

Bio Base Europe Pilot Plant

Turning grammes into tonnes



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Project Acquisition Coordinator

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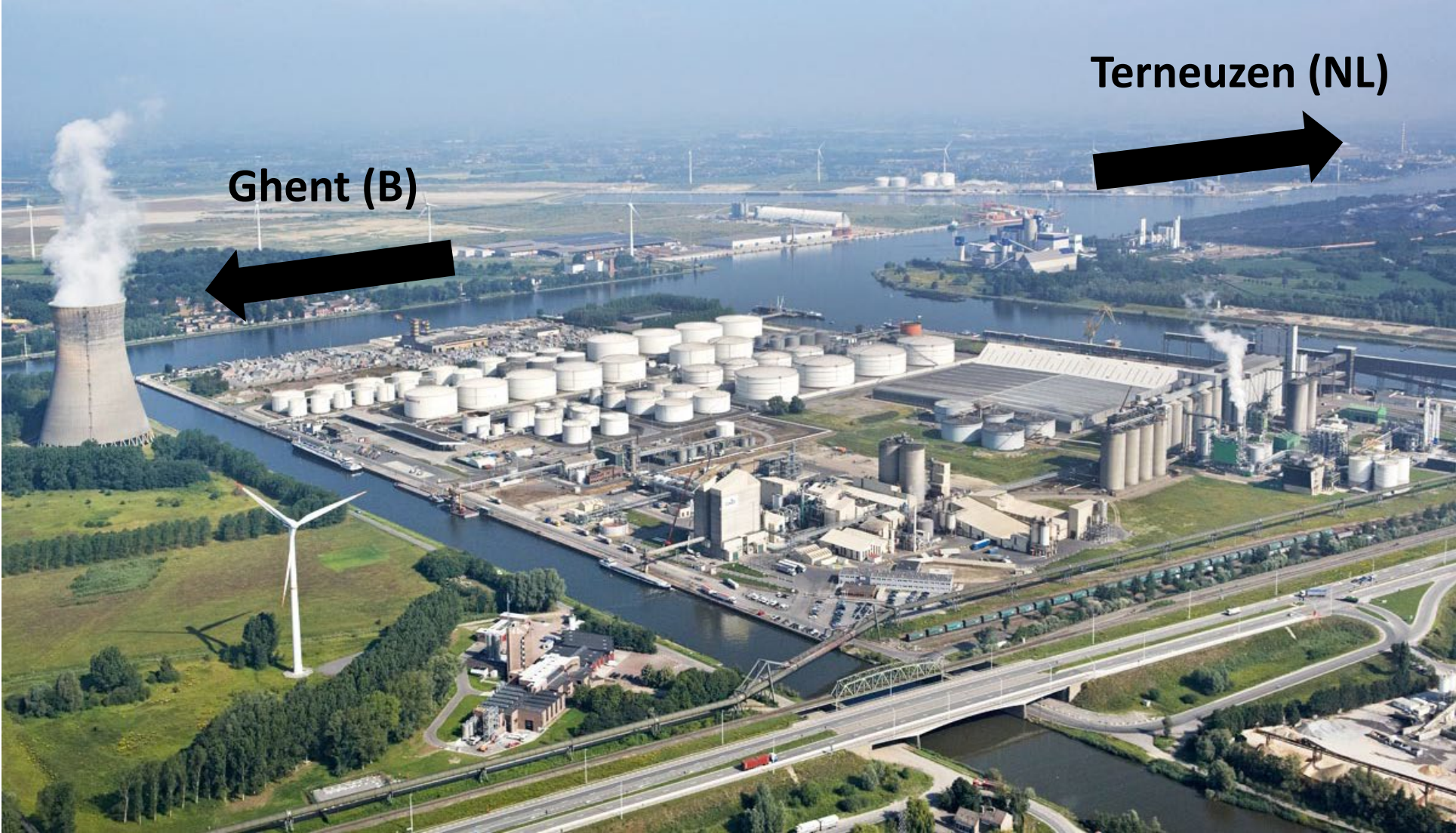
Who are we?



- Multi-purpose pilot facility for process development, scale-up and custom manufacturing of biobased products and processes
- Founded in 2008, operational since 2010
- **Independent**, non-for profit SME
- Located in Ghent, North Sea Port
- 140 employees today



Where are we located?



What do we offer?

Services



Process Development

- Concept design
- Fermentation optimization
- Downstream processing (DSP) development and optimization



Scale-up

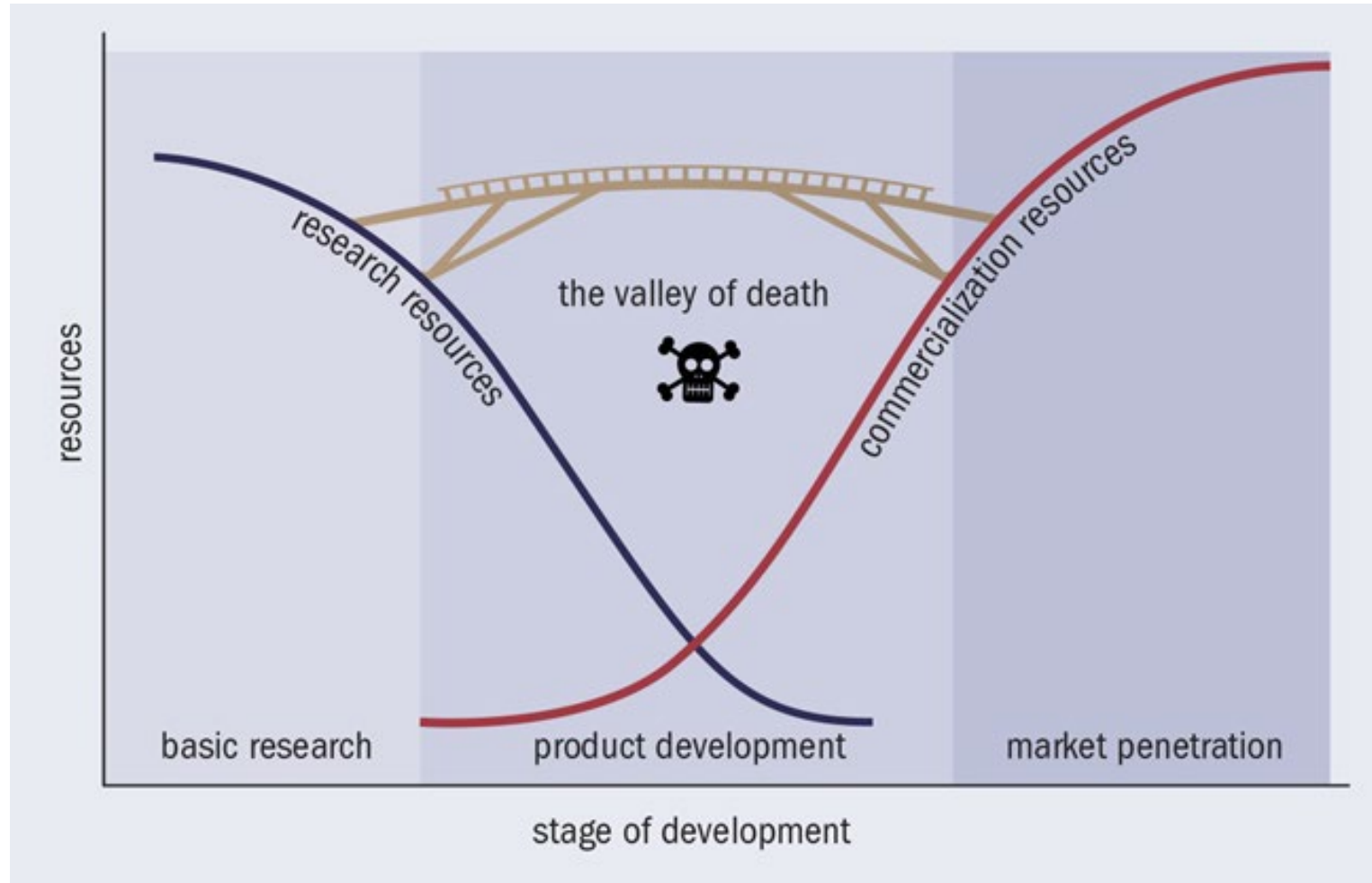
- From 10 L to 15m³ for fermentation + DSP, up to 50m³ for other processes
- Generation of samples for application research
- Demonstration of technology at larger scale



Custom Manufacturing

- 1,5m³, 4,5m³ and 15m³ in house
- access to 85m³, 100m³ and 250m³ through partners
- Fermentation
- (Solvent-)based DSP
- Biocatalysis

Why do we need pilot facilities?



