigot & Cuchet, 2003; Moskalik, 2002.

Locally in France (mountains, large hardwoods, maritime pine region) and generally in Poland, skidders or agricultural tractors still play a more important role than forwarders. They are used for skidding long poles to the road-side. Sorting and bucking are made at the mill in France and predominantly also in Poland.

In Poland are still prevailing trends to use forwarders mainly together with technology based on work carry out by chain-saw operators. The same phenomenon is found in France for broadleaves but for coniferous, since the nineties, the trend is to use the Cut-To-Length system (forwarder + harvester).

Public support has been important in France and Poland:

- about 60 % of the French harvesting machines have been bought with the help of public finance (from French funds and the European Union); this support accounts for 7% of the total investment in average, and for 20% after the December 99 large windstorms (Laurier, 2005);
- from 1997 to 2003, the financial support (special grants and loans at favourable terms) in Poland was strong; since 2004, due to EU regulation, the administrative rules have changed and actors are looking for new solutions.

If public support has an influence on the development of mechanisation, the study of its dynamics shows that the prime forces are found outside of the logging sector. Those forces are mainly:

- France: forest resources (large reforestation program after the second world war), wood demand (pulp industry, new important sawmills), windstorms (external factor), manual workforce shortage;
- Poland: pulp industry standard requirements (length, certainty, quantity and quality), political and economical changes (transition to market economy), wood demand (new sawmills, increasing capacities of the existing units, export).

This dynamics could explain in some extent the possible impacts of mechanisation on forestry management, wood procurement organisation, work at the mills and other local activities.

Mechanisation and forestry management

In France, mechanisation has led to the improvement of the accessibility of forest stands, with the enlargement of forest roads networks. Sylvicultural schemes have been also adapted: distances and width of corridors, thinning practices (one line on 4 or 5 systematically removed for the first thinning in plantations for example), marking practices (the forest manager has to take into account the constraints of mechanisation : position of the trees to be removed, visible marks from the cab of the machine), etc.

The change from skidders to forwarders has also influenced the environmental impacts (fewer injuries on the remaining trees, different haulage traffic patterns...) and increased manoeuvrability.

Mechanisation and wood procurement organisation

No doubt that replacing several men (up to 8) by one machine operated by one or two people makes easier not only the management of the logging operations but also the wood procurement of mill:

- Organisation is less hierarchical,
- Time dedicated to work supervision and coordination is reduced,
- Data transfer between the forest and the mill is easier (on-board computers, internet solutions...),
- Flexibility and reactivity have increased, allowing a better answer to client demands,
- Hot logging is feasible (confidence in a continuous and predictable production allows stakeholders to reduce their storage capacities),
- Emergence of preferred suppliers, with long-term contracts, able to ensure large and predictable deliveries to wood industry.

In the interviews, French contractors and wood dealers with an experience of mechanisation have noticed all these evolutions but they recognise also that there are still some progress to be done concerning data transfer, especially wood volume measurements. Harvester in-board computers record volume data but these are not used for the payment: volume is measured at roadside or at the mill, and sometimes both.

Those observations based on French experiences apply also to Polish conditions; we already noticed the tendencies of data transfer from computer installed on tracks to the saw mills.

Harvester technology and work at the mill

The technological interaction is asymmetric: changes in the mills can impact the logging, but the reverse is not so important. In France, mechanisation has been established step by step and is rather a “follower”. In Poland, due to the technological catching-up in logging operations, mechanisation of wood harvesting will have significant impacts on sawmill organisation and labour management.

Examples from France

In the past, sorting and bucking operations were often carried out in the woodyard of sawmills (or sometimes on special landings at roadside), on long poles (delimbed trees cut at the top end diameter or at the maximum authorized length for the transport). Nowadays, if this habit is still common for broadleaves or very large conifers, things turned different for small to medium sized coniferous trees. For this type of timber, the harvester technology made possible to do and automate the sorting and the bucking in the forest. As a result, the supplying of softwood sawmills have changed from long and heterogeneous poles to shorter and homogeneous logs. Large sawing companies that have completely outsourced the harvesting operations consider this standardisation as a progress (less operations to do in the woodyard). But in France, 2/3 of the sawmills are also involved in the logging and the wood dealing (2001 data), and mainly of them are family business that regret the time they could take advantage of the added value they could gain from the sorting carried out by them.

Meanwhile, another change happened for pulpwood, or special products as timber for peeling or chestnut flooring industries. While chainsaw operators used to cut 1 or 2m length logs, harvesters gave the opportunity to process longer logs and a larger range of products (2m, 4m or more). As a result, operations such as the unloading of trucks or wagons in mill woodyards have been reduced.

Examples from Poland

The number of firms processing timber is decreasing and it will be a permanent tendency in the nearest future. The small firms (mills) are not able to compete with their efficiency and products quality on the internal and external market. The natural monopolist on the timber market as a State Forest Enterprise gradually will change the existing structure of wood industry and wood market, especially in saw mills and small carpenter's enterprises. Through introducing new technologies and new methods of timber processing in timber sector, employees will be much more interested to improve their level of education, in different courses, vocational studies, *etc.*,

Due to asymmetry between the ownership structure between the State Forest Enterprise and almost 100% private sector in timber industry, even large saw mills are not interested in investing money in new technologies of logging and timber transport or buying or leasing a new equipment.

Introducing the new harvesting technologies in forestry will reduce the number of manual workers directly involved in some of the sawmills operations (in storage places, yarding, scaling) or in other auxiliary works (grading, measurements). At the same time, it will increase the number of people employed in sawmills doing more complicated work, like computing, marketing, logistics *etc.*

Can other activities in the local community gain from the new technology?

In France, maintenance, repairing and spare parts supply are of course activities that gain directly from the new technology brought by mechanisation. But, this gain is not always “local”, and could probably be more important. Indeed, only a couple of large logging companies have completely outsourced the maintenance. More generally, contractors, depending on their skills and interest in mechanics, prefer doing themselves the basic maintenance and repairing operations that do not require special heavy equipment, to save costs. For special maintenance and heavy repairing operations, they generally rely on local repairing enterprises (specialized or not in forest machines) or on the forest machine seller, who can be in the region or several hundreds km away. A minority of contractors who are fond of mechanics have developed their own garage and go just a couple of times per year to the machine seller. (Sutter & al., 1999; Bigot, 2005)

Other local activities are undoubtedly influenced by the development of mechanisation. However, due to the low pace of the forest technology development and the major influence of agricultural innovation in rural areas, it is difficult to assess the specific impact of logging technology on local community.

