istituto SPALLANZANI

P680
THE SUSTAINABLE BIOFACTORY

microflower

PROGETTO **SABANA**

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fondazione cariplo

Sponsor dell'evento:

LUMSON
Cosmetic Packaging Industries

GRAFICHE CAM
Pandino (CR)

This project is funded by
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SABANA
Sustainable Algae Biorefinery for Agriculture aNd Aquaculture

Aims:

Develop a large-scale integrated microalgae-based biorefinery for the production of
biostimulants, biopesticides and feed additives, in addition to biofertilizers and aquafeed, using only marine water and nutrients from wastewaters (sewage, centrate and pig manure).

Objective:

Achieve a zerowaste process at a demonstration scales up to 5 ha sustainable both environmentally and economically.

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Key advantages:

- **Sustainability of the process**: using marine water and recovering nutrients from wastewaters while minimizing the energy consumption;

- **Socio-economic benefits:** due to the relevance of the target bio-products for two major pillars in food production as agriculture and aquaculture.

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Partnership

Participant	Participant organisation name	Country	Type
1 (Coord.)	University of Almeria (UAL)	Spain	RTO
2	Aqualia (AQA)	Spain	Industrial
3	Westfalia-GEA (GEA)	Germany	Industrial
4	Karlsruhe Institute Technology (KIT)	Germany	RTO
5	Biorizon Biotech S.L. (BZN)	Spain	Industrial
6	Mikrobiologicky ustav - AVCR, v.v.i. (IMIC)	Czech Republic	RTO
7	Universita degli studi di Milano (UNIMI)	Italy	RTO
8	Agricola Italiana Alimentare (AIA)	Italy	Industrial
9	Universidad de las Palmas-Spanish Bank of Algae (BEA)	Spain	RTO
10	Széchenyi István University (SZE)	Hungary	RTO
11	Consorzio Italiano Biogas e Gassificazione (CIB)	Italy	Industrial

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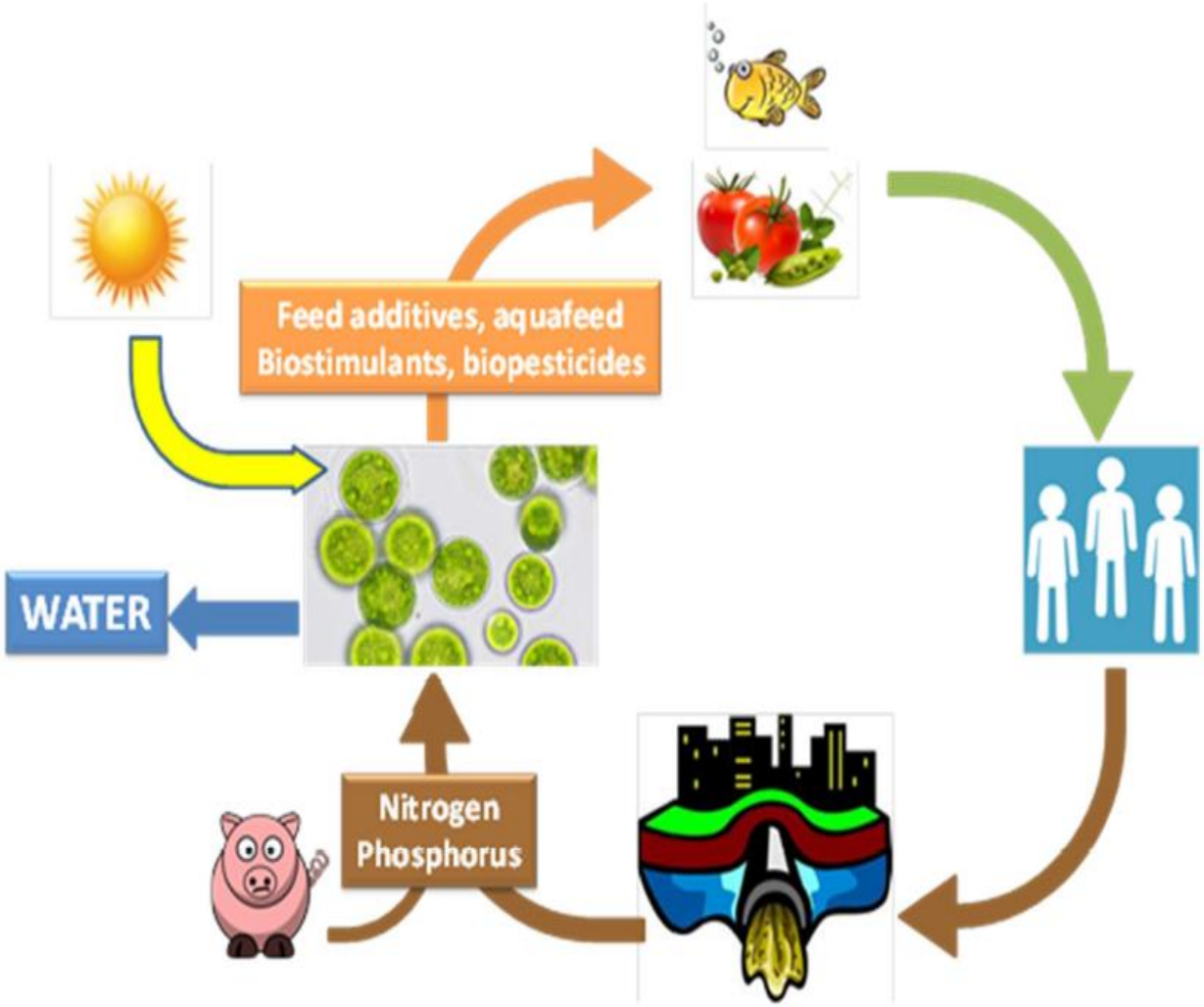
SABANA concept



