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Private Forest Owners Play Key Role in European Forest Derived Fuel Utilization

Jyrki Raitila[1], Martti Kuusinen[2], Robin Ridley[3] and Matti Virkkunen[1]

1. VTT Technical Research Centre of Finland, Jyväskylä FI-40100, Finland

2. Forestry Development Centre Tapio, Helsinki FI-00700, Finland

3. South Yorkshire Forest Partnership, Sheffield S1 2SH, UK

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Abstract: The AFO (activating private forest owners to increase forest fuel supply) project was set up to discover the best tools for activating an important fraction of the 12 million PFOs (private forest owners) in Europe to supply wood fuel, especially to small and medium-sized heating plants. It aimed to increase the utilization of Europe's vast forest fuel reserves. This was expected to benefit both the economy of the forest owners and rural areas and increase the use of renewable energy sources. The project was carried out between 2009 and 2012. The project operated in selected target regions that have a high proportion of private forest ownership (France, Slovenia, Latvia and the UK). It started by analyzing the potential wood fuel supply and use in relation to current regional markets. After assessing through inquiries the potential wood fuel supply and demand and the parties involved, the next step was to initiate and support the formation of wood fuel supply clusters and organize supply chains. This was followed by the dissemination of best practice examples from Austria and Finland—countries with the most expertise and long traditions of forest fuel production. In the last phase of the project, results and approved activation methods were disseminated to all 27 EU (European Union) countries.

Key words: Private forest owners, wood fuel, supply cluster, bioenergy, activate.

1. Introduction

In 2009, nine European organizations from European countries Finland, Latvia, Slovenia, Austria, France and the UK launched an EU (European Union) funded AFO (activating private forest owners to increase forest fuel supply) project, with the aim to meet ambitious targets for increased energy from wood utilization. The AFO target regions were located in South Yorkshire in the UK; in Midi Pyrenees and Limousin in France, in Slovenia and in Valmiera and Cesis regions in Latvia (Fig. 1).

With over half of the forested area of Europe in the ownership or operation of PFOs (private forest owners), they are an essential stakeholder in increasing wood fuel utilization. On the other hand, the estimated contribution of wood energy to the EU's renewable energy target is more than 50% in total. These two facts highlight the importance of mobilizing wood from private European forests.

Corresponding author: Jyrki Raitila, senior scientist, research field: bioenergy. E-mail: jyrki.raitila@vtt.fi.

2. Project Objectives

The main objective of the AFO project was to activate forest owners and to increase the wood fuel supply at both regional and local levels. The project aims to activate an important fraction of the 12 million PFOs in Europe to supply wood fuel, especially to small and medium-sized heating plants. Co-operation between PFOs is often weak and the formation of wood fuel supply networks may be significantly boosted by activation through a third party.

The AFO project also aimed to "activate" forest owners into management activity in their woodland, bringing increased timber supply to market. It aimed to identify and then help reduce the barriers for increased forest derived fuel supply. It identified the potential

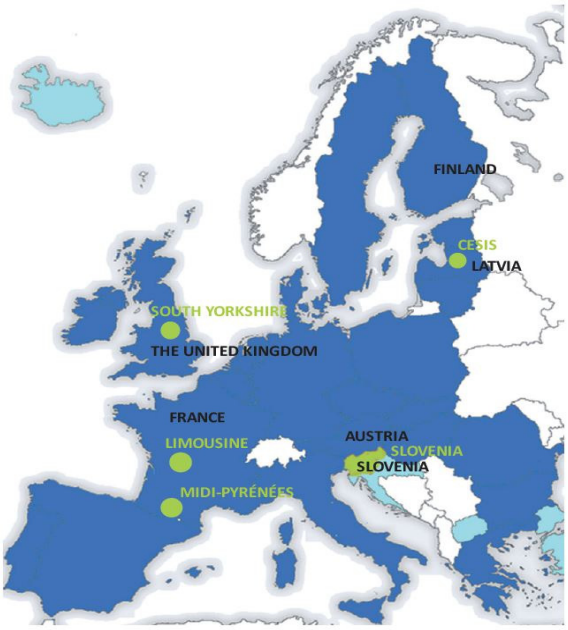

Fig. 1 AFO project regions.