In Poland can be anticipated that all those changes will have a great impact on local development of local communities. It should be seen as a consequence of the expansion of all kinds of services linked to the supply of materials directly used by machines, and also by the development of accommodation facilities (willingness of manual workers to work close to their home, while machine operators have to move far from their home and need at place extra services such as restaurant, hotel). In addition, the local communities will get an additional income through the local tax. Moreover, mechanisation requires large forest roads’ network so investments for the local communities will be larger, and the accessibility of the forest to the public use will be improved. Finally, the local communities will have a chance to learn from coming modern technologies: this is the spillover of technologies (natural process of development of society is observing, repeating, understanding), mechanisation will be the first sign that the work of the forestry can be permanent and non-seasonal.

32. Forest workers / machine operators employment

Employment in forestry

Occasional work in small private wood lots concerns in all likelihood more than one million people in France and is estimated (there is no proof data), not less than 1 million in Poland (ILO estimation), who cut fuel wood and other wood for their own use, most of them being rural people not specifically trained and not very well equipped for this job. Besides, black or grey work does exist in some extent (even if a strong enforcement of regulation has reduced this phenomenon in both countries), but this report is concentrating only on the official data and information.

| Estimation | France | Poland |
|--------------------|-----------|--------|
| Manual workers | 15-20 000 | 55 000 |
| Machine operators* | 4-5 000 | 800 |
| Total | 19-25 000 | 56 000 |

Note: * = skidders, harvesters, forwarders and tractors operators.

The general trend in France and Poland is a reduction of the employment in forest sector while the number of contractors is growing. Large private woodworking companies want the concentration movement in both countries. In Poland, this movement is also stimulated in some extent by the State Forest administration.

In France, the number of people working in forest is not well known. Most of the official statistics concern wage earners, not individual entrepreneurs¹. From 1978 to 2002, wage earners - full time equivalent population in harvesting operations has decreased from 18 000 to 6 000. Nowadays, there are about 6 000 self-employed contractors, about 50 % of whom working by themselves as chainsaw or forest machine operators (skidders, forwarders, harvesters), the others in small groups of up to about six men, including wage earners.

On this period, the structure of the logging companies has changed, with a continuous diminution of the number of employees and employers. One of the factors explaining this trend is the development of individual enterprises and the building-up of flexible mechanisms in the wood chain by outsourcing and subcontracting (entrepreneurs). Indeed, in the past, some pulp mills and sawmills used to employ tens of chainsaw operators, up to 150 in some cases. At the beginning of the eighties, they have outsourced the logging operations: many of their former employees created their own business. In the same way, the large logging companies belonging to pulp industry that were the first ones, during the eighties and the beginning of the nineties, to implement and develop mechanisation with their own machines and workforce, have later on nearly completely outsourced the full-mechanized logging operations.

In Poland, the changeover to free-market economies had a dramatic effect on the manual workers of the State Forest Enterprise, where the majority of them had enjoyed until now stable employment. Between 1989 and 1996 the reduction of the workforce amounted to 45 834 or 61% of the total. Overall employment in Polish forestry significantly decreased from 134 000 in the early nineties to 55 000 in 2002. In 2003, the State Forests Enterprise administration employs around 30 000 people and gives work to around 56 000 contractors. The decreasing trend in employment in the forest administration is still going on. At the beginning of the nineties large numbers of directly employed workers were dismissed and re-employed as contractors. At present, in Poland the level of privatisation of the forestry work exceeds 90 %, and in logging operations is over 95 %.

Profession evolution

In both countries, the differentiation of the workforce, that is to say the marginalisation (seasonal, immigrants, farmers) vs. specialisation (full time job, wage-earners, supervisors, *etc.*), is observed. As an example, only 1% in France and 6% in Poland of the forest machine operators interviewed in the ErgoWood project are still also farmers: operating a harvester or a forwarder is a full time job while motor-manual harvesting during wintertime used to be quite common among farmers.

In France this differentiation have been accompanied by other phenomena such as :

- the development of a new status / profession. Mechanised contractors are, generally speaking, better considered than motor manual contractors: skill professionals with a wide range of knowledge (hydraulics, silviculture, mechanics...), modern people (using new technologies), sense of entrepreneurship (financial risk...). These considerations are true, but limited.
- new arrangements in the wood chain, with the development of preferential relationships between stakeholders. For example, it happens that mills or wood dealers provide their “preferred” contractors with a financial support when they invest in a new forest machine. Nevertheless, most of the time, relationships remain implicit, without written contract, only based on a mutual confidence, and this is finally quite similar to the habits of motor-manual loggers.

¹ The wage earners in full time equivalent are done by the CCMSA. CCMSA is the organisation in charge of the social insurance of people working in agriculture (included forest).

In the former Polish system, people in the State Forest Enterprise used to carry out the whole range of operational activities such as seed collection, nursery work, planting, protection and harvesting. Nowadays, mechanisation processes are in the starting point and until now, there is no clear define forthcoming directions of the development of mechanisation. Polish forest workers are afraid of these changes, which may have impact on their status and rate of employment. Such a situation encourages some of them to do self-education and to get employed by contractor in Poland; there is also an observed tendency to seek a job abroad.

Attractiveness and reputation of the jobs

It is considered that several general factors are taken into consideration to assess the attractiveness of jobs: physical constraints of the job, relative wages in the activity comparing to others, job's constraints such as working far from home, how easy is the change from one activity to another one, subjective components as reputation.

In France, the shortage of motor-manual workforce has been the main factor explaining the development of the mechanisation. This situation has been observed for softwood in the last two decades, and is still true for hardwoods now. Driving a machine has a better image than manual work (in forest, agriculture...) nevertheless, French loggers all agree on the fact that it is very difficult to recruit a forest machine operator and keep him for a long time in the job. Young people are not very willing to work long hours alone in the forest, even inside a machine equipped with radio and air-conditioned system.