Shared Pilot Facilities

=

risk sharing & reduction

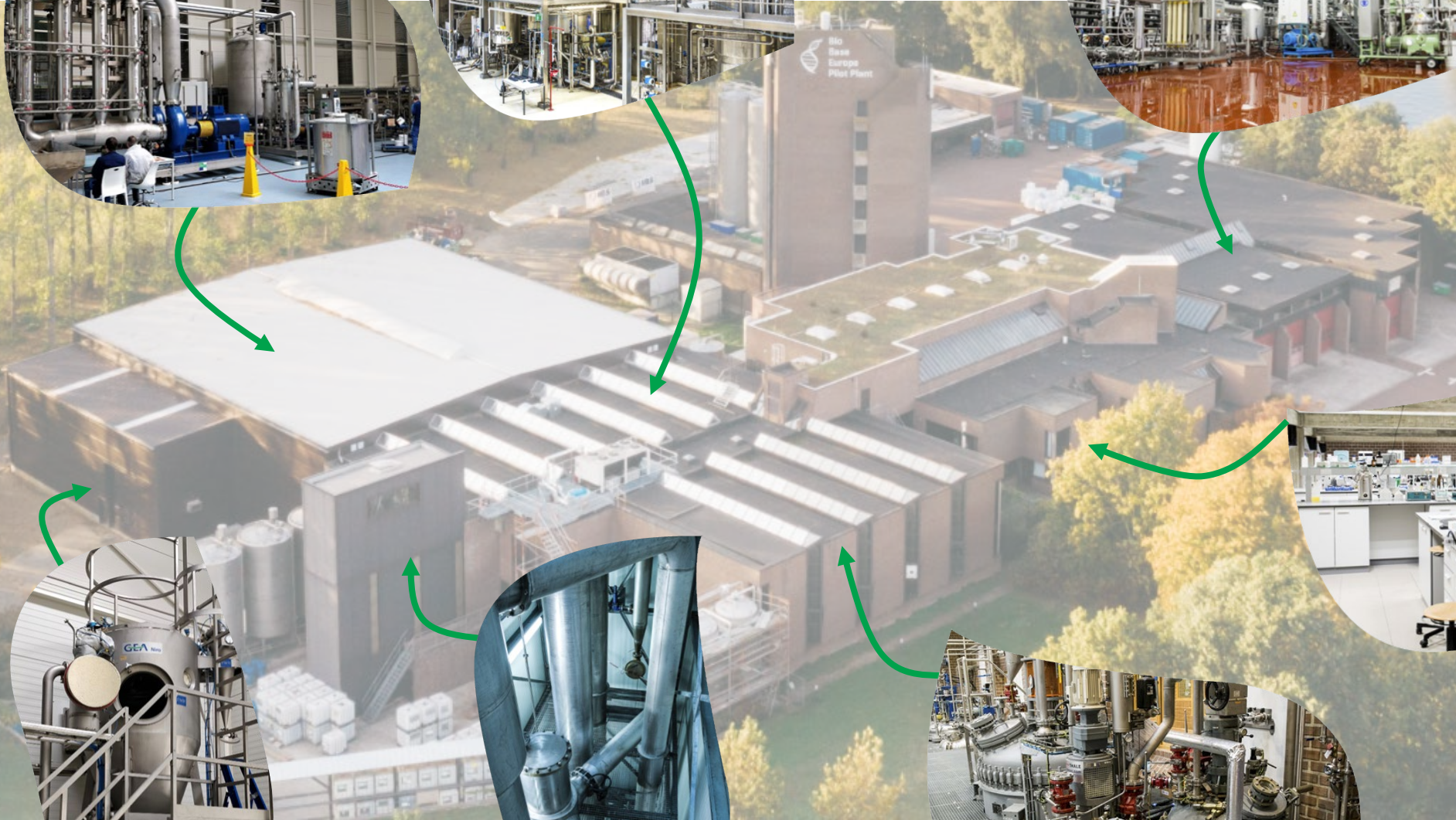
Process Hall 4
Large scale DSP



Process Hall 2
Fermentation
and DSP



Process Hall 1
Pretreatment, DSP, biocatalysis



Laboratory and offices



Spray dryer room



Thin film evaporator



Process Hall 3
Green chem – ATEX DSP

BBEPP business model

Open innovation service projects



Private projects

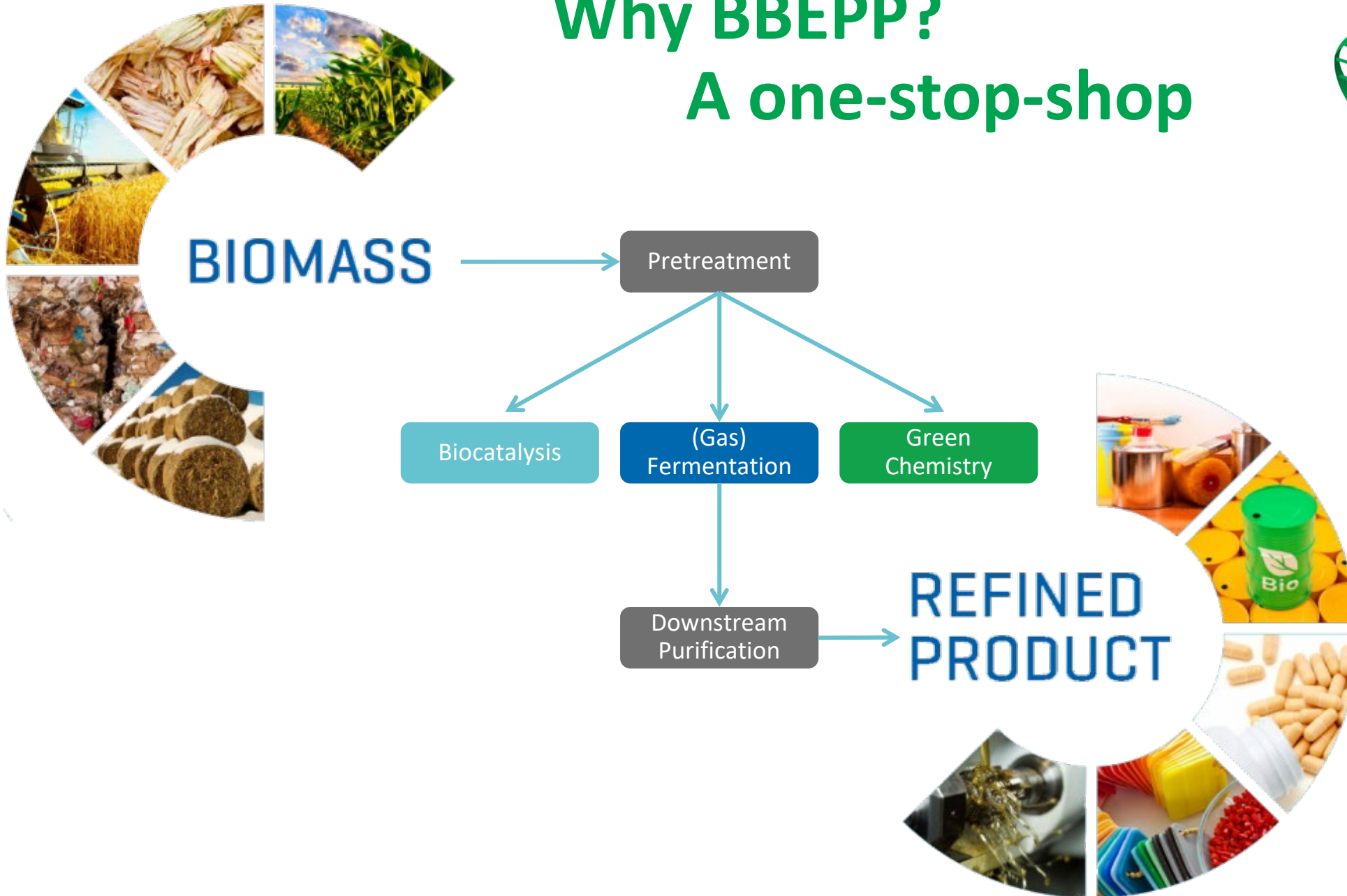
- ✓ Bilateral projects
- ✓ Funded by companies
- ✓ SME's and large companies
- ✓ > 450 projects for > 150 companies