Save water, save energy, save CO_2 emissions, recover nutrients..., thus be sustainable

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The SABANA project is based on the **previous expertise** of the partners that demonstrate that:

- Microalgae can be used to recycle effluents (wastewaters/flue gases)
- Microalgae biomass contains plant growth promoters and biopesticides
- Microalgae contain additives (antioxidants, peptides, fatty acids) that can be incorporated into fish diets
- Microalgae biomass can be used to produce biofertilizers highly demanded for intensive agriculture,
- Microalgae biomass contains relevant amounts of proteins (40%) and lipids (30%) of high nutritional value that can be used in aquaculture
- The production of microalgae at large scale requires the improvement of the biological aspects of the process, and to ensure its stability and the quality of produced biomass

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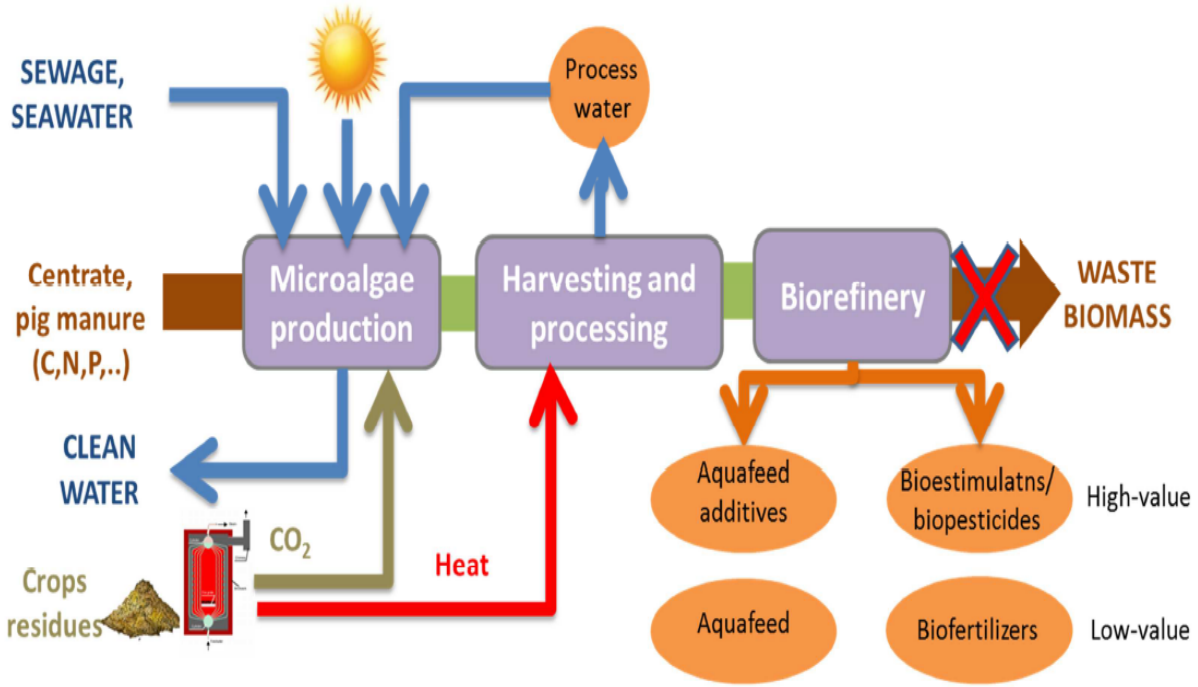
Overall scheme of the project indicating the fundamentals of the proposed technology and the different scales to be achieved



LARGE SCALE BIOMASS PRODUCTION

INTEGRAL UTILIZATION OF BIOMASS

DEMO1 SCALE=1 ha

DEMO2 SCALE=5 ha

DEMO3 SCALE=20 ha

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Large scale production of biomass

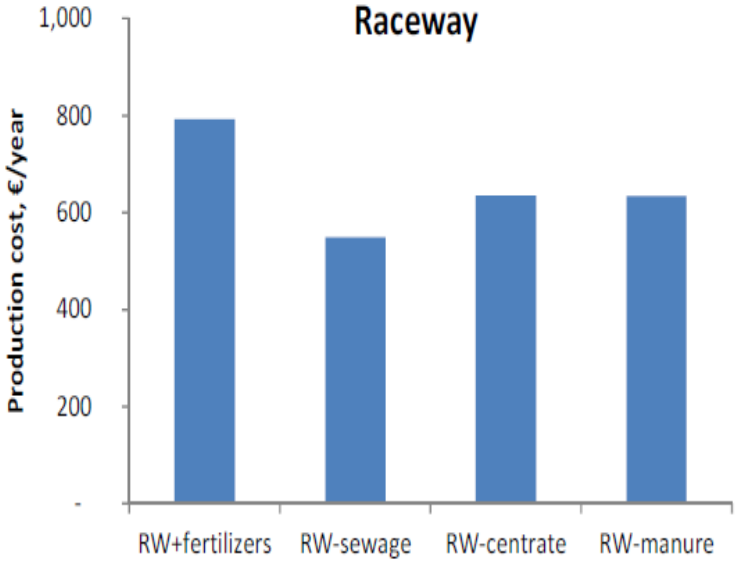
Microalgal biomass production cost is largely a function of the photobioreactors and raw materials utilized.

