

PORTUGAL

Energy use efficiency

Location

Porto

Programming period

2014 – 2020

Priority

P5 – Resource efficiency & climate

Measure

M16 - Cooperation

Funding (EUR) Total budget

316 375.32

EAFRD 213 553.34

National/Region. 23 728.15

Private 79 093.83

Project duration

2017 – 2020

Project promoter*

Forestis – Associação
Florestal de Portugal

Contact

geral@forestis.pt

Website

www.forestis.pt

www.gotecfor.pt

GOTECFOR is an EIP-AGRI operational group that contributes to the bioeconomy by seeking to optimise the value chain of forest biomass, as a fuel for heating.

Summary

Portuguese forests represent more than 3 million hectares and about 87% of them are owned by four hundred thousand individual forest owners. The average forest holding has less than 5 hectares. When forest owners manage their forests, they produce waste that remains on the ground as it is costly to remove it. However, this increases the surface fuel load for forest fires.



A forest federation teamed up with private companies and research institutes to set up an EIP-AGRI operational group to improve the efficiency of the forest biomass supply chain. The operational group aims to make forest biomass more accessible to the market by solving problems in the collection, transformation, transport and delivery of forest biomass (wood chips). Making it attractive to the agro-industry, that can use forest biomass for heating.

Results

The application of the biomass management software is expected to make companies 40% more efficient in terms of operational and logistic costs compared with the previous biomass management systems.

For the agro-industry, FLORALVES, it is estimated that the cost of buying forest biomass (wood chips) is 82% less than buying natural gas.

The new software promoted by the operation group will reduce the forest management costs for forest owners.

The use of forest biomass reduces the risk of fire, since it encourages better forest management and decreases the fuel load in forests.

The project contributes to climate change mitigation by replacing fossil fuel with a renewable fuel which is CO₂ neutral.

* The Project promoter/beneficiary is an EIP-AGRI Operational Group (<https://ec.europa.eu/eip/agriculture/en>)

Context

Portuguese forests represent more than 3 million hectares and about 87% of them are owned by four hundred thousand individual forest owners. The average forest holding has less than 5 hectares.

When forest owners manage their forests, they produce waste that remains on the ground as it is costly to remove, leading to increases in surface fuel load for forest fires. In 2017, more than five hundred thousand hectares of forests burned and more than 100 people died. Although foresters are aware of fire risk, the majority of landowners do not have the economic capacity to re-use their residues.

One solution would be to add value to forest biomass, by using it for energy. To do this, forestry companies need new logistic models, in order to make the exploitation of biomass economically attractive. Agro-industries such as Floriculture and Horticulture need efficient heating forms at low and stable prices. The use of the forest biomass would allow them to lower their energy bills and thus increase the productivity of greenhouses during the winter.

In Portugal, there are 1 541 intensive horticulture and floriculture holdings which mostly use gas/diesel to heat their greenhouses between October and May, at a significant economic cost. Studies indicate that heating through forest biomass could reduce energy costs by 80% compared to diesel and eliminate about 3.1 tonnes of CO₂ emissions.

In this context, the GOTECFOR partnership was established in the form of an EIP-AGRI operational group consisting of forest owners, research institutes, forest companies and local consumers, to optimise the forest biomass supply chain.

Objectives

The objectives / needs which this operational group aim to address are:

- Develop efficient models for collecting, planning and transporting forest biomass;
- Identify and test solutions on adapted and automated machines that reduce costs, increase safety and reduce the physical effort required during biomass collection and pre-processing; and
- Provide solutions for greenhouse heating equipment that uses wood chips to achieve increased efficiency and lower energy costs.

Activities

GOTECFOR is still ongoing, therefore many of the following activities are still in progress:

1. Mapping and analysis of the agro-industries as potential users of energy from biomass:

- Established a database of agro-industries operating in Portugal (2017).
- 43 companies received a questionnaire about their location, energy needs, main energy sources and costs (2019).
- Report on the conclusions and findings that emerged from the questionnaires (2020).

2. Identification of existing technological solutions and problems associated with their use:

- Identification of technological solutions on the market to burn forest biomass, for heating agro-industries (2018).
- Analysis of the problems in energy production related to the characteristics of forest biomass, capacity and profitability of equipment (2018).
- Development of a matrix to identify which of those problems may be resolved (2019).

