From Food Waste to Innovative Bio-based Products

INSPIRATION FROM SPAIN

Mr. Andrés Pascual

ainia

Pre-Conference Workshop FOOD 2030
12 October 2016

CONTENTS:

- ABOUT AINIA
- PRACTICAL RESULTS ON FOOD WASTE
- CHALLENGES FOR THE FUTURE
- PHBOTTLE PROJECT (VIDEO)

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► Andrés Pascual Vidal,

Head of Environment, Bioenergy & Hygiene.

- **Agriculture Engineer** by Univ. Politécnica de Valencia (Spain)
- Specialist in **Food Industries**.
- **19 years experience on R&D projects**, technological consultancy and training:
  - 4 years as project manager at the New Food Products Dept.
  - 15 years as Head of Environment, BioEnergy and Hygiene Dept.
- Chair of WG “Quality, Manufacturing and Sustainability” of the Spanish **Food for Life Technology Platform.**
- Knowledge Member of the **Spanish Biogas Association**.
- Member of the Executive Committee of **EHEDG** (European Hygienic Engineering and Design Group).

@andpasvid

ABOUT AINIA

private non-profit	710 associates	186 people	13,8 M € revenue

customer-led services · independence · confidentiality · integrity · commitment

ainia

We give support and add value to companies, leading innovation and technological development in a responsible and committed way

| More than **1.100 associated companies** | More than **20 years** of experience in applied R&D |
| A staff of **200**, mainly **technologists** | **12.000 m² of facilities** |

We work for the Food, Pharma, Chemical and Cosmetic sectors

We are specialists in **Food** Technology | **Bio**technology | **Nano**technology | **Electronics** and Communications | **Chemical** Technologies | **Environmental** and energetic technologies |

We provide Solutions for Food & Health | Food Quality & Safety | Design and Industrial Production | Sustainability | Packaging |

12.000 m2	7 laboratories	10 pilot plants

OUR INFRASTRUCTURES

Our infrastructures are prepared to respond to the technological needs:

7 laboratories:

Chromatography | General Chemistry | Physical Tests (food and packaging materials) | Microbiology | Molecular Biology | Cell Culture Laboratory | Bio-Security Level P3 Laboratory |

10 pilot plants:

Unit Operations in food Processing | Biogas | Supercritical Fluid Technology (scf) | Packaging | New Product Development | Water | Hygiene | Bio-Production | Spectroscopy | Vision |

- 5 polyvalent and multifunctional rooms
- Researchers' room (100 people)
- 12.000 m² of facilities
- Assembly hall (120 people)

www.ainia.es

PRACTICAL RESULTS FOOD WASTE

Altex
ALTA TECNOLOGÍA EXTRACTIVA

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4 Extractors x1000 L.

1st multi-purpose industrial supercritical CO2 extraction plant

ALTEX works as a **service company** offering industrial production under contract or test manufacturing.

Applications:

-Obtaining nutraceutical products and dietary supplements such as: **vitamins**, **antioxidants** from plants or **essential oils**, fish oil or derivatives deodorised and purified, etc. Extraction, fractionation and purification of **herbal or medicinal plant extracts** for cosmetic and pharma applications.

▶ CLUMBER Project.

CLaMber

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AINIA developed a **Winery Waste Biorefinery,** including new **bioprocesses** like:

-**Fermentation** of *Bacillus cereus group* on wine **vinasses** to be used as a "bioestimulant" of plants.
-**Enzymatic** process of grape **peels/seeds** to aminoacids to be used as "biofertiliser".

