INTERHUB MISSION TO ANDALUSIA (18-19/10/2017)

Background:

In order to support technology transfer and exploitation of results as well as improving transnational cooperation on agroforest biomass sidestreams valorization, site visits to best practice cases will be organized for each Hub.

As for the Andalusian Hub, five potential visits have been identified in order to show good practice examples, both in the agrofood and forestry sectors, as well as research facilities for testing different processing techniques.

Date proposal: 16-20/10/2017

Visits proposed:

1.- Campillos Biogas Plant

Company: GIESA Agroenergía

Location: Campillos (Malaga)

Description: The Campillos Biogas Plant is an anaerobic digestion plant promoted, constructed and managed by GIESA Agroenergía. The plant has the capacity to transform 65,000 metric tons per year of agricultural waste into 2,200,000 Nm3 of biogas, equivalent to 1,600 kW, and nearly 10,000 metric tons of compost.

The project builds on an innovative business model. The project has established long-term commercial agreements for waste management and heat supply with private actors nearby the plant. This way, the plant treats the waste generated in a number of farms and food industries in its immediate surroundings, generating through anaerobic digestion biogas that is directly supplied to different turkey farms and to a feed factory. The suppliers of the waste and the consumers of the biogas are all located within a radius of 4 km from the anaerobic digestion plant.

The plant has a high relevance at the Spanish level due to the demonstrative character of its innovative business model, its being one of the few biogas plants in the country whose economic profitability does not depend on public subsidies. In this way, the plant aims to demonstrate the economic and environmental benefits of its model, its being an example for future projects.

More info: https://vimeo.com/216647337

Figure 1: Campillos Biogas plant

2.- Bioactive compounds extraction from Olive oil sidestreams

Company: NATAC – Oleicola El Tejar

Location: Palenciana (Cordoba)

Description: strategic alliance between a world leader in olive tree production, Oleícola El Tejar, and the biotechnology company Natac, which, through its technology, know-how, and biomass resources, have made it possible to commercialize innovative and value-added olive tree-derived ingredients at very competitive prices on international markets.

From olive biomass sidestreams (e.g. olive pomace, olive stones), polyphenols and other bioactive compounds are extracted and commercialized through international markets.

Through extraction, purification and drying, bio-active compounds and neutraceuticals for cardiovascular health are produced. After extraction of these high value compounds, the secondary biomass is combusted for the generation of electricity.

Besides olive waste, also grape waste (skin, leaves, seeds) are used for pharmaceutical, food and feed applications. Through years of research it is has become possible to pinpoint the health properties of grapes and locate the bioactive compounds responsible for them within the different areas of the grapevine.

Through extraction and purification grape pomace, skin, seed and lees as well as vine stem and leaf extracts are obtained. Depending on the part of the plant used, the type of grape (white or red) and the extraction and purification processes, different compounds are obtained.

More info: http://www.natac.es/innovaoleo-by-natac/?lang=en

Figure 2: Oleicola El Tejar – NATAC extraction plant

3.- Electricity generation from agro biomass

Company: Valoriza Energía

Location: Puente Genil (Cordoba)

Description: The Puente Genil biomass plant, with capacity to incinerate 75,000 tons of orujillo (olive waste) per year and built in 2006 by Valoriza Energía and Alvaro Espuny SL, with a budget of 46 million euros, is organized around three companies: Biomass Dryers, SA (Sedebisa), Compañía Energética Pata de Mulo, SL (Cepalo) and Biomass Puente Genil, SL

The first one, the pomace oil extractor, provides the base product (alperujo) and extracts olive bone and oils from review or chemical extraction of the dried dry olive (orujillo). The second one provides the necessary heat to dry the alperujo and convert it into dry fatty pomace, an essential transformation for the chemical extraction of the oil. Finally, Biomass Puente Genil, SL, is responsible for energy recovery from biomass and, in particular, the use of the orujillo, residue from the extraction of olive pomace oil.

Characteristics:
Power output 9 MWe
Biomass fuel Dry olive residue + cotton shell + olive
Steam production 41.6 T / h
Steam output pressure 42 bar
Steam outlet temperature 403 ° C

More info: https://www.youtube.com/watch?v=GRoW96NmmdU

Figure 3: Valoriza Energia biomass plant in Puente Genil (Cordoba)

4.- Electricity generation from forest biomass

Company: ENCE

Description: Since December 2012, the Ence Operations Center in Huelva has been running the 50 MW biomass power generation plant, the most important in Spain and one of the largest in Europe.

The plant consumes about 500,000 tons of forest biomass (mostly eucalyptus) a year to produce 180 tons / hour of steam at 100 bars of pressure and 500ºC of temperature, which is the thermal energy that allows the turbine to produce more than 400 million kWh / year.

The new plant has been built with the Best Available Techniques recommended by the EU for the transport, storage and production of energy with biomass. Among these techniques is the non-catalytic selective reduction system, which allows to reduce emissions of nitrogen oxide. The commitment to fluid bed technology for the boiler, the use of natural gas as an auxiliary fuel for specific operations, or the incorporation of an effective electrostatic precipitator to collect flue gases at the outlet of the boiler also enable Ence to comply with the aim of minimizing the environmental impact of its operations.