Public projects

- ✓ Consortium projects
- ✓ Funded publicly
- ✓ 29 projects ongoing
- ✓ 31 projects finished



Why BBEPP? A one-stop-shop



A one-stop-shop



- Corn stover
- Paper pulp
- Oils and fats
- Husks, bran, straw
- Agro Industrial by-products
- Bagasse, beet pulp, seed press cakes
- Algae
- Non-food crops
- Syngas
- Defined media: glucose, sucrose, etc.
- ...

- Bio-chemicals
- Bio-based building blocks
- Industrial Enzymes
- Solvents
- Polymers
- Flavors and fragrances
- Biopesticides and biostimulants
- Surfactants
- Nutraceuticals
- Fuels
- Specialty carbohydrates



Biomass Pretreatment

- Steam Injection
- Organosolv
- Acid/Alkaline pre-treatments
- Pressure reactions
- Enzymatic hydrolysis
- Solid/Liquid separation
- Multi ton scale



Fermentation

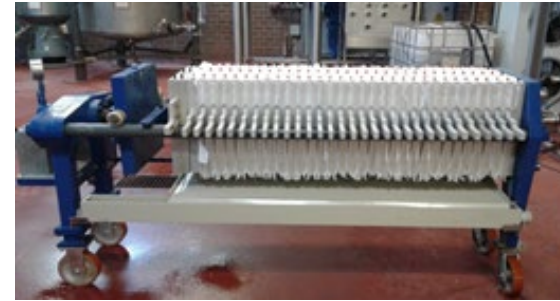
- Bacteria, yeast and fungi
- Lab scale fermentation
- 10 x 150L fermentors
- 2 x 1,5 m³ fermentors
- 2 x 15 m³ fermentors
- Expanding:
 - 8 x 30L +
 - New 2x 1.5 + 1x 15m³
 - 75 m³ line



	150L	1,5 m ³	15 m ³
Ratio	3,14	2,9	2,96
Volume	~100L	~1000L	~10000L
Tip speed	0.16-5.02 m/s	0.75-5.65 m/s	0.69-5.18 m/s
Aeration	<2 vvm	<2,5 vvm	<2,5 vvm
MeOH		<8 kg/h	<80 kg/h

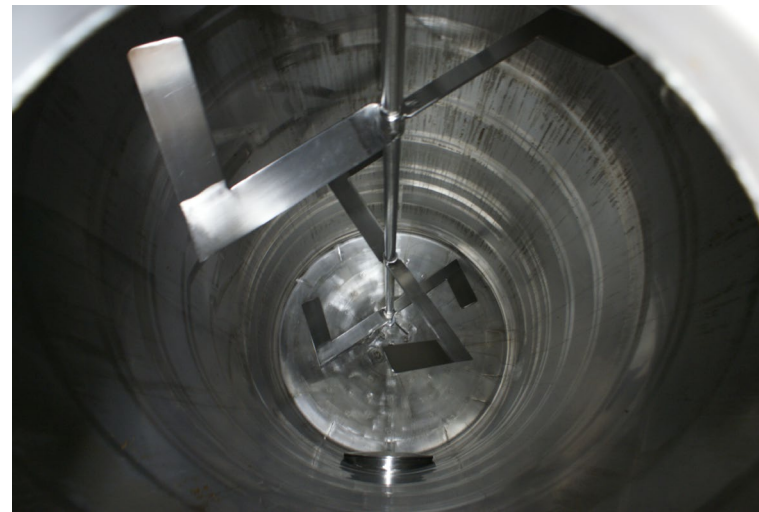
Downstream purification

- High speed separators: decanters, DSC
- Dead-end and Membrane filtration: MF, UF, NF
 - Spiral wound, ceramic, hollow fiber
- Ion exchange, activated carbon treatment
- Solvent extraction
- Evaporation
- Crystallization
- Drying



Biocatalysis

- Aqueous, Two-phase and Three-phase Systems
- Batch, Fed-batch, Continuous
- High solids contents
- Reactors up to 50 m³
- Immobilization
- Whole cell biocatalysts
- Enzyme production

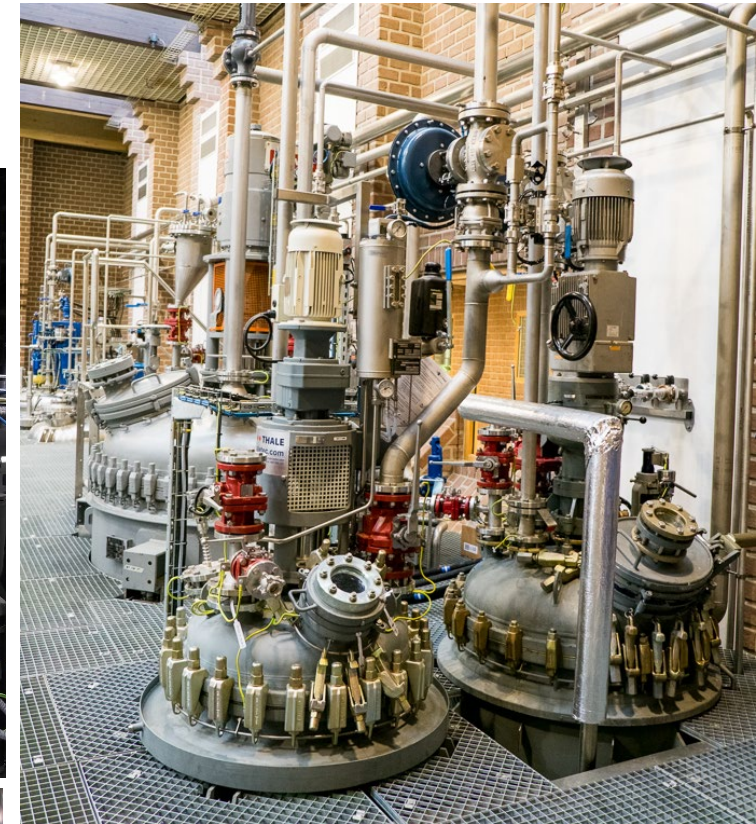
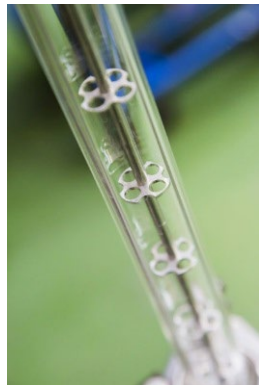


Green chemistry

- Glass lined Reactors up to 5 m³
- Filter Dryer, Centrifuge
- Liq-Liq and Sol-Liq extraction
- Crystallisation, filtration

For

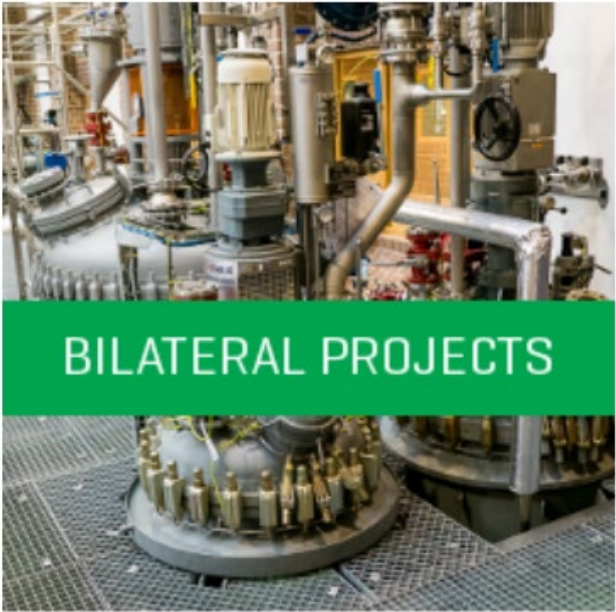
- Chemical reactions
- Solvent based DSP
- Corrosive conditions





RELAX!
We have all the equipment you need

What do we do?



