

LIFE ECO CITRIC



Obtaining biomass, essential oils and animal feed from citric pruning waste



The Municipality of **La Vall d'Uixó** leads the Project that takes place within the **Demonstration Environmental Programme LIFE** in its 2013 call for proposals, within the priority Environment Policy and Governance. This project began officially on **1st June 2014**, with a duration of 30 months up to **30 November 2016**.

II



Why is the project needed?

- Spain is the largest producer of citrus fruit of the European Union and the 5th in the world with an annual production over 5 million tons during last decade.
- The Region of Valencia is the main citrus region at the national level.
- At La Vall d'Uixó, municipality the crops surface dedicated to citrus is **1.855 hectares**, with a yearly production of about **10.700 tons of waste which management was very difficult and expensive for farmers.**

Total amount of prune's waste by variety generated at La Vall



Variety	Tn	Variety	Tn
Arrufatina	362,78	Nadorcoot	51,90
Capola	1,07	Navelate	122,63
Clemenules	6.548,40	Orogrande	184,60
Clemenrubi	130,07	Orogros	1,07
Clemensoon	21,22	Oronules	1.169,53
Esbal	116,61	Oroval	157,75
Fortune	24,38	Ortanique	410,61
Hernandina	529,05	Safor	1,07
Lane-late	546,99	Terreno	43,72
Marisol	154,14	Tomatera	110,41
TOTAL		10.688,01 Tn	

II



Waste management

- **Waste coming from citrus prune are burnt in crops fields without any type of leverage, producing a lot of air and land-based pollution, apart from multiply the risk of forest fire.**
- LIFE Ecocitric presents a waste recovery methodology for the full use of pruning citrus as **biomass** made into pellets, **animal food** and **essential oils**.



Los restos de la poda (ramas y hojas) llegan a la planta piloto.

Sistema de separación y clasificación

Permite llevar a cabo la separación de la fracción leñosa y las hojas de los restos de poda mediante el sistema Llfth, capaz de clasificar dos productos similares de densidad muy baja.



Sistema de destilación/condensación
Dos depósitos de acero inoxidable y un sistema de condensación de vapor y decantación del aceite obtenido. Permiten extraer los aceites esenciales de las hojas.



Aceites esenciales



Pienso animal



Biocombustible o pellet

BIOMASS



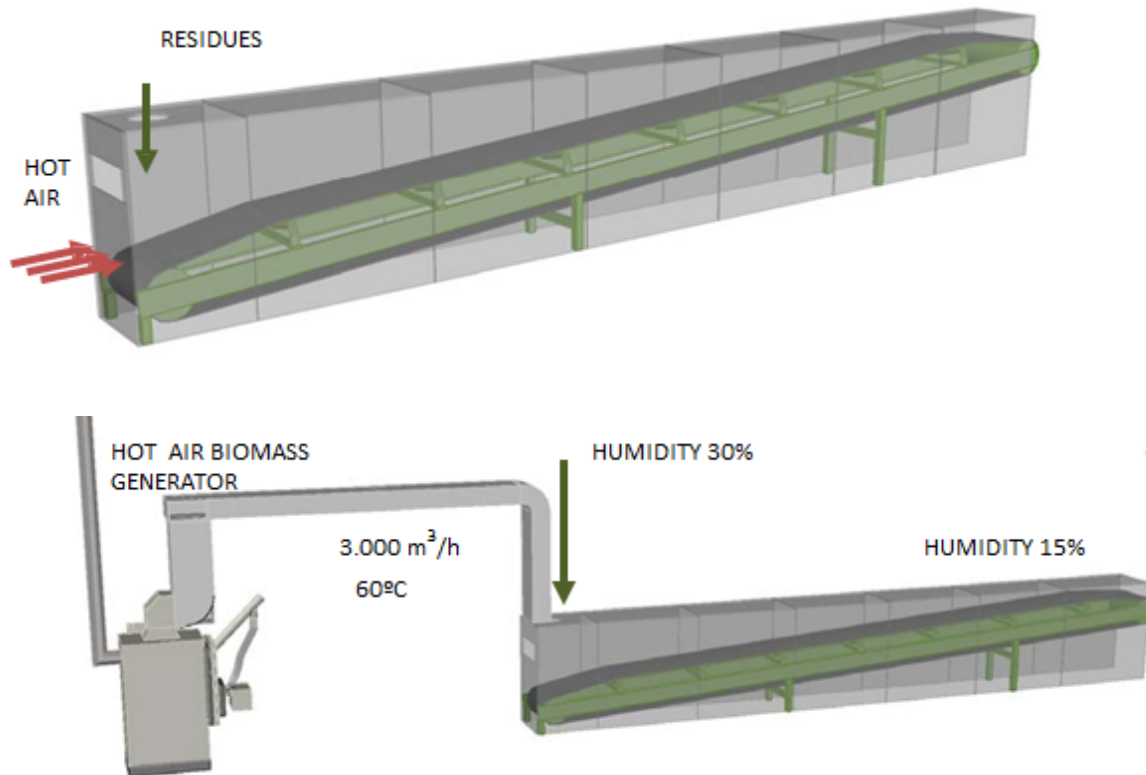
To get a high quality biomass, it is firstly needed to **reduce the content of waste's water**.