In Poland, the level of attraction of the forestry manual work is very low and there is no significant demand to be employed in such a kind of work. It is observed that the traditionally granted position for manual forest workers has been changed and even in the rural areas, is not even more treated as a professional career. On the other hand, the current situation should be seen in the whole economic context (about 19% of unemployment in average in the country, and even more in some east and south regions). The attractiveness of the forestry work – at the manual level even if treated as a low status of work, is still demanded, due to a lack of other choice. However, the opportunity to be independent is important for people and especially young ones. Being a forest contractor or driving a forwarder or a harvester is one solution to find a job and to get a higher status as an employee.

Labour cost and efficiency

The efficiency of machine operators in comparison with manual workers (m^3 /person) overcomes the difference of labour cost. The ratio generally varies from 1 machine for 4 up to 8 manual workers.

| €/month | France | Poland |
|----------------------|----------------|--------|
| Motor-Manual workers | 1 100 to 1 500 | 400 |
| Machine operators | 1400 to 2 500 | 500 |
| Minimum wage | 1 100 | 250 |

In France, contractors (for both mechanized and motor manual logging systems) are paid according to the volume they process or haul so the variability of the remuneration is high. Employed machine operators have generally a fix wage plus a bonus based on the productivity and / or the quality so the variability is also high for them.

In Poland, contractors are also paid according to the volume they process or haul so the variability of the remuneration is high. Employed machine operators are paid by piecework, without any extra remuneration.

In the decreasing trend of employment, what happens with the manual workers? Can the local/regional labour market assimilate redundant workers?

It is difficult to estimate the evolution of the employment of manual workers, especially in forestry. There is not exact data of redundant workers. The local and regional, rural labour market is very flexible. Therefore, a lot of activities are proposed to the people who are looking for work, such as gathering non-wood product, agriculture, construction, gardening, and other activities.

In both countries, the number of manual workers employed in logging operations is decreasing, and is expected to go on decreasing with the development of mechanization. Nevertheless, the problem of redundant workers is or can be limited, for different reasons.

In France for example, the lack of manual workforce is a driving force for the development of mechanisation, rather than a consequence. This lack results from a combination of different facts: retirements are not balanced with the entrance of new and young people in the logging business, foreign workers go back to their country, some workers prefer to start a new career (in building or public work operations generally).

In Poland, in the near future, tendencies of decreasing number of forestry workers will probably be not significant, due to two major facts: firstly, due to lack of capital and investment into the mechanisation processes and secondly, due to the still existing possibilities to find a job in other forestry operations. Indeed, the rather low level of health of the Polish forest and the expanding plans for new afforestation create additional opportunities for finding new work places (sanitation cuttings, trees plantations...). The Forest State management is also preparing plans of intensive silvicultural operations that will create new work places.

In both countries, job's crossing is encouraged. Motor-manual forest workers are generally people very willing to work and use to work in hard conditions but due to the rather low level of their education, there are not so many possibilities for them to start a new career, especially in rural areas. It should also be noticed that in both countries, these people are not very much interesting in moving to another region than the one of their current employment. In Poland should be highlighted the problem of housing (a lack of housing investments and very high prices of flats, rooms and houses) which in a very natural way limit the mobility of forestry workers. For such people, becoming a machine operator, working in other forestry operations (silviculture, forest protection, *etc.*), in timber industry or in other sectors like building and public works, agriculture or orchards can represent an interesting opportunity.

Developing special programs for manual workers, for their training and their further employment, is a solution experimented in both countries to solve the problem of the low education level. In France for example, specific social programs have been elaborated to increase qualification of motor-manual loggers (learning French for Turkish workers, improving safety habits and working methods...). Another objective of those programs is to improve the social image of this work. In Poland, there are also several social programmes dealing with these issues, but all of them are working with open formula - for all unemployed people and are not specific for forest redundant workers.

33. Training of forest workers and forest machine operators

In France, 62% of the operators interviewed with the ErgoWood questionnaire claim that they are self-educated (this is coherent with former local studies) and 45% in Poland. As far as contractors are concerned, 70% of the French ones had no business training, and 100% for the Polish ones.

What about vocational schools reaction to mechanisation?

Situation in Poland

In 2003 over 300 people have graduated in different forestry specializations, but only 108 have found work as a silvicultural workers and motor-manual workers for harvesting. The number of enrolment to the schools is rather stable, but the share of the graduated people who will have a chance to find a work in forestry are decreasing.

There is by now no vocational schools including specific mechanised harvesting training. It is expected that a new program will be build in the near future (2005) with the support of the State Forest Enterprise. There is already one school dedicated for forest contractors (40 students per year). The curricula pay a special attention to the knowledge related to the organisation of forest enterprises, market functioning and marketing. Vocational teachers belong to the Forest administration and have, at least, a master degree.

At present forwarder and harvester operators are trained with the support of machine suppliers. An example for this approach to training was a course organized in May 2003 in which two machine operators participated as well as two machine service men from PML, a newly established firm which is servicing harvesting machines from different foreign countries (e.g. Timberjack, Valmet and Ponsse). Of the two machine operators, one had already operated a Timberjack 1010 for six years; the other had only worked with skidders. The course lasted four and a half days and concerned maintenance and operation of a new forwarder. The first day was spent on machine maintenance, the remainder days on practical training, mostly of the operator who had already driven a forwarder before. This kind of training is clearly insufficient and just shows how up to now the machine suppliers provide machine operators with some initial instructions of harvesting under improvised conditions on an *ad hoc* basis.

The main difficulties for training are the costs of equipments that are expensive (simulator in particular). The State Forest Enterprise wants to structure the training system and take responsibility on not more than 8 schools (technicians level).

Note: For using a crane, it is necessary to have a licence delivered by the State Organization (Technical inspection Unit). It is not a forest specific licence. Every operator of forwarder or harvester must pass a special practical exam to get it.

Situation in France

Training of forest workers is provided separately for three groups of workers (silvicultural workers, motor-manual workers for harvesting and forest machine operators) according to three different training systems for young persons and adults (initial training, apprenticeship, continuous training).