CONSORTIUM BASED PROJECTS

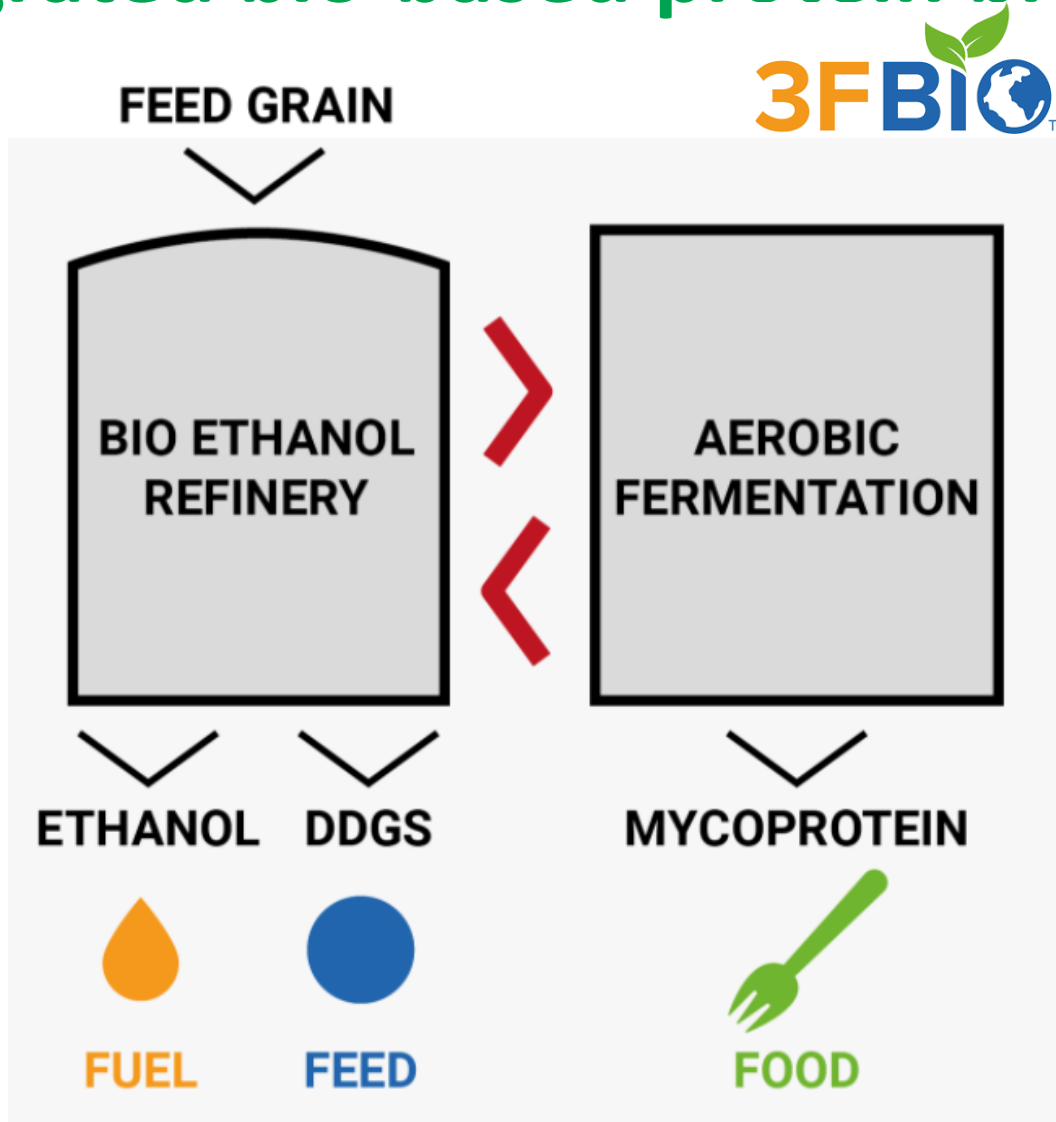
Logos included: Ghent Bio-Economy Valley, FlandersBio, essencia, Cosmetic, Universiteit Gent, Bio Base Europe Pilot Plant, Fraunhofer IGB, collectis, vito, IMD Natural Solutions, CIMV, inbiose, EOC, IQS, IMV, FISCH, BCNP Consultants.

What do we do?



- >450 projects for >150 companies
- Bilateral, privately funded
- Intellectual Property remains with customer
- Confidential

Integrated bio-based protein biorefinery



Activities of the Bio Base Europe Pilot Plant:
Development and scale-up to 15 m³ scale of production of mycoprotein from residual biomass from bioethanol production

Integrated bio-based protein biorefinery




ABUNDA®

ABUNDA® is a high quality source of protein and fibre, which as a complete food meets the global need of feeding a growing population in a sustainable manner.

ABUNDA® is trademark of 3F BIO Ltd for mycoprotein made using our proprietary zero waste process.



Integrated bio-based protein biorefinery



Successful scale-up of 3FBIO technology paves the way for first integrated bio-based protein biorefinery, to be built in Ghent

The **Bio Base Europe Pilot Plant** successfully scaled-up, to 15m³ scale, the 3FBIO technology to convert starch into mycoprotein, traded as **ABUNDA®**. ABUNDA® is a high quality source of protein and fibre, which as a complete food meets the global need of feeding a growing population in a sustainable manner.

The resulting data recently led to investments, including €17 million by the European Commission in the form of the **PLENITUDE flagship**, for the construction of first-of-its-kind integrated bio-based protein biorefinery at Alco Biofuel in the Ghent area of the NorthSeaPort.

Paul Hudman, technical Director at 3FBIO, testifies about the successful collaboration with the Bio Base Europe Pilot Plant in the video below.



Unilever partners with mycoprotein supplier ENOUGH on 'game changing' protein innovation

By [Katy Askew](#)

27-May-2021 - Last updated on 27-May-2021 at 14:06 GMT



From whisky industry residues to biofuel



Draff



Pot Ale



Acetone



Butanol



Ethanol

Activities of the Bio Base Europe Pilot Plant:

Development and scale-up to 5 m³ scale of ABE fermentation from whisky industry residues

From whisky industry residues to biofuel



Celtic Renewables Biorefinery Sparks Boost For Scotland's Green Economic Recovery

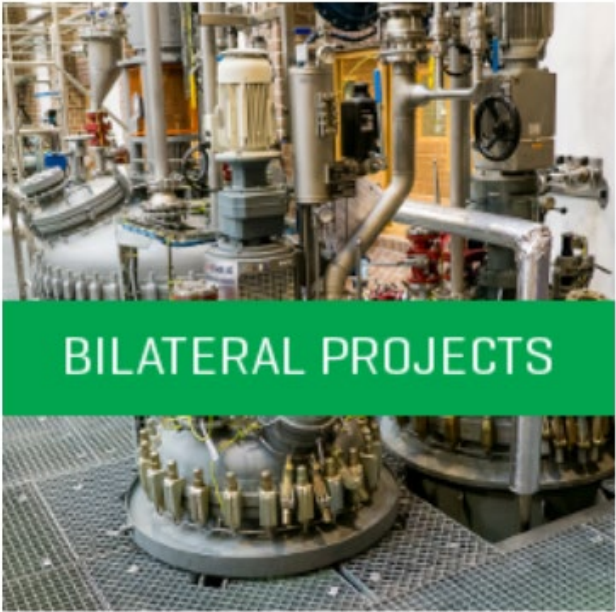
SEPTEMBER 15, 2020



The first sign that the Scottish economy is on track for a green recovery became evident today as the construction of Scotland's first biorefinery took a significant step forward with the arrival of six purpose-built 130,000 litre fermentation vessels from the Netherlands.

