



Agri & food waste valorisation co-ops based on flexible multi-feedstocks biorefinery processing technologies for new high added value applications

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CHIESA VIRGINIO

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Webinar training session on agricultural by-products valorisation through bio-refineries
(FCAC - Virtual Event)

Company Presentation



Azienda Agricola Chiesa Virginio is a modern family business farm located in Lombardy (Canneto sull'Oglio), whose original activity was the cultivation of cereals and the breeding of beef cattle.

For zootechnical nutrition it uses, in addition to cereals, **agro-industrial by-products** like tomato peels.



Biogas Plant



Since 2009, the year in which the 1-Megawatt biogas activity began, the company is aligned with concepts of the **circular economy**: every product, including wastewater, is fully valorised.



Agriculture & Food Waste Valorisation



Through the participation in the European Biocopac, Biocopac Plus and now **Agrimax** projects, we have been able to implement a **pilot plant** for the extraction of **high added value products** such as cutin, lycopene, ferulic acid, compost and hidrocompost, starting from **raw materials** like tomato peels, wheat bran, tomato culls and others.



Company Expansion

- enlargement to reach about 950 cattle
- conversion of the biogas plant to methane for use also as a fuel in company tractors and trucks
- further exploitation of the results coming from the IPP



Project Overview



AgriMax - Agri and food waste valorisation co-ops based on flexible multi-feedstocks biorefinery processing technologies for new high added value applications

TRL >7 - Demonstration Action Target

October 2016 – September 2021 - Starting/Closing date

15 Million € - Total Budget (12 Million € EC Contribution)

29 Partners (9 Italians) from 11 Countries: Austria, Belgium, Germany, Hungary, Ireland, Italy, the Netherlands, Norway, Slovenia, Spain, United Kingdom

BBi VC3.D5 - 2015 - Valorisation of agricultural residues and side streams from the agro-food industry

The Consortium - Italian partners

- 11 RTDs (3 Italians)
- 18 SME and Large industry (6 Italians)
- 3 partners are BIC members and 8 associated BIC members to maximise the output alignment to the BBI programme (2 Italians)

