Competitiveness of corporate sourcing of renewable energy

Annex A.4 to Part 2 *of the Study on the competitiveness of the renewable energy sector*

Case study: AGRIS S.A.

ENER/C2/2016-501

28 June 2019

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1 Introduction[1]

AGRIS S.A. is a medium-sized company in the horticulture sector based in Greece and operating in South-East Europe. In compliance with its sustainability corporate value, in 2012, **AGRIS installed eight biomass boilers for heating** at its main production unit, a seedlings (eggplants, tomatoes, etc.) nursery with about three hectares of greenhouses in Kleidi, Imathia, Greece. The solid biomass boiler system currently uses **sunflower husk pellets**, imported from Bulgaria, as the main fuel for heat generation. The direct benefit of such an investment into self-generation renewable energy sources for heating (RES-H) has been a **cost reduction in the range of 20-30% compared with the heavy fuel oil alternative.**

By focusing on a medium-sized company, leader in its sector, this case study sets out to draw policy recommendations that may foster small and medium-sized enterprises (SMEs) in Europe's **horticulture sector**, as well as other sectors where heating costs represent a significant portion of operating expenses, to embrace the green energy revolution.

2 Sector

According to the NACE (Rev.2) statistical classification of economic activities in the European Union (EU), seedlings producers belong to the "**Plant propagation**" group and are included in the class 01.30 that covers the production of all vegetative planting materials[2]:

- Growing of plants for planting;
- Growing of plants for ornamental purposes, including turf for transplanting;
- Growing of live plants for bulbs, tubers and roots; cuttings and slips; mushroom spawn;
- Operation of tree nurseries.

Plant propagation is the approach to **create new plants from existing ones**, performed either directly (through cuttings, suckers, and seedlings) or by grafting.

3 Company

Established in 1983, AGRIS S.A. is a medium-sized company based in Greece, which operates in the **horticulture sector**. More specifically, AGRIS is a provider of seeds, seedlings, and know-how in the service of the agri-food chain and vegetable crop farming. In this respect, the company's main features in the operations and production process are research, development, production, and marketing of propagating material, as well as the AGRIS Horticulture Chain, which includes consulting services in the areas of cultivation and contract farming.

In terms of its competitive position on the market, AGRIS is one of the largest propagators of vegetable seedling in the Balkan region and a **dominant player** in the horticulture sector in South-Eastern Europe. Totalling **six different facilities**, AGRIS operates at its main site in Greece, as well as through its two subsidiaries in Bulgaria

[1] The authors of this case study express out appreciation to CERTH - Centre for Research & Technology Hellas and the AgroBioHeat project (http://agrobioheat.eu), funded by the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 818369, for their support and expertise that greatly assisted the research and earlier versions of the manuscript for this case study.
[2] Eurostat, 2008, NACE Rev. 2 – Statistical classification of economic activities in the European Community.

and Romania, and three trial stations in Greece (Macedonia, Peloponnese, and Crete). These facilities allow the company to develop knowledge of various cultivation climate zones and provide this expertise to crop farmers. Integrated within these facilities, the company has **four hectares of advanced nurseries** for plant production, 10 high-tech healing chambers for grafted plants and three trial stations in separate horticultural zones across South-East Europe. All of these amounts to the production of **100 million plants per year**, and 12 million grafted plants per year.

The company has invested more than €6 million over the last six years in the improvement of production and organisational structures. Modernisation works were undertaken at the main production facility in Kleidi, Imathia (Greece) through the creation of ten model healing chambers for grafted seedlings, and the instalment of a new system for heating, irrigation, plant spacing and monitoring of production.

What is of particular interest to this case study is the investment the company undertook in 2012 with the installation of **eight biomass boilers for heating** at its main operational unit in Kleidi, Imathia. This facility covers a total surface area of 10 hectares that includes:

- A warehouse of 1,000 m2 and an office area of 500 m2;
- A three-hectare nursery and a 0.2-hectare trial station (totalling a capacity of 80milion seedlings a year);
- A division for Research and Development of propagating material; and
- A 200 m2 seed pre-germination chamber, 10 state-of-the-art healing chambers for grafted seedlings, and a sowing section with automatic seed drills.

Figure 1 AGRIS operational unit at Kleidi, Imathia, Northern Greece

Source: CERTH – Centre for Research & Technology Hellas

4 Country

The headquarters of AGRIS is in **Greece**, a country where the current policy for promoting electricity producing from renewable sources is based on a feed-in premium scheme granted for technology-specific tenders. Additionally, also net metering for small wind plants and photovoltaic (PV) installations is in place, and the 2016 Development Law (Law 4414/2016) has made provisions for subsidy schemes and tax regulation mechanisms. Nevertheless, for the purposes of the chosen case study, a detailed synopsis of the renewable energy sources for electricity (RES-E) is not relevant.