supply and demand opportunities, along with supporting the formation of wood fuel clusters consisting of owners, managers, agents, contractors, users and suppliers of wood fuel and assisting in the organization of supply chains. Work took place through a series of local workshops, regional study tours, face-to-face meetings, dissemination of best practice and training weeks in countries of high wood fuel utilization (donor countries); Austria and Finland.

3. Observed Challenges and Barriers

The challenges of mobilizing wood fuel reserves in privately owned forests are similar in most European countries, allowing the projects results to be circulated widely. Forest owner surveys in AFO target regions (UK, France, Latvia and Slovenia) identified the following challenges for enhancing wood fuel supply from privately owned woodlands.

First, forest holdings are small and becoming more scattered. The average size of a forest holding is just a few hectares in many countries. As a great share of forest holdings is inherited, the size tends to decrease with every new generation of forest owners.

Second, they often belong to a diverse and urbanizing group of owners. The stereotype of a forest owner is no longer a farmer living in the middle of his/her forests, but an urban citizen living in a city far from the forests. It is not unknown that a forest owner is not even aware of the location of his/her woodland. If there is no bond whatsoever to the forest, it is not very likely that the woodland is actively treated and harvested.

Third, due to their small size, the forest holding is not considered to be an actual investment, it is under-valued, and therefore not expected to generate revenue.

Fourth, an increasing proportion of forest owners are aged and retired citizens**.** For example in France, 60% of the queried forest owners were retired. On the other hand, in the Eastern European countries (Latvia and Slovenia), the age distribution was much more balanced with a greater number of forest owners of 30 years of age or less. In these countries, the willingness to increase wood fuel supply was higher.

4. Fuel Suppliers and Fuel Users Identified

The first step of the AFO project was an inquiry on PFOs in order to increase knowledge of their characteristics: who they are, what is their behavior with their forest, what is their attitude towards wood felling, and their interest in participating in a network for supplying a heating plant. The same questionnaire was used in the four countries and even if PFOs characteristics were not the same in each country, great similarities could be found in the target countries.

Farmers and retired people are more represented in the PFOs population than in the national population. Farmers constitute 15% to 34% of PFOs population in all countries (Fig. 2) [1].

Retired people constitute the major part of the PFO population in France (60%), while other occupations are dominant in other countries (nearly 70% in Cesis (LV) and South Yorkshire (UK). At the same time, the French PFO population is the oldest (> 60 y) of all the regions studied, and the Latvian PFO population is the youngest (< 50 y) (Fig. 3).

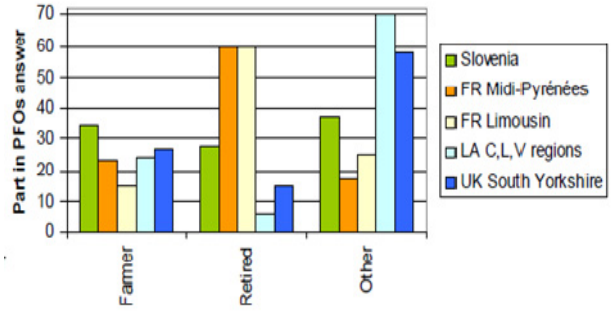

Fig. 2 Observed PFO occupation groups (%) [1].

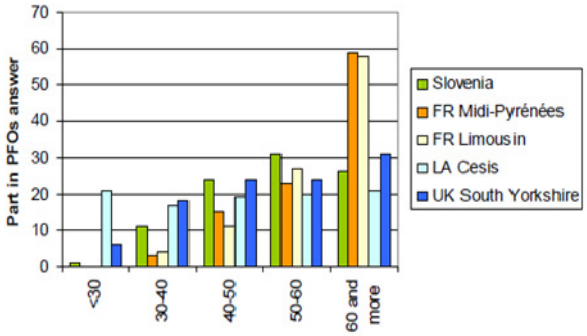

Fig. 3 Observed PFO age groups (%) [1].