covering the whole supply and value chain

TRIVIUM
PACKAGING

ARCHA
Analisi, ricerca e formazione



FEMTO
Engineering srl



moqu
RADICAL BY NATURE

SSICA
STAZIONE SPERIMENTALE PER L'INDUSTRIA DELLE CONSERVE ALIMENTARI



Agri & Food Waste: a global challenge

90 million tons of food is wasted in Europe

32%
of the food
produced is
wasted



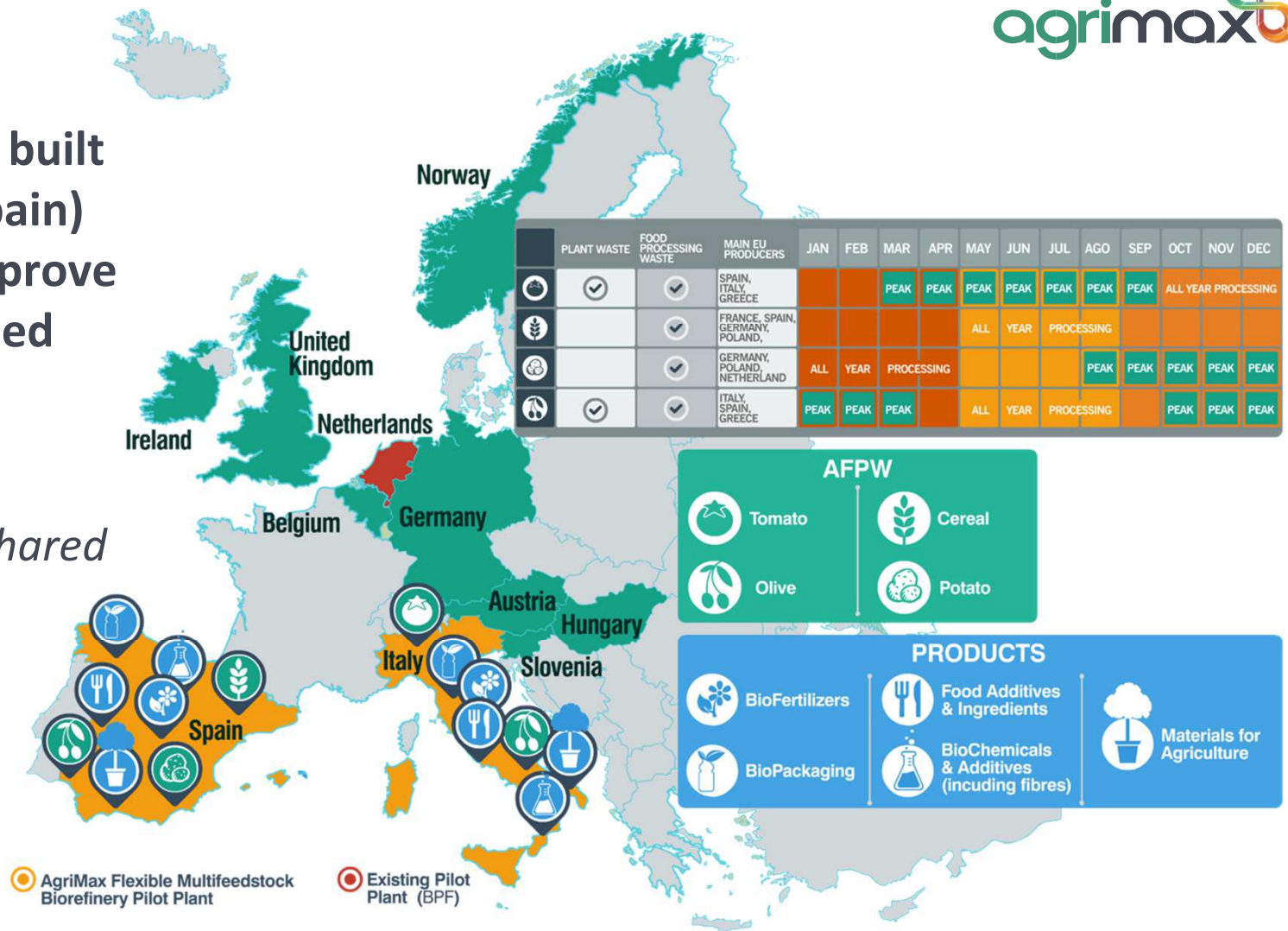
16% of food waste is generated at **field and processing level**

700 million tons of agricultural waste are generated in EU annually

2 pilot biorefineries

The two pilot plants were built (one in Italy and one in Spain) on a cooperative basis to prove the viability of the proposed approach

