COST ACTION E42: COUNTRY REPORT - FINLAND

1. Introduction

The volume of the growing stock of Finnish forests is 2 024 mill. m^3 (1992 - 2002). The volume of broadleaved tree species is 382 mill m^3. Birch species (*Betula pendula, B. pubescens*) are the most important with the volume of 311 mill m^3 (15 %). The proportion of other species, such as aspen, (*Populus tremula*) and alder species (*Alnus incana, Alnus glutinosa*) is 3.5 % of the total volume of the growing stock. Most of the broadleaved tree species grow mixed stands, dominated by coniferous tree species. The total area of forest land is 20.2 mill.ha. The proportion of stands, in which broadleaved tree species is dominant species is 10%. Annual increment of the growing stock is ca 81 mill m^3. Increment of birch is 14.3 mill. m^3 (17%) and the increment of other broadleaved tree species is 4.3 mill. m^3 (5%).

In Finland, there are two industrially prominent broadleaved species growing in boreal and temperate climatic zones, European birch (*Betula pendula, B. pubescens*) and European aspen (native aspen, *Populus tremula*, and various hybrids of aspens). The other broadleaved species are used only in the small and medium-scale enterprises of wood industries.

In 2003, roundwoods from broadleaved species were used commercially 17.8 mill. m^3 (o.b.); of this volume, 1.7 mill. m^3 for wood product industries, 13.2 mill. m^3 for pulp and paper industries and 2.9 mill. m^3 for commercial firewood. Birch constitutes more than 90 % of the commercial wood volume of broadleaved species. Of all birch logs and pulpwood, domestic birch makes up of 70 % and 40 %, respectively, the rest being imported, up to more than 90 % from European Russia and to a smaller extent from Baltic countries and Sweden..

Birch is the most important species for the Finnish plywood industries. Finland is the biggest manufacturer of hardwood and softwood plywoods in Europe. Birch is used to less extent in saw mill, furniture and flooring industries. Industrial business includes also rotary-cut and sliced, high-grade veneers for furniture and interiorm as well as special products of curly-grained birch (*Betula pendula* var. *carelica*) and flamy (wavy) birch (*Betula pendula, B. pubescens*) for miscellaneous decorative purposes. Commercial firewood for private consumers is growing back to an important business, due to the increased importance of renewable sources of energy. Birch constitutes an essential part of manufacturing different paper grades as well as paper boards for packaging.

Aspen is a source of roundwood for mechanical pulping and the linked paper industries during, and kraft pulping. It is also used to some extent for interior wood products. Alder species are used in the wood product industries in notable amounts. Less important boreal broadleaved species that are used occasionally for wood products include rowan *tree (Sorbus aucuparia*), black cherry (*Prunus padus*), and certain willows (e.g., *Salix caprea*). High-value temperate broad-leaved species, European red oak (*Quercus robur*), European ash (*Fraxinus excelsior*), European maple (*Acer platanoides*), linden tree (*Tilia cordata*) and elms (*Ulmus glabra, U. laevis*) occur only locally in the most southern Finland, and have minor importance in wood products industries for special furniture, interior and handicraft products.

Except for forest industry products, broadleaved species are used to very small extent for multifunctional food, medical and hermeutic products. The most famous of them are birch sap and birch xylitol. Birch tar production (from resins) was newly started in 2004; however, the end-uses are still under progress and the status in relation to European consumer product codes is still under discussions.

2. Completed research

21. Ecology, genetics and forest tree breeding

- Provenance variation, seed transfers and climatic adaptation in birch: survival, height, yield, abiotic and biotic leader damage (herbivory), stem quality, wood quality
- Annual rhythm of birch, timing and regulation of height growth cessation (as a part of winter-hardening and as an indicator of climatic adaptation)
- National Forest Tree Breeding and Seed Orchard Programs (silver birch, curly birch, pubescent birch, oak, common alder)
    - development of biotechnological methods as a part of forest genetics and tree breeding research
        - vegetative propagation and cryopreservation
        - genetic modification (used as a research tool, and for evaluating the benefits and risks of potential applications of this technique in forestry)
        - applications of marker techniques.