- Young people undergo initial training during a 2-year training period either at a residential training centre or as apprentices by alternating between practical training in a forest enterprise and courses at the vocational school. At the end of the period, the trainee receives a certificate of professional skills called CAPA (*Certificat d'aptitude professionnelle agricole*).

- Adults can follow a special training of 5 to 6 months at the training centre (with a lot of practice) and sometimes also 1 month in the enterprise to obtain a diploma of professional skills called BPA (*Brevet professionnel agricole*).

Until now, there is no defined and common national approach of training for forest machine operators (especially in term of number of hours of practice) but training requirements for harvesting machines operators are under discussion. It is expected, that in future they will have to be trained at a higher level than CAPA and BPA, possibly by completing additional training modules.

| | 1995 | 2001 | 2002 | Trend since 1995 |
|-------------------------------------|------|------|------|------------------|
| Silvicultural workers | 235 | 148 | 90 | ↘ |
| Motor-manual workers for harvesting | 783 | 594 | 525 | ↘ |
| Machine operators | 141 | 142 | 156 | → |

With the time and the development of mechanization, training has changed to respond to new needs and qualifications (more operational oriented). From modest beginnings in the sixties, forest worker training has rapidly expanded from the mid-seventies onwards, though in a rather uncoordinated manner. From 1975 to 1985, pulp industry helped the creation and/or the development of training centres. This aid was financial (1.8 millions euros for this period of time) and technical. In 1975: it helped to create 8 training centres for motor-manual workers and then, in 1978, to equip 5 centres with forest machines (skidders or forwarders).

Nowadays 17 training centres are training forwarder operators. Eight of those are also training operators for harvesters (Bazas, Etang-sur-Arroux, Javols, Marlhes, Meymac, Mirecourt, Saint-Laurent, Sauges), with a global potential of 50 trainees per year. Unfortunately, sessions are sometimes cancelled for lack of candidates or money. Training centres are differently sized, in terms of number of trainees (from less than 10 to several tens of trainees) and equipment (from 1 forest machine only to 10). CFPPA of Bazas is the only one to have simultaneously in 2005 3 harvesters and a simulator.

Teachers have at least the French licence degree (a 3-year *cursus* at the University) but can also be, for the very technical subjects (forwarder or harvester driving, mechanics and hydraulic...) former experienced and skilled professionals. Schools and training financing come from a variety of sources such as public funds (at the regional level since the decentralisation process), wood industries and employers. However many of the training centres are struggling for financial survive.

The system suffers from 3 main difficulties:

- Forest machines are so expensive that those belonging to schools are generally old ones (so the trainees are not very much efficient when they start to work for a boss),
- Training centres find not enough candidates or not enough good and motivated candidates (so the number of trainees are insufficient to face the needs of the logging sector (evaluated at 50 to 100 harvester operators per year),
- Training centres are not enough prepared and equipped to face the needs of professionals concerning very short training sessions on the use of in-board computer and more generally for continuous training.

It also has to be noted that machine manufacturers / suppliers provide some training to operators when they deliver new machines but until now they are not really invested in the training system as a whole.

The perspectives for training in France and Poland

In countries with recent and low level of mechanisation, some specific needs are to be faced:

- Keep a training system for motor-manual workers (according to the needs),
- Fit the training system for machine operators to the development of mechanization in the country,
- Enforce continuous training for forest machine operators to integrate step-by-step the technologies and their improvements (for instance the use of the machines' computer).

The major problem for the training of forest machine operators is the cost of this very special training, in a context of lack of money and struggle for competitiveness. The education program for forest workers / operators is based on national capacity and resources, but these are insufficient to provide the training system with adequate means (modern forest machines especially), and the training system is unable to face professional demands (both in quantity and quality). Meanwhile, all forest machines are produced abroad and bought by entrepreneurs directly involved in the logging operations that cannot be expected to carry the burden of training machine operators.

In both France and Poland, some measures have been already identified for future improvements:

- To build a real curriculum for harvesters and forwarders operators, completed by a special teaching module on business management for those intending to become entrepreneur (business calculation, administration and leadership...). Teaching programme shouldn't be concentrated on economical and technical issues only (organisation of work, improvement of efficiency...). It is also extremely important to introduce into the programme much more materials dealing with environmental and certification issues, ergonomics, health and safety knowledge, related to the sustainability and multifunctional roles of forestry.
- To settle a rational network of training centres, that is to say a small number of large schools geographically well situated, having the financial potential to buy modern equipment and provide a complete and effective training.
- To oblige the forest entrepreneurs to provide a special training system for their operators (labour regulation).

New technologies may be of help for the future development of machine operators training. As an example, an interesting experience of distance training involving the training centre of Bazas, the organisation in charge of the training tax collected from the professionals (FAFSEA), local loggers and AFOCEL has been developed in 2004 in the region Aquitaine in France.

Five training modules (30 hours) on forest machine maintenance have been developed and provided to about 20 employed machine operators through 3 sessions. Each session has been composed of 3 human components: 1 teacher, 6-7 trainees and their respective tutors (generally the boss of the employees). It starts with a first meeting in presence of tutors, and another one in presence of the trainees. A portable computer, the special training software and an internet access are provided to each trainee. There is a regular distance follow-up, support and evaluation by the teacher. The trainee may also find help from his tutor. The final evaluation is carried out in the field.

This pilot operation has been a success and the dissemination is in progress in another region (Limousin), with the involvement of an extra local training centre as a partner. Two other training modules are also in preparation.

34. Forest machine operators working and life conditions

To find possible solutions to manage more attractive circumstances for future labour, the results of interviews and questionnaires carried out within the ERGOWOOD project can highlight the main difficulties met and the solutions the operators proposed. The main information for France and Poland are hereafter exposed; some of them reflect the specificities of a recent low level of mechanisation.