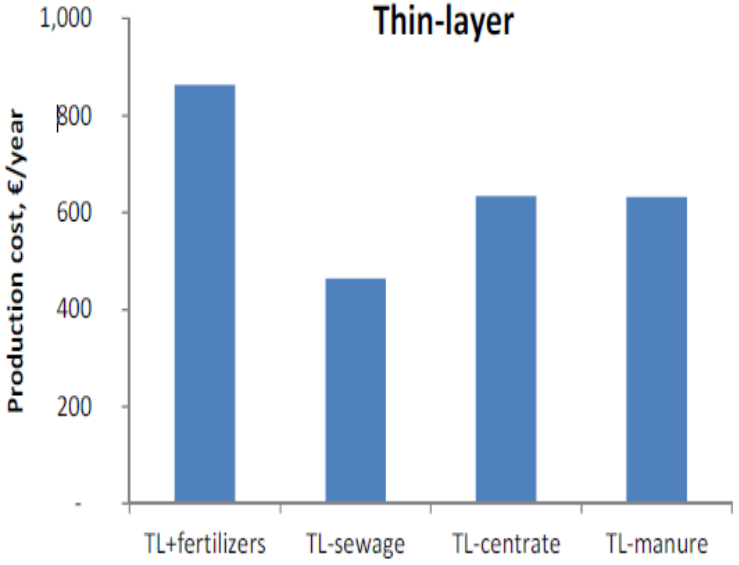
Different scenarios have been analysed:

overall biomass production cost

800 k€/year

860 k€/year





Production cost of 5 ha facility using raceway or thin-layer cascades in different scenarios.

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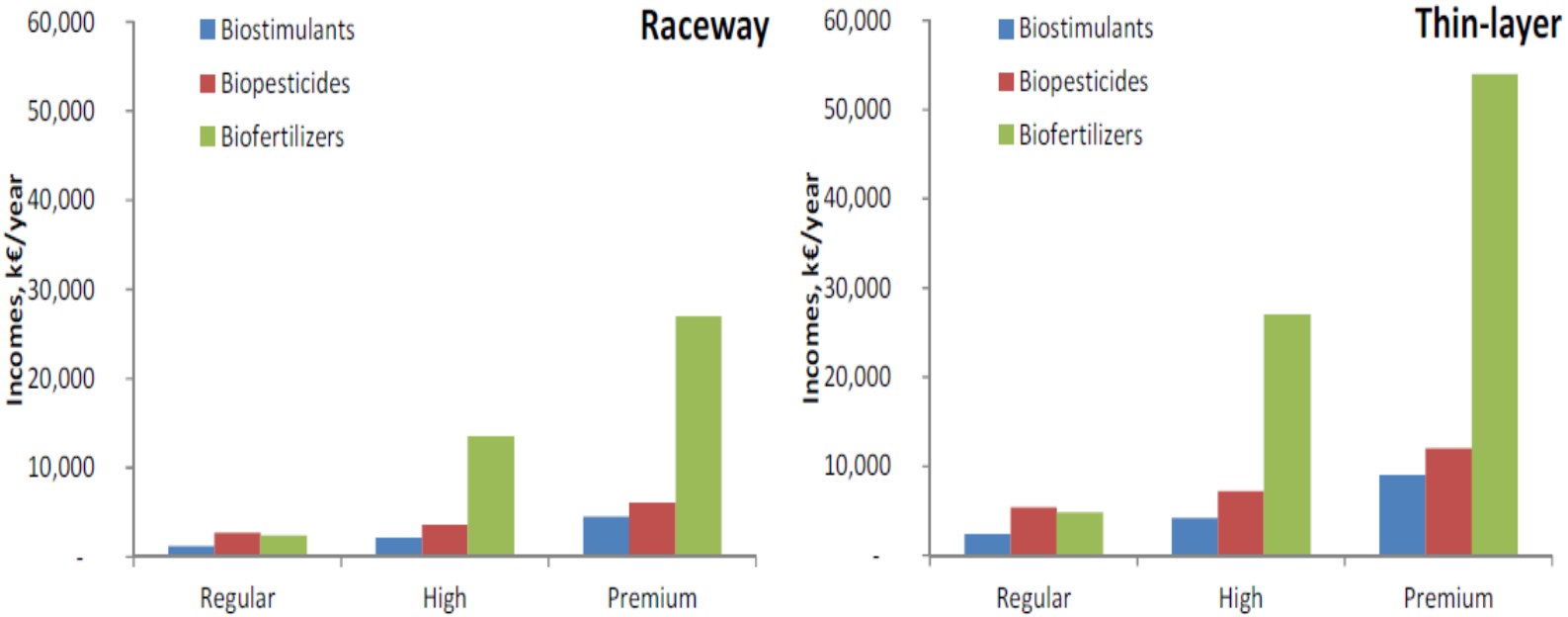
Production of biostimulants, biopesticides, biofertilizers for agricultural uses

Three different qualities of products (regular, high and premium)

Purity of the final product performed and the market for which it is produced (cereals, trees and vegetables).



Incomes obtained at DEMO5 scale from target products for agricultural uses.