5. Regional Trends or Possibilities in Wood Fuel Supply, Use and Import/Export

As a part of the AFO-project wood fuel consumption and end-users (domestic, municipal and industrial heating and CHP plants) in the project, target regions were defined if installations were 100 kW or larger. In addition, the wood fuel consumption in the region from 2015 to 2020 was estimated. Also the current wood fuel imports into and exports out of the AFO target regions were studied.

Based on the study on wood fuel consumption and end-users in the project's target regions, the following conclusions can be drawn from Ref. [2]:

- In France, by-products from forest industry are the dominating fuel in wood-fired boilers. In terms of the installed power most capacity is in industrial boilers and boilers owned by municipalities, local authorities, hospitals and nursing homes.
- In the UK (South Yorkshire), forest chips are the most common wood fuel, some wood pellets are also used. In South Yorkshire, 40 of the 48 boilers are operated and owned by local authorities.
- In Slovenia, the most common wood fuel types are wood chips and sawmill by-products like bark and sawdust. Most of the boilers are owned and operated by industry whereas most district heating networks are publicly owned.
- In Latvia, wood chips and wood logs dominate in the wood fuel mix. Some pellets and sawmill industry by-products are used. No privately owned boilers were identified in the category of over 100 kW. Most of the boilers are owned by municipalities or industry. Also six boilers are operated by house owner associations.

The wood fuel consumption estimation in the region for the years 2015 to 2020 reveal that wood fuel use is likely to increase in all AFO regions [3]:

- In Midi Pyrenees in France, a strong increase in wood fuel use is expected: Compared to current consumption of forest wood chips in Midi Pyrenees (38,000 m^3/a) the expected increase in wood chip use by 2020 with 99,500 m^3 to 137,500 m^3/a is roughly 260% increase. Currently there is 157 MW of installed capacity for wood fuel in Midi Pyrenees. The new installations will increase the installed capacity to 317 MW (200% increase).
- In Limousin in France, an increase is expected as well: Compared to current forest wood energy use (15,500 m^3/a) the expected increase in forest fuel use between 2015 and 2020 is 74%, as the absolute increase is 27,000 m^3/a. The total capacity for wood fuel will increase by 13 % from current 190.7 MW to 214.6 MW.
- In South Yorkshire, the current wood fuel demand in South Yorkshire is 17,439 MWh/a. The demand will increase by 19,122 MWh/a or 109% to 36,561 MWh/a. In tonnes, the increase is from 7,838 to 16,432 tonnes/a. The installed capacity will increase from existing 14.6 MW to 25.2 MW (173%) in 2015-2020.
- In Slovenia, the current use of wood fuel is 4,600 GWh/a Wood fuel use is expected to increase by 2,126

GWh/a between 2015 and 2020. The increase is 46% and the total consumption will be 6,726 GWh/a. The installed capacity is expected to increase by 44 MW during this period.

• In Latvia, the total current wood fuel use in the region is 186.4 GWh. The estimated wood fuel consumption increase between 2015 and 2020 is 92.5 GWh. The total annual future wood fuel consumption in the region is estimated to be 278.8 GWh. The increase in wood fuel use compared to current use is 49.5%.

The current knowledge about wood fuel imports into and exports out of the AFO target regions is outlined as follows [4]:

• In Midi Pyrenees, in France 38,000 m^3 of wood is consumed as wood chips. Around 16,000 m^3 to 21,000 m^3 of wood coming from local sources in the region is used for wood chip production. Thus, 17,000 to 22,000 m^3 of wood is imported from other parts of France to the region for supplying the local wood chip production. Since the wood chip use in Midi Pyrenees exceeds the local production, no export of wood fuel is expected.