The Greek government has adopted several policies on renewable energy, most of which address energy efficiency in buildings. These new standards in energy efficiency have enforced the installations of renewable energy sources (RES) in public and new buildings. Moreover, the current policies provide incentives for RES installation in existing buildings and support research and development (R&D) activities in this field.

Energy efficiency trends in the agricultural sector in Greece suggest considerable progress between 2000 and 2016 with a 71% reduction in final energy consumption (from 1.1Mtoe in 2000 to 0.32Mtoe in 2016).[3] Notably, for our case study, renewable energy sources in heating and cooling (RES-HC) are supported by **subsidies and tax relief mechanisms**. The main provision of the 2016 Greek Development Law for subsidies and leasing subsidies supports RES-HC facilities (mostly for self-consumption) and combined heat and power (CHP) plants. Regarding tax reliefs, the same law includes support for RES-HC and CHP facilities as income tax relief and a balancing of the income tax coefficient. Additionally, the law also provides that both types of support schemes can be interchangeably substituted.

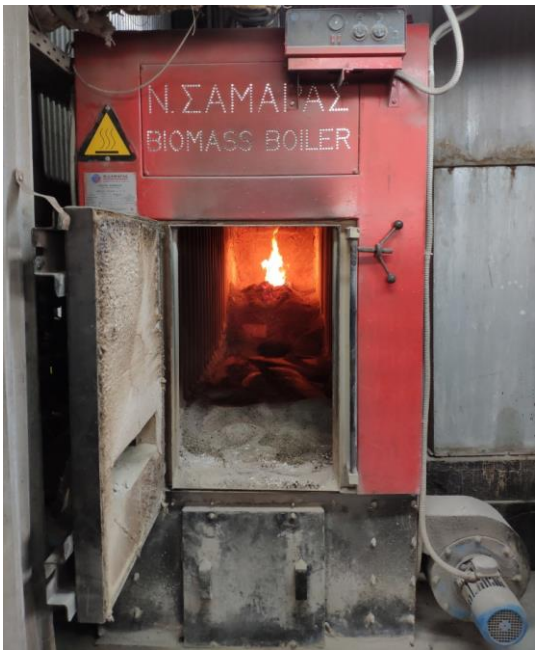
5 Energy use

Energy costs for the heating of the three-hectare nursery facility is a significant cost item for AGRIS, representing up to **13% of the total production costs**. The main system currently used for heat production is a set of eight biomass boilers; each boiler has a thermal capacity of 1.16 MW, for a total of 9.28 MW. As a yearly average, the **heating demand of the greenhouses is covered at a level of 95-97% from the biomass boilers.**

The demand for space heating is seasonal, and the company maintains an old back-up heating system on heavy fuel oil, occasionally used during extreme weather conditions or when the biomass boilers are out of service for technical reasons. This system contributes only to 3 – 5% of the yearly thermal production.

[3] Centre for Renewable Energy Sources and Saving (CRES), 2018*, Energy Efficiency trends and policies in Greece.*

Figure 2 Close-up of the biomass boilers used by AGRIS



Source: CERTH – Centre for Research & Technology Hellas

6 RE procurement method and technology

Even though AGRIS is operating in the wider agricultural sector, the plant nurseries do not produce any significant quantities of biomass by-products that could be used as fuel for the boiler. Therefore, AGRIS depends on **external biomass fuel sourcing** for the boiler operation.

The level of fuel consumption does not depend so much on the volume of production, but rather on **weather conditions**; a typical range is around 3,600 t/year.

In the first years of the operation of the boiler, AGRIS was mainly using exhausted olive cake as a fuel. The exhausted olive cake is an agro-industrial by-product of the olive oil production process and a very common and low-cost biomass fuel available in southern Greece. Despite its low cost, AGRIS was not fully satisfied with the fuel due to variability in its fuel properties and – most importantly – its smell, which could cause **public acceptance** issues with the nearby villages. For this reason, the logistics department of AGRIS undertook a market survey in order to identify biomass suppliers that could deliver fuels at cost-effective prices and acceptable fuel qualities.