The incomes from the utilization of the biomass for agriculture products is highly positive whatever the final product and quality considered.

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Production of feed additives and aquafeed for aquaculture uses

Three different qualities of products (regular, high and premium)

Purity of the final product performed and the market for which it is produced (young to old individuals).

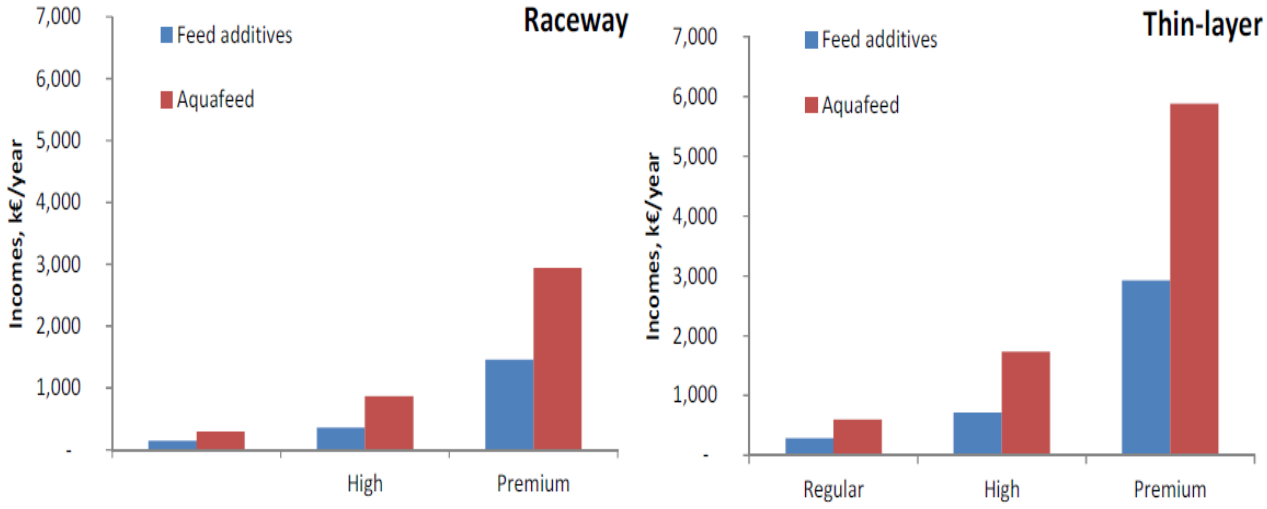

Figure 14.- Incomes obtained at DEMO5 scale from target products for aquaculture uses.

The incomes from the utilization of the biomass for aquaculture are less positive than from the agricultural uses, but also it varies as a function of the final product and quality considered

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Only the fabrication of the cheapest regular feed additive and the cheapest regular aquafeed have negative economic balance.

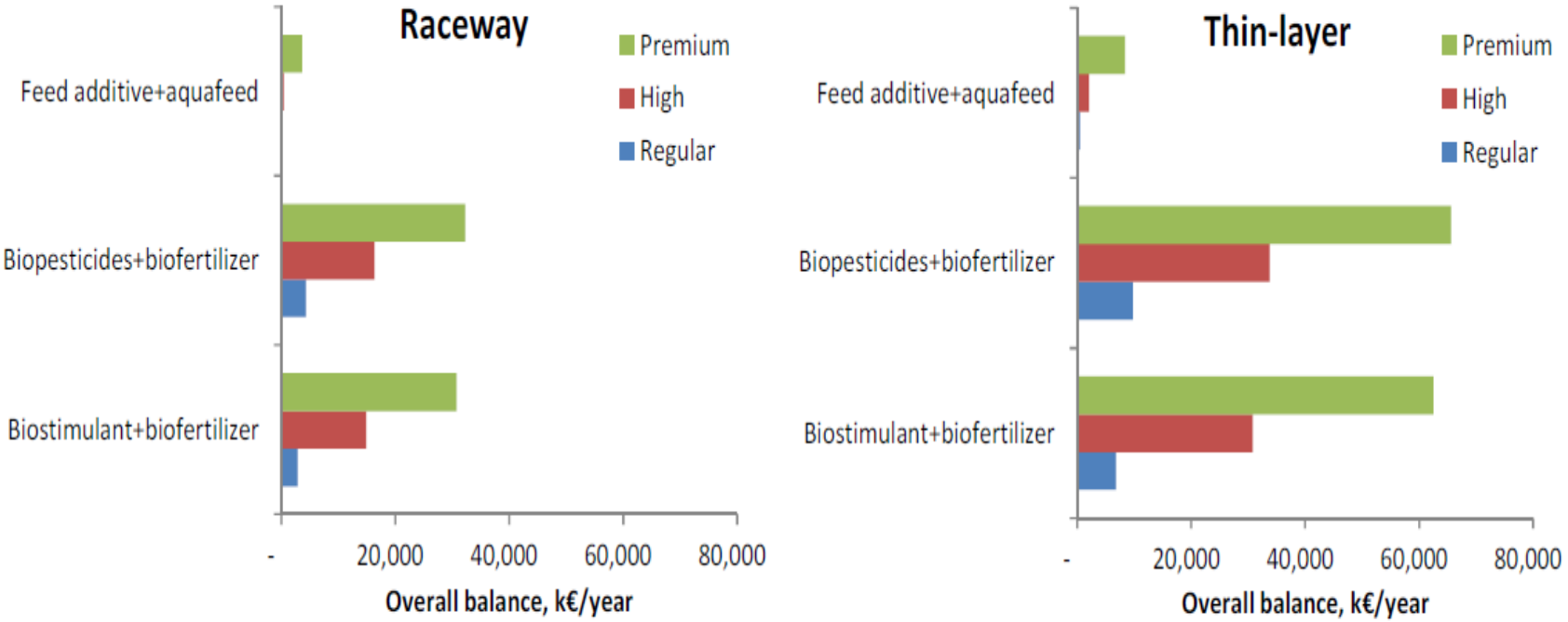

Figure 15.- Overall economic balance (incomes-cost) for the SABANA project according to three different scenarios and the two technologies considered.