Forest machine operators profile

The average age of interviewed machine operators was quite similar in France and Poland: respectively 40 and 38.3 years (with also a similar stratification: from below 25 to more than 46 years). Despite these similarities, the experience of French contractor and Polish contractors is quite different: figures confirm that mechanization has a longer story in France than in Poland.

| <i>Machine Operator Experience (including apprentice time)</i> | France | Poland |
|--|---------------|---------------|
| Years in forestry | 17,6 | 13,3 |
| Years in the logging business | 14,3 | 8,1 |
| Years at present employer | 9,8 | 6,0 |
| Years – harvester | 2,9 | 1 |
| Years – forwarder | 6 | 1,7 |
| Years – skidder | 5,9 | 1,6 |
| Years – other machines | 1,3 | 4,1 |
| Years – chain saw work | 2 | 2,6 |
| Years – other physical | 1,4 | 2,1 |
| Years – other non-physical | 1,6 | 1,7 |
| Years – sedentary | 0,7 | 0,6 |

Many French operators have decided to establish their own firm, because of family tradition (56%). In Poland, social and economic transformation going on since 1989 was the main external factor influencing decision of work on one's own account. Such activity became at that moment one of the more important ways enabling the firm to cope with competitors on the work market, and such factors as family tradition and love of machines (60%) were mentioned as a major factors influencing decision on establishing one's own firm.

In France, 9% of operators live alone and 6% in Poland. In France 55% of the respondents, and 65% in Poland, live in households with children less than 15 years. The rest of the participants live with at least another family relation (married couples without children or with children over 15, single persons living together with a parent...).

In both countries, more than 80% of the machine operators own their home. Living in a house is the predominant system but is more common in France than in Poland.

| <i>What kind of home do you live in?</i> | France | Poland |
|--|---------------|---------------|
| a family house owned by you or your family | 79% | 48% |
| an apartment owned by you or your family | 1% | 34% |
| a family house rented | 11% | 7% |
| an apartment rented | 8% | 10% |


General considerations on working conditions

In both countries:

- about $\frac{3}{4}$ of the forest machine operators usually feel positive, good and content on their way to go to work but on the other hand,
- at least 60% of the operators find their job interesting and stimulating while less than 10% find little interest and stimulation in their job
- but only 38-35% of the operators consider that the balance between their job and their private time is good.

| <i>How do you usually feel about your work on your way there?</i> | France | Poland |
|---|---------------|---------------|
| Good and content of the interesting work that awaits | 17% | 26% |
| Positive | 59% | 45% |
| Neither positive nor negative | 23% | 16% |
| Some uneasiness | 1% | 13% |
| Strong uneasiness | 0% | 0% |

Regarding working conditions, Polish operators find them more difficult than French operators.

| <i>How are working conditions on the whole?</i> | <i>Difficult</i>  | | | | |
|---|---|----------|----------|----------|-------------------------|
| | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>Easy</i> <i>5</i> |
| France | 9% | 25% | 43% | 17% | 5% |
| Poland | 29% | 19% | 45% | 3% | 3% |

Regarding the working time, there are differences between France and Poland. Polish operators work rather 6 days per week on the average, and their French colleagues one day less. Weekly activity of French operators is however considerably higher: they devote 50 hours per week for work, while 44 hours per week is the average for their Polish colleagues. The average number of weeks of holiday is similar in both countries (respectively 3.4 in France and 3 in Poland), but the range is larger in France than in Poland (from 0 to 8 weeks in France, from 0 to 4 in Poland). The reason for that is that in France a special regulation limits the number of working hours to about 1700 hours per year for employees of large companies. Nevertheless, the average value is the same for employees and contractors, both in France and in Poland, probably because the majority of the employees work for very small company (<5 people).

| <i>Number of days usually work during a week</i> | France | Poland |
|--|---------------|---------------|
| 3 days | 0% | 3% |
| 4 days | 5% | 0% |
| 5 days | 68% | 39% |
| 6 days | 25% | 58% |
| 7 days | 3% | 0% |

The fact that operators / contractors are out of home, at service, is a reason that can influence a willingness of changing the work for another one. Not so much the average number of nights spent at service per year is a problem, best rather a summed time of such absence at home (in France even up to 30 nights out of home per month). French operators / contractors spend 1,7 nights per month out of home on the average (in a hotel / boarding house or in a caravan), while their Polish colleagues almost 2,5 nights (in a hotel / boarding house). It results from the interview with Polish operators that the necessity of being out of home especially in the case of having little children is sensed as a special trouble. The thinking about home and family is a special mental load of operators who complain of that fact.

| <i>How many nights per month do you spend elsewhere than home, when you are working?</i> | France | Poland |
|--|---------------|---------------|
| None | 75% | 74% |
| 1 – 4 nights | 16% | 10% |
| 5 – 8 nights | 1% | 3% |
| 9 – 18 nights | 5% | 6% |
| > 19 nights | 3% | 6% |

When it comes to the conditions in those operators have their main meal during the day, it appears that in both countries, about one operator on 2 is eating by himself in the field.

| <i>How and where do you usually eat your main meal during the working day?</i> | France | Poland |
|--|---------------|---------------|
| Alone at the work site | 52% | 46% |
| With colleagues at the work site | 28% | 32% |
| Alone in a restaurant or similar | 9% | 4% |
| With colleagues in a restaurant or similar | 3% | 0% |
| At home | 9% | 18% |

Nevertheless, from a social point of view, during their work, Polish operators feel lonelier than the French ones.

| <i>How is your typical working day from a social point of view?</i> | <i>Lonely</i> → <i>Sociable</i> | | | | |
|---|---------------------------------|----------|----------|----------|----------|
| | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> |
| France | 16% | 23% | 25% | 19% | 17% |
| Poland | 39% | 26% | 19% | 13% | 3% |

At least, machine operators have been asked to list the problems encountered in their job. It appears that the main problem faced in France and Poland is the inadequacy of the pay. Insecurity is also a major problem for Polish operators (they are afraid of the short-term contract - one year) while the French ones complain about too long working hours. In both countries, operators are noticing “physical load” of their work as the third problem quoted, but more than 90% of the operators do not mentioned “poor health and safety conditions”.

| <i>Problems experienced in your work</i> | France | Poland |
|--|---------------|---------------|
| Inadequate pay | 48% | 48% |
| Insecurity | 10% | 45% |
| Working hours too long | 39% | 19% |
| Physically too demanding | 21% | 26% |
| No career possibilities | 19% | 26% |
| Organisation problems | 13% | 23% |
| Mentally too demanding | 16% | 16% |
| Poor health and safety conditions | 4% | 10% |
| Others | 8% | 13% |

Work and its organisation

Among machine operators, it seems that the degree of freedom for planning and organizing the work is more common in France than in Poland.

| <i>Are there possibilities for you to plan and organise your own work?</i> | <i>Few</i> <i>Many</i> <i>1</i> <i>2</i> <i>3</i> <i>4</i> <i>5</i> | | | | |
|--|---|-----|-----|-----|-----|
| | France | 5% | 4% | 10% | 26% |
| Poland | 39% | 16% | 19% | 16% | 10% |

Despite this difference, in both countries:

- about 90% of the operators have the freedom to decide **how** to do their work often or quite often,
- 72% of the operators in France and 64% in Poland have the freedom to decide **what** to do their work often or quite often.