- Flexible and integrated
- Designed to maximise shared equipment



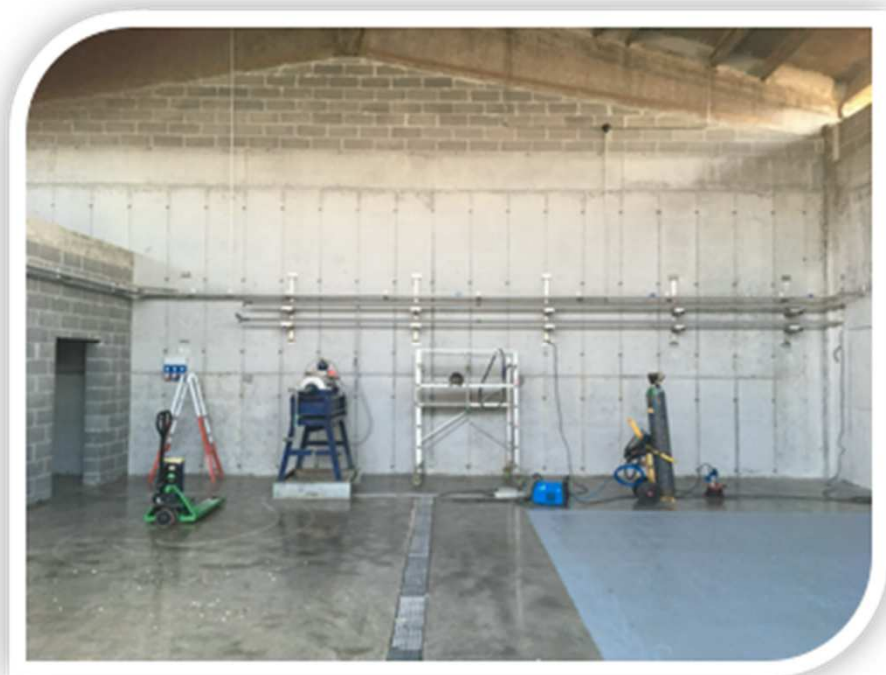


Italian Pilot Plant - CHIESA VIRGINIO Canneto sull'Oglio (MN) - ITALY

IPP Construction and Enlargement



IPP Construction and Enlargement



IPP Construction and Enlargement





Italian Pilot Plant equipment

IPP Equipment



IPP Equipment



IPP Raw Material Storage



IPP Raw Material Storage



IPP Raw Material Storage





Tomato (peels & seeds) waste =

- **Cutin extraction:** a new coating for metal food packaging industry, safer to the consumer, more sustainable
- **Lycopene extraction:** antioxidant, food ingredient for the food industry
- **Biogas production:** after the cutin and lycopene extraction better performances of the exhausted skins in comparison with non-treated ones

Cutin

- From **100 kg/h to 500 kg/h** of tomato by-products processed
- Production of bio-lacquer on **industrial line**
- Application of the bio-lacquer and production of metal cans on industrial line, using the **same equipment as for the standard process**



Courtesy of Salchi Metalcoat srl

Lycopene

- Extraction of tomato peels discarded by cutin extraction process (additional valorization of tomato by-products)
- From **2 L to 40 L for a batch** of extraction (lab to pilot scale)
- Optimization of the extraction yield on the pilot plant process: improvement of **70 times of the extraction yield**
- Application as food colorant





Cereals (wheat bran) waste =

- Biopolymers (mycelium materials) for farming / packaging industry, extraction of ferulic acid, phenolic compounds and fibres
- Proteins plus ferulic acid extract as ingredient for functional food

Substrate

Mogu's technology

Products



Side-stream from Italian Pilot Plant



Mycelium acts as the main binding agent (glue) for the substrate, providing strength to the new bio-material



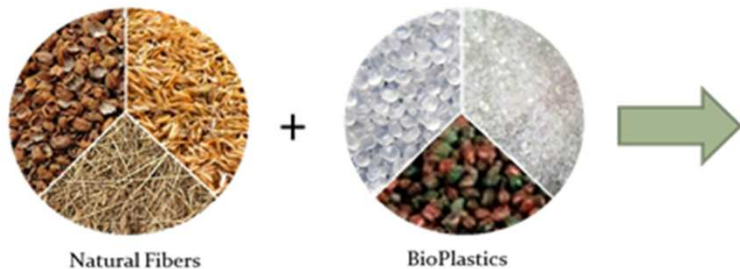
Mechanical performance characterization
Biodegradation analysis



Process TRL

Production capacity

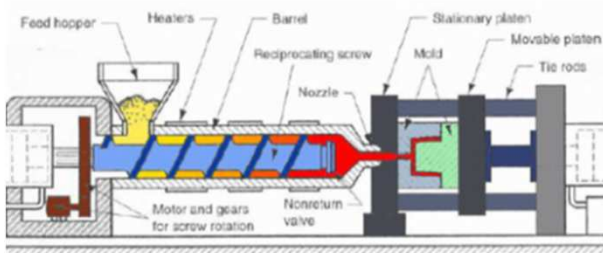
**By-product valorisation
for packaging and
agricultural purposes**