22. Silviculture, forest management planning and forest economics

- Nursery production and planting chain of birch and aspen
- Management of mixed stands on mineral soils (broadleaved mixture in young stands, management of two-storied birch-spruce stands)
- Management regimes of pubescent birch stands on ditched peatlands.
- Growing of high-quality timber in silver and curly birch stands
    - biological and economic bases of the production of high quality birch timber
    - pruning (methods, tools and techniques, pruning seasons)
    - visual quality problems caused by the birch cambium fly on silver birch
- The prediction of the tree growth and quality in birch
    - growth and yield modelling (regeneration, growth, mortality)
    - modeling stem quality of birch
- Profitability of alternative management regimes for silver birch and pubescent birch
- Development of decision support tool for multipurpose forest management planning

23. Wood science and technology

- Diversifying hardwood utilization: enhance and modernise the hardwood utilisation, saw milling and further processing of sawn wood, in particular.
    - timber and wood properties and wood processing chains for hardwoods
- Novel upgraded products of mechanical wood processing
    - wood resources for engineered wood products (EWP) and modified wood products (MWP)
    - market potentials and competitive abilities of the products
- Competitive advantage of Finnish wood and timber in wood products markets
    - attitudes of consumers and companies towards wood products
    - possibilities to find new market areas and new ways of using for wood products
- Properties and utilization of domestic birch, aspen and alder for wood product industries

- Chemistry and discoloration of birch wood (Univ. of Joensuu, YTI Institute & Metla)
- Conventional and high-frequency vacuum drying of birch lumber (Univ. of Helsinki)
- High-temperature drying and heat treatment of birch sawn timber (Lappeenranta Univ. of Tech.).

3. Recent research (on-going and started)

31. Ecology, genetics and forest tree breeding

Work in the same topics as mentioned in 21. "Completed research" is being continued:

- Climatic adaptation in birch, provenance variation in and effect of seed transfers on survival, height, yield, abiotic and biotic damage, stem quality, wood quality
- Annual rhythm of birch and its regulation by photoperiod and other factors
- National Forest Tree Breeding and Seed Orchard Programs
- Development of biotechnological methods as a part of forest genetics and tree breeding research

New topic:

- Responses of silver birch to atmospheric change

32. Silviculture, forest management planning and forest economics

- Management and utilization of birch – book project
- Decidious trees for energy wood: growing, quality and harvesting (*Betula pubescens, Populas tremula, Populus x tremuloides, Alnus incana*).
- Management regimes of silver birch stands (density of sapling stands, thinnings, rotation, growth and yield, stem quality)
- Birch growth and yield modelling *(continued)*
- Natural birch regeneration and development in mixed seedling stands (and the influence on growth and quality of coniferous tree species)
- Growing of high-quality timber in silver and curly birch stands:
    - New pruning trials: branch cutting techniques, pruning seasons
    - Larval tunnels of Phytobia betulea in birch wood from mixed stands
    - Birch growth and yield modelling *(continued)*

33. Wood science and technology

- Diversifying hardwood utilization: enhance and modernise the hardwood utilisation, saw milling and further processing of sawn wood, in particular
    - timber and wood properties and wood processing chains for hardwood raw materials *(continued)*
- Profitability of pruning birch with clipping tools
    - vulnerability to pruning defects
    - further development of tree quality
    - net income over the rotation and internal interest of investment in pruning
- Quality and value of birch logs imported from Russia: differences between Russian and Finnish and raw materials from the viewpoints of joinery and furniture products
    - Russian naturally regenerated birch stands, logs and wood in Eastern Karelia and St.Peterburg province vs. birch plantations in Eastern Finland
    - veneer, plywood and sawn goods
- European and hybrid aspen as raw materials for saw milling and further processing