



CLaMber

CASTILLA-LA MANCHA BIO-ECONOMY REGION PROJECT



EUROPEAN UNION
Investing in Your Future
European Regional
Development Fund 2007-13

Europe Challenge: Demonstration scale



Lab Scale

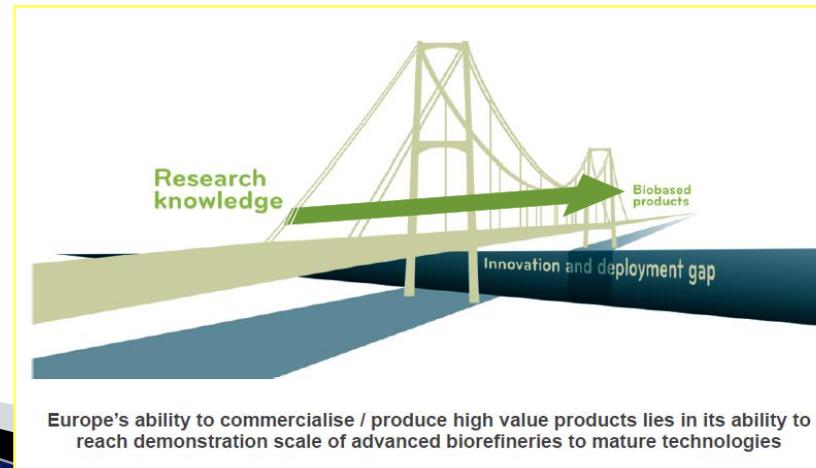


Demonstration Scale Biorefinery



Mature Biorefinery

Source: Bio-Based Industries Consortium



PLACING CASTILLA-LA MANCHA IN THE CENTER OF THE NEW EUROPEAN STRATEGY FOR BIOECONOMY



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Biomass availability in Castilla-La Mancha



WASTE BIOMASS AVAILABLE FOR ENERGY RECOVERY

BIOMASS		t/year	
AGRICULTURAL	HERBACEOUS	Cereal straw	649.939
		Stem and cob corn	221.908
		Waste of sunflower fields	258.473
		Subtotal	1.130.320
	WOODY	Vine pruning	621.437
		Olive pruning	354.982
		Fruit pruning	60.172
		Vine grubbing up	109.807
		Subtotal	1.146.398
		Firewoods, branches, etc.	121.416
FOREST	WOOD INDUSTRY	Subtotal	121.416
		Sawmill	66.895,50
		Boards	3.524,60
		Construction	115.945,59
		Containers	8.961,50
		Others and bobber	2.628,80
		Furniture	49.973,20
		Subtotal	247.929,19
FOOD AND AGRICULTURAL INDUSTRY	FOOD AND AGRICULTURAL INDUSTRY	Brewers	25.000
		Grape pomace	105.000
		Olive pomace	38.000
		Subtotal	168.000
TOTAL		2.814.063,19	

Biomass availability in Castilla-La Mancha



WASTE BIOMASS AVAILABLE FOR DIGESTION

WASTE	t/year
Pig manure	1.545.616
Cow manure	890.133
Poultry manure	618.835
Other species manure	1.043.121
Slaughterhouse raw material	81.293
Poultry Slaughterhouse raw material	14.829
Housing raw material	27.876
Meat and bone meal	0
WWTP sludge – meat	15.799
WWTP sludge – dairy	10.989
Whey	478.598
Dairy raw material	1.190
Fish raw material	27
WWTP sludge – fish	22
Surplus vegetables	4.146
Surplus citrics	0
Surplus fruit	56
Nonconforming vegetables	83.336
Nonconforming tubers	4.768
Nonconforming citrics	0