Polish operators do fewer tasks and these tasks are less varied than in France.

| Total number of tasks | France Poland | | Number of tasks beside machine operating | France Poland | |
|------------------------------|-----------------------------|-----|---|-----------------------------|------|
| | 1-6 | 11% | | 26% | None |
| 7-12 | 37% | 68% | 1-5 | 12% | 39% |
| 13-18 | 42% | 3% | 6-10 | 38% | 55% |
| 19 - | 11% | 3% | 11-15 | 36% | 3% |
| | | | 16 - | 13% | 3% |

| <i>How varied are your work tasks during a typical day?</i> | <i>Little</i> <i>Much</i> <i>1</i> <i>2</i> <i>3</i> <i>4</i> <i>5</i> | | | | |
|---|--|-----|-----|-----|-----|
| | France | 16% | 22% | 23% | 17% |
| Poland | 42% | 26% | 23% | 6% | 3% |

Nevertheless, Polish operators are more numerous (70%) than the French ones (52%) to consider their job varied.

| <i>How would you describe your work?</i> | France | Poland |
|--|---------------|---------------|
| Varied and consisting of many different work tasks | 16% | 29% |
| Rather varied | 36% | 39% |
| It can be both monotonous and varied | 37% | 16% |
| Rather monotonous | 11% | 16% |
| Very monotonous | 1% | 0% |

French and Polish operators both consider that they learn new things in their work, and that their job requires inventiveness and skill, but Polish ones in a larger extent.

| | Almost never | Seldom | Quite often | Often |
|--|---------------------|---------------|--------------------|--------------|
| <i>Do you learn new things in your work?</i> | | | | |
| France | 9% | 35% | 38% | 18% |
| Poland | 6% | 19% | 32% | 42% |
| <i>Does your work require skill?</i> | | | | |
| France | 0% | 1% | 36% | 63% |
| Poland | 0% | 0% | 19% | 81% |
| <i>Does your work require inventiveness?</i> | | | | |
| France | 8% | 15% | 42% | 34% |
| Poland | 3% | 13% | 19% | 65% |

All these differences between Poland and France may be related to the duration of the experience in the activity: Polish operators, more novices in the business, appear more “enthusiastic” while the French ones find less novelty and feel as a little bit blasé.

Working load and pace

In both countries:

- about 60% of the machine operators consider their job load as adequate or occasionally heavy.
- about 2/3 operators find that the working pace is high or rather high while they are less than 1/10 to find it low or rather low.
- more than ¾ of the operators (76% in France, 87% in Poland) find that there are usually few or rather few interruptions or stops when operating the machine.

| <i>What do you think about your job load?</i> | France | Poland |
|---|---------------|---------------|
| Right, not in any way annoying | 16% | 16% |
| Occasionally heavy, usually enough | 45% | 45% |
| Heavy from time to time | 24% | 29% |
| Often annoyingly heavy | 13% | 3% |
| Very often annoyingly heavy | 3% | 6% |

On the other hand, the job appears more demanding to French operators than Polish operators.

| | Almost never | Seldom | Quite often | Often |
|--|---------------------|---------------|--------------------|--------------|
| <i>Does your work require you to work very hard?</i> | | | | |
| France | 12% | 38% | 29% | 21% |
| Poland | 29% | 55% | 16% | 0% |
| <i>Does your work require too much effort?</i> | | | | |
| France | 25% | 40% | 24% | 11% |
| Poland | 52% | 35% | 13% | 0% |

| <i>Do you think your work is mentally trying?</i> | France | Poland |
|---|---------------|---------------|
| No, not at all | 16% | 13% |
| No, hardly | 14% | 26% |
| To some extent | 31% | 35% |
| Yes, to rather high extent | 32% | 19% |
| Yes, to a very high extent | 6% | 6% |

French operators seem also to feel more pressed for time than the Polish ones, even if they are more numerous in France to consider that they can decide the work pace themselves to a high extent.

| <i>To what extent do you feel pressed for time at your work?</i> | France | Poland |
|--|---------------|---------------|
| To a small extent | 6% | 23% |
| Rather small extent | 17% | 19% |
| Some extent | 25% | 19% |
| Rather high extent | 27% | 26% |
| To a high extent | 25% | 13% |

| <i>Do you usually have the possibility to take a break and relax when you feel stressed and tired during work?</i> | France | Poland |
|--|---------------|---------------|
| Yes, I have many possibilities | 35% | 68% |
| Yes, I have some possibilities | 42% | 32% |
| Doubtful | 17% | 0% |
| No, hardly | 5% | 0% |
| No, not at all | 1% | 0% |

| <i>To what extent can you decide the work pace yourself?</i> | <i>To a high extent</i> | | | | <i>To a small extent</i> |
|--|-------------------------|----------|----------|----------|--------------------------|
| | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> |
| France | 49% | 38% | 4% | 9% | 0% |
| Poland | 19% | 55% | 23% | 3% | 0% |

In both countries, operators are rather satisfied with their workload, there is a certain degree of autonomy (higher in France than in Poland) but the job is demanding (high pace, few breaks...).

