European Innovation Council

Funded by the European Union

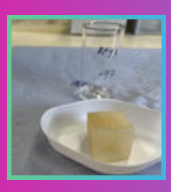
BioLaMer

PROOF OF PRINCIPLE FLY LARVAE BIOREFINERY FOR BIOPOLYMER PLASTIC PRODUCTION

BioLaMer, funded by the EIC Pathfinder Open project, tackles two major global challenges: food waste and the petrochemical plastics problems, by introducing a new value chain. BioLaMer is demonstrating a proof of principle fly larvae biorefinery by establishing food-eating black soldier fly larvae (*Hermetia illucens*) as a high-impact feedstock for the production of two biopolymers, chitosan and polyhydroxyalkanoates (PHA), and value-added bioplastics-based products from them.

INNOVATION IN THE PROJECT

EIC Innovation Radar recognizes two innovations from BioLaMer project and categorized them under exploring phase, marking significant potential for future market applications.



All natural super-absorbent material

PHA production from larvae biomass

2023-2026

2.95 Million Euros

4 Academic Institutions + 3 SMEs

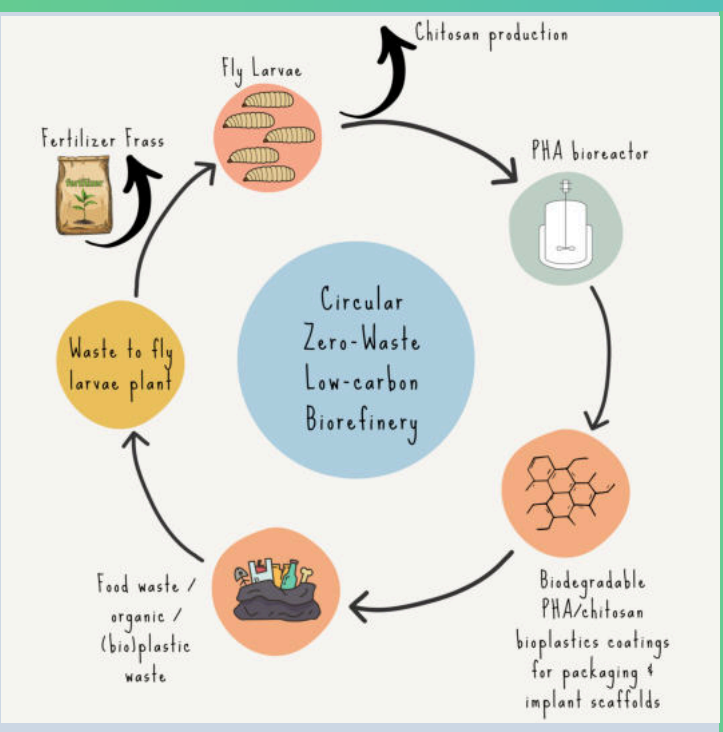
EU FOOD WASTE BY VARIOUS SECTOR IN 2022 (PER CAPITA)[1]

BioLaMer Approach Contributing to the Food Waste Mitigation

BioLaMer is actively demonstrating the development of a Black Soldier Fly Larvae cultivation plant (larvae biorefinery) that utilizes food waste collected from restaurants, aiming to significantly mitigate the 15 kg per capita of food wasted by restaurants and food services when scaled up to a large scale.

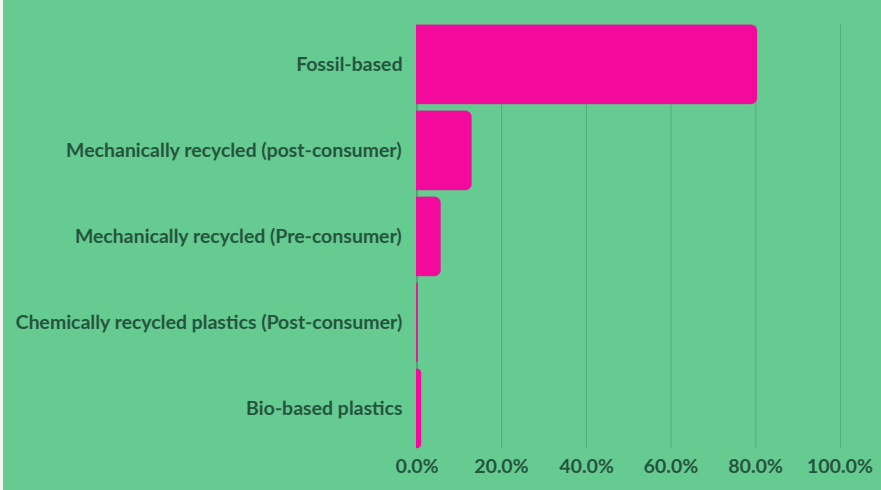
Food Waste to Larvae Conversion

In the current BioLaMer larvae production bioreactor, approximately 1 kg of larvae is produced from approximately 6 kg of food waste.



BioLaMer Circular Approach

EUROPEAN PLASTICS PRODUCTION PERCENTAGE BY SOURCE MATERIALS[2]



BioLaMer approach drives the development of bio-based biodegradable plastics with a focus on advancing a circular plastics economy.

RESEARCH PROGRESS

- Chitosan extraction from larvae shells
- Sustainability analysis of BioLaMer biorefinery
- Social perception and dissemination
- Food waste valorization to larvae
- PHA production from larvae biomass
- Hybrid model development to enhance PHA production

TARGET AUDIENCE & STAKEHOLDERS

All stakeholders in the food supply chain, including food producers, processors, packaging companies, distributors, restaurants, households, bioplastics industry participants, researchers, consumers, NGOs, policymakers, youth, students and general public/consumers.

References:

1. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Food_waste_and_food_waste_prevention_-_estimates
2. https://plasticseurope.org/knowledge-hub/plastics-the-fast-facts-2023/
3. https://www.marketdataforecast.com/market-reports/polyhydroxyalkanoate-market
4. 1Molenveld, K., Post, W., Ferreira, S. F., De Sévaux, G., & Hartstra, M. (2022). Paving the way for biobased materials : a roadmap for the market introduction of PHA's. https://doi.org/10.18174/561676

Larvae Cultivation Plant

Black Soldier Fly Larvae

BSF shells

Chitin from larvae shells

Chitosan flakes prepared

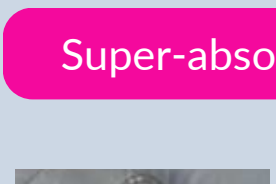
RESULT DASHBOARD

Larvae biomass without chitin