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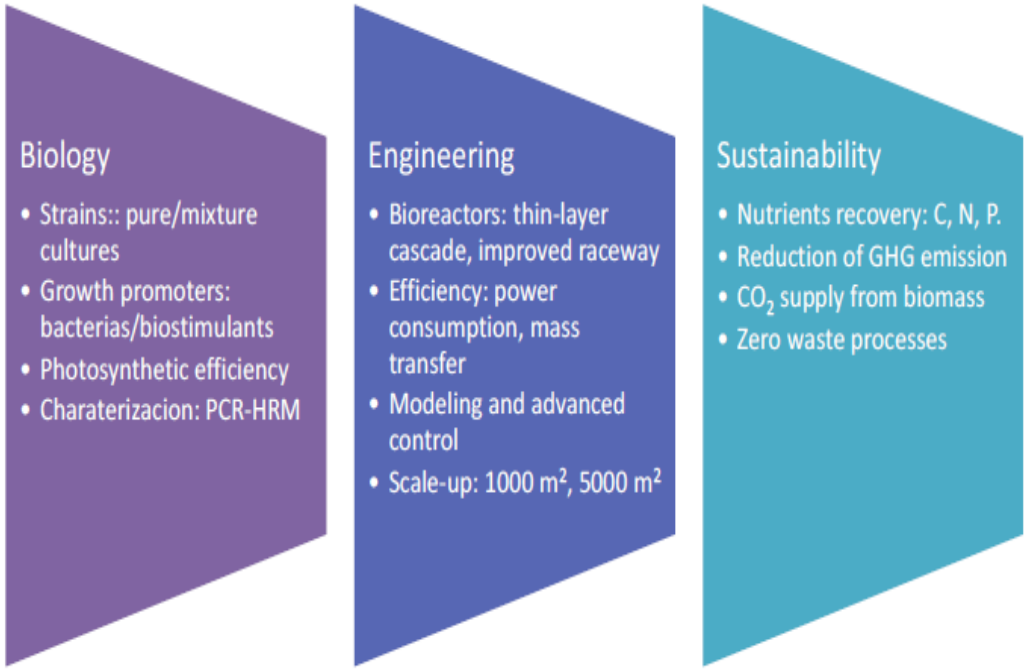
LARGE SCALE BIOMASS PRODUCTION



Major aspects to be improved for the development of sustainable, efficient and robust microalgae large scale production facilities.

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Development of suitable technology for the efficient harvesting and processing of the biomass to obtain valuable products, allowing an integral valorization of the biomass

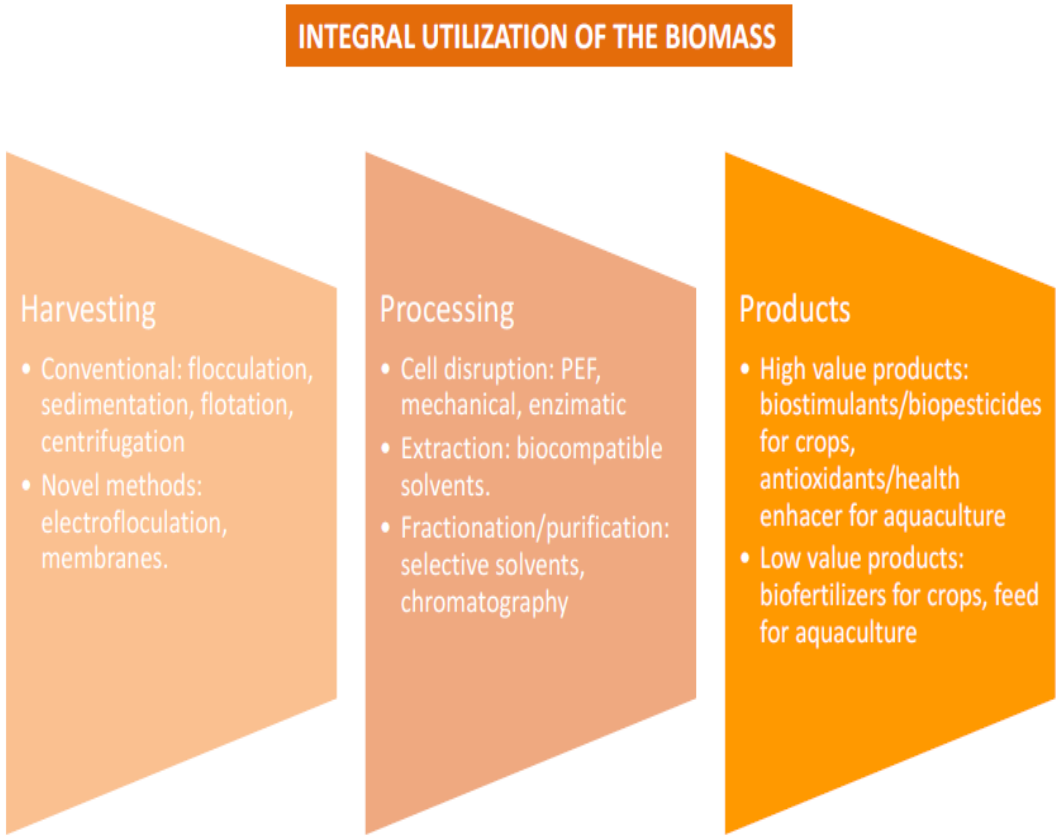

Figure 18.- Major tasks to be performed for the development of processes allowing the integral utilization of the microalgae biomass.

