IMACFORD Task B1

Regional workshop "Research needs for the sustainable management of cultivated forests"
Consultation of the Portuguese forestry-wood chains actors

7/8 April 2003 – Celbi, Óbidos- Portugal

- Main points of discussion

Appendix
1. *Workshop programme*
2. *Participants*

Approximately 80 people attended the Portuguese workshop. Representatives of the forestry sector (private forest owners associations, public and private forest companies, forest development organisations), the industrial sector (pulp and sawing companies), the governmental and no-governmental environmental organisations, the national forest authority and the private and public research communities (the full list of participants is given in annex), have demonstrated their interest in an open inter-professional discussion on research priorities for the development of the forest activities in Portugal.

The large participation of the public research community and the forestry sector shows the willingness to bring the national research closer to end-users expectations and to reinforce the cooperation for the transfer of new tools and methodologies from research to practice.

Some specific research needs have been expressed by the participants.

1. Research needs expressed by the forestry and wood sectors – context and expectations

1.1. Silviculture, forest planning and inventories

The assessment of the sustainability of the current silvicultural practices (e.g. soil preparation) regarding some essential forest productivity factors (e.g. soil and water) needs to be conducted in order to provide Portuguese forest managers with technical guidelines for the sustainable management of their forest stands (e.g. concrete means to avoid soil erosion). Moreover, research needs to integrate the environmental, social and economic impacts of silvicultural practices into the recommendations provided by decision support systems.
In intensive forestry contexts (e.g. eucalypts plantations), the management of soil fertility is an essential issue and the foresters are interested in the maintenance of forest stand fertility. In parallel, pulp mills produce a high volume of mineral ashes and their destruction is expensive (Araujo, Celbi). The opportunities to fertilize forests with industrial residues have to be further explored. More generally, in order to supply the right quantity of nutrients, research has to better understand the role of soils and silvicultures on tree growth. Furthermore, scientific studies have to be conducted to identify the appropriate fertilization practices (operating conditions, quantity of fertilizers and cost) and the impacts of added nutrients on site productivity and ecological parameters (soils, water, forest health, biodiversity).

Considering the socio-economic demands for wood quality, non-wood forest products (cork, pine cones, resin and hunting) and forest services (e.g. recreation or biodiversity), research has to propose silvicultural scenarios that enhance new forest uses, for both industrial forest tree species (maritime pine, eucalypts and cork oak) and other forest tree species (stone pine, holm oak, chestnut tree, acacia).

For instance, research should explore new attractive forestry schemes in order to avoid the negative environmental impacts of the plantation of eucalyptus in poor soils (e.g. higher biotic risk) and to optimize the economic investments (Sande Silva, LPN).
Furthermore, considering the emerging market of carbon credits, the Portuguese forest managers could be interested in the implementation of silvicultural scenarios to store carbon in their forests in order to diversify their income or to allocate funds to non-wood forest productions. In that perspective, research still has to evaluate the energetic efficiency and the economic balance of "carbon-sink scenarios" within the Portuguese forest context (Calado, AFLOPS).

To contribute to the achievement of the multiple socio-economic demands towards forests, the forest models need to integrate new variables from the forest inventories. It concerns the tree level (mensurations, wood quality, bark content and wood density) as well as the stand level (non-wood products or biodiversity). Methodologies to collect the new data and tools to map the data on the territory have to be further explored (Tomé, ISA).

1.2. Risk management

FOREST HEALTH

The understanding of health and vitality conditions of the forest stands (silviculture, site, tree species) is required for the implementation of sustainable silvicultural practices (Calado, AFLOPS). Research also has to propose curative methods to eradicate the Pine nematode (*Bursaphelenchus xylophilus).*

FOREST FIRES

Mainly because of the predominance of unmanaged small scale forest ownerships, forest fires represent a considerable threat to the development of the forestry sector in Portugal. Therefore, forest fires control is a major issue to both private and public forest actors (Rato, DGF).
At the forest manager level, silvicultural practices that enhance forest fires prevention need to be developed. For research, it concerns the identification of preventive methods (pruning, burning), regarding their cost and their efficiency to prevent forest fires (Sande Silva, LPN). The effects of both tree species and stand structures on fire behaviours also need to be better understood in order to provide silvicultural recommendations to the foresters.
At the national level, planning strategies and protection methods are required by the national forest authority in order to fulfil its political commitments on forest fires control (Rato, DGF).

1.3. Degraded soil rehabilitation

In Portugal, site rehabilitation techniques are claimed by the foresters because of the importance of the erosion process and the large surface of burnt areas (Cunha, Forestis).

1.4. Biodiversity

Inventories of the biodiversity associated to Portuguese forest ecosystems are required for the integration of biodiversity conservation into forest management models (Leal, CELPA). Also, technical recommendations for the enhancement of biodiversity in private forests (and multifunctionality in a broader sense) would help the foresters to implement the Natura 2000 network requirements (Calado, AFLOPS).
Studies on the impacts of the invasiveness of eucalypts (as exotic tree species) in remarkable habitats would help landscape planning of the areas surrounding the protected areas (Sande Silva, LPN).