▶ Anaerobic Digestion.

probiogas PSE

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Proyecto cofinanciado por

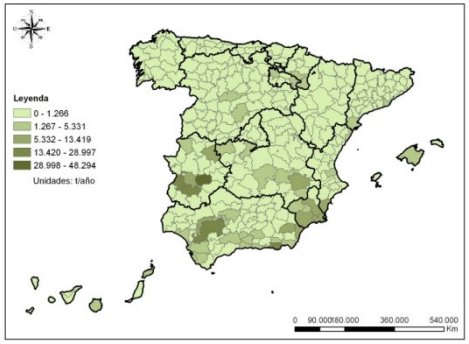
GOBIERNO DE ESPAÑA · MINISTERIO DE CIENCIA E INNOVACIÓN

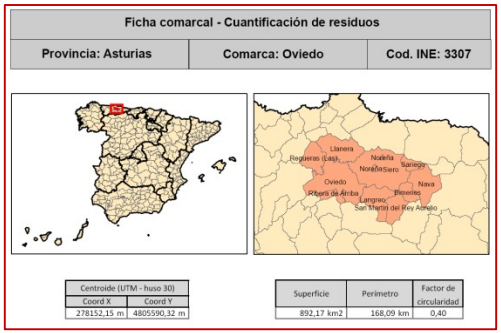
2007-2011

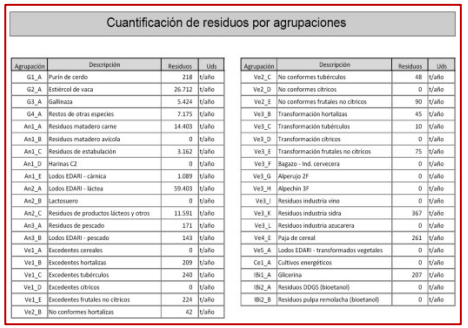
Food waste characterization and quantification.
DATABASE with **180 subcategories of agro-food waste in 330 Spanish subregions**.

www.probiogas.es

Project data has been used to define the
Spanish BioEconomy Strategic Plan 2020.



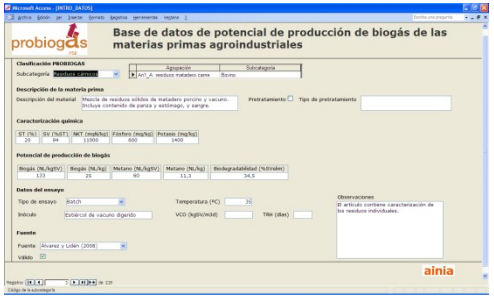




FICHA	RESIDUO CARACTERIZADO	TIPO	CATEGORÍA	SUBCATEGORÍA
An1_100	HARINA DE AVE	An	An1	An1.110

PARÁMETROS IMPORTANTES DEL PROCESO ANAEROBIO

ANÁLISIS DETALLADO	PROM_CSR	MIN_CSR	MAX_CSR	FUENTE	OBSERV
ST - %	98,8			Probiogas	
SV - %ST	81,0			Probiogas	
pH a 20ºC	6,1			Probiogas	
CE - mS/cm	3.450,0			Probiogas	
N-NH4 - mg/kg	5.684,0			Probiogas	
DQO total - mgO2/kg	772.215,0			Probiogas	
DQO soluble - mgO2/kg	220.776,0			Probiogas	
COT - mg/kg	7.829,0			Probiogas	
Alcalinidad - mg CaCO3/kg	1.000,0			Probiogas	
AGV - mg HAc/kg	2.074,7			Probiogas	
NKT - mg/kg	90.469,0			Probiogas	
P total - mg/kg	32.545,0			Probiogas	
K total - mg/kg	5.781,0			Probiogas	
C/N					
COT/Norg	0,1			Probiogas	
Biogás - NL/kg SV	660,0			Probiogas	
Metano - NL/kg SV	513,0			Probiogas	



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integral b

Demonstration of a new **INTEGRAL** **B**iogas and **B**iodiesel valorization system for food waste from city restaurants.

2009-2011

Awarded Project
LIFE Best Environment Projects 2012

www.integral-b.com






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Unión Europea
Fondo Europeo
de Desarrollo Regional
"Una manera de hacer Europa"

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

agrobiomet

1st car in Spain to use **biomethane from agro-food waste** as a biofuel.