• Data on the supply of wood fuel imports into the AFO target region of South Yorkshire, UK, is not currently available. There is currently no evidence that wood fuel used in the target region of South Yorkshire is imported from other countries into the UK. However, wood fuel is actively traded between the target region of South Yorkshire and neighboring regions.

• Slovenia imports roughly 91,019 tonnes of fuel wood per year. Fuel wood is mainly imported from Bosnia, Croatia, Ukraine and Hungary. Imported wood fuel is mainly used in the biggest district heating or co-firing systems.

• Latvia imported 28,000 tonnes of wood fuel in 2009. The respective figure for wood fuel exports from Latvia is 2,750,000 tonnes of wood fuel. The main driver for importing/exporting of wood fuel instead of local use is the price. In 2009, the export price of wood fuel was Latvian lats 70/tonne (€98.75/tonne) and import price Latvian lats 40/tonne (€56.43/tonne).

6. Potential Measures to Overcome These Barriers

The AFO project has allowed forest owners, operators and managers to hear and see at first hand successful wood fuel supply chains and business models that operate or could be replicated in their own country and in partner countries. Instead of relying on theoretical concepts, the project has also provided cost, market proof examples, which is, vital to ensure successful implementation. AFO has brought different stakeholders together, removing suspicion and building bridges to create new business opportunities. Cluster formations can reduce overhead costs, open new markets and allow forestry works to become cost effective.

The key activation measures can be drawn from Refs. [5, 6]:

• Forest owners should be encouraged to form clusters providing, e.g., shared ownership, communal forestry operations or wood fuel supply to a plant.

• It should be made more attractive to concentrate forest ownership to larger units through regulatory taxation and legislation.

• Forest owners should be informed about their forests and the potential they possess as a source of renewable resources and income.

• Harvesting and selling wood should be made as easy as possible from the owner's point of view. In most cases, management needs to be outsourced and harvesting should be carried out as gently as possible.

The theoretical process of creating a business relationship followed an experienced model for the establishment of small- and medium-scale heating plants and wood fuel supply chains in Finland and Austria is displayed in Fig. 4. The goal was to develop a functioning co-operation between supply clusters and wood fuel users. In the long run, this should result in the construction of new boilers and heating plants and the increased use of wood fuel.

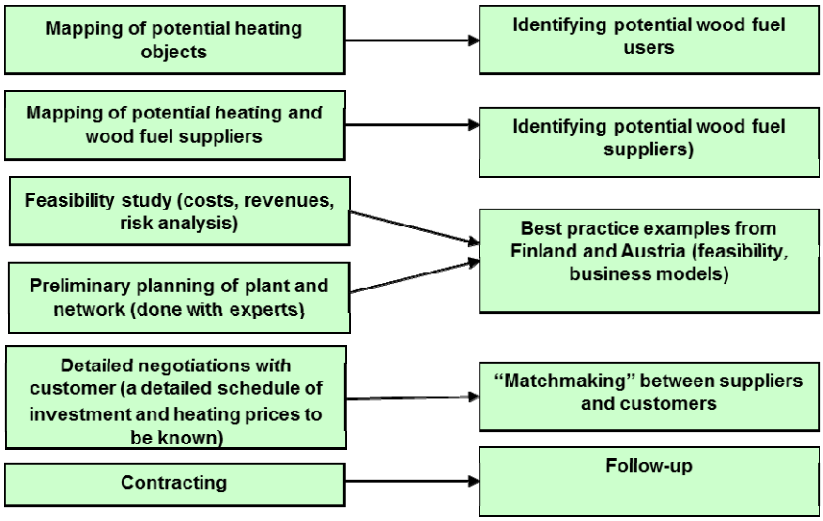

Fig. 4 The theoretical process of creating a business relationship applied in the AFO project. The sequences of different steps are from left to right and top to bottom.