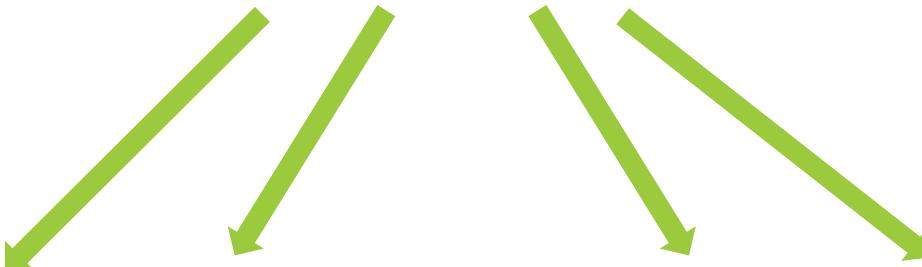
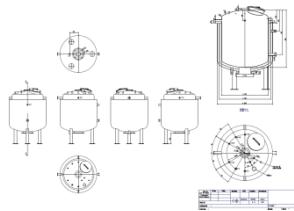
WASTE	t/year
Nonconforming fruits	1.325
Vegetable transformation	28.471
Tuber transformation	379
Citric transformation	0
Fruit transformation	1.078
Brewer	97.290
Alperujo 2Phases	235.240
Alpechín 3Phases	52.038
Vine raw material	414.180
Cider raw material	0
Sugar raw material	77.091
Cereal straw	3.447.943
Sludges IWWTP – Vegetable Transf.	3.734
Energetic crops	5.660
Glycerin	23.780
Raw material DDGS (bioethanol)	16.130
Raw material beet pulp (bioethanol)	0
Wholesale	34.281
Bars and Restaurants	26.870
Hotels	2.098

TOTAL: 9.288.222 t/year

First action involved in the CLaMber Project



CONSTRUCTION OF A DEMONSTRATION SCALE BIOREFINERY



INTEGRAL

MODULAR

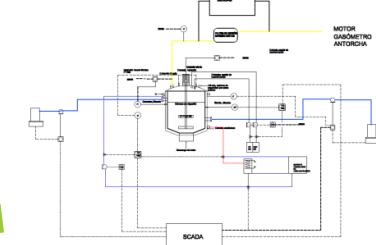
FLEXIBLE

INNOVATIVE

1 t dry material
per day



PROCESS OPTIMIZATION, DEVELOPMENT OF
NEW BIOPRODUCTS, SCALE-UP
EXPERIMENTS, COST REDUCTION, ETC.



SERVICES:

- RENTAL OF FACILITIES
- PROCUREMENT OF R&D PROJECTS
- PARTNER FOR COMPETITIVE
FUNDINGS (RTO)
- TRAINING IN BIOTECHNOLOGY