Celtic Renewables apply microbiology expertise and modern process technology to produce high-value low-carbon biochemicals and next generation biofuel from biological waste and residues. The new plant is expected to process around 50,000 tonnes of residues each year from the whisky industry, adding value and sustainability to one of the country's most important sectors.

What do we do?



CONSORTIUM BASED PROJECTS

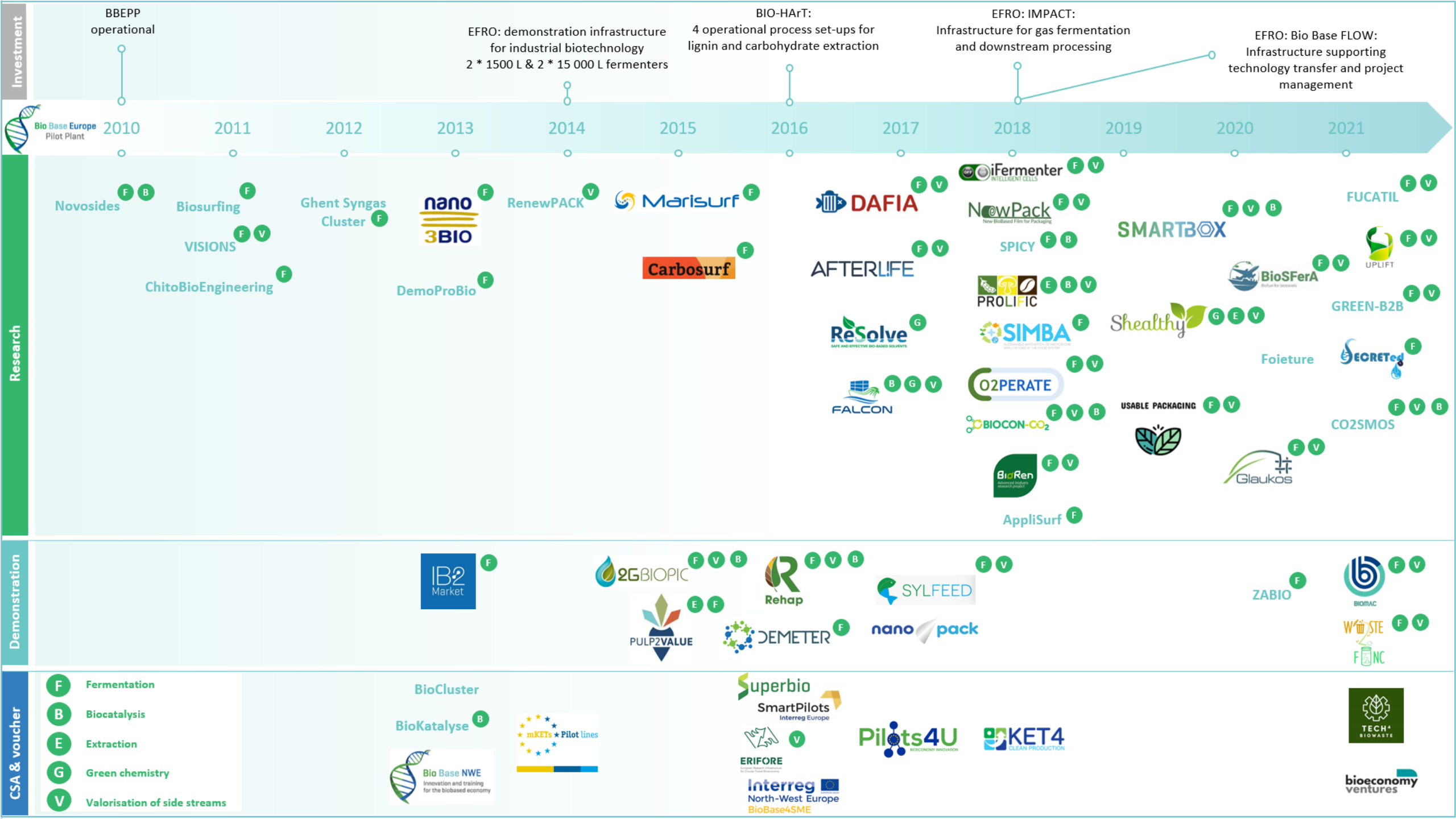


What do we do?



- >50 projects, of which 25 ongoing
- Partly subsidized, partly privately funded
- Building expertise
- Value chains
- Allows publicity and communication





Investment



BBEPP operational

EFRO: demonstration infrastructure for industrial biotechnology
2 * 1500 L & 2 * 15 000 L fermenters

BIO-HaT:
4 operational process set-ups for lignin and carbohydrate extraction

EFRO: IMPACT:
Infrastructure for gas fermentation and downstream processing

EFRO: Bio Base FLOW:
Infrastructure supporting technology transfer and project management

2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

Research

Novosides (F, B) Biosurfing (F) Ghent Syngas Cluster (F) nano 3BIO (F) RenewPACK (V) Marisurf (F) DAFIA (F, V) iFermenter (F, V) FUCATIL (F, V)

VISIONS (F, V) ChitoBioEngineering (F) DemoProBio (F) Carbosurf (F) AFTERLIFE (F, V) NowPack (F, V) SMARTBOX (F, V, B) UPLIFT (F, V)

ReResolve (G) PROLIFIC (E, B, V) SPICY (F, B) SIMBA (F) Shealthy (G, E, V) GREEN-B2B (F, V)

FALCON (B, G, V) O2PERATE (F, V) BIOCON-CO2 (F, V, B) Foieture (F) SECRETOS (F) CO2SMOS (F, V, B)

USABLE PACKAGING (F, V) BioRen (F, V) AppliSurf (F) Glaukos (F, V)

Demonstration

IB2 Market (F) 2GBIOPIC (F, V, B) Rehap (F, V, B) SYLFEED (F, V) ZABIO (F) BIOMAC (F, V)

PULP2VALUE (E, F) DEMETER (F) nano pack

CSA & voucher

- F Fermentation
- B Biocatalysis
- E Extraction
- G Green chemistry
- V Valorisation of side streams

BioCluster
BioKatalyse (B)
mKETs Pilot lines
Bio Base NWE
Innovation and training for the biobased economy

Superbio
SmartPilots Interreg Europe
ERIFORE
Interreg North-West Europe BioBase4SME
Pilots4U
KET4 CLEAN PRODUCTION

