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ABSTRACT

One of the strategic tasks of the Hungarian economy in the new century is to find a solution for increased timber use within the conditions of sustainable forest management. The "Forest & Wood" project under the umbrella of National Research and Development Programmes has recently been launched in Hungary with the aim of a sustainability- and quality-focused improvement of the national forest assets and the forwarding of the sound use of wood.

A nation-wide consortium, lead by the Faculty of Wood Sciences of the University of West Hungary, the Forest Research Institute and the Energetic, Environmental and Wood Processing Service Ltd. is working on the project objectives. The consortium also includes a number of state forestry enterprises, major wood-processing companies and machinery manufacturers.

In this project, forest management and timber utilisation are dealt with in an integrated manner. The overall objective of the project is to contribute to the prevention of the ecological hazards and to the meeting of the demands for high value wood products.

Components of the project are as follows:

- A quality-driven enhancement of the national forest assets;
- A firm foundation of the new forestation programme due with the accession to the EU;
- Survey on the quantity and quality of the domestic timber supply;
- Forwarding of the energetic utilisation of dendro-mass;
- Development of new methods for processing short roundwood;

- Modernisation of the processing of quality roundwood;
- Development of new, competitive wood products;
- Integration of the development of forestry and wood industry into regional development.

As an outcome of the project, it is anticipated that a multi-party undertaking comprising the whole process of timber utilisation from afforestation and forest renewal to the manufacture of final wood products and reuse of timber will be implemented.

Achievements to date include an analysis of criteria for an ecological sound and viable afforestation programme, development of new nursery machinery, study of the competitive situation of wood-based products, building elements and systems in Hungary, development of new engineered wood-based products based on domestic raw material.

Fulfilment of all the objectives will largely contribute to the promotion and sound use of wood in Hungary.

Key words : ecology, sustainability, wood processing, value added

INTRODUCTION

Currently, the forested area amounts to 1 798 thousand hectares in Hungary. The growing stock is of 331 million cubic meters, with an annual growth of over 9.3 million cubic meters. The actual gross removal is around 7 million m³ a year, not more than just over 70 per cent of the potential, corresponding to a net amount of roughly 6 million m³. Out of this amount, wood fuel represents 2.45 million m³ while logs and pulpwood not more than 1.45 m³ and 0.62 m³ respectively.

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The resources required for the fulfilment of project tasks include, beyond the leading organisation, contribution to experimental work of 17 companies, 8 of which are the major forestry companies in Hungary.

ECONOMIC FOUNDATION AND SCIENTIFIC CONTENT OF THE PROJECT TASKS

1. Sustainable forest management and quality-driven enhancement of the national forest assets

Although the condition of Hungarian forests is not worse than the average of the European region, growing stock volumes are still estimated to be 20 to 30% behind the potentials. Quality-driven enhancement primarily means a better, sustainable use of the ecological endowments of the country, and the improvement of production and preservation practices. However, economisation of wood production will stay dominant since the improvement of profitability remains a key objective in the 21st century as well. Accordingly, this chapter of the project starts with a survey of the historical development of Hungarian forests and the description of the current conditions. Areas of development that arise from the above analysis are the better use of the ecological potentials, the transformation of biologically and economically improper stands, the improvement of the propagating materials.

Survey of the historical development of the national forest assets and evaluation of the present conditions

This survey consists of

- the ecological description of forestry sub-regions and regions and their grouping by administrative regions, and
- the description of species of potential industrial use by forestry sub-regions regarding area and yield.

Semi-natural beech forests and black locust stands are the most important from the forest management point of view. Other important species include pedunculate oak, sessile oak, Turkey oak, hornbeam, poplars Scots pine, Austrian pine and spruce.

The possibilities of quality enhancement, fulfilling the requirements of the semi-natural forest management

Elements of this survey are

- the survey of stands not suited to their site of growing, with recommendations for their transformation based on ecological and economical criteria,
- the survey of stands of improper biological and economical structure, with recommendations for their transformation,
- the satisfactory use of high quality propagating material, and
- the ecological and economic evaluation of silvicultural practices.

Establishment of ecologically sound silvicultural guidelines of the forest management planning for a full exploitation of beech and black locust stands.

- yield and stand structure survey and analysis of beech and black locust stands order to determine the annual growth,
- development of afforestation guidelines,
- development of silvicultural treatment guidelines.

As a result, the elaboration of detailed silvicultural guidelines is underway for our most endangered indigenous species and also for the most widespread exotic one, namely black locust.