Front view of the Plant



BIOMASS

LIGNOCELLULOSIC

Lignocellulosic crops



Herbaceous agricultural wastes



Woody agricultural wastes



SUGARED/STARCHY

Sugared crops



Starchy crops



RESIDUAL MIX

Manures



Whey



OFMSW



Grape marcs and lees



WWTP Sludges



Alperujo



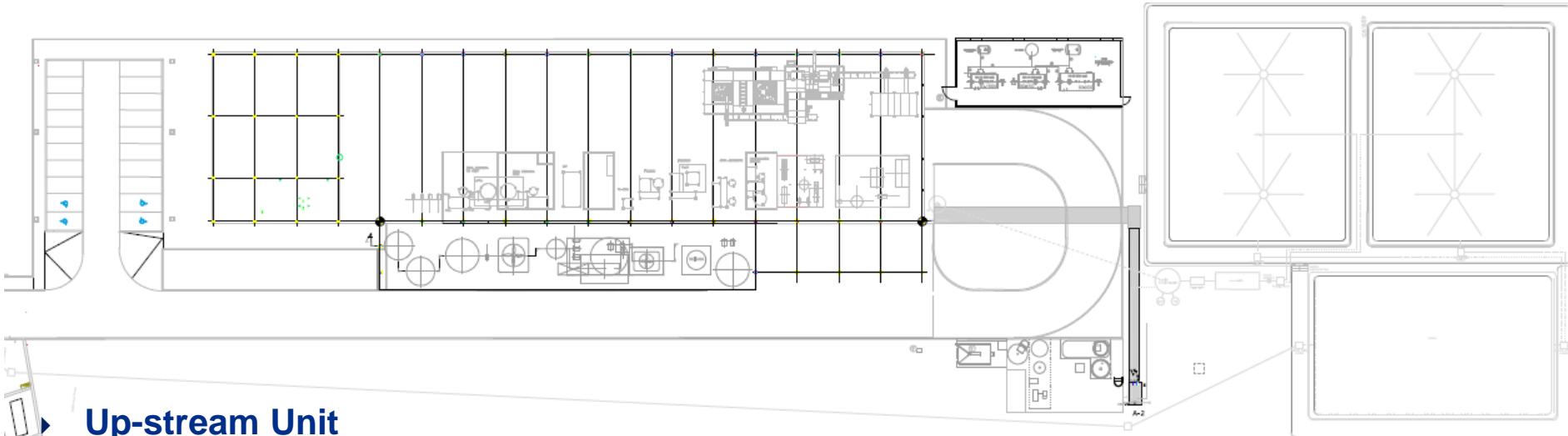
Slaughterhouse wastes



High loading WW
(vinasse, alpechin),

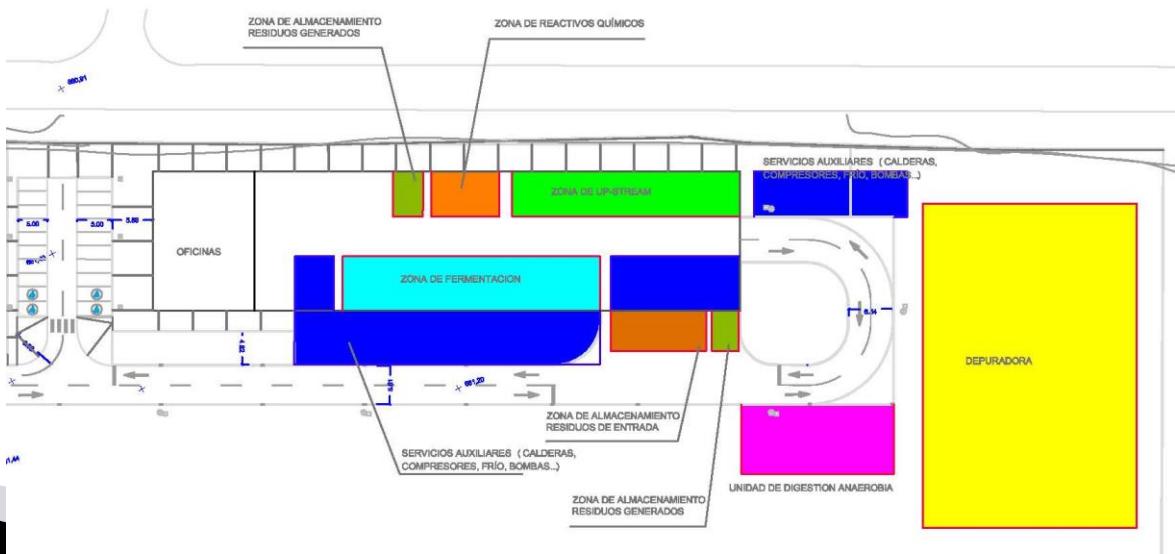


General distribution



Up-stream Unit

- ▶ Mid-stream Unit
- ▶ Down-stream Unit
- ▶ Anaerobic digestion Unit
- ▶ Utilities
- ▶ Waste Management Unit