TECH+ BIOWASTE
bioeconomy ventures

Our consortium based projects



Projects

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Feedstock



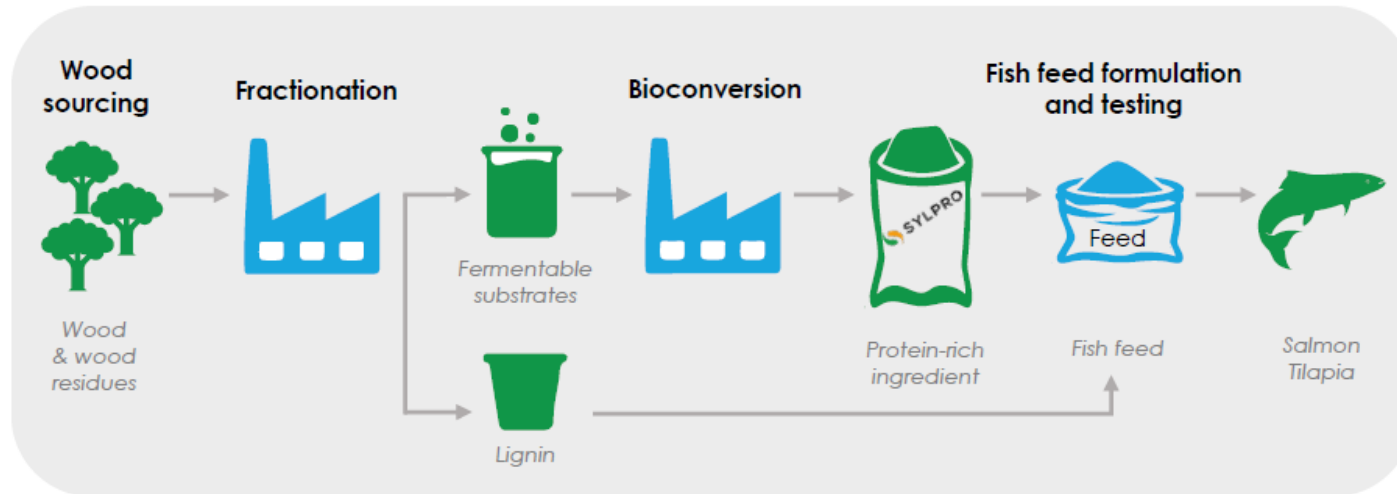
CLEO

Sustainable and competitive lignin-based biofuels with sufficient supply-chain security and cost-efficiency to be used as a replacement of fossil-based oils in the marine sector.

 [Read More](#)

<https://www.bbeu.org/projects/>

From wood to food



SYLFEED VIDEO

https://www.youtube.com/watch?time_continue=2&v=WWfe7Tp0d2c&feature=emb_logo

From wood to food



Activities of the Bio Base Europe Pilot Plant:

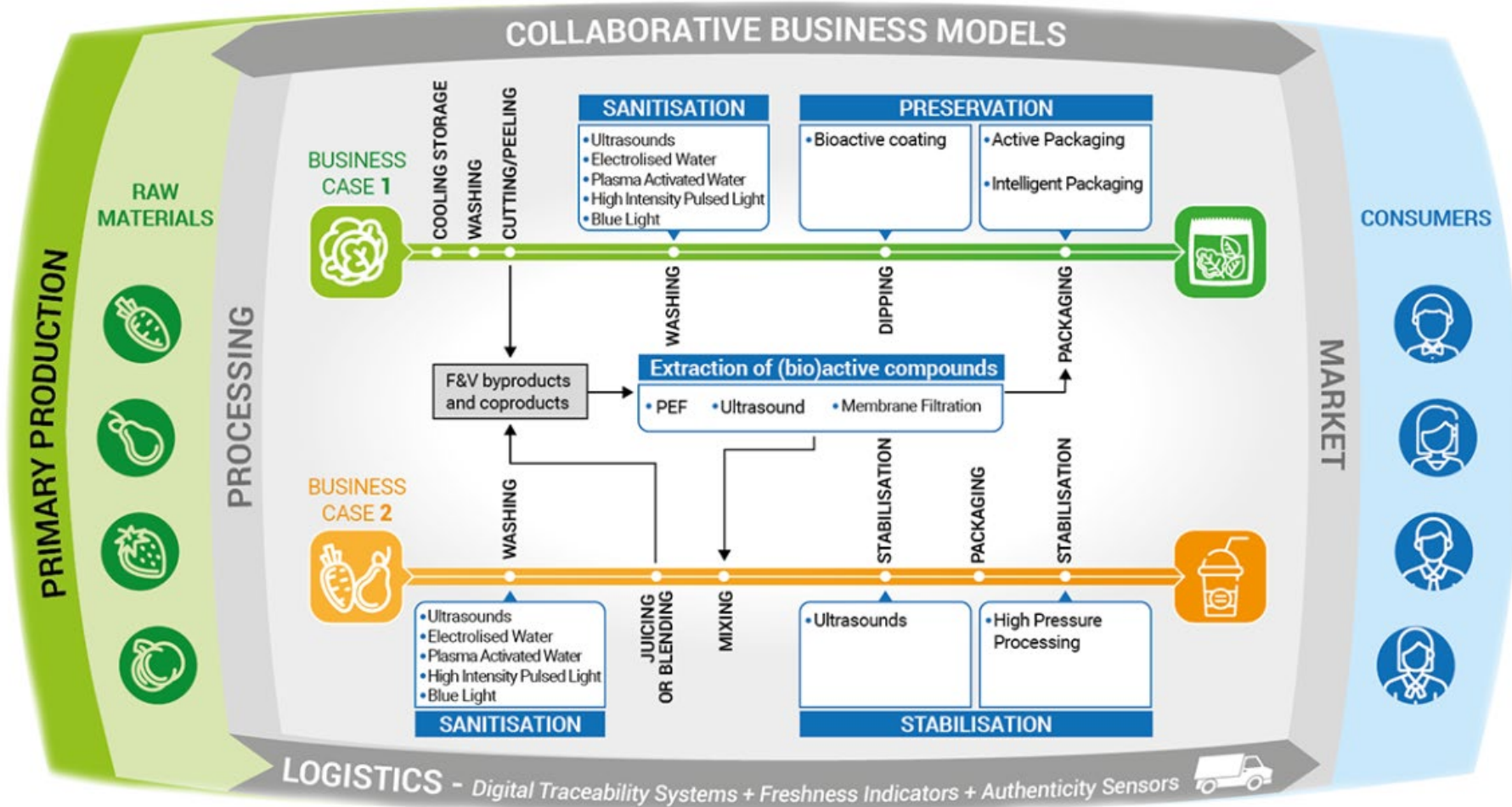
Scale-up and demonstration of the Wood to Food technology

Partners:





Non-thermal physical technologies to preserve fresh and minimally processed fruit and vegetables



This project has received funding from the European Union's Horizon 2020 research innovation programme under Grant Agreement number: 817936





Activities of the Bio Base Europe Pilot Plant:

Scale-up of the extraction of bioactive compounds from co-products and post-harvest rejects. Optimize and validate the extraction process in an industry relevant and scalable environment.

Host the partners' pilot equipment to perform pilot scale trials, including state-of-the-art technologies as UAE (Ultrasound Assisted Extraction), PEF (Pulsed Electric Fields) and membrane filtrations.

Screening of up and downstream unit operations at bench and pilot scale to establish most favourable process scheme.

