

Hybrid Workshop on Developing novel Blue biorefineries from aquatic resources

Organized by



10 | **09** | **25**
Day | Month | Year

13h00 - 16h15 Icelandic time UTC+0

15h00 - 18h15 Paris time UTC +2

ONLINE & IN ICELAND

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event



CIRCALGAE



FOODIMAR



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From Fish Waste to Functional Value: Scaling Marine Biorefineries with Green Technology

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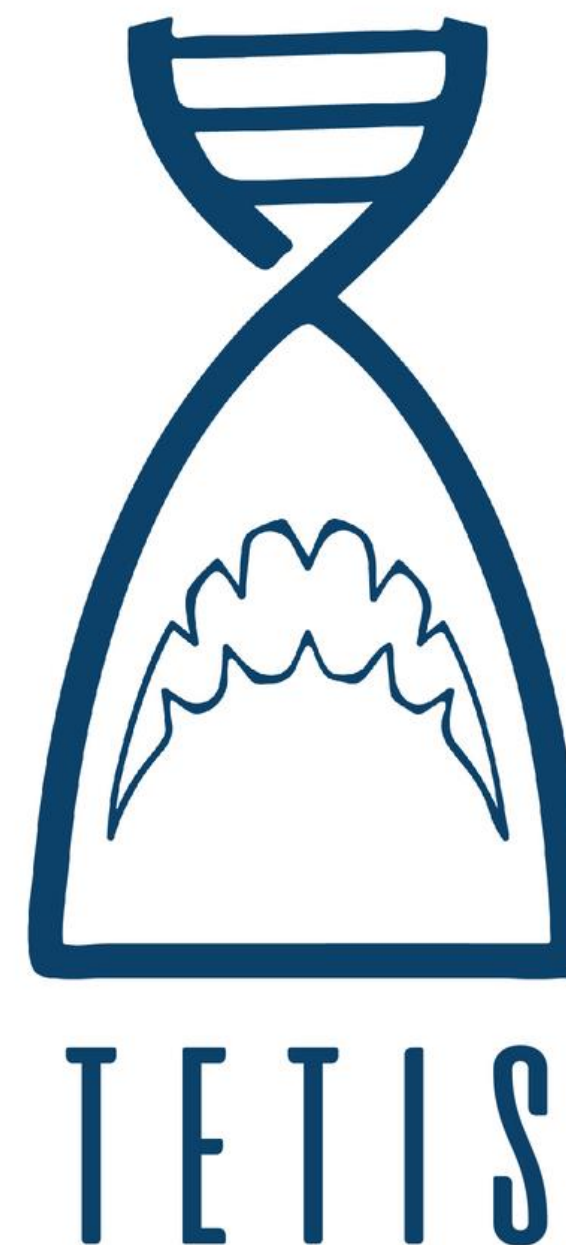
Introduction : Why It Matters

- Around 20 million tons of fish by-products are generated annually (FAO, 2022).
- 70% is turned into low-value feed/oil or wasted.
- A circular economy perspective reveals a huge untapped potential.



Who are We? - TETIS

- Established in 2018, Istanbul-based green biotechnology startup.
- 'Transforming waste into functional value.'
- Technology portfolio: supercritical CO₂, enzymatic, ultrasonic, microwave extraction.



Foodimar Project & Ecosystem

- Tetis participates in the FOODIMAR Horizon Europe project.
- **Goal:** Converting marine side-streams into functional compounds.
- **Tetis' contribution:** pilot-scale green extraction validation and product development (CollaRich, Seanacks).



The Problem

- **Current** value of marine by-products:
~€200–500/ton.
- When upcycled into functional compounds:
€2,000–10,000/ton (BlueBio Alliance, 2023).
- Represents up to 10× higher economic potential.



Our Solution : Green Biorefinery Model

- Single raw material → multiple products.
- Collagen, chitosan, peptides, omega oils, minerals.
- Zero-waste principle.
- Patented low-chemical, low-water extraction processes.



Market Opportunity

Collagen Market

USD 10.9 B
in 2025



USD 18.7 B
in 2030

11.3% CAGR

(Grand View Research)

Functional Food Market

USD 280.7 B
in 2021



USD 586.1 B
in 2030

8.5% CAGR

Cosmetic Market

USD 430 B
in 2022

natural ingredients segment

+12% growth

(Allied Market Research)