More info: https://youtu.be/emKFXJVwLdM

Figure 4: ENCE Biomass plant in Huelva

5.- Pilot plant for agro biomass processing and testing

Company: Instituto de la Grasa - IG (Spanish council of Research)

Location: Seville

Description: The IG was created in 1947 with the aim of contributing to the improvement and development of the industrial sectors related to fats. Since its founding, it has dedicated a special attention to the olive oil and table olive sector, which is of great economic and social relevance in Andalusia, contributing decisively to improving the scientific and technological level of both sectors. However, the dynamics of the research groups and the emergence of new demands and needs in the industry environment, due to the strategic geographical location of the IG, close to the area of production of olive products, have led to the expansion of its initial scientific objectives and the incorporation of new lines of research, jointly with the traditional ones.

They own a pilot plant where researchers develop and test different topics such as:

1. Production of protein isolates and hydrolysates (with biological activity) from industrial and marine byproducts in Pilot Plant

    - Plant for obtaining Concentrates and Protein Isolates: It has 1500 liter tank for separation of non-protein components and 4 Tanks of 400 liters capacity with agitation, to obtain the different type of proteins, provided with pH and level sensor. For Solid-liquid separations, the plant has two decanters (Sharples) and A vertical centrifuge (Clara 20, Alfa Laval).
    - Protein hydrolyzate production plant: The plant is composed of an enzymatic reactor, batch type, with a capacity of 50 liters, jacket Thermostated, temperature and pH probe. A team of Concentration (Fischer) at a flow rate of 10 l / h, at a pressure of 100 mb and evaporates water at about 45 ° C without degrading the proteins or peptides Contained in the solutions to be concentrated. Deposit of receipt of Samples of 150 liters. Ultrafiltration equipment (Millipore) with membranes Of 0.45 micron, 5, 10 and 30 kDa and with a surface of Exchange of 25 m2.
    - Spray-dryer plant: Two atomizers, capable of Drying of 20 l / h (Production Minor, Gea Niro) and 7 l / h (Lab Type S1, Anhydro). With input and output temperature control.

Figure 5: IG Pilot plant for production of protein isolates and hydrolysates.

2. Production of biogas from the anaerobic digestion of agroindustrial sidestreams

- Design of various pre-treatments (mechanical, thermal, chemical, thermochemical, ultrasonic and microwave) combined with anaerobic digestion processes to improve methane production and increase the biodegradability of solid by-products and wastewater.
- Anaerobic digestion of a wide variety of organic waste: solid waste resulting from the process of making olive oil by centrifugation in two stages (wet pomace or "alperujo"), animal waste (manure), as well as waste from other agro-food industries (waste from distilleries and wine industries, meat, dairy industries, etc.).
- Optimization of anaerobic digestion processes in one and two stages, both on a laboratory scale (continuous and discontinuous) and pilot plant.
- Use of microalgae as co-substrate in anaerobic digestion processes and for the treatment of anaerobic effluents.

Figure 6: Anaerobic reactor (IG Pilot plant).

Figure 7: Equipment for Anaerobic digestion in two stages (IG Pilot plant)

3. Extraction of high added value compounds from vegetable by-products

- Availability of a semi-pilot steam explosion system and a pilot steam treatment plant for the extraction of bioactive compounds from any vegetable by-product.
- Pilot plant for the purification of individual components from vegetable by-products. It has equipment for filtration, centrifugation, decantation, concentration, and purification.

Figure 8: Semi-pilot steam explosion system (IG Pilot plant)

AGENDA

DAY 1: **18/10/2017**

8:00h	Trip from Seville to Campillos (Malaga) - 133km
10:00h-11:00h	**Visit to GIESA Agroenergia Biogas plant**
11:00-11:30h	Coffee break
11:30h	Trip from Campillos to Palenciana (Cordoba) – 51km
12:30h-13:30h	**Visit to NATAC-Oleicola El Tejar olive waste biorefinery**
13:30h – 14:30h	Lunch break
14:30h	Trip from Palenciana to Puente Genil (Córdoba) – 52km
15:30h-16:30h	**Visit to VALORIZA ENERGÍA electricity generation plant**
16:30-17:00	Coffee break
17:00h	Trip back to Seville – 129 km
18:30h	Arrival to Seville
20:30h	Dinner

DAY 2: 19/10/2017

8:00h	Trip from Seville to San Juan del Puerto (Huelva) – 85 km
9:00h-10:00h	**Visit to ENCE electricity generation plant**
10:00-10:30h	Coffee break
10:30h	Trip from San Juan del Puerto to Seville
12:00h-13:00h	**Visit to Instituto de la Grasa (CSIC) pilot plant** in Seville
13:00h-14:00h	Lunch break
14:00h-15:00h	Pitching session
15:00h-17:00h	B2b meetings
18:00h	Trip to Seviile
End of the Interhub mission	