Transnational Innovation Road Map and Research Agenda – Filling Innovation Gaps

Background – Innovation and Research in the primary forest fuel sector

FOROPA analysed the innovation needs of forest owners, enterprises and commercial end users in the forest fuel supply chain. However, there are some peculiarities of the primary forest fuel sector that influence innovation activities and research: (i) The forest-based sector (providing round wood and woody biomass) is a traditionally cost-based sector shaped by SMEs and small family-owned businesses; (ii) Long-term relations along the value chain dominate; (iii) The innovation behaviour is generally slow and concentrates mostly on the adaptation of proven practices and of copying of what others do; (iv) R&D spending and research-driven innovations are dramatically low in comparison to other industrial sectors. As innovation can only be gradually infused into the sector through a long bottom-up process or through a faster top-down procedure, intermediaries have been formed in the forest sector across Europe to overcome those structural deficits and play a vital role supporting innovation processes, RTD development and transnational cooperation and coordination activities.

In this sense, the FOROPA partners exploited the interregional nature of the project:

(i) to raise the awareness of the stakeholders along the biomass value chain on innovation and innovation processes, (ii) to facilitate the uptake and diffusion of new technologies and processes by entrepreneurs along the biomass supply chain, (iii) to transfer best practices and knowledge to less advanced partners and regions, and (iv) to enhance efficiency and performance of regional innovation providers.

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The technology roadmap on bioenergy for heat and power (IEA 2012, p6) defines as one key action "support international collaboration on capacity building and technology transfer to promote the adoption of best practices in sustainable agriculture, forestry and bioenergy production." Therefore, FOROPA itself can be seen as measure related to this key action, surveying best practices in the forest fuel supply chain and specifying in detail the interregional process of adopting best practices. Additionally, a second key action, namely to "support the installation of more pilot and demonstration projects, including their complete supply chains (IEA 2012, p6) has been taken by FOROPA by promoting cross boarder implementations of pilot projects covering the whole forest fuel supply chain. Based on these pillars of the roadmap on bioenergy for heat and power (IEA 2012) it was possible for FOROPA to include both, practitioners and scientists view to identify the following, forest fuel supply chain specific innovation needs:

- **Introduce new and expand existing innovation networks in SEE**
    - Promote international R&D collaboration

- Stimulate use of national competencies
- Enhance adaption and implementation of best practices in the forest fuel supply chain

- **Improve process and customer orientation**
  - Use of online tools for selling forest fuel assortments (online information/ordering platform for biomass, Biomass trading Geo Portal)
  - Increase the use of ICT within all processes
  - Automatic round wood takeover at biomass trade centres
  - Enabling the possibility for customers to pick up firewood outside the opening hours of biomass trade centres or similar retailers
  - Introduce trademarks
  - Biomass trade centres: such facilities have been established for example in Styria, but are absent in most of the other region although there are many people using wood for residential heating

- **How to reduce the energy input in the supply chain?**
  - Reduction of energy input in processing biomass (e.g. chipping)
  - Increase tool life and extend periodicity of maintenance to reduce overall energy input over the life time
  - Apply economic methods to determine optimal processing with reduced energy input
  - Reduction of energy consumption in forest fuel logistics

- **How to store biofuels?**
  - Improving storage properties of slash
  - Improving properties of storage rooms for pellets at the consumer
  - Increase the knowledge of long-term storage of wood pellets. Europe needs to be independent of fossil fuels; however, fuels must be stored to bridge temporary shortages and as a strategic reserve
  - Study self-ignition of stored material.

- **How to improve material characteristics?**
  - Develop new methods for easily measuring quality characteristics
  - Drying of forest fuels
    - Technologies
    - Economic calculations

        - Incorporation is efficient supply chain
    - Torrefaction
    - Reduce contamination of forest fuel due to harvesting techniques
    - Separation of undesired contaminations
- **How to improve forest fuel logistic concepts?**
    - Increase the use of the railway for forest fuel transport
    - Use inland water way for forest fuel transport if possible
    - Seek for multimodal solution for forest fuel transport
    - Increase the number and capability of biomass terminals
    - Balance intermediate storage against the connected extra costs
    - Optimize location and capacity of comminution
    - Develop methods to reduce empty drives (Special case: In order to reduce empty trips of round wood trucks which deliver wood to a sawmill with included pellet plant and delivering wood pellets to an intermediate storage, pellets in Big Bags shall be transported by the trucks on their way from the sawmill/pellet plant to the forest sites)
    - Develop new types of containers or adapt existing container types according to customer needs and feedstock properties
    - Increase the use of a system enabling delivery of wood chips (blow into storage) similar to pellets
    - Studying the interaction of different supply chains to each other
    - Creation of material flow analysis for biomass in the different regions
- **How to expand the resource basis for bioenergy generation?**
    - Market barriers should be eliminated by uniform quality standards and the increasing need for resources should be served by an extension of the usable feedstock
    - Energetic use of wood from slopes, meadows and less economically valuable forests
    - Harvesting and energetic utilization of non-woody biomass (e.g. reed, miscanthus, etc.)
    - Broadleaved wood utilization efficiency increase in some regions
    - Fundamental research in breeding and agriculture for energy plants
    - Establishment of short rotation plantation of fast growing trees on agricultural land

- Afforestation of abandoned land (this is not primarily intended for biomass, but will definitely give some yields of biomass)
- Fundamental research in breeding and agricultural technology (plantation, harvesting, etc.)
- Research in conflicts between natural conservation and biomass production on both, woodland and agricultural land.
- Research in CO_2-storage, and -emissions for different types of biomass
- Use of non-forest wood fuels, e.g. wood from tree pruning along roads or paths, from parks as well as from agricultural sites (fruit trees)
- Use of wood from removing trees from pasture land.
- Improve harvesting technology to provide additional assortments for energetic use (e.g. corncobs)
- Basic studies on material blends: e.g. logistics and storage; combustion characteristic, disposal of ash, emissions

- **How to deal with technical/ecological challenges?**
  - Utilization of biomass ashes
  - Slash utilization map for specific regions
  - Decision support system (DSS) for ecologically efficient supply chains utilizing logging residues
  - Study of nutrient cycles for (i) forest biomass, (ii) energy plants, and (iii) secondary feedstock
  - Development of recognized and practicable methods for the preparation of LCAs for the entire biomass supply chain

- **Cooperation**
  - Cooperation between forest owners for market development
  - Cooperation between different actors within the forest fuel supply chain
  - Cooperation between material and energetic use via joint procurement reducing procurement costs and increasing supply security for both usesCooperation between different organisations and countries in SEE for knowledge transfer
  - Development of usage concepts, operators and business models for diverse supply chains
  - Development of supply concepts for industrial applications, especially with regard to security of supply and risk management

- **Standardisation**

- Improve standardisation in the field of bioenergy

References

IEA (2012): Technology Roadmap. Bioenergy for Heat and Power. 68p.