2010-2013

www.agrobiomet.es

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Co-funded by the Intelligent Energy Europe Programme of the European Union

IEE/13/477/SI2.675801

2014-2016

Sustainable **small-scale biogas production** from agro food waste for energy self-sufficiency

www.biogas3.eu





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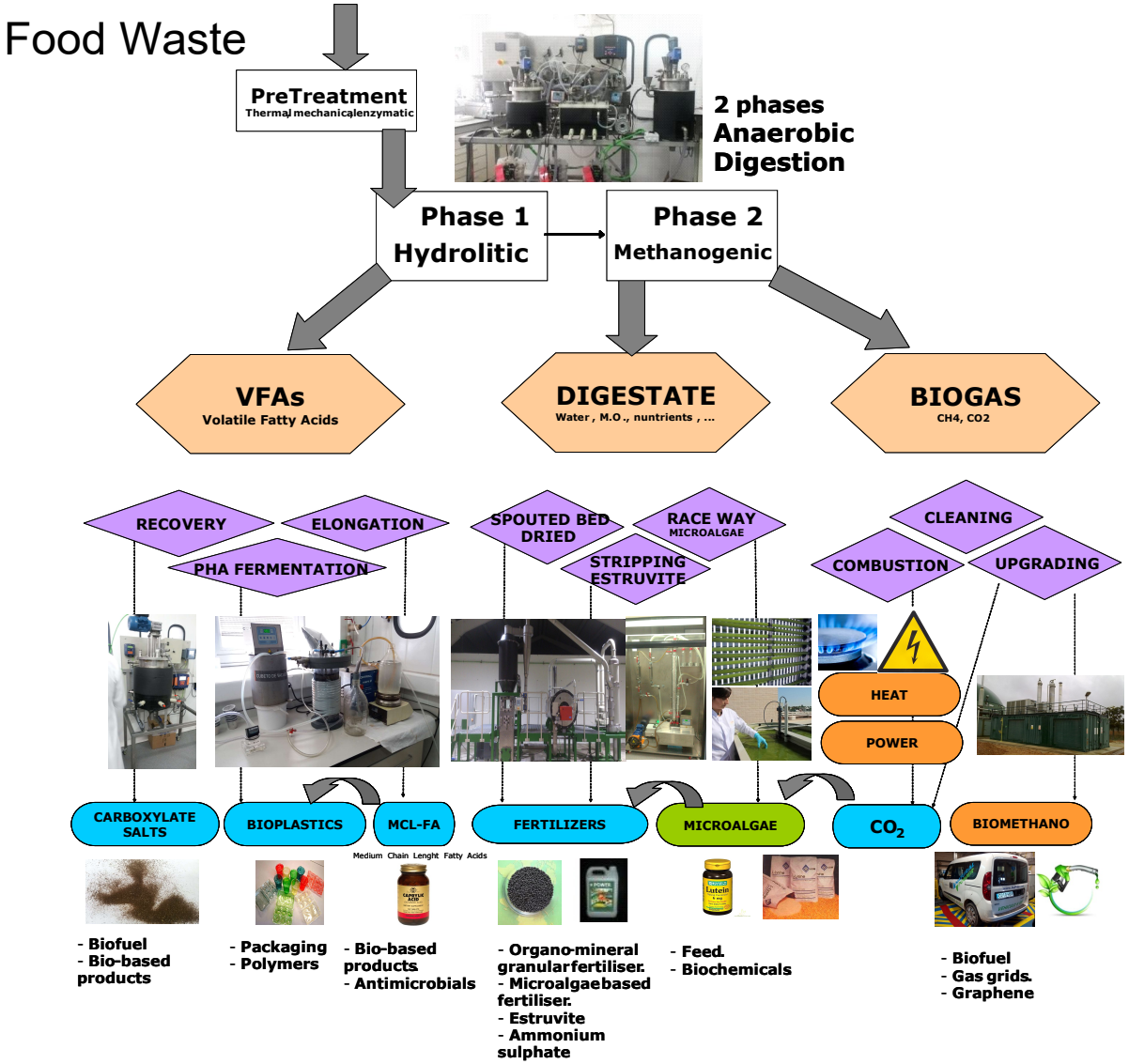
From food waste biogas plants to biorefineries.