UP-STREAM

- ▶ **Objective:** Conditioning and pretreatment of herbaceous and woody biomass in order to do a conversion of biomass in a fermentable carbon source
- ▶ **Equipment Overview:**
 - ✓ Solid biomass storage (4 x 35 m³)
 - ✓ Mills for herbaceous and woody biomass (200 kg/h)
 - ✓ Extractor with vapour (3 m³)
 - ✓ Two-step Steam Explosion Reactor (400 l, up to 21 barg)
 - ✓ Solid/liquid separators (15 m³/h)

Up-stream



MID-STREAM

- ▶ **Objective:** Fermenting or biotransform the carbon source generated in upstream into different bioproducts (bioplastics, biofuels, building blocks, etc.)
- ▶ **Equipment overview:**
 - ✓ Microbiology laboratory for micro management (starters, inoculants, etc.)
 - ✓ Reactors for hydrolysis and anaerobic and aerobic fermentation: 2 x 3 l, 2 x 30 l, 1 x 300 l, 1 x 3000 l and 1 x 20000 l
 - ✓ Systems for sterilization, substrate preparation, addition of sterile reactants, cleaning in place, and other utilities

Mid-stream



DOWN-STREAM

- ▶ **Objective:** Purification and concentration of the fermentation product of interest
- ▶ **Equipment overview:**
 - ✓ Harvesting tanks with capacity to act as a extractor: 1 x 10000 l (ATEX), 1 x 10000 l (No ATEX), 1 x 1500 l (ATEX) and 1 x 1500 l (No ATEX)
 - ✓ Microfiltration system (1 m³/h)
 - ✓ Centrifugation system (1,5 m³/h) (ATEX)

Down-stream



ANAEROBIC DIGESTION

- ▶ **Objective:** It is a modular and transportable pilot plant (400 l/d) for experiments of anaerobic digestion and codigestion of solid and liquid organic biomass to obtain biogas, VFA or biofertilizers.
- ▶ **Equipment overview:**
 - Liquid storage tank (20 m³)
 - Solid storage hopper (10 m³)
 - Pasteurization tank (1 m³)
 - Homogenization Tank (3 m³)
 - Digester (11 m³)
 - Digestate tank (5 m³)
 - Gasometer (10 m³)

Anaerobic digestion



Utilities



Wastewater treatment



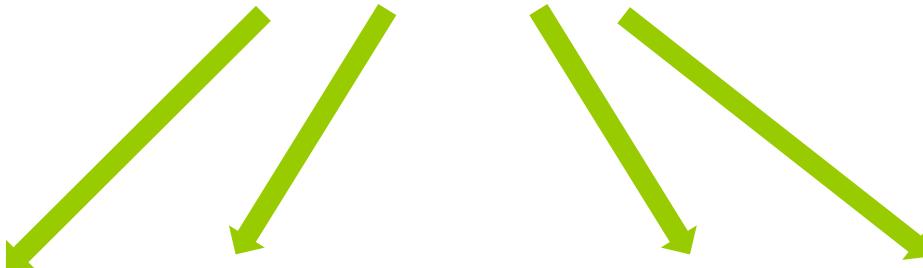
Process Control



Second action involved in the CLaMber Project



Issuance of a Pre-commercial Public Procurement (PPP) (8,6 Millions €) for conducting innovative R&D projects aimed at:

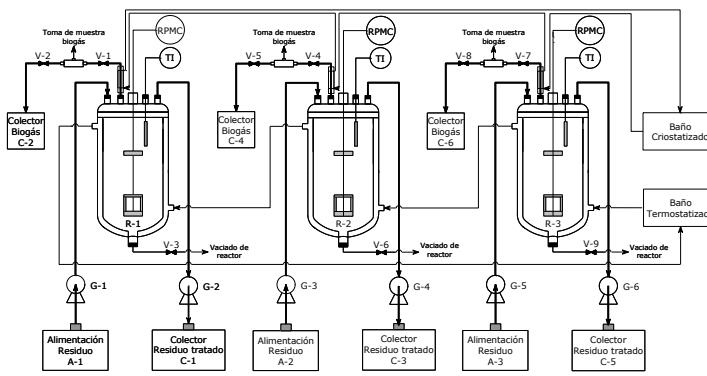


**SELECTION OF
OPTIMAL RAW
MATERIALS**

**IMPROVEMENT OR
DEVELOPMENT OF
NEW BIOPROCESS**

**DEVELOPMENT OF
NEW BIOPRODUCTS**

**SOCIOECONOMIC
RESEARCH, NEW
BUSINESS MODELS,
LOGISTIC AND
OTHER
TECHNOLOGY
CHALLENGES**



Tender winners



TENDER	LOT	LOT NAME	WINNER
LIGNOCELLULOSIC	1	WOODY WASTES	F.U. ALCALÁ
	2	HERBACEOUS WASTES	NEOL BIOPOLIS
	3	LIGNOCELLULOSIC CROPS	NEOL
	4	LIGNIN	NATAC
OILY	-	OILY CROPS	CAMELINA COMPANY
AGRIFOOD	1	WINERY WASTES	NATAC AINIA
	2	ALPERUJO	INNOVAOLEO
	3	WHEY	BIOPOLIS
	4	SLAUGHTERHOUSE WASTES	BIOGAS FUEL CELL
	5	HIGH ORGANIC LOADING WASTEWATERS	ALVINESA BIOMASA PENINSULAR
NO AGRIFOOD	1	LIVESTOCK WASTES	AINIA PURINES ALMAZÁN
	2	OFMSW	BIOMASA PENINSULAR
	3	WWTP SLUDGES	AINIA
	4	GLICERIN	TECNALIA
	5	NON ENERGETIC BIOGAS	BIOPOLIS



DEMONSTRATION OF AN INTEGRATED INNOVATIVE BIOREFINERY FOR THE TRANSFORMATION OF MUNICIPAL SOLID WASTE (MSW) INTO NEW BIOBASED PRODUCTS

Table 1.1a Targeted biobased products to be obtained at demo scale during URBIOFIN project

Biobased product	Use/ final application
Bioethanol	Chemical building block for bioethylene production and VFAs elongation
Mcl fatty acids (MCFA)	Chemical platform for mcl-PHA production
Biogas	Chemical building block for scl-PHA
Bioethylene gas	Ripening Gas in Post-Harvest Fruit Chambers
Short chain polyhydroxyalcanoates (scl-PHA)	Agriculture Bioplastic and use for household bags
Medium chain polyhydroxyalcanoates (mcl-PHA)	Bioplastic for packaging
Biocomposites of scl and mcl-PHA	Cosmetic and hygienic applications
Aminoacids rich liquid fertiliser	High added value liquid biofertilisers
Dry Organic-Mineral Granules	Solid Biofertiliser



Total budget
15 M€

Jun 2017
Jun 2021



BIOREGIO boosts bio-based circular economy through transfer of expertise about best available technologies and cooperation models.

www.interregeurope.eu/bioregio

An interregional cooperation project for improving resource-efficient economy policies.

Project Partners

Lahti University of Applied Sciences (FI)
Regional Council of Päijät-Häme (FI)
Deputy Regional Ministry of Environment (ES)
Slovak University of Agriculture in Nitra (SK)
Aristotle University of Thessaloniki (EL)
Region of Central Macedonia (EL)

National Research and Development Institute for Chemistry and Petrochemistry ICECHIM, Calarasi Subsidiary (RO)
Association of the Chambers of Agriculture of the Atlantic Area (FR)



European Union
European Regional
Development Fund

An interregional cooperation project to share expertise about circular economy models and best available technologies of biological streams between other european regions.

DEVELOPED BY THE DEPUTY REGIONAL MINISTRY OF ENVIRONMENT OF CASTILLA-LA MANCHA.

The policy instrument that Castilla-La Mancha expects to improve with this project is the ERDF Regional Operational Programme.



CLaMber



IRIAF

THANK YOU

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