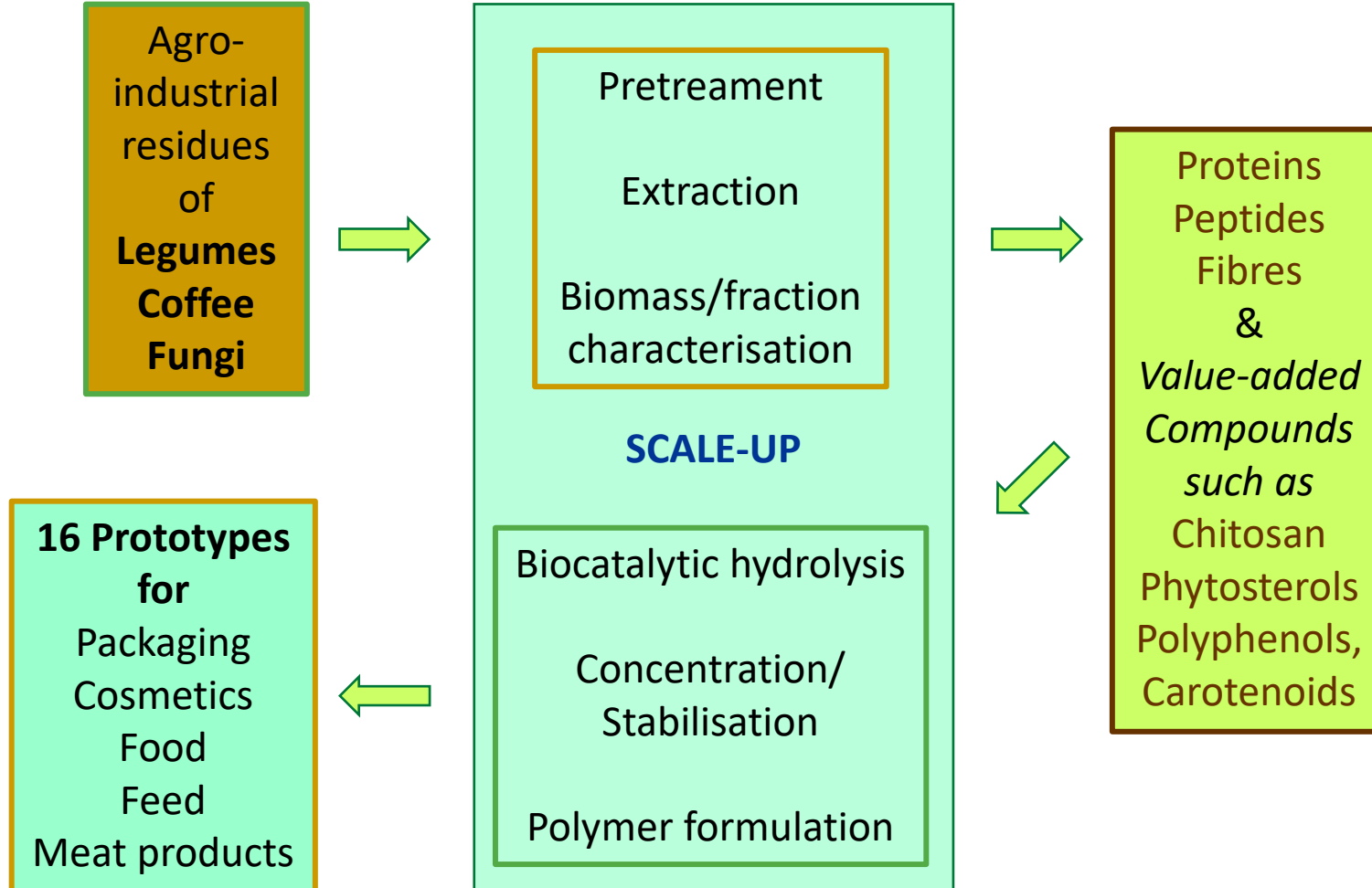
Produce enough product to enable application testing and market entry testing

Partners:





Integrated cascades of PROcesses for the extraction and valorisation of proteins and bioactive molecules from Legumes, Fungi and Coffee agro-industrial side streams



16 Prototypes for
Packaging
Cosmetics
Food
Feed
Meat products





Integrated cascades of PROcesses for the extraction and valorisation of proteins and bioactive molecules from Legumes, Fungi and Coffee agro-industrial side streams



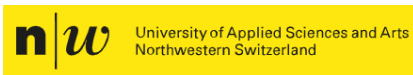
ACTIVITIES of the Bio Base Europe Pilot Plant:

Industrial scale-up of the most promising processes including:

- Pretreatment
- Biochemical modification
- Formulation.

Supply sufficient product to do final product prototyping for different sectors (food, cosmetics, packaging and feed).

Partners:



UNIVERSITÀ
DI PARMA



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



SSICA
STAZIONE SPERIMENTALE PER L'INDUSTRIA DELLE CONSERVE ALIMENTARI



RTD Talos

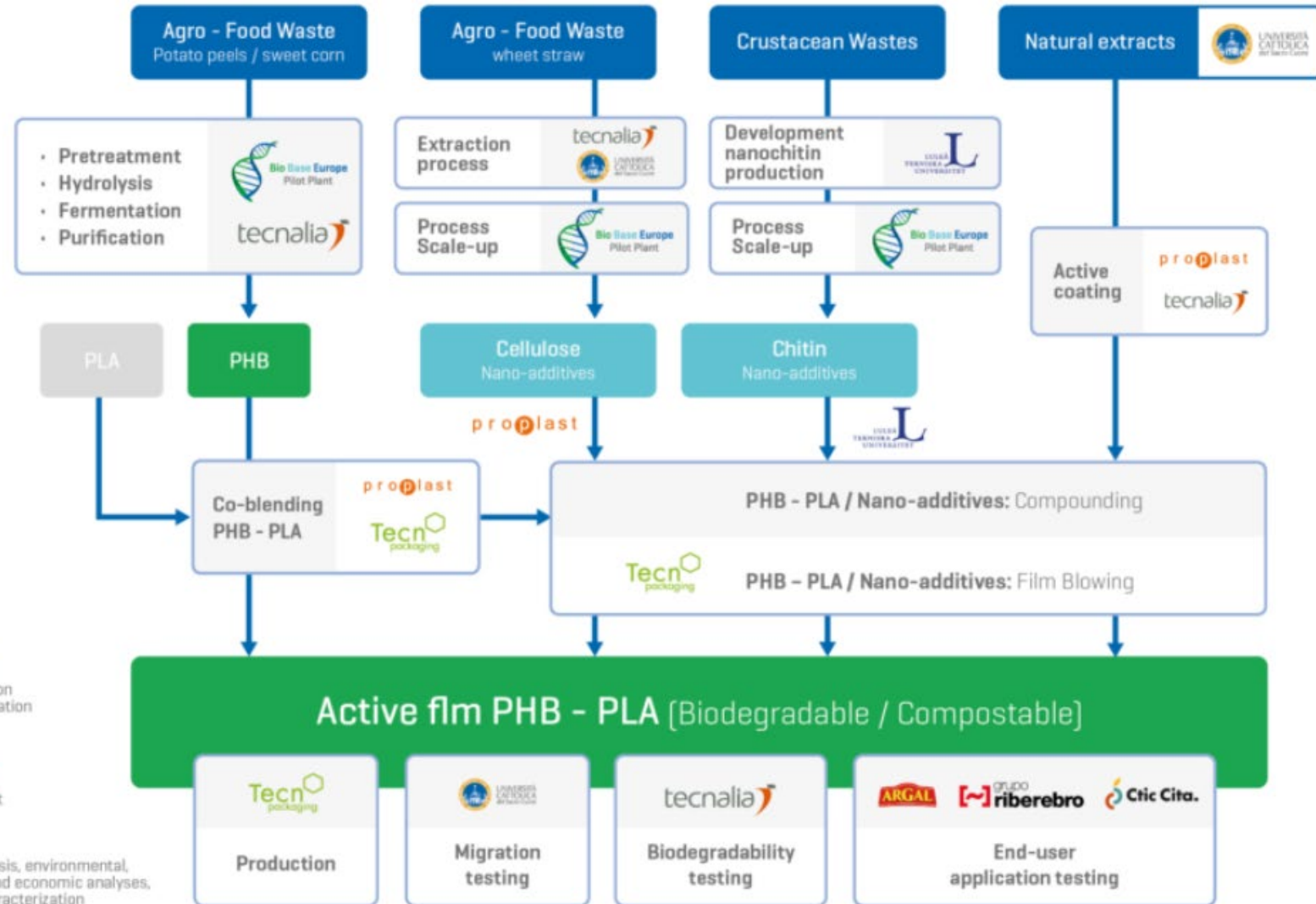


From waste to bioplastics



NowPack
New BioBased Film for Packaging

Development of new
Competitive and Sustainable
Bio-Based Plastics



TRI TECC
Awareness, exploitation
and impact, dissemination

Quantis
Life Cycle Assessment

Market analysis, environmental,
regulatory and economic analyses,
material characterization



From waste to bioplastics



Activities of the Bio Base Europe Pilot Plant:

Production of fermentable sugars from agro-food industry co-products potato peels and sweet corn residues

Production of biopolymer PHB from above sugars using more sustainable “green” downstream purification process

Pilot scale production of nano-additives from chitin and wheat straw



Full pilot scale reached!

From a kilo to 15 tons of industrial potato peels processed!