1.5. Competitiveness of the forestry-wood chains

WOOD QUALITY AND PRODUCTS

The main discriminative factor of a broader commercial use of wood products lies in the natural heterogeneity of the material. Wood quality improvement represents a key issue for the economic development of the forestry and wood sectors (Baptista, SONAE).
To provide their customers with homogeneous wood products and to optimize the cost of the industrial processes, sawmills need tools to classify timber in accordance to simple criteria for wood quality (wood density, log geometry, log quality, decaying rates).

Analyses of the forest products markets (wood products, cork, resin, pine cones, hunting, mushrooms, etc.) also have to be conducted in order to better identify the market opportunities for the whole forestry-wood actors. For instance, is there a niche market for acacia wood products? Moreover, from a better understanding of the forest products markets, the development of an adequate marketing strategy would serve the forestry-wood sectors in anticipating the market demands.
The emerging markets of environmental services provided by forests (carbon, biodiversity, soils and water conservation, recreation, landscape, etc.) also have to be further explored (Leal, CELPA).

FOREST OPERATIONS AND EQUIPMENTS
Key parameters for the improvement of the competitiveness of the forestry-wood chains lie in the optimization of the forest works (costs) and logs transportation (fuel consumption). In that perspective, optimised logistic systems coupled with GIS are required.

To reduce the costs of the logging operations, the forest contractors need tools to identify the right equipments and techniques (Gomes, ESAC) in relation with the forest and site characteristics (surface, slopes, soil humidity, etc.). Furthermore, contractors have to rely on technical recommendations for the integration of environmental constraints in the site preparation techniques (e.g. erosion control).
Applied research also has to develop environmental-friendly and product-adapted (resin, cork, pine seeds) forest operations machines (Araujo, Celbi).

INDUSTRIAL PROCESSES
The pulp companies need to optimize their fabrication processes (better yield and lower lignin content) and, at the same time, to reduce their energy and chemical products consumptions (less chemical inputs and less leachings). Another main issue for the pulp companies is to adapt their industrial process to provide their customer with homogeneous products (Venzeller, Celbi).

1.6. Tree breeding

To achieve the process and market constraints, the pulp companies require fibres with good mechanical and optical properties. In addition to the optimization of the industrial processes, genetic improvement programmes for better fibre properties are need to be developed (Venzeller, Celbi).

In the context of less intensively managed forests, the quality of forest reproductive material is quite often overlooked by the foresters. In order to improve globally the forest productivity and the wood quality in Portugal, the establishment of rules for seed collection in forests and the improvement of the controls concerning the production of commercial seeds in nursery (towards the certification of tree seeds) are necessary regulatory tools.

1.7. Socio-economics

In Portugal, the high forest fragmentation implies serious constraints regarding the industrial wood supply (70% of the eucalypts stands are owned by non-industrial private forest owners). Most of the time, small scale forests are not managed and they constitute an important threat for the whole forestry-wood chains (forest fires, sanitary problems).
In that context, the understanding of the private forest owners motivations and decision-making processes represents an essential issue for the development of the Portuguese forestry-wood sectors. Specific forest management tools have to be developed for small scale forestry systems (Araujo, Celbi).

The new economic opportunities for the forest owners to fund the fulfilment of traditional forest productions (wood and non-wood products) and forest services (carbon, recreation, biodiversity, soil conservation) should be integrated within the forest management tools. Also, considering the enhancement at the regional level of multifunctional forestry systems through Natura 2000 network, the viability between conservation values and local forest economies (forestry, hunting, etc.) need to be assessed by the research community.
In addition to those new social demands, the impacts of the forest operations on landscapes have to be scientifically evaluated and landscape management guidelines are required.

1.8. Sustainable Forest Management (SFM)

Portugal has signed the international commitments on SFM (Rio, Helsinki). To achieve the international obligations and the new market demands for certified forest products (Calado, AFLOPS), the Portuguese R&D sectors need to elaborate scientifically-based indicators of SFM.
The definition of the relevant indicators, the scale for their reliability, the methodologies and the cost of their assessment are still required (Rato, DGF).

2. Research needs expressed by the scientific community – research programme opportunities

2.1. Silviculture and modelling

In order to better understand forest ecosystem functioning, to integrate the scientific results at regional/national scale (tree breeding, forest health, edaphology, etc.), or to identify adequate forest management practices, scientists and forest managers need complex process-based and empirical models that take into account both current and future "natural" (e.g. climate change) and "anthropic" parameters (e.g. demands for new forest products and services) and that provide multiple, reliable and pragmatic outputs (Tomé, ISA).