3. Design and management of biomass supply chains:

- Adaptation of a biomass management software, developed by the FOCUS project (2014-2016), to support planning and decision making in logistical processes (e.g. distribution routes and stocks) of forest biomass supply chains to greenhouses (2020).

4. Mobilisation of forest biomass:

- Identification of new forest biomass collection models to be implemented by groups of forest owners and working teams from forest associations, for small-scale use. This will also contribute to the reduction of the fire risk by removing surface fuel loads (2020).

GOTECFOR partners

FORESTIS - forest federation representing 31 Forest Owner Associations that technically support 17 500 private forest owners

FLORALVES - floriculture company

FLORESTA JOVEM - forest company

INEGI - research institution

INESCTEC - research institution

5. Identification of technological development needs and creation of action plan proposals:

- Collection of information about the needs and identifying the problems / constraints of forest companies (2019).
- Listing and prioritisation of a set of technical requirements that can feed into an appropriate technical specification (2019).
- Create a roadmap for stimulating innovation in forest biomass processing equipment, that is safer and more appropriate to Portuguese forest conditions (e.g. small tractors and adapted and more intelligent tools) (2020).

6. Development and implementation of a demonstrator:

- Establish a test case to determine the technical feasibility of the proposed solutions, considering a set of forest properties (FORESTIS), greenhouses (FLORALVES) and forest companies (FLORESTA JOVEM) (2020).
- Monitor and follow-up of the forest biomass burning process, considering the characteristics of the biomass used, its burning efficiency and quantification and control of gaseous emissions (2020).
- Compare two greenhouse heating scenarios considering: a) the use of a biomass boiler in comparison with no heating system; b) the use of forest biomass in comparison with natural gas (2020).

It is predicted that the productivity of FLORALVES may decrease with the use of forest biomass as a source of fuel, in comparison to the previous use of natural gas. At the moment, it is not possible to inject CO₂ from the boiler into the greenhouse without previous treatment to remove particles in the CO₂ produced from burning biomass. To overcome this, the operational group will test the physical/mechanical treatment of CO₂ emissions in the biomass boiler, using a cyclonic separation method which removes the particles.

Main results

GOTECFOR intends to achieve the following results:

- The roadmap of forest biomass processing equipment and the biomass mobilisation models, will be presented to forest companies;
- The application of the biomass management software is expected to make companies 40% more efficient in terms of operational and logistical costs compared with the previous biomass management system/approach;

- Due to the importance of moisture in forest biomass, partners are trying to develop a portable prototype that measures the moisture in each pile of biomass;
- For the agro-industry, FLORALVES, it is estimated that the cost of buying forest biomass (wood chips) is 82% less than buying natural gas. The calculations do not include the investment amortization of the biomass boiler; and
- The ashes from the biomass boiler are being used by FLORALVES as fertilizer on the land next to the greenhouse. It is not used in the greenhouse since the flower production is hydroponic.

Problems identified in relation to the change of fuel include:

- The biomass boiler presented difficulties, in relation to the quality of the wood chip from residual forest biomass, namely its heterogeneity in terms of composition (moisture and ash content), which causes problems associated with the feeding system and with combustion;
- The use of a biomass boiler has increased the number of hours needed for maintenance and cleaning; and
- It is not possible to inject the biomass boiler exhaustion gases directly into the greenhouse without prior treatments that removes particles.

Environmental benefits:

- The use of forest biomass reduces the risk of fire, since it prompts better forest management, and decreases the fuel load in forests;
- Better forest management decreases pests and diseases; and
- Mitigation of climate change by replacing a fossil fuel with a renewable CO₂ neutral fuel.

Economic benefits:

- Forest biomass is no longer a waste product, but a resource that has value and can be sold;
- Reduces the forest management costs for forest owners; and
- It is expected that the forest companies' revenues will increase, by becoming more efficient due to the biomass management software.

Additional sources of information

<http://forestis.pt/pagina,2411.aspx>

www.inesctec.pt/en/projects/gotecfor

<https://inovacao.rederural.gov.pt/grupos-operacionais/13-projetos-grupos-operacionais/80-gotecfor-tecnologia-para-a-mobilizacao-e-aproveitamento-de-biomassa-florestal-na-agroindustria>

<https://ec.europa.eu/eip/agriculture/en/find-connect/projects/gotecfor-tecnologia-para-mobiliza%C3%A7%C3%A3o-e>