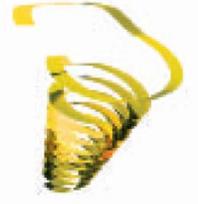


Forest-Based Sector
Technology Platform



*Developing the Strategic Research Agenda (SRA)
for the Forest-Based Sector Technology Platform (FTP)*

Collected themes: Forestry

May 16, 2005

Theme 1

Title: Entrepreneurship-based silvicultural services

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Providing products and services that respond to changes in societal needs.
- Responding to new competition from other regions.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: Throughout the whole Europe, provision of services for wood production as business has been dominated by public organizations. Aging population in most European countries create pressure on availability of labour for forest operations and tightens public funding. ICT-based solutions with improved logistics systems should provide improved cost efficiency for production of wood raw material with high production potential. Wood procurement in the Nordic countries has shown marked decrease in production unit costs. In silvicultural operations the cost trend has still been increasing. Decreasing cost of wood production would be one competitive factor in European forestry towards southern plantation forestry.

Approach: So far, the principles of production economics have been used to only a small extent in research of wood production operations. Utilization of ICT and logistics has played a key role in development wood procurement operations towards decreased unit costs during recent years. The hypothesis is that same cost trend could be true for wood production operations with a reasonable amount of research and development effort. As the place of public forestry organizations in wood production becomes partly taken by entrepreneurs and other private organizations, development of new principles for service marketing create basis for effective technology transfer to practical wood producers. The role of extensive silvicultural instruction organizations can be adjusted to tightening public funding.

Theme 2

Title: Availability of wood to the markets

Positioning:

- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: Private forest ownership in Finland and elsewhere in Europe provide less economic value for the owners than in the past. Forest owners are less interested in forestry and more and more forest land is left out from timber production. Relation to vision 2030: Key challenge to secure the availability of renewable raw material (solid wood and virgin fibre).

Approach: Research on attitudes of forest owners (behavioral studies). Research on mechanisms like owners associations and co-operatives to support wood production function of the forests (forest policy research). Competencies on both exist at universities and research institutes.

Theme 3

Title: New uses of wood and forests

Positioning:

- Customer: Expected response to future consumer needs.
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Providing products and services that respond to changes in societal needs.
- Substituting non-renewable materials through innovative solutions from forest-based materials.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: Forest sector development is mostly based on process innovations (forestry, sawing, pulp&paper). Most of the process innovations are aimed for production or energy efficiency improvement. This is acceptable, but aside this main stream of research, more attention should be paid on developing radical innovations. They exist for example in wood chemistry (biofuel), health products (xylitol, benecol), energy (wood residuals for energy, afforestation) and health (lignan). These provide many opportunities for new spin-offs in forest industries, where many opportunities are lost because the new innovations are not at the core of business strategies. Relation to Vision 2030: Key challenge that the new products and services respond to the changes in societal needs.

Approach: The approach could be to announce open a research programme or similar at national or Eu level to invite proposals for establishing new uses of wood and forests => the new "projects" initiated should then include R&D and perhaps enterprise incubators to really support for new livelihood. Methods for research vary according to the product or service in question. Competencies exist in universities and research institutes; the problem is rather on how to activate the competencies (like could be done with the mentioned research programme type of an instrument).

Theme 4

Title: Formation of wood properties in the growth process

Positioning:

- Customer: Expected response to future consumer needs.
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Attracting young talent to the sector.
- Increasing the share of high value added products offered to consumers.

Description: In order to understand how climate and forest management affect wood quality, we need to analyse the growth process which on one hand is affected by the environmental drivers, and on the other hand, results in the formation of wood properties, including knottiness and stem form as well as wood density, fiber properties, etc. The theme would integrate existing physiological and eco-physiological knowledge with raw material properties and requirements, as well as increase our knowledge base and understanding. This kind of integrated understanding is essential if we intend to develop the forestry value chain towards a knowledge-based technology. It provides the key link between silvicultural measures and industrial use of wood as raw material. It also helps understand the impacts of climate change on forest growth and wood quality.

Approach: This theme would link expertise on whole-tree physiology and wood material science. It could also benefit from biochemical understanding of the genetic aspects of wood formation. In addition, mathematical, modelling, and computing skills would be required.

Theme 5

Title: Impacts of unevenaged forest management on raw material production and properties

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Providing products and services that respond to changes in societal needs.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.