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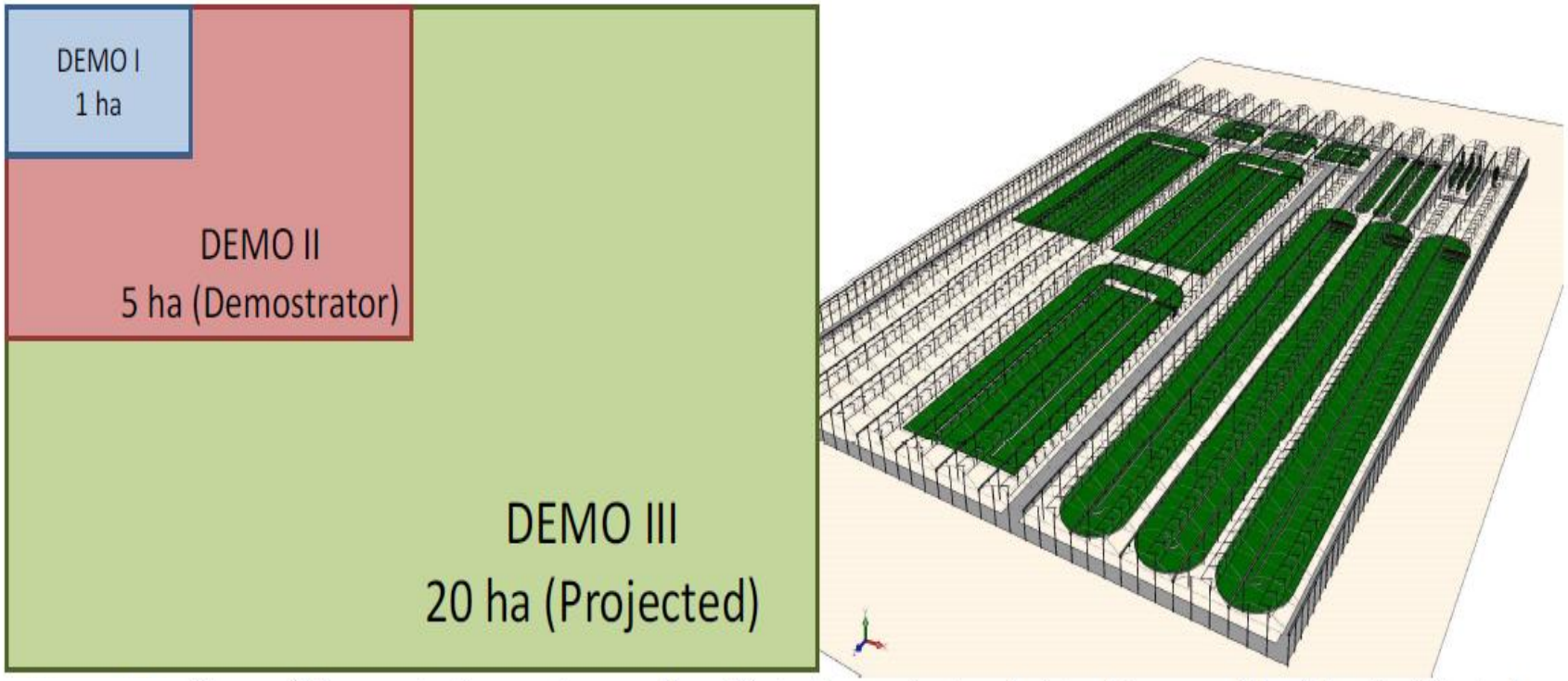
Demonstration facilities



Steps of demonstration scale considered into the project and virtual image of the 1 ha facility to be installed from the beginning of the project.