The search for optimal biomass fuels has led AGRIS to choose **sunflower husk pellets**, **imported from Bulgaria**, as their main biomass fuel. Sunflower husk pellets are a by-product of sunflower oil production plants; the sunflower husks are pelletized to homogenize their particle size and make handling easier. The qualities of sunflower husk pellets that can be found on the market vary depending on their origin. Generally, AGRIS prefers to purchase **fuels of higher qualities**, even if it means paying a premium price since the boiler operators have observed that a higher quality is associated with **fewer handling and operational problems**. Some typical properties of the fuel sourced by AGRIS are: moisture content below 10% w/w, lower heating value 16.3 MJ/kg (as received), mechanical durability 95% and ash content

4.1% w/w (dry basis)[4]. Moisture content influences the heating value (e.g. the energy obtained by fuel combustion). Higher mechanical durability ensures that the pellets do not break up during handling, while the ash content affects operational issues related to the boiler operation (e.g. frequency of cleaning) as well as the particle emissions from the chimney.

Figure 3 Sunflower husk pellets used as main biomass fuel by AGRIS

Source: CERTH – Centre for Research & Technology Hellas

Sunflower husk pellets are usually not produced in Greece, so AGRIS is importing from Bulgaria; therefore, procurement of renewable energy for AGRIS has **a cross-border** aspect. The company policy is to avoid engagement in the fuel logistics operations, so AGRIS is relying on two **external providers for fuel import and transportation** to its premises.

The system used for fuel conversion is **solid biomass boilers**, installed in 2012. The biomass boilers are based on the **fixed grate technology** with underfed feeding system and were designed and produced by a **Greek boiler manufacturer**. It is a robust and efficient heating system, well-proven in the combustion of similar fuels as used by AGRIS; its main drawback is the **lack of automation of the ash cleaning** in the furnace, which requires manual intervention. The **lifetime** of the boilers is expected to be of a minimum of **30 years**.

7 Benefits

The main benefit of renewable energy self-generation from biomass fuel for AGRIS lies in the **reduction of fuel costs**. AGRIS estimates that the heating costs of the

[4] Based on an analysis by the Centre for Research and Technology Hellas (CERTH), performed within the AGROinLOG project (http://agroinlog-h2020.eu/).

company have been reduced by 20-30% through the substitution of heavy fuel oil with biomass. In addition, an annual **reduction of CO_2 emissions** is being realised, estimated to be in the range of 3,000 tCO_2 per annum. Finally, it is interesting to note that the installation of the biomass boilers has resulted in the creation of **one permanent job** (technical working with fuel handling, feeding and boiler maintenance) as well as a **few part-time jobs** related to manual operations (e.g. boiler cleaning).

The green sourcing of its heating requirements has not been a key point of discussion between the AGRIS and its customers; as noted, the main advantage of the RES-H system installed is the reduction of the running fuel costs.

8 Costs

The main costs associated with the RES-H system installed at AGRIS are related to **capital expenditure** (CAPEX) **for the installation of the boilers** and the **fuel costs for the boiler operation**.

The total CAPEX for the purchase and installation of the biomass boilers was in the range of €1 million (around 108 €/kW of installed thermal capacity). The investment was supported with a **public support scheme**, the Greek Investment Law of that time, which provided around 30% of the amount from EU structural and national funds. The remaining 70% corresponded to own funds of AGRIS.

As mentioned, the annual fuel costs associated with the boiler operation is variable and depends on both the level of consumption as well as the price of the biomass; the order of magnitude is in the range of €270,000 to €340,000 per year.

Sourcing biomass for renewable energy heating represents a challenge to be solved. There are **no long-term fuel contracts**, so every batch of fuel delivery has to be negotiated on a separate basis. **Fuel quality** is also variable. As aforementioned, AGRIS is willing to pay a premium in the range of 15 – 20€/t of biomass, in order to acquire a good quality fuel.

In order to identify suitable and cost-effective biomass fuels, the logistics department of AGRIS is constantly on the look-out for potential suppliers. However, the current policy of the company is to not be involved in the development of the biomass supply chain and logistics but to negotiate fuel purchases based on **delivery prices at the plant gate**.

9 Policy recommendations

The case of AGRIS demonstrates that **substitution of fossil fuels with biomass fuels** for heating in a business environment can lead to quite **significant cost savings** as well as increased environmental protection through the **reduction of CO_2 emissions** in the atmosphere. **Creation of new jobs** related to the biomass supply chain (e.g. harvesting, transportation, handling and operation at a biomass plant) leads also to **positive societal impact**.

However, it should be noted that the savings margin can be quite tight and subject to variations in the fuel prices. Care should also be taken to **minimizing local environmental impacts** from biomass combustion (e.g. pollutants, odours).

In light of these, the following **policy recommendations** can be made for the case of industrial heating with biomass:

1. Support schemes should be based on **supporting the CAPEX** for a biomass heating system since this can be one of the main bottlenecks for investment.

Such schemes should be developed in a way that is supportive of the most modern, low-emission biomass heating systems, equipped with appropriate flue gas cleaning systems (e.g. filters) in order to minimize local environmental pollution. Assessing the possibility of supporting a higher investment cost in the cases where the level of biomass consumption is sufficient to justify CHP production should also be considered.