Fatigue, health and medicine aspects

For 87% of the operators in both countries, a night's rest or a week-end is enough for feeling "fully recovered". Fatigue is felt rather in the body than in the mind. Regarding the stress at the general level, there is no clear tendency.

| <i>How does your body feel after a typical working day?</i> | <i>Fatigued</i> | | | | <i>Fresh</i> |
|---|-----------------|----------|----------|----------|--------------|
| | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> |
| France | 30% | 30% | 27% | 12% | 1% |
| Poland | 23% | 29% | 32% | 16% | 0% |

| <i>How does your mind feel after a typical working day?</i> | <i>Tired</i> | | | | <i>Alert</i> |
|---|--------------|----------|----------|----------|--------------|
| | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> |
| France | 14% | 23% | 34% | 17% | 12% |
| Poland | 6% | 29% | 52% | 13% | 0% |

| <i>How stressed do you generally feel when the working day is over?</i> | <i>Tense</i> | | | | <i>Relaxed</i> |
|---|--------------|----------|----------|----------|----------------|
| | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> |
| France | 18% | 22% | 30% | 16% | 14% |
| Poland | 0% | 29% | 55% | 16% | 0% |

The health of operators is an important matter for employers in Poland (90%) vs. France (61%) at recruitment stage. One explanation is that Polish operators are employees and have to get a medical certificate to work. This obligation does exist in France for employees, but not for contractors (51% of the respondents).

During their work, operators have regular health checks in both countries. Disorders are the same for French and Polish operators: not many neck (60%) and shoulders (35%) problems, but highest prevalence of symptoms can be found in France and Poland for lower back (75%).

In Poland, the understanding and the knowledge of machine operations and their effects on operator health is uncertain for people involved in mechanisation. In France, the feeling is that health is not taking into account, even if it is supposed that managers should have a better understanding.

Nevertheless, considering the past 12 months:

- no Polish operator and only 7% of the French operators have been absent due to an accident at work,
- no Polish operator and only 10% of the French operators have been absent due to health problems caused by work.

4. CONCLUSION

The results and the analysis carried out within work package 1.3 of the Ergowood project concerning the introduction of logging mechanisation in France and Poland allow to understand the dynamics of the process and identify their positive and/or negative impacts on forestry, industry and social issues. Three dimensions can be considered:

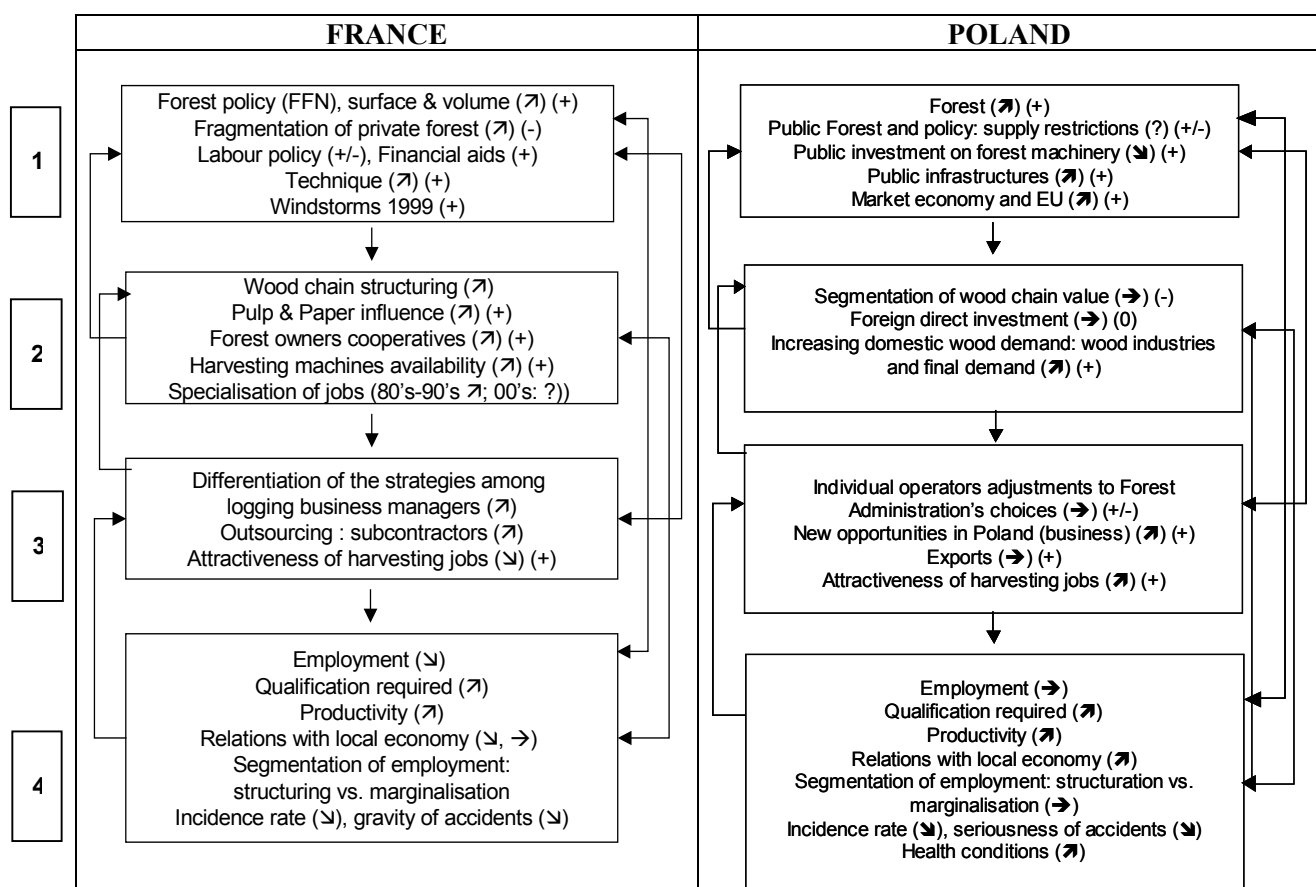
- The national path and its dynamics,
- The macro-economic level,
- The micro-economic level.

The national path analysis allows to point out the macro-economic results and, to a less extent, the micro-economic results. Those last results are mainly based on the ErgoWood interviews.