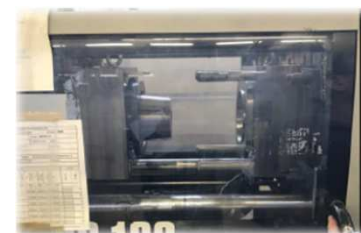
BIOCOMPOSITES



Injection moulding machine



Injection moulding machine «Sandretto» model HP120

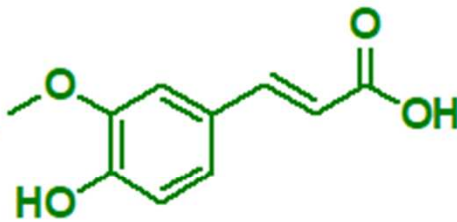
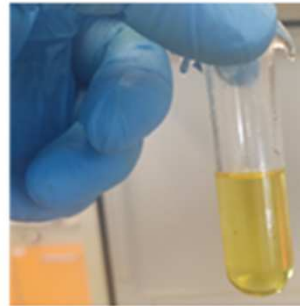


Ferulic acid

Step 1: Extraction and purification

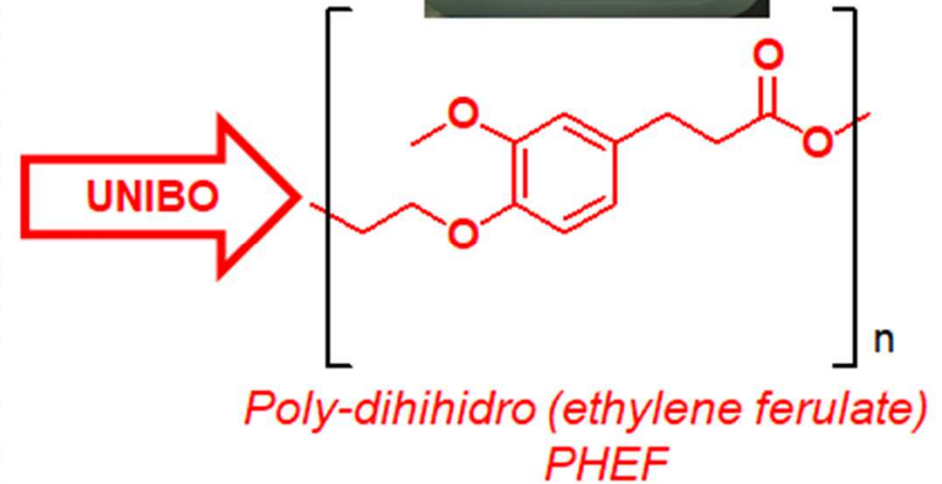


CHIESA/UNIBO



Ferulic acid

Step 2: Polymerization





Tomato (cull fruit & plant) waste =

- Compost: Solid fertiliser for the farming industry
- Hydrocompost: liquid fertiliser for the farming industry

Video



AGRIMAX^{WILL} DEMONSTRATE THE POTENTIAL



Environmental, societal and economic impacts



- H&S assessment of pilot plant
- New markets for sustainable bio-based products.
- Creation of new Startup “*Tomapaint S.r.l.*”
- Connection of sectors that have not previously worked together.
- Increased value of crop and food residues.
- Reduced Europe’s dependence on fossil-fuels and improving its sustainability.



Project next steps and implementation



- Final validation steps (MODELLING-LCA-LCC-TEA)
- Final certification allowing the use post-project of the pilot plant
- Building of the industrial plant with a capacity of 200 t/year by the startup Tomapaint srl for the commercialization of cutine
- Creation of new job opportunities at regional level
- Improvement of the Circular economy awareness at local and rural level

Thanks for your attention!

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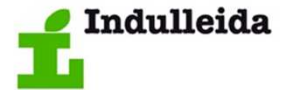
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The Consortium



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