2. Care should be taken to **avoid fiscal measures that are negatively impacting the competitiveness of biomass fuels** compared to fossil fuels. For example, the current Value Added Tax (VAT) in Greece for natural gas is 13%, while biomass fuels are at 24% VAT.
3. Adoption of a **carbon tax** could also provide incentives for industrial facilities to switch to biomass heating, especially in the cases where their installed capacity excludes them from the EU Emission Trading Scheme (ETS).
4. Design of a **national system for RES-HC Guarantees of Origin** (GOs) that can be developed after a reliable measuring method for monitoring the renewable-based volume of heating on a periodic basis is in place. Such a GOs system could be developed with the involvement of the Association of Issuing Bodies[5]. However, it should be noted that the implementation of such a system can be quite complicated from a policy perspective, especially the monitoring and verification of the quantity of useful heat per period (month) generated from biomass.
5. **Agrobiomass** represents a huge, indigenous and renewable energy source in Europe that can be effectively used to decarbonize the heating sector while providing positive social impact in the form of new job creation. **Research and technical development efforts** should also be devoted to activities related to **mobilization of new biomass sources**, especially coming from the agricultural sector and the measures needed for their utilization in an industrial setting. The collaboration of industrial actors with local research institutions can provide interesting opportunities and synergies for such a switch leading to incremental and more rigorous cost-reducing technological change. In the case of AGRIS, a collaboration with the Centre for Research and Technology Hellas (CERTH) has already been initiated for the investigation of olive tree pruning pellets as an alternative biomass fuel source[6].

[5] Association of Issuing Bodies - AIB (https://www.aib-net.org/)

[6] The collaboration is currently established within the AGROinLOG project (http://agroinlog-h2020.eu/), funded by the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 727961. CERTH is participating in AGROinLOG as a project partner, while AGRIS is an external collaborator for the validation of market value of olive tree pruning pellets.

CASE STUDY

AGRIS S.A., Greece

Source: CERTH (2019)

AGRIS S.A., Kleidi – Imathia, Greece

Overview

Company

- One of the largest propagators of vegetable seedling in the Balkans and a dominant player in horticulture in South-East Europe
- Provides seeds, seedlings, agri-food chain and vegetable crop farming know-how
- 6 Facilities: Greece headquarters, subsidiaries in Bulgaria & Romania, 3 trial stations in separate horticultural zones in Greece (Macedonia, Peloponnese, Crete)
- Total production: 100mln plants/y; 12mln grafted plants/y
- A 2012 investment in self-generation of heating (8 biomass boilers) at Kleidi headquarters (Greece)

Energy use

- Energy costs for heating the 3ha seedlings nursery greenhouse facility = 13% of total production costs
- Heat production via 8 biomass boilers (1.16MW of thermal capacity each), which cover 95-97% of heating demand of the greenhouses (yearly average)

Procurement method

- Dependence on external biomass fuel sourcing (plant nurseries don't produce significant biomass by-products)
- Fuel consumption: about 3,600t/y (weather dependent)
- Current main biomass fuel: sunflower husk pellets imported from Bulgaria

AGRIS S.A., Kleidi – Imathia, Greece

Overview

Costs

- CAPEX for the 8 biomass boilers = €1 million (around 108€/kW of installed thermal capacity)
- Investment: 30% public support scheme (EU Structural Funds + national funds), 70% own company funds
- Annual fuels costs: between €270,000-€340,000 per year
- Biomass sourcing has no long-term contracts, and the company pays a premium (€15-€20/t) for higher quality fuel

Benefits

- Heating cost reduction in the range of 20-30% compared with the heavy fuel oil alternative
- Annual CO_2 emissions reduction: about 3,000t CO_2 per annum
- Creation of 1 permanent job (technical working with fuel handling, feeding and boiler maintenance) and few part-time jobs related to manual operations (e.g. boiler cleaning)

Policy Recommendations

- Support schemes could be based on supporting the CAPEX (as main bottleneck for investment) for the most modern, low-emission biomass heating systems
- Avoidance of fiscal measures that negatively impact the competitiveness of biomass fuels compared to fossil fuels
- Adoption of a carbon tax could provide incentives for industrial facilities to switch to biomass heating (especially when their installed capacity excludes them from the EU ETS)
- A national RES-HC Guarantees of Origin (GOs) system could be designed after a reliable measuring method for monitoring the renewables-based volume of heating on a periodic basis is in place
- Research-industry collaborations and technical development efforts could be devoted to activities related to mobilization of new biomass sources (especially coming from the agricultural sector) and the measures needed for their utilization in an industrial setting