7. Key Results

First key result of the AFO project was the identification and activation of wood fuel suppliers and users in the target regions and an analysis of regional wood fuel reserves and barriers hindering their mobilization. The aim was the creation of forest owner cluster groups that operate as a network instead of small individual units. This "capacity building" means owners are able to develop larger scale wood fuel supply chains for increasing the wood heat market.

Second, by identifying over 1,300 forest owners, it was observed that forest owners are ageing and the size of forest holdings is decreasing. Due to this, the forests have less economic value to its owner. In addition, PFOs often live some distance from their forest and have no immediate bond with their forest. Measures for activation include promoting co-operation, promoting forests as a source of income and creating easy ways of selling wood.

Third key result was the creation of substantial wood energy supply chains (or clusters) and heating facilities in the target regions. The AFO project boosted wood fuel supply by establishing clusters of forest owners. In total 23 clusters were formed and 17 more clusters are to be established in the near future. Each cluster will correspond to approximately 1,000 ha/year of woodland, where wood fuel is supplied from around 23,000 ha of woodland brought to active management.

Fourth, new wood heat and CHP (combined heat and power) capacity has been created. The project has led to the creation of new small-medium sized wood heat or CHP installations using local wood fuel. In total 24 MW of capacity has been installed with the support of the AFO project and a further 11 MW will be installed in the near future.

In addition to these four key results, the project has yielded proven and applicable promotion methods and materials for forest fuel utilization in small and medium scale heating enterprises. Through EU-wide dissemination, the proven activation methods and supply chain models will support the ambitious energy and climate policies of the whole 27 EU countries.

8. Conclusions

8.1 Momentum

Forest owners who are not already actively engaged in managing their woodlands take time to understand what might be needed to bring their woodlands back into management, and how they can supply fuel wood for energy purposes in a profitable way. It is unrealistic to expect PFOs to commit to starting to manage their woodlands while at the same time committing to enter

into business relationships with other owners and contractors they have never dealt with before. Similarly, public or private bodies interested in using bioenergy need enough time and knowledge of biomass heating systems and business models before they can seriously consider investing in the system. The duration of one project is not long enough to develop a truly sustainable model for all target regions. However, it is vital to have this kind of project to boost regional and local efforts to increase energy wood supply and enhance wood-based heat business.

Momentum is vital. The AFO project shows a positive impact on the use of bioenergy in the target regions, increasing both the number of initiated bioenergy business projects as well as policy measures supporting the use of biomass for energy. However, it is vital that consideration is given to developing a long-term way of operating. In each target region in particular, and at the EU level in general, the recommendation is to establish a local support service that does not involve high costs but provides further contact for those interested in supplying or using energy wood. Networking support and regional activities boost the interest in biomass business activities and key actors profit largely from regionally available experience. Agricultural and forestry organizations, preferably non-profit, can well serve in this in the long term. They do not have to be experts in technology or business, but just able to provide initial help and guidance for the following steps, and when necessary to further direct to professional expertise.

8.2 Seeing Is Believing

The study tours and training in Austria and Finland were a key part of the overall project and therefore identifying delegates who would make best use of the training was a priority. Seeing best practice examples and proven solutions and hearing directly from experts and entrepreneurs is one of the most effective ways to convince potential investors and decision makers to believe that the decentralized bioenergy system can be a very feasible and economic alternative. Study tours also enable effective interaction between stakeholders and can serve as a stepping stone for new business relationships.

Carefully prepared training materials tailored for local situations can easily be used to train regional bioenergy advisors to share proven concepts and help modify them for any local situation. Furthermore, the training materials can be used for capacity building, i.e., as a tool that allows for the transfer of the knowledge and the experiences gathered in six European countries to other countries not involved in the project.

8.3 Energy Market Developments Are Difficult to Predict

Energy markets are never stable but can be easily tipped in any direction with changes in fuel prices or incentives affecting energy generation. Policies, subsidies and incentives can significantly change after national elections or new EU directives. Because bioenergy investments are usually very capital intensive, investors should be able to predict the future development for at least 10 years to 20 years. Constant changes in policies and subsidies tend to stall investments in new systems.