Biogas plant TODAY	Furte biogas plant based in the concept of BIOREFINERY
1- Biogas: •Power. •Heat. •Biomethane 2-**Digestate.** • Compost. • Direct land application.	1-Plataform **VFAs (carboxylates):** •Carboxylate salts (as building block) •PHA (bioplásticos). • MCL-FA. 2-Plataform **digestate** •New biobased solid fertilisers like ammonium sulphate or estruvite. •Microalgae for biobased products, specially for biofertilisers. 3. Plataform **biogas** •Power, heat and biomethane. •CO2 and CH4 to biochemicals and biobased products (bioplastics, etc.)

From food waste biogas plants to biorefineries through 2-phases anaerobic digestion



BIOREF ANALYTICS

Identificación

Usuario | Configurar Red

a

Contraseña

ACEPTAR | CANCELAR

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Software helping to select best biorefinery configuration

Proyectos | **Proyecto ID1-PROYECTO PARA EL ...**

PROYECTO PARA EL CLIENTE 1

Q Total (L/d): 10.000 | Carbox. (%): 40 | Algas (%): 10 | R. Raceway | R. Inclinado | Caldera | Cogeneración | Biometano | VER DATOS | VER TABLA

Sustratos

Sustrato	Q (kg/d)	Q (l/d)	Volume Ratio (%)	COD (g O2/L)	NTK (g N/L)	Phosporous (mg P/L)	ALK. (g CaCO3/L)	TS (g TS/L)	VS (g VS/L)	NH4+ (g N/L)	Potassium (mg/L)	Chloride (g/L)	Sulphate (g SO42-/L)	Liq. Fract. (g liq/kgw)	Density (kgw/L)	BMP (%)
Estiércol Cerdo	2.500	2.500	25	32,5	3,3	1.100	7,5	17,3	11,7	3,1	3.300	0,85	0,03	983	1	0,6234
Estiércol Vaca	7.500	7.500	75	154	5,5	5.374	5,4	132	93	1,486	5.000	19,8	0	891,5	1	0,75
Estiércol Pollo	0	0	0	262	21,75	5.664	0	250	175	1	8.963	0	0	750	1	0,6598
MEZCLA	10.000	10.000	100	123,625	4,95	4.305,5	5,925	103,325	72,675	1,8895	4.575	15,0625	0,0075	914,375	1	0,71835

Evolución

Características	ENT. AD1	CARBOX	ENT. AD2	GAS (m3/d)	SSL	SOLIDO	SPOUTED	LIQUIDO	STRUVITE	STRIPPING	m Algas (strp)	m Algas (Dir)	m Algas
Q (kg/d)	10.000,00	4.000,00	6.000,00	207,69	6.000,00	304,16	187,52	5.126,25	4.152,26	3.737,04	14.948,15	5.126,25	20.074,40
COD (g O2/L)	123,63	123,63	123,63	593,40	24,73	234,11	0,00	1,08	1,20	1,20	0,67	0,08	0,76
NTK (g N/L)	4,95	4,70	4,70	0,00	4,47	14,98	178,95	3,86	3,52	1,56	0,58	0,20	0,78
Phosporous (g P...	4,31	4,31	4,31	0,00	4,31	18,51	76,47	3.537,63	0,98	1,09	1,02	0,45	1,47
ALK. (g CaCO3/L)	5,93	5,93	5,93	0,00	5,93	5,93	0,00	5,93	6,58	2,93	10,93	3,04	13,97
TS(g TS/L)	103,33	37,92	37,92	0,00	24,29	230,00	970,00	10,64	10,64	9,46	7,07	1,09	8,16
VS (g VS/L)	72,68	18,17	18,17	0,00	4,54	43,01	0,00	1,87	1,87	1,66	2,17	0,33	2,50