Our Product Lines

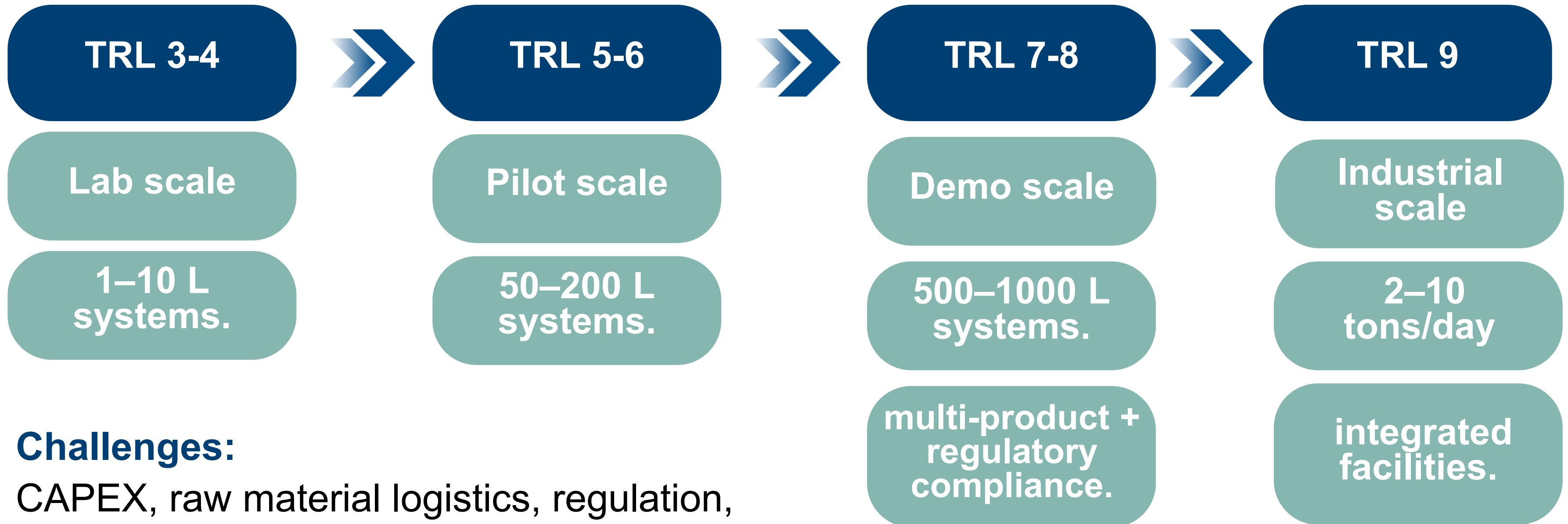
- **CollaRich**: liquid & powder collagen (B2B).
- **Seanacks**: freeze-dried fruit + marine collagen snacks (B2C).



Scalable Green Biorefinery Models

Model	Core Technology	Main Products	Advantages	Scalability	Investments
Enzymatic & Biocatalytic	Protease, collagenase, chitinase, enzymes	Collagen, peptides, chitosan, amino acids	Mild conditions, high purity, low energy consumption	Modular reactors 50 L → 5000L	Medium (high enzyme cost, but clean process)
Supercritical / Subcritical	CO ₂ , subcritical water extraction	Omega-3 fatty acids, lipids, pigments	No solvent residues, safe for food/cosmetic applications	10-30L pilot → 500-1000L industrials	High (high-pressure reactors & safety systems)
Ultrasonic & Microwave-Assisted	Ultrasonic cavitation, microwave extraction	Proteins, polysaccharides, biopolymers	Fast, energy-efficient, reduces solvent requirements	Easily integrated → continuous production lines	Medium-low (compact equipment, easy integration)
Cascade (Multi-product) Model	Multi-step separation (protein → oil → mineral)	Collagen, oil, mineral fertilizer, feed	Zero-waste, maximum value recovery	Parallel lines in one plant → scalable	High (requires integrated facility)
Microalgae & Fish By-product Hybrid	Using fish waste as nutrient for microalgae	Proteins, oils, antioxidants, pigments	Circular economy, carbon & nutrient recycling	Photobioreactors & open ponds → large scale	High (infrastructure + culture optimization)
Digital & Modular (Next-Gen)	IoT, AI, digital twin integration/	Traceable high-quality bioactivities	Flexible, adaptable to multiple raw materials, standardization	Plug-and-play → rapid scale-up	Medium-high (infrastructure + software integrations)

Biorefinery Scale-Up Journey



Challenges:

CAPEX, raw material logistics, regulation, consumer acceptance (OECD, FAO).



Market Needs and Customer Segments

- Functional food market: USD 364.18 B in 2024 → USD 793.60 B by 2032 (10.33% CAGR).
- US functional food market: USD 72.37 B in 2023 → USD 131.45 B by 2030 (8.9% CAGR).



Consumer trends: healthy ageing, high protein demand, clean label, natural ingredients.

Customer segments:

- B2B: food, cosmetics, nutraceutical companies.
- B2C: health-conscious consumers, athletes, young professionals.
- Public & institutions: EU programs, sustainability funds.



Priorities:

1. Functional food sector (fast growth, high demand).
2. Cosmetics (high margin, natural trend).
3. Nutraceutical & pharma (longer regulation, high potential).



Thank You

'Marine species waste is not a problem but the raw material of the future.'

Delivering functional value with green technology.

Sea Goodness Inside

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