Description: In many countries forest policies are going towards more natural-like forest management which means heterogeneous forest structures regarding both species and age, and variable regeneration methods avoiding clear cuts. There is little information to date on the growth dynamics and optimum management methods of such forests, let alone the raw material properties of trees from heterogeneous forests. Economically competitive harvesting technologies particularly in unevenaged forests are also a challenge. Diagnostic methods are required to classify and mark the wood coming from such a resource.

Approach: This area should be studied combining empirical (silviculture + wood properties), theoretical (eco-physiological growth modelling, statistical analysis) and economic expertise. Required competence: - forest growth modelling - wood quality modelling - silviculture and forest management - tree eco-physiology - statistics, Bayesian analysis

Theme 6

Title: Technical, economic and social strategies and operative development of the value and procurement chains of wood raw materials within Europe, incl. profits and costs to the involved organisations and groups of people

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Providing products and services that respond to changes in societal needs.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Theme 7

Title: Linking profitable and environmentally, ecologically and socially sound forest silviculture and use for energy and industries in the sense of long-term sustainability in different European countries - model approach and case applications

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Substituting non-renewable materials through innovative solutions from forest-based materials.
- Becoming a major producer of "green electricity", biofuels and other bio-energy products.

Theme 8

Title: Methods and techniques of forest planning and decision support

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Providing products and services that respond to changes in societal needs.
- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: Forest management planning is a tool of central importance, both for providing forestry advisory service and for public participation, in forestry-related decision making. The aim in forest planning is to provide support for forestry decision-making, so that an efficient mix of inputs and outputs can be found for best fulfilling the criteria set for the management of the forest planning area. Forest simulators and numerical optimisation have long been employed in timber management planning worldwide. Today's forestry, with multiple criteria and functions, and often with multiple stakeholders with conflicting interests, calls however, for more flexible and versatile decision support than can be gained using "traditional" simulation and optimisation tools alone. Planning situations and planning needs vary greatly. Acquiring decision support for tactical planning is different from acquiring it for strategic planning; for non-industrial private forest planning compared to public or industrial forestry; for an individual decision-maker compared to a consortium; for planning solely for wood production in comparison to ecosystem management planning; or when using quantitative criteria in comparison to qualitative criteria; etc. R&D on forest planning should provide tools for different kinds of planning needs.

Approach:

Theme 9

Title: Acquiring and managing information on forest resources

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: Higher quality is continuously required of the information on forest resources in forest management planning and forestry decision-making. In addition, because of the needs to decrease management costs in forestry practice, the high quality information should in the future be able to be acquired cheaper than today. Correspondingly, new methods and practices are called for to improve the cost-efficiency of forest inventory. In order to fully exploit the utilities possible to gain by making use of modern methods and techniques of knowledge management, the quality of input data is essential. Currently, information available on forest resources is not satisfactory in this sense (to be used, e.g. in simulation and optimisation of forest development/use).

Approach:

Theme 10

Title: Possibilities to increase the profitability of forest management

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: Environmental and social pressures towards forestry and forest management are continuously increasing. At the same time we must be able to increase the profitability of forestry, and to secure the economic sustainability of forestry. An important research task therefore is to study possibilities to increase economically sound wood/timber production in areas where commercial wood/timber production is a priority.

Approach:

Theme 11

Title: Tailoring the wood and fibre properties using traditional breeding techniques or genetic engineering

Positioning:

- Customer: Expected response to future consumer needs.
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Responding to new competition from other regions.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: This is a sub-research area in the WoodWisdom Net ERA Net project under the area sustainable forest productivity

Approach:

Theme 12

Title: Understanding the factors affecting wood and fibre properties (forest management, climate change ect.)

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: This is a sub-research area in the WoodWisdom Net ERA Net project under the area sustainable forest productivity

Approach:

Theme 13

Title: In biorefinery concept optimizing the raw material supply chain for specific products or demands

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Becoming a major producer of "green electricity", biofuels and other bio-energy products.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: This is a sub-research area in the WoodWisdom Net ERA Net project under the area sustainable forest productivity

Approach:

Theme 14

Title: Efficient Processes

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Developing new industrial activities based on “green chemicals” from wood.

Description: More efficient processes: - better utilisation of wood in the processes, by-products -low environmental load, all components are utilized - minimizing of the losses

Approach:

Theme 15

Title: Non-wood fibres

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: Non-wood fibres utilisation - biotechnology, not conventional processes - special fibre production with special properties

Approach: Biotechnology Animal sciences, some animals can eat non-wood and other components are utilized but fibres are left.