Resultados

Resultados	CARBOXILATOS	SPOUTED	GAS	STRUVITA	STRIPPING	m ALGAS	TOTAL
Masa (Kg)	0,00	187,52	207,69	31,61	25,25	100,37	0,00
Importe (€)	0,00	3.750,32	6.121,49	284,47	0,00	802,98	10.959,26

Salir


CHALLENGES FOR THE FUTURE

Challenge #1
TO CREATE NEW BIO-BASED VALUE CHAINS

To design **innovative models** to enable the build-up of **sustainable** new, **circular**, **local** bio-based value chains

Challenge #2
TO BOOST THE CONCEPT OF BIOREFINERY IN NEW AND EXISTING BIOINDUSTRIES

Can a existing food factory or a waste treatment be transformed in a biorefinery?

Challenge #3
NEW BIOTECHNOLOGY DEVELOPMENTS TO ENABLE FOOD WASTE CONVERSION

To develop advanced bioconversion technologies of food waste into bio-based products.

Challenge #4

WASTE WATER OF FOOD INDUSTRIES AS A SOURCE OF BIORESOURCES

Recovery and/or bioconversion of valuable components, as well as water reuse


Inspiration
NEXT EXIT


PHBOTTLE PROJECT (VIDEO)

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PHBOTTLE

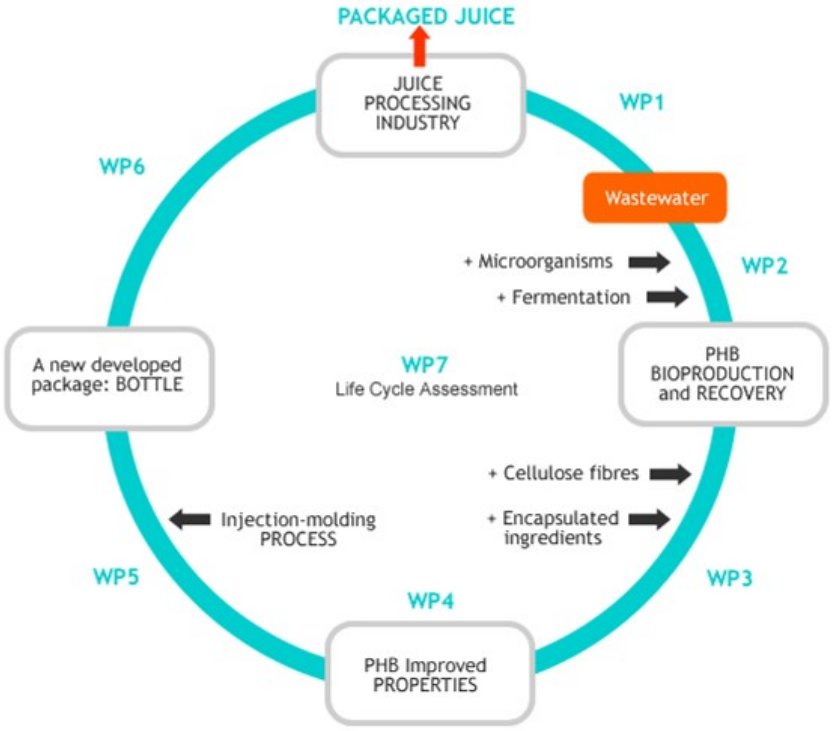
SEVENTH FRAMEWORK PROGRAMME

FP7 NMP.2011.2.3-1.

To develop a bioplastic (PHB, polyhydroxybutyrate) by fermentation of juice processing wastewater.

2011-2015

www.phbottle.eu



THANK YOU FOR YOUR ATTENTION

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