2. Enlargement of the national forest assets trough the afforestation of areas not used by agriculture

Boundary conditions:

- About 700 to 800 thousand hectares of new forest plantations can be established during the next 50 years. Afforestation of some 174 thousand hectares is planned between 2001 and 2001.
- Ecological factors must be dominant in the choice of species. Autochthonal trees have priority; however planting of exotic species (poplars, conifers, black locust) may also be reasonable for alternative land use and regional development.
- Afforestation should be based on national investment for public interest.
- Funds available for EU Member States have to be acquired through the fulfilment of the relevant criteria.
- The majority of the afforestation is likely to take place on privately-owned lands.
- Preparatory measures for the afforestation of 15 to 18 thousand hectares each year have to be taken.

This huge task can only be executed on the condition of the necessary propagating material and the mechanisation background.

The propagating material can be grown with open-air cultivation methods. Safe and economical implementation can be guaranteed by a powerful nursery machinery system that supports the key operations of afforestation (fertilisation, soil preparation, sowing, planting, irrigation, care, removal).

Afforestation programme meeting the criteria of ecology, environment, economy and regional development

- Survey of the ecological potential available for afforestation.
- Decision of the size of afforestation based on grading according to the forestry site-class system of the area that cannot be economically utilised by agriculture.
- The selection of the species by site.
- Development of afforestation technologies and the setting of technological guidelines.
- Prediction of the timber yield of the sites recommended for afforestation.
- Development of new nursery machinery systems.

3. Assessment of the quantities and the quality of the domestic timber supply for an up-to-date industrial use.

The manufacturing of high-quality wood products requires an in-depth knowledge of the properties of wood grown in the different sites in Hungary. These properties affect the quality and economy of processing as well as the final product's performance in use. They are satisfactorily clarified in the case of a few commonly utilised species only.

Experience shows that about 20% of the harvested industrial wood is lost due to improper storage and other handling errors in the wood-processing chain. Another typical problem is that the majority of the chemicals used for wood preservation seriously harm the environment. Therefore it is of utmost importance to develop environmentally friendly methods of an integrated forest protection extended to the timber harvested.

Specific tasks are as follows.

Survey of timber resources by species and assortment with regard to the end use of value-added products

- Prediction of harvesting data by assortments based on the existing national forest assets within the rotation age.
- Prediction of harvesting data by assortments based on the improved national forest assets in the next 30 years.
- Prediction of harvesting data by assortments based on the enlarged national forest assets within the rotation age.
- Assessment and forecast of the costs of harvesting and wood transport, with regard to the different technologies and requirements of semi-natural and plantation forest management.

Study of the quality of domestic wood.

- Identification and evaluation of growth characteristics (e.g. log size and shape, false heartwood, interlocked grain, etc.) from the utilisation point of view.
- Physical properties and their variability due to growing conditions.
- Other properties affecting the use (colour, texture, durability etc.).
- Establishment of assortment criteria by use, based on the quality of raw material.

New methods for the environmentally friendly protection of wood after harvesting and during processing

- Environmentally optimal wood protection at the felling sites.
- Methods of roundwood protection at storage
- New methods for the preservative treatment of semi-finished and finished wood products.

4. Forwarding of the energetic utilisation of dendro-mass

Wood is the most important renewable energy source. The share of wood from the total energy consumption is between 7 and 23 per cent in the EU Member States. In Hungary, this figure is about 3 per cent only.

Government Resolution 11 7/99 concerning the "Kyoto Protocol" intends to increase the current 28 PJ per year renewable energy use to 53 PJ per year by 2010.

The specific tasks are as follows:

- Study of the environmental impact of wood energetics.
- The conditions of the establishment of energetic plantations, energy forests, and their eco-energetic analysis.

5. New methods for processing short and low-diameter roundwood

Most part of the wood fuel removed in Hungary could be categorised as pulpwood or other industrial wood. Broad-leaved hardwoods are prevailing in Hungary and in the case of wood in the rough other than logs utilisation is not yet solved.

The annual growth of small-size hardwood is some 4.2 million cubic meters, as opposed to the 1.8 million cubic meters of soft broad-leaved and coniferous pulpwood and wood fuel. Utilisation of this latter as industrial wood has no real obstacles.

Strategies for a more value-added use include hardboard and MDF product development based on domestic hardwoods, as well as the development of engineered wood composites. The specific tasks are as follows:

- The development of gypsum-bonded fibreboard of medium and high density.
- The manufacturing of engineered, oriented-structure composites (OSD, LSL etc.) based on domestic species.

6. Modernisation of the processing of quality roundwood

Currently over 9 million cubic meters of wood per year could be removed in Hungary. Of this amount, logs represent 25 per cent. Removal however attains some 70 per cent of the potential, due to the last decade's changes in the ownership structure and in the demand by domestic wood-processing industry.

The strategic problems to be solved regarding the use of logs are:

- Roundwood should be processed in Hungary instead of being exported.
- Novel hardwood-based products have to be introduced to the domestic and EU markets.
- Supply of sawn and veneer-based products has to be enhanced on the domestic market based on the competitiveness of the domestic wood-processing industry, in order to reduce the import of wood and wood products.