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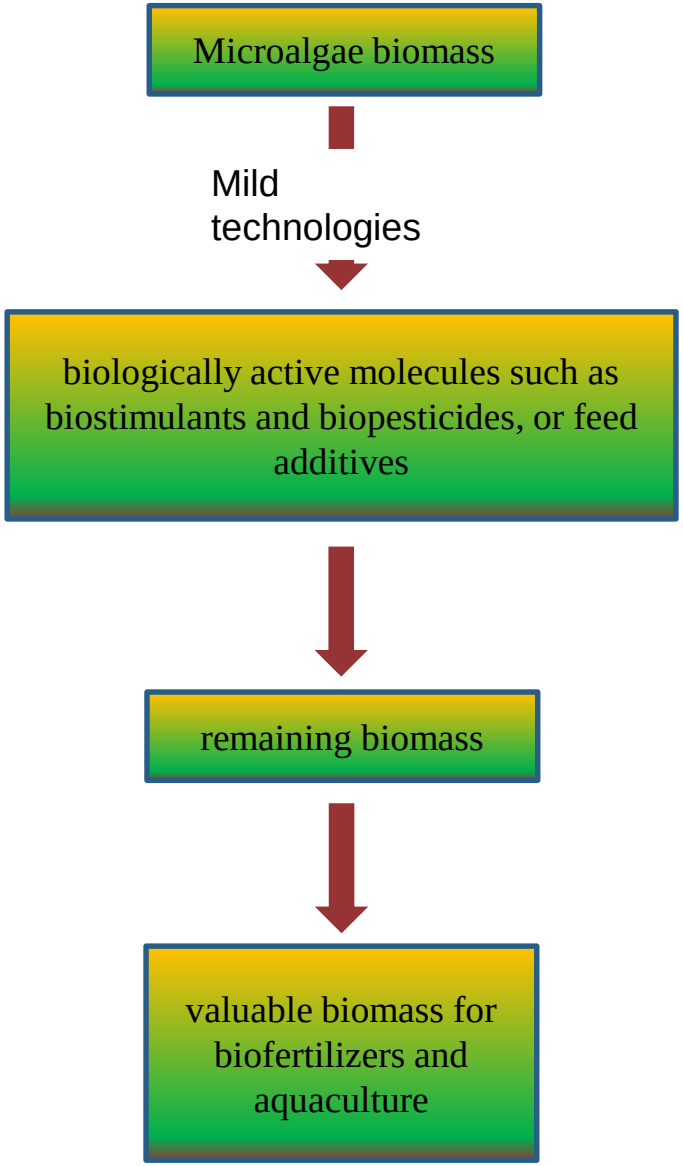
Ambition

SABANA project is focused to produce valuable compounds from microalgae biomass, especially for agriculture and aquaculture, using marine water and wastes as raw materials



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Major advantages of SABANA

- Production of biostimulants
- Production of biopesticides
- Production of aquafeed additives
- Production of biofertilizers
- Production of aquafeed
- Treatment of wastewater
- Treatment of manure

SABANA project boosts the development of a new integrated biorefinery concept to transform wastes into valuable products using microalgae, redesigning the concept of wastewater treatment from a problem to an opportunity.

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Work packages

Work packages and work packages leaders

WP	WP Name	WP Leader	Organiz.	Main other partners
WP1	Techno-economic analysis	Biorizon Biotech	SME	Aqualia, Agricola Italiana Alimentare
WP2	Sustainability	Universitá Degli Studi Di Milano	RTO	Aqualia, Westfalia-GEA, University of Almeria, Karlsruhe Institute Technology, Italian Biogas Consortium
WP3	Engineering	Aqualia	Industry	University of Almeria, Institute of Microbiology, Biorizon Biotech
WP4	Harvesting	Westfalia-GEA	Industry	Aqualia, University of Almeria, Karlsruhe Institute Technology
WP5	Processing	Karlsruhe Institute Technology	RTO	Westfalia-GEA, University of Almería, Biorizon Biotech, Agricola Italiana Alimentare
WP6	Biology	Széchenyi István University	RTO	Spanish Bank of Algae, University of Milano, University of Almería, Institute of Microbiology
WP7	Products	Agricola Italiana Alimentare	Industry	Biorizon Biotech
WP8	Coordination/Dissemination	University of Almería	RTO	All

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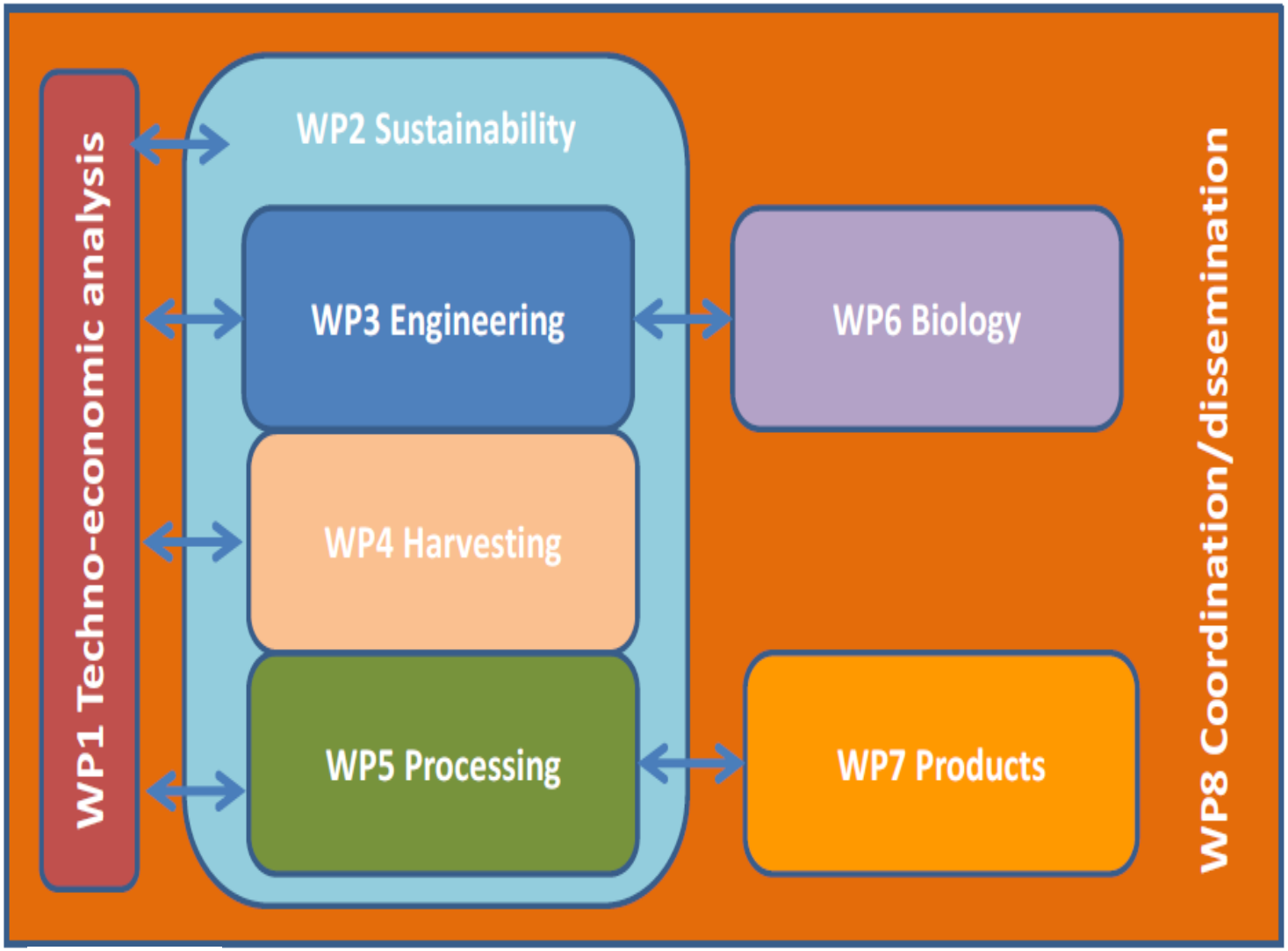
SABANA WP diagram