The national path of mechanisation in France and Poland

Even though similar general phenomena can be observed in France and Poland, the general dynamics of the mechanisation of the logging operations are different. The figure below summarizes the driving forces, the main variables trends, the interactions and the feedbacks according to the general economic methodology based on 4 components (cf. Appendix I): from the basic conditions (top box, n°1) to the results (down box, n°4) through the structures (box n°2) and the behaviours (box n°3).

Within each component, the main variables identified are listed, and their trend (arrows →, ↗ or ↘) as well as their positive or negative impact on logging mechanisation development (sign + or -) are noted. For instance: forest is growing in France (it is a contextual variable, i.e. a basic condition) and this trend is positive for the development of forest mechanisation.



Until now in France, mechanisation has rather been a follower (a consequence) than a national objective for which coordinated politics and means have been dedicated to. This is probably one of the explanations of the low rate of mechanisation in this country, together with the predominance of the broadleaves in the French forest.

In Poland, mechanisation is at the starting point but depending on the strategy chosen (at macro and microeconomic levels), the pace of mechanisation development may be more or less fast.

The macro-economic level

In both countries, the share of forest and wood sector in the economy is not predominant, and the rural areas are more oriented towards agriculture. Growth and development in forestry are strongly interconnected with the development of mechanisation of logging operations. In France as in Poland, the main driving forces for mechanisation are found both in forestry management and in the wood industry: forest ownership structure, forest resources endowment and wood demand are important factors. The political and socio-economical changes – the systemic change – are also one of the major variables for Poland. In France, external factors as large windstorms and the continuous diminution of the motor-manual workforce (consequence of the very low level of attractiveness of those jobs) had a strong impact on the development of mechanisation too.

The intensification of mechanisation is one of the phenomena positively influencing and stimulating rural development, even if it is very difficult to assess precisely the effects. One major prerequisite to obtain such positive reaction is to anticipate the consequences of mechanisation on social structure and employment rate in forestry, and to implement plans of actions and / or specific regulations to limit negative impacts. As an example, depending on the context and the decisions taken, the problem of redundant workers may be more or less limited. A reflection on this question is needed both for France and Poland - one of the major problems being that forest manual workers often have a low qualification level and difficulties to adapt to new conditions. Policy makers have to know that multi-sector-related solutions will probably have to be undertaken, both by the local and governmental organisations, as forestry itself may be not able to solve the problem by itself.

Special skills are required for forest machines operators, which should be obtained through special training courses. Learning by doing is indeed not enough and is a serious handicap for the logging business competitiveness. For health, safety and ergonomic reasons also (and they have indirect consequences on the competitiveness), such special training should be obligatory and organised, both within initial and continuous training. Forest machine operator training is expensive, due to not only the high cost of the training equipments and the high need of practice, but also the relative small number of trainees at the national level. In France, some forestry schools already provide some vocational special training for operators and in Poland, so far, there is no such facilities. Nevertheless, in both countries, an effective and rationalised training system is requested, to answer the future needs of the logging sector in terms of quantity (fit the balance motor-manual operators / forest machine operators) and quality (elaborate a special curriculum for forest machine operators).

Forest machine operator work could be more attractive if specific circumstances are fulfilled. Among them, safety, health and ergonomic issues are of course very important but, generally speaking, working and life conditions as a whole have the prime role. Despite higher safety conditions (compared to the motor-manual logging), working and life conditions are tough: long working days / weeks with a high working pace and only a few breaks, alone in the forest, sometimes far from home and family... This appreciation is found both among French and Polish workers that, however, like very much their job and consider it as interesting, rather varied and requiring skills and autonomy. Besides individual or local organisation measures (discussed in the next chapter), the national social frame of the forest work is important (regulations, habits, support...). For example, in France, work at night in the forest is prohibited. As a result, the 3-shift organisation (3 x 8h) is impossible for logging

operations, and the double-shift is quite difficult to implement, but operators are rather satisfied to spend their nights and weekends at home.

At least, and especially for entrepreneurs, security (and confidence in the future) is a very important issue related, directly or indirectly, to the sustainability of the forest-wood chain. Outsourcing and contracting are predominant both in France and Poland, and individual business or micro-enterprises too. Long-term contracts have to be encouraged, as it is a driving force to reinforce and develop logging enterprises and to provide more stable working conditions. The interviews made in ErgoWood show that security seems more a more important problem for Polish operators and entrepreneurs than for the French ones. In Poland, actions diminishing uncertainty appear extremely essential, such as regulations that are still at the initial stage. In France, regulations are not considered as a solution, perhaps because there are already strong rules concerning the employment of wage-earning people; a better communication between stakeholders, and the development of partnerships are considered as interesting alternatives to improve security among entrepreneurs.

The micro-economic level

In addition to the recommendations oriented to the national policy makers, concerning the strong need of anticipating the short and medium term consequences of mechanisation, other solutions and actions have to be developed at the regional and local levels for a further and sustainable mechanisation.

To reduce the social impacts and to overcome some expected difficulties at the regional level, some actions have been already mentioned in the last paragraph (special plans for redundant workers, working organisation...), but the idea here is to reach an operational dimension very well adapted to the local context.

Local / regional solutions have to answer the local/regional people expectations, but they can be inspired from a national policy or strategy, foreign experiences from more mechanised countries such as Scandinavian countries, *etc.* In such a process, operators' motivation and expectations for the work and life that have been collected within the Ergowood project can also be a useful base for the elaboration of proactive recommendations.

Among these expectations are:

- Being independent entrepreneurs to be able to manage their work and life,
- Being supported by a dynamic politics meeting their needs and those of their family (schools, accommodation, infrastructure, leisure, medicine and all social infrastructure),
- Being integrated into a local strategy (including woodworking industries and services) and finding synergies,
- Improving the organisation of the logging operations (better flow of decisions and information between forest owners, operators and wood industries, long term contracts...)
- Improving their working conditions (better logistic for the travel between the working places and family home, solutions for better safety and ergonomics conditions...),
- Having a positive image within the public (high quality work, qualified workers, innovativeness of services...).

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APPENDIXES

Appendix 1 : Implementation and socio-economic impact of mechanisation in France and Poland - the French experience

Appendix 2 : Implementation and socio-economic impact of mechanisation in France and Poland - the Polish experience

N.B. Appendices 1 and 2 are separate reports with their own literature references.