Theme 16

Title: New plants and trees

Positioning:

- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: Plant modification, one part is utilized for food and part for fibre production. Common benefit food and fibre.

Approach: Food and chemical sciences Biotechnology Plant sciences

Theme 17

Title: Energy efficiency with papermachine clothing

Positioning:

- Energy: Expected impact on energy production and use (energy from forest biomass, energy efficiency etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Substituting non-renewable materials through innovative solutions from forest-based materials.
- Becoming a major producer of “green electricity”, biofuels and other bio-energy products.

Description: The aim of the program is to identify and develop highly effective and sustainable concepts of paper machine clothing, especially belts and press felts, and drying section wire-belts. The energy efficiency of paper machine is especially depending on the mechanical water separation without necessity of evaporating high volumes of water. The press concepts, like shoe press, are developed in the recent years due to increased line speeds and now increasingly also taking the high energy cost in the engineering parameters. In the second research line the mechanical properties and hydrodynamic efficiency of paper machine cloths in press section are of increasing development needs. Requirements of high pressing, long operation times, and especially efficient water removal achievable through optimized construction and material will be answered. The third research line is related to drying section, where efficiency is improved mainly increasing the allowable delta temperature and net heat requiring also new wire-belt materials and constructions.

Approach: A key concept for development is the improved materials and constructions of paper machine cloths especially belts and press felts, and drying section wire-belts, enabling advanced engineering parameters and optimized operation for paper machinery.

Theme 18

Title: Surface modification of fibre based products

Positioning:

- Customer: Expected response to future consumer needs.
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Developing and designing products that can be recycled, reused and finally converted to bio-energy.
- Responding to new competition from other regions.
- Increasing the share of high value added products offered to consumers.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: The aim of the program is to identify and develop highly effective chemicals and polymers enabling surface modification of fibre based products with minute amount of chemicals. The surface energy modification of printable paper and board is essentials of the high value products. Highly filled and coated qualities are, however, a problem for recycling. The high consumption of chemicals is as well issue of production costs. Thus high performance chemicals, typically functional polymers and supra-molecular substances are developed to improve the overall product efficiency. In the second research line is developed non-contacting coating methods, such as high speed and electrostatic spraying for very low amounts of polymers, adhesives, and other surface modifiers to be spread in roll-to-roll process on the paper or board substrate. The third research line is related to chemical converting of the paper and board in reactive gas-phase typically in presence of reactive species through corona or plasma. Process is resulting chemically modified grafted fibre product.

Approach: A key concept for development of existing industrial raw materials in fibre based industries into efficiently modified and easy to re-circulate products. This requires development of highly effective chemicals, which are only economically viable through coating technology able of handling very small amounts of the chemicals. For the second and third item the technology should be viable also for chemical additivation of the soft paper and hygienic products.

Theme 19

Title: Biodiversity and forestry

Positioning:

- Customer: Expected response to future consumer needs.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.

Description: We don't have enough information about how forestry really affects biodiversity and where we should do investments in forest management to reach best results from the biodiversity point of view. If we would have large common understanding about real connection between forestry and biodiversity, we would have also largely accepted forestry productions and understanding that we do sustainable natural resources management.

Approach: Inventories of biodiversity and endangered species in different circumstances in large area scale. Comparison of forestry methods in large area scale, how these methods affect in biodiversity and endangered species and their relationship. Good competency in biology, biodiversity and knowledge of species and ecosystems.

Theme 20

Title: Use of information technology in forestry

Positioning:

- Customer: Expected response to future consumer needs.
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Providing products and services that respond to changes in societal needs.
- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Attracting young talent to the sector.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: Develop the use of information systems and new technologies in forest planning and delivery of forest natural resources information for public consumers. Forest planning should become much more automatic by using satellites, multi-information coming from different systems and delivery of this information should be done to public by internet to make it possible for interests to participate the planning processes or to get otherwise needed information about forests and recreation or other multiple use of natural resources in forests. This way we could get people more interested in forests and the use of forests for many purposes. Forest could be much more used in wellbeing of citizens and maybe also it would bring young talented to work in forestry.

Approach: Develop and testing of information systems very much maybe used in other sectors of society. How to get information of multiple use of forests to become available for large public.

Theme 21

Title: Mechanization and automatization of wood production.