Block diagram of major work packages on which the project is divided.

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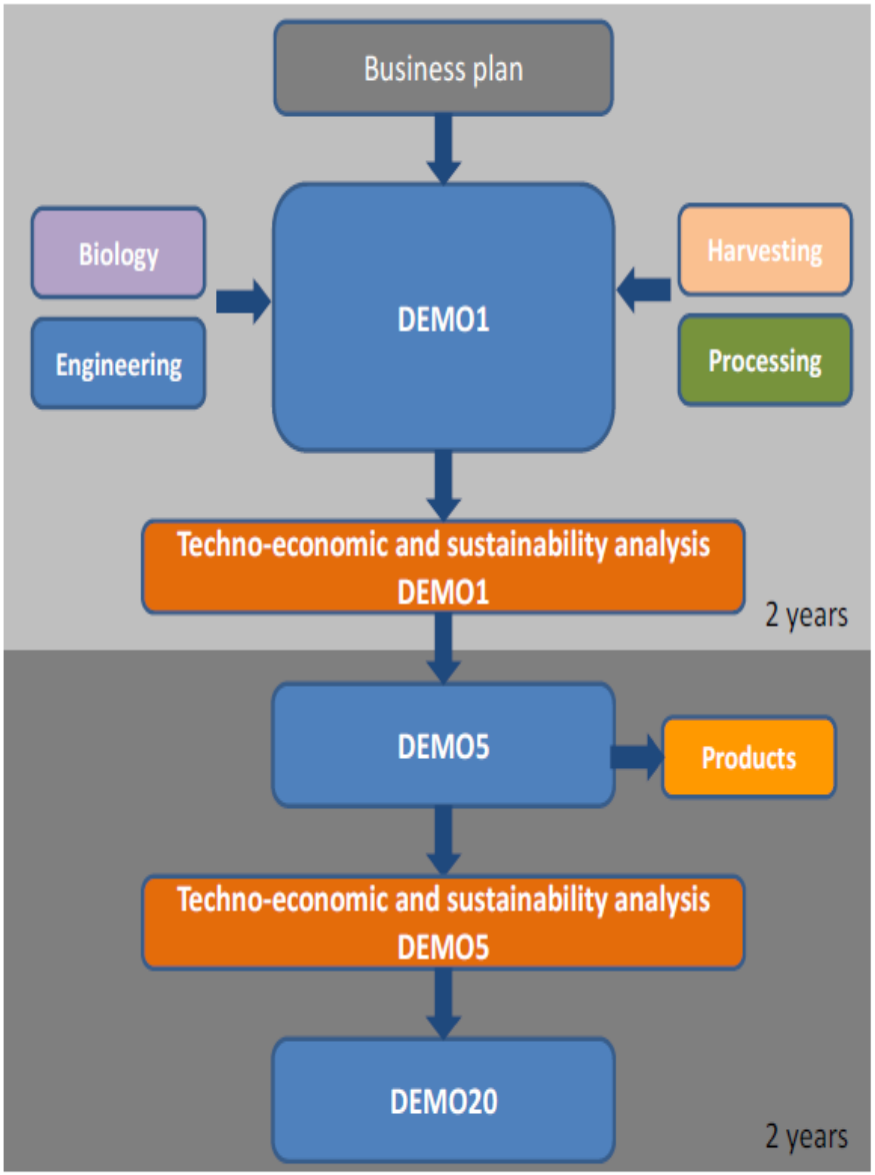
SABANA project steps



Main steps on which the project is divided.

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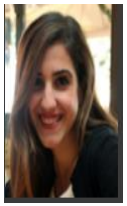

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Grazie dell'attenzione!

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