The wood fraction in the pilot plant undergoes a bio-drying process by means of microbial action.

To obtain this product, first of all, is done a bio-drying in greenhouse until humidity reaches 25% and subsequently a thermal drying using a biomass furnace. Then, the dry residue (with only 10% of humidity) is crushed and pelletized.

II

Bio-drying system



I

CHARACTERISTICS

- Calorific on dry mass: 4110.21 kcal / kg
- Calorific on wet mass: 3721.39 kcal / kg
- Moisture content: 9.46%
- Ashes on dry mass: 2.56%
- Ashes on wet mass: 2.31%
- Volatile matter on dry matter: 81%
- Volatile matter on dry mass: 73,34%
- Diameter: 6 mm
- Length: $3 <L <4$ mm
- Fixed carbon on dry mass: 16,44%
- Fixed carbon on wet mass: 14.89%
- Raw material: 100% pruning citrus



RESULT



- In the demonstration plant was achieved the production of a biomass fuel draw from low cost raw material that can be sold as biomass made into pellet or be burnt to generate electric or thermic energy.
- **The final energy balance is very positive because to dry 1kg of biomass are only required 0,048 kg of pellet.** All of that indicates a performance efficiency of 94%. The pellets resulting from the process are accepted as fuel according to DIN 51731, 2012 standards.

II



ESSENTIAL OILS AND ANIMAL FEED



Essential oils and animal feed will be obtained from the **leaves**, which undergo two treatment stages.



II



1. distillation and digestion process. In this process, CITRIC ESSENCES are obtained by means of steam distillation



CHARACTERISTICS

- **Appearance:** High purity, absence of foreign matter
- **Color:** transparent straw-colored hue
- **Odor:** Characteristic citric
- **Form:** Liquid dense





RESULT

The **essences gotten from the leaves**, contrary to the ones obtained for example from the shell or from the flowers, have a transparent colour and they **contain aromatic substances called terpene esters** which behave as anti-inflammatory, analgesics and antispasmodics.

It is very common that they take part of the formulation of preparations used to treat a wide variety of pain such as migraines. By the same token, they can be used as painkillers and relaxants. **In addition to the therapeutic use, the essences obtained can also be used in the food industry as natural flavourings.**

2. the remaining proteins and fats undergo **dewatering, refining and pelleting** to convert them into meal in granulated form that can be used as **ANIMAL FEED** with a high protein value.



CHARACTERISTICS

- **ORGANOLEPTICS**
- Appearance: Absence of foreign material
- Color: Greenish
- Odor: Characteristic
- Form: citrus meal compacted into a cylinder

- **MICROBIOLOGICAL QUALITY**

- Salmonella (25 g. ABSENCE)
- E. Coli (1 g) ABSENCE
- Staphylococcal (CFU / g) <10 (LDD)



- **ABSENCE OF UNDESIRABLE SUBSTANCES (RD 465/2003)**

- **NUTRITIONAL PARAMETERS**

- Gross Protein 14%
- Crude fat 2.5%
- Crude fiber 17%
- FAD 17%
- Ash 12.5%
- Moisture 8%
- Starch <2%
- Total Sugars <2%



- **AMINOGRAM**

- Aspartic acid 0,94%
- glutamic acid 1,05%
- Alanine 0,54%
- Arginine 0,59%
- Cysteine (aq. Citric) 0,17%
- Phenylalanine 0,52%
- Glycine 0,64%
- Histidine 0,25%
- Isoleucine 0,44%
- Leucine 0,79%
- Lysine 0,51%
- Methionine (Methionine sulfone) 0,18%
- Proline 1,62%
- Serine 0,47%
- Threonine 0,34%
- Tyrosine 0,45%
- Tryptophan 0,19%
- Valine 0,57%



Prescription for a Circular Economy



Foliar Fertilizer

Livestock Bedding

Animal Feed

Biofuel

Essential Oils



Become in...



Leaves



Branches



Agricultural waste from pruning citrus

Thank you for your attention!



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More information:

www.lifeecocitric.eu



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Ajuntament de la Vall d'Uixó