FOR MORE INFORMATION, PLEASE VISIT:
www.newpack-h2020.eu



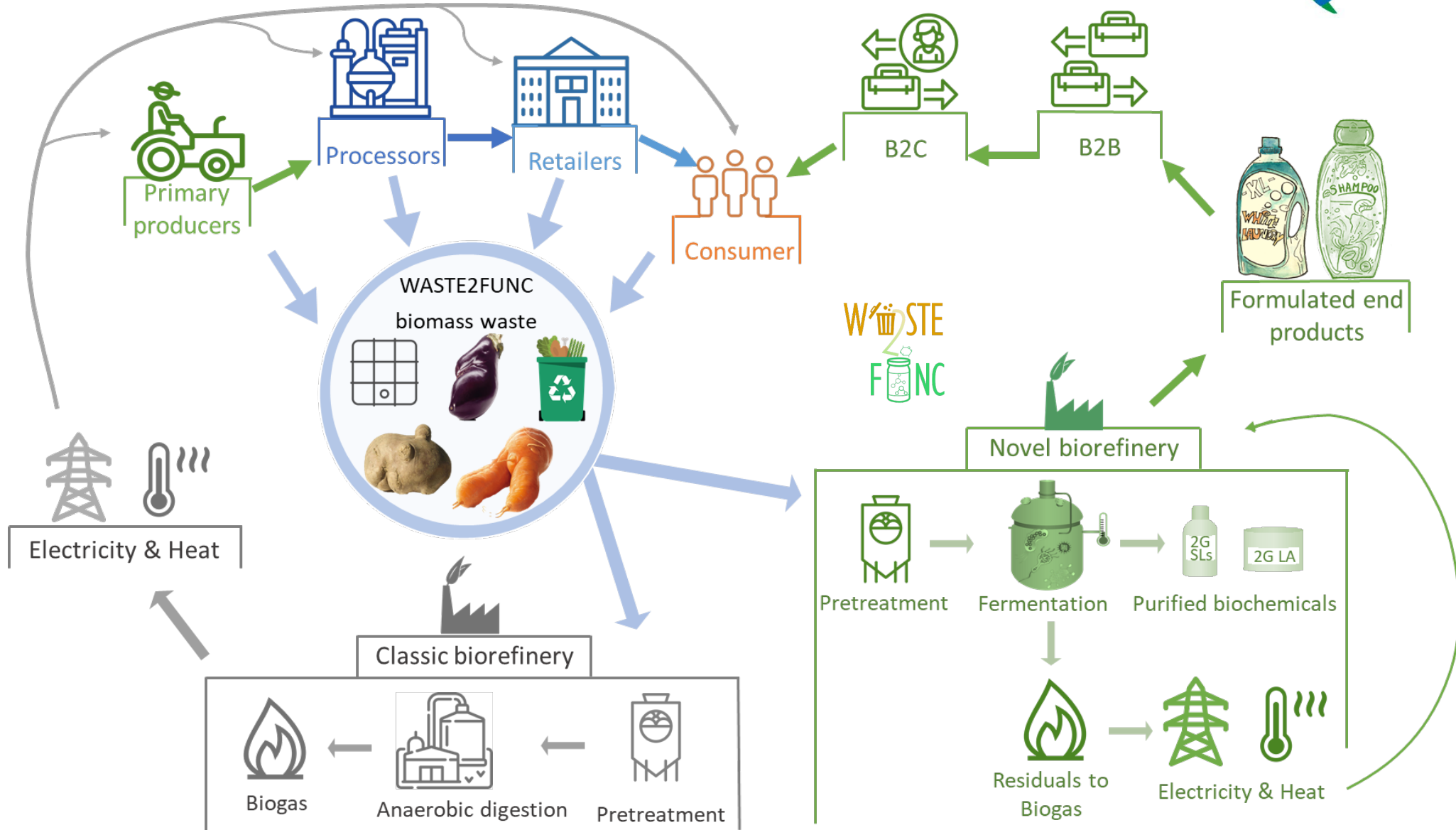
From food waste to biochemicals



Lactic acid and biosurfactants sourced from sustainable agricultural and industrial (food) WASTE feedstocks as novel FUNCTIONal ingredients for consumer products



From food waste to biochemicals



From food waste to biochemicals



Activities of the Bio Base Europe Pilot Plant:

Project Management and Coordination

Communication and dissemination

Organisation of stakeholder focus group workshops

Scale-up and demonstration of food waste pretreatment

Scale-up and demonstration of fermentation of food waste to lactic acid and biosurfactants

Scale-up and demonstration of purification of lactic acid and biosurfactants

Partners:



From food waste to biochemicals



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AmphiStar

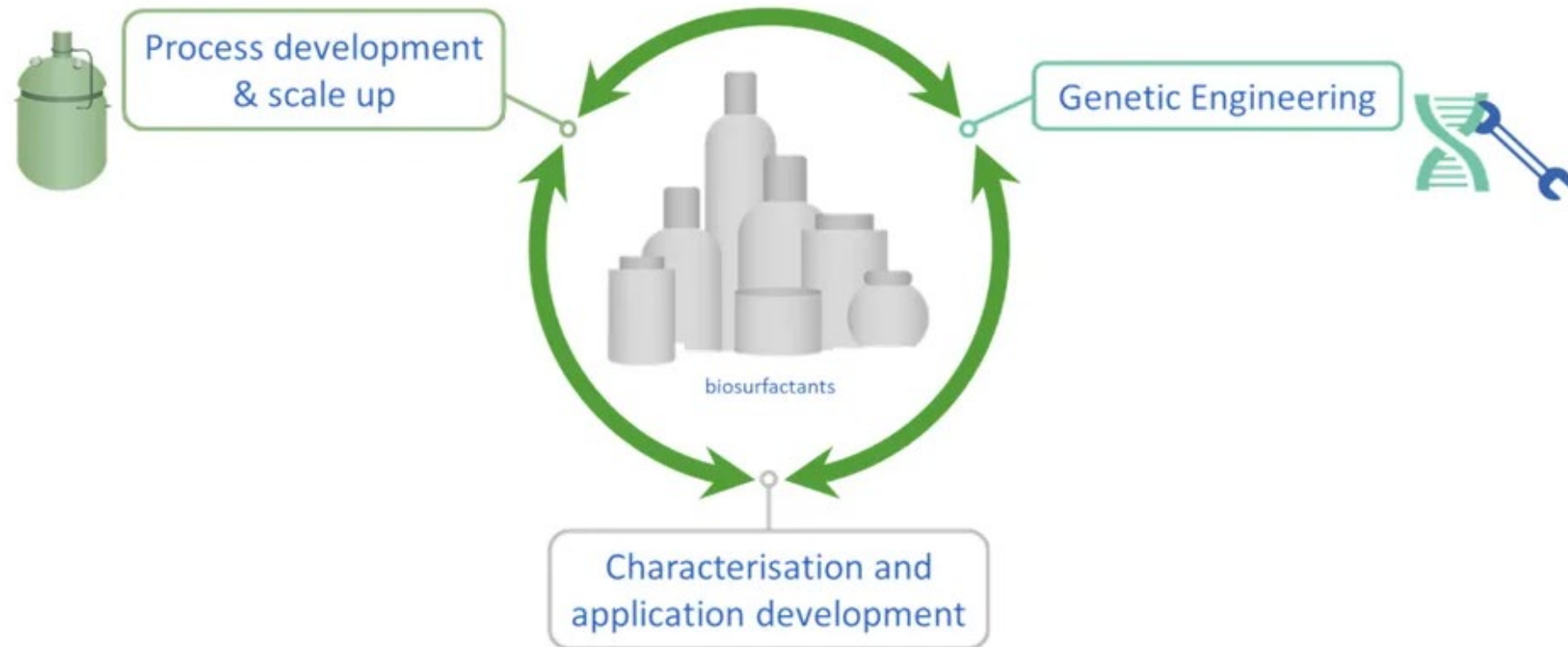
BIOSURFACTANTS

<https://amphistar.be/>

A spin-off company from



Biosurfactants



Our strong customer base



And many more!



And world class Research Institutes



We offer all stages to success



Interested to have us as your
upscaling partner?

Sofie Lodens, PhD
Project Acquisition Coordinator
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<https://www.bbeu.org>

Have a look at our equipment folders!