In the course of the last 10 to 15 years, as a result of the privatisation process, development in the Hungarian sawmill industry mostly lacked behind, except for a few cases. Veneer and plywood

plants have not modernised much either. These facts determine the viability of domestically produced wood products to a large extent.

In order to alleviate the problem, technical solutions requiring R&D input are necessary as below:

- Construction of a model for the technological and economic analysis of sawmills processing domestic hardwoods in order to be able to improve their efficiency through the manufacture of competitive products and a better utilisation of wastes.
- Application of novel technologies for the processing of logs of reduced size.
- Development of novel veneer-based composites (LVL, PSL etc.).
- The improvement of the raw-materials' processing characteristics via special treatments.
- Improvement of conversion ratio, product quality and tool life through debarking in sawmills.
- Elaboration of the logistics of traceability for roundwood processing in the chain-of-custody of wood.

7. Development of new, competitive wood products

Hungary is one of the richest countries in Europe in terms of the number of broad-leaved wood species grown. At the same time, when products of high added value (such as pieces of furniture and alike) are to be manufactured, a number of adverse material features show up. For example, in the case of beech and poplar, false heartwood corrupting the aesthetics of the final product is a fundamental problem, since it affects some 60 to 70 per cent of the wood harvested. With other species, colour variations and structural inhomogeneities due to different growing sites pose problems.

Broad-leaved species offer a wide scale of opportunities for the favourable modification of wood. Other high added value area may be building elements, where the knowledge on the mechanical behaviour of less used species is of utmost significance.

Attaining the desired surface quality of solid wood parts in final products at reasonable effort is crucial in the competitiveness of wood products. Development of machine tools therefore becomes necessary.

Ecological and environmental issues have to be duly considered in the development of wood processing. Models have to be worked out for the ecological balance of wood products to be manufactured. This may give the opportunity for promoting a wider use of wood.

Possible health-damaging effect of a few wood-dusts cannot be neglected either. In addition, emission of harmful substances in the manufacturing and finishing process may spoil the competitiveness of wood-based products when not managed in a proper way.

From the above, R&D tasks as follow have been formulated:

- Design and manufacturing of new competitive furniture made of domestically grown solid wood. Possible new areas: outdoor furniture.
- The development of indoor wood products (parquet, furniture) made of an extended source of domestic hardwoods.
- The development of elements of wooden building structures based on locally available solid wood.
- Development of a planing tool and machine for high surface machining quality.

- Study on the occurrence, management and utilisation of wood wastes of primary and secondary processing.
- Modelling of the ecological balance of wood products and structures for the assessment of environmental impacts in the course of the whole life cycle, with special regard to wood-dust issues; development of more efficient exhaust systems.

8. Integration of the development of forestry and wood industry into the regional development

With Hungary's accession to the European Union, the forest and wood sector will become an even more important part of the regional development. Delegation of the tasks of national forest management into regional and sub-regional programmes will be the guarantee for the implementation of the national forest strategy.

Social objectives of forest management are far beyond the direct economic interest of forest owners and managers, and it is reasonable to provide state budget support for the maintenance and development of non-wood goods and services.

Afforestation and wood use should appear in the development of the local economies in several ways:

being an indicator of the quality of environment,

generating income,

providing employment,

generating added value,

being an important element of diversifying income generation.

The actual tasks are as follows:

- The improvement of the land use forms of the regions.
- Building of models for wood production and wood use by target stands.

ACHIEVEMENTS AND FURTHER EXPECTED OUTCOMES OF THE PROJECT

Through the implementation of the project, the participating companies will contribute to the definition of the conditions of a new approach of sustainable forest management in Hungary. It is expected to attain a better use of the ecological potential of the forests managed by the individual companies, and consequently the yield of the forests can be increased. In addition, the wood removed will be used at higher value added, thus the processing companies' profitability can improve.

The development of new board products offering a modern outlet for lower-value industrial wood will actually be a firm foundation of the planned investment of a major manufacturing consortium.

The main benefit of the anticipated integrated results of the project will be the models for wood production and wood use by target stands, the first users of which will be the members of the project consortium.

It is anticipated that the implementation of “Forest&Wood” programme will contribute to putting Hungary in the right place as regards the prevention of global environmental damages through the sound use of wood according to the demand of the new millennium.

It is expected that the in-depth elaboration of the conditions of ecologically sound sustainable forest management will be suited both to the requirements of the EU and the Hungarian society. The survey of the relationships and processes in natural forest associations and plantations serves the observance of the international convention on biodiversity and climate; at the same time, it makes environmental protection and economic exploitation of the ecological potential simultaneously possible. Results may be incorporated into the professional guidelines used by public administration of forestry and forest managers.

The resulting novel wood uses, new technologies, machinery and products will form the professional background of a qualitative change that makes the use of the domestic wood resources more intensive, processing the same into value added products domestically.

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