In term of inputs, the forest models have to integrate the changing "natural" parameters (climate, site characteristics, abiotic risks, forest species natural dynamics, biodiversity, etc.) as well as the parameters that can be directly modified by humans (silviculture regimes, genetic pool and biotic risks). In accordance with what has been presented above, the scientific and economic challenge for forest inventories is to provide research with new reliable and cost effectiveness data at the tree and the stand level.

In term of outputs for the models, forest managers and the people in charge of landscape planning need to simulate and to assess, in an ecological and socio-economic changing context, the impacts of their choices on forest ecosystem components (soil, water, biodiversity), forest productivity (wood quality, non-wood forest products), and microeconomics (profitability of the forest scenario).
One practical challenge lies in transferring the information from detailed scientific models to empirical forest growth models that can be easily used in forest management models. The development of forest growth models in association with GIS will provide decision support tools for forestry practices as well as for policy making.

2.2. Tree breeding

In the Portuguese context, the climate change scenarios are foreseeing that water stress will become a leading constraint to forest primary production. Therefore, tree breeding strategies have to be focused on the improvement of adaptability factors (drought tolerance and resistance to pests and diseases) as well as forest productivity and quality of forest products (market demands).
Nevertheless, strong constraints are limiting the large deployment of genetically improved trees in the Portuguese forests (Almeida, ISA). In addition to the problem of overlooked seeds quality, erratic public financings represent a constraint for the fulfilment of the long-term tree breeding objectives, like for instance the conservation of the genetic diversity of non-industrial tree species (*Umbrella pine*, *Holm oak*, etc.).

For the tree breeders, physiological markers are needed in order to improve the efficiency of indirect selection for adaptability (low genetic heritability). Regarding the development of early selection tests useful in the optimization of the genetic improvement processes, research needs to elaborate molecular markers based on the genetic architecture of the economic traits of interest.

A larger deployment of improved varieties in the forests lies on the diffusion of a reliable and pragmatic information to the foresters. For instance, the integration of the silvicultural requirements of improved varieties (fertilization, thinning, spacing, etc.) into forest models would conduct to provide forest managers with optimized silvicultural recommendations.

2.3. Forest health

The development of models to predict sanitary risks lies on the evaluation of the density of forest pests and diseases populations in relation with the damages occurred at stand and landscape level. To achieve that objective, a national forest health survey system is required (Branco, ISA).
The understanding of the biotic risks associated with (i) the planning of trees and crops biodiversity at landscape level, (ii) the silvicultural scenarios (tree species, shortening rotation time), and (iii) the silvicultural management practices (fertilizations, thinning, pruning, understorey management) would lead to the edition of pragmatic silvicultural guidelines for a biotic risk management strategy.

Furthermore, within an intensive forestry system in which genetically improved varieties are commonly used, the evaluation of the susceptibility of those new varieties (e.g. genetically modified trees) to pests and diseases are required by the tree breeders for the integration of biotic risks into their genetic improvement programmes.

Regarding the forest managers, the development of Integrated Pest Management strategies (biological control and use of semiochemicals) would favour an ecologically-friendly and economically-reasonable control of biotic threats. To achieve this objective, studies on the direct (forest productivity) and indirect (forest services) costs and benefits of those strategies need to be assessed. Integrated Pest Management strategies have to be included into decision support systems.

CONCLUSIONS OF THE WORKSHOP

The representatives of the Portuguese forestry-wood sectors expressed the willingness to adapt their current development strategies in order to fulfil the new market and society requirements for forests. In that perspective, they demanded diversified and profitable forestry options through the proposal of new silvicultural scenarios (for both industrial and non-economically traditional forest tree species) to enhance wood quality or to ensure the production of non-wood forests goods and services.
In addition to that, the end-users asked for new development tools to optimize their activities (logistic systems, decision support tools, certified plants) and to achieve the new requirements of sustainable forest management (indicators, technical guidelines).
Furthermore, the socio-economic actors stressed the importance to better protect the Portuguese forests from biotic and abiotic threats through the development of new strategies (forest fire prevention strategies, integrated pest management approaches) and tools (decision support systems that do integrate the multiple risks).

To contribute to the achievement of their requirements, the end-users highlighted the central role of research. Nevertheless, they agreed on the necessary reorganisation of the relations between the research organisations in Portugal. Setting up multidisciplinary teams and national and interregional research networks would avoid effort duplications (Rato, DGF).
The participants also highlighted the necessity to define new financing opportunities for the research sector in order to solve the recurrent problem of erratic public financings and its impacts on the implementation of long term research activities (e.g. tree breeding).

In order to capture all gains, research has to be followed by efficient technology transfers for day-to-day operations. In that perspective, the idea to set up a Portuguese “forest information system” emerged from the discussion (Cunha, Forestis). This intersectorial platform would contribute to the development of the forest activities by the enhancement of exchanges in terms of (i) diffusion of the scientific results, (ii) identification, anticipation and definition of research priorities from end-users and Society research needs, (iii) development of knowledge and technology transfer strategies in order to provide the end-users with the tools and methodologies they require.