Fuel wood markets do not only depend on the general economic situation, but are also highly affected by the demands of the forestry industry. Most timber and energy wood supply chains as well as prices are linked together. The wood processing industry and energy utilities using wood fuels are increasingly competing for round wood and by-products from forest owners and sawmills. Therefore, future projects should also cover forest residues and the cascading use of wood in order to decrease the competition for industrial timber. In addition, the actors have to adapt to a rapidly changing biomass market. For instance, the increased demand for woody biomass on an international level has also led to an increase in biomass trade with large biomass trade flows inside Europe and between continents.

8.4 Public and Private Partnerships Are Challenging

In more advanced bioenergy using countries, such as Austria and in Finland's municipalities, wood processing industries or other similar customers were the key actors making investments in biomass heating systems some twenty years ago when heating started to rapidly evolve. In those early phases entrepreneurs or farmers often supplied biomass fuels and operated the plant or boiler. This business model, also often called "contracting", was more appealing to the entrepreneur because investor bore a much larger economic risk. Later on, when entrepreneurs and enterprises had gained experience and confidence, they were willing to take a bigger economic risk and invest in own plants.

Public and private partnership almost sounds like an ideal way of starting a biomass heating enterprise. The downside, however, is that often public investments involve political decisions and the whole decision making process may easily take several years. The situation becomes even more complicated if local elections take place during such a process. Regional emphases may change and often negotiations have to be started over again. It seems many European countries are not yet used to public and private partnerships in energy services. There is still a certain amount of suspicion among both customers and public decision makers about leaving the running of such a basic service in private hands. Would the service be reliable and energy prices decent? Supply of wood fuel has to be secured. How can the service be secured for a long term with predictable benefits for both the supplier and consumer of energy?

Most challenges regarding supplier/customer relationships can be dealt with in a detailed written contract. It should always be emphasized, however, that heating business involves a long term. Returns on investment times are long, often at least ten years, so there should be contracts between the suppliers and customers. Terms can be changed but both parties should have confidence in a continuous, mutually beneficial business deal.

8.5 Entrepreneurship to Be Encouraged

Regional and local authorities responsible for public services, such as heating, are seldom experts in building or operating heating systems. Therefore, outsourcing such service to professionals is very reasonable.

With decentralized heat supplies, heating can be outsourced to so-called heat entrepreneurs or heat enterprises. Heat entrepreneurs or enterprises are single entrepreneurs, a cooperative, a limited liability company or an entrepreneur consortium that supplies customers with heat. Investments in the heating plant can be made by the public partner or private entrepreneur, or investments can be shared. Possible business models for heat entrepreneurs include single entrepreneur, limited company, cooperative, energy saving company, franchise, network model (entrepreneur consortium)—several companies make contracts with each other to provide part of the whole supply chain, and contractor [7].

Privatization of heating provides mutual benefits. For heat entrepreneurs, this provides an extra or even the main source of income; use for fuel wood; benefits of improved forest management; more use for under-utilized harvesting equipment and unutilized wood resources; as well as increased and balanced employment. For the municipality, heat entrepreneurship provides increased security of heat supply and savings on operational and investment costs of energy production when more expensive fossil fuels are replaced with renewable ones. Naturally increased use of local labor and creation of new business opportunities, support for existing employment, environmental benefits and induced economic impacts of local spending should be taken into account as well.

As mentioned above, public investment processes often take a lot of time and political changes may further complicate such decision making. Usually, private investors and enterprises are much more agile in making quick decisions if business opportunities seem feasible. However, because many bioenergy

enterprises are small and some quite new in this business, practical advisory help and encouragement should be provided. Ideally, impartial basic consultation should be available in all potential bioenergy regions at very modest costs or even free of charge. Close cooperation between stakeholders, like biomass supply organizations, technology providers and energy companies, is recommended.

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