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Attracting young talent to the sector.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: Technological development of silvicultural work in forestry. First there should be much more machines doing silvicultural work in forests and next step there should be "robots" very much doing this work in forests. This way we could respond the need of employees in forestry and also keep costs in the reasonable level in future.

Approach: The use of applications in other technical areas for forestry work and co-operation with technical development processes. Technical competency together with forestry work.

Theme 22

Title: Production of forest based chemicals

Positioning:

- Customer: Expected response to future consumer needs.
- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Substituting non-renewable materials through innovative solutions from forest-based materials.

Description: Forest is a renewable source for rawmaterials for the production of bio-chemicals. It can be chemicals produced from the different parts of the tree as well as chemicals produced from other forest biomaterial It can be rawmeterials for drugs as well as rawmaterial for the production of polymers and also for the production of liquid fuels to be used in cars.

Approach: A good combination of wood chemistry and other branches of chemistry (polymer, medical) in order to make use of the chemical components in different parts of the tree. The focus should not be totaly on trees and different parts of the trees but also on other “forest products”.

Theme 23

Title: Usage of fiber rawmaterials from “fiber fields”

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Responding to new competition from other regions.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: In tropical and sub-tropical areas of the world, forests are managed for the production of fibers. i.e. short rotation. It is clear that the production of fibers, due to different climat, can not be as effective in Europ as in tropical areas, but also the magement of the forest has an other goal (production of timber). If the goal for the forest management was to produce fibers (long or short fibers), the production would be much higher (calculated as kg of fibers / ha / year). The quality of such fibers would be different and the suitability for paper and board production is not totaly known. Also the fertilazation and harvesting would require research. As such short rotation (15-30 year) fiber fields would have a positive effect on carbon balance.

Approach: A combination of pulp and paper competence with forest management in order to be able to evaluate what the fiber properties such a tree produced under different growing conditions. Also long term studies of growing potential of such “fiber fields

Theme 24

Title: A better use of european fiber rawmaterial in the production of paper and board

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Responding to new competition from other regions.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.

Description: The competition with fast growing eucalyptus in tropical parts of the world will lead to problems for some european tree species (birch, poplar...) as a rawmaterial for the production of paper and board. By using these wood material optimal the usage of european forest can be continued. As an example the usage of birch as raw material for CTMP will increase its potential to compete with eucalyptus. Also higher yield in kraft cooking will result in a better use of the existing rawmaterial. Also the optimal usage of the wood as a rawmaterial to be divided into fibers and energy (what is the optimal yield/energy output of the kraft mill). A production change from chemical pulp to high yield pulps and the influence of this on paper and board qualities.

Approach: A better understanding of the optimal fiber for different paper and board grades is needed. Better energy output from the kraft mill will result in both a energy and fiber production.

Theme 25

Title: Bio-chemistry (bio-polymers, green composites, chemicals for enhancing biological durability but also for all potential end uses)

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Substituting non-renewable materials through innovative solutions from forest-based materials.

Description: Bio-chemistry - (bio-polymers, green composites, chemicals for enhancing biological durability but also all potential end uses) Goals: To develop bio-based chemicals needed to substitute existing chemicals out of oil and other non-renewable raw-materials. New products for forestry and forest procurement to support old industries and forest products to carry the costs in forestry.

Approach:

Theme 26

Title: End use fitted forestry and raw-material base in Nordic countries.

Positioning:

- Customer: Expected response to future consumer needs.
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Achieving a significant decrease in capital intensity and increased production flexibility through process innovations.
- Responding to new competition from other regions.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: End use fitted forestry and raw-material base in Nordic countries. Different forest practices & cutting patterns for different product value chains (also sawmilling). Genus modified plantation forests. Homogenous raw-material base, regarding size & growth, for wood products industry. Optimizing of value chain from plantation forests to manufacturing process of specific wood products.

Approach:

Theme 27

Title: Changing forests

Positioning:

- Customer: Expected response to future consumer needs.
- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: Forests in Europe are changing rapidly. Climate change is a major challenge for forest research that is tried to solve either by finding suitable variation in present tree populations, or by locally changing tree species used in forestry. Modern forest industry has high demands for the wood material which encourages studies on variety of different tree species. The free markets of seedlings within EU also possesses new challenges for forest research to define suitable planting areas for foreign seedling material. These activities: change in the species composition or in the origin of seedling should be studied for economical reasons, and for their general impact to the forest ecosystems (e.g., biodiversity).

Approach: Multidisciplinary forest research: forest genetics and tree breeding, wood material science, silviculture and growth, forest pathology, biodiversity studies.

Theme 28

Title: Factors influencing natural variation in wood quality traits

Positioning:

- Customer: Expected response to future consumer needs.
- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Providing products and services that respond to changes in societal needs.
- Developing and designing products that can be recycled, reused and finally converted to bio-energy.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the share of high value added products offered to consumers.
- Taking advantage in process and product developments of alliances with other sectors and of exploiting emerging technologies.

Description: Factors influencing wood quality can be divided into environmental effects and to genetic components. The research here would mainly address the genetic components. A good understanding of the genetic basis of wood quality would aid in controlling aspects of wood quality, either through environmental manipulation, or through breeding and genetics. It is especially important to be able to use the natural genetic variation that is available in the forests now. This variation is adapted to the environment and the rest of the genome, and further, is accepted by the consumers. Various modern genetic methods can be used to access this variation.

Approach: The detecting of natural variation in wood quality requires a combination of approaches, including molecular population genetics, plant physiology, wood chemistry and quantitative genetics. Using methods like those in human health genetics, it is possible to identify the loci that most contribute to natural variation in wood, and examine methods to cause changes in the quality.

Theme 29

Title: Adaptation of trees to climate change

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Attracting young talent to the sector.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: Trees are quite well adapted to the locations where they grow, but the environment is changing rapidly. It is important to examine how genetic adaptation could be used to assure well adapted, high biodiversity forests also in the future. This requires examining the genetics of adaptation.

Approach: Examining natural variation in adaptation is the key to this approach. It will be important to identify the actual genes that could contribute to climatic adaptation, i.e. those that control the timing of various biological processes, such as cessation of growth in the fall, or beginning of growth in the spring. Further, cold tolerance will be an important part of the physiology to be examined, as well as disease resistance. We need to combine physiology, genetics, molecular biology, population biology, and bioinformatics in these approaches.

Theme 30

Title: Innovation management in forestry

Positioning:

- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Providing products and services that respond to changes in societal needs.
- Responding to new competition from other regions.

Description: Innovation level in forestry and forest products industry should be raised. We should strengthen the ability of forest organizations, forest owners and other members of value chain to meet future competition through new innovative environment.

Approach:

Theme 31

Title: ENERGYQUALITY

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).
- Energy: Expected impact on energy production and use (energy from forest biomass, energy efficiency etc).

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: Logistics of wood energy harvesting and quality improvement (ENERGYQUALITY) Wood energy harvesting can be done as separate operation or integrated with normal forest harvesting. All stages of the operation also affect the quality of produced energy wood and have impact on the environment e.g. as different amounts of nutrients removed from the site. Also at the present increasing use of wood energy implies collection of energy wood from clear cut areas and thinning also from areas with less energy density per area unit. The economy of harvesting and transport technology becomes vital for viable collection of wood biomass. Thus research on the optimization of the logistic chain of wood from felling to the power plant is needed. It should look apart from the present technology where different fractions of wood are separated in the early stages of harvesting also other options where fractioning of woody material is performed at different stages of chain. At the same time the quality of wood measured as energy content can be affected. The environmental consequences of different harvesting technologies should also be taken into consideration the most economically and environmentally sustainable methodologies as a goal.

Approach: The research team consists of forest technology, forest economy (business economy), logistics and forest environment researchers. It should also involve forest machinery industry. The emphasis in the approach should be economical taking also into account the environmental price of the removal of wood residues from forest. Specially the effects of whole-tree harvesting on the nutrient balance on peatlands should be given consideration. The effects of logging, haulage and storing on the quality of biomass as well as effects of different methods of storing to promote drying and prevent loss of energy content should be studied as part of the whole wood energy chain from stump to plant.

Theme 32

Title: PEATFOREST

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: Challenges of peatland forestry (PEATFOREST) Drained peatlands (app. 5 mill ha) produce about one fifth of our annual wood raw material. The area of peatlands needing either silvicultural, logging or ditch network maintenance operations is increasing and will continue to increase in the near future. The properties of peatlands change after drainage, after logging, after complementary drainage and after clear felling. The knowledge about these changes is inadequate. There is continuous and growing need to keep peatlands productive and at the same time minimize the possible environmental risks that are related to the forestry operations on peatlands. The challenge is to find economically and environmentally sound methods for utilizing peatlands for forestry.

Approach: The research in this area would need multidisciplinary approach involving silviculturists, forest and wood technologists, soil scientists, and economists to solve the problems. That would also involve machine developers to overcome the special conditions of peatlands. The quality of the wood for various end use purposes produced in peatlands also should be studied.

Theme 33

Title: EUFORMA

Positioning:

- Customer: Expected response to future consumer needs.
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Providing products and services that respond to changes in societal needs.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Substituting non-renewable materials through innovative solutions from forest-based materials.

Description: End-user based forest management (EUFORMA) As the rotation of forests in boreal zone is long, it has been seen wise to base the forest management on a few general principles that are expected to produce a quite wide range of products and give safe income. However, the product scale has increased and is expected to increase in the future. The present silvicultural and management practice is not optimal for all the uses wood may have. There is need to study possibilities to produce wood for predetermined use and find out how much productivity could be increased by separating management methods, starting from the regeneration, depending on the end use of wood. This idea is already in the use in short rotation tropical plantations.

Approach: This research would need silviculturists, growth and yield scientists, economists, forest technologists, wood technologists and wood processing industries to work together. To shorten the research time and get indicative results first modelling approach would be ideal. However, some more field research and permanent sample plots would be needed to study effects of new management alternatives.

Theme 34

Title: Willingness to supply wood and changing motives and structure of forest owners

Positioning:

- Energy: Expected impact on energy production and use (energy from forest biomass, energy efficiency etc).
- Competitiveness: Expected impact on the competitiveness of European industry/companies in global competition.

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Responding to new competition from other regions.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.
- Becoming a major producer of “green electricity”, biofuels and other bio-energy products.

Description: Forest ownership in Europe is dominated by private ownership. The ownership is fairly fragmented and will be even more so. At the same time, forest owners structure (age, profession, rural vs. urban background) is changing, and the motives, attitudes and interest among forest owners change. The expected changes or the speed of change are not well-known. However, these should be known to be able to anticipate potential changes in wood supply, interest to supply recreational or other non-wood utilities, to meet the growing demand for wood biomass for energy, and forest owners' interest to invest in forest management.

Approach: Methods: Data needed: cross-sectional survey and panel data about forest owners, combinations of survey data with other type of data, Methods: econometric statistical analyses, qualitative analyses, future scenarios

Theme 35

Title: Forests role as renewable energy source and new products from wood

Positioning:

- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).
- Energy: Expected impact on energy production and use (energy from forest biomass, energy efficiency etc).

Challenges and Opportunities:

- Helping society to mitigate climate change.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Providing products and services that respond to changes in societal needs.
- Substituting non-renewable materials through innovative solutions from forest-based materials.
- Developing new industrial activities based on "green chemicals" from wood.
- Becoming a major producer of "green electricity", biofuels and other bio-energy products.

Description: Analysis of forests as potential source of wood-based fuels, connected various energy products and technologies, and other new products from wood (chemicals, nutrients etc.), outlook for markets for energy and potential other new products from wood biomass

Approach: various methods: Analysis of forest resources and their growth Production technology (production of liquid/solid fuels, other potential products, such as chemicals) Analysis of future potential of markets and trade flows in Europe, identification of competing new or existing products/materials

Theme 36

Title: Forest management schemes which combine wood production and recreation/scenic issues and other forestry functions in effective and balanced way

Positioning:

- Customer: Expected response to future consumer needs.
- Society: Expected impact on prioritized social and general economic goals of the EU (employment in rural areas, development of SMEs, etc).
- Environment: Expected impact on main environmental drivers (water consumption, wastes, emissions/effluents, climate, chain issues etc).

Challenges and Opportunities:

- Securing the availability of renewable raw materials, while supporting the varied uses of forests and safeguarding biodiversity, through sustainable forest management.
- Obtaining an economic and environmental balance in using forest biomass for products and energy, as well as substantially improving the industry's energy efficiency.
- Providing products and services that respond to changes in societal needs.
- Balancing forests as a resource for renewable raw material with other important functions such as offering recreation and safeguarding biodiversity.
- Increasing the availability of renewable resources, e.g. through afforestation, and extending their use in new and existing applications thus securing forest-based materials as the material of choice.

Description: Society's values, and thus also functions of forestry from the society's point of view, keep on changing in Europe. In the future, other functions than wood production become increasingly important (water management, climate change etc.) but the importance of existing major functions, such as wood production, hunting and recreation, remain at least as important as these are at the moment. Thus, there is a clear need to develop methods of forest management which could take into consideration, and efficiently contribute, to several objectives and functions of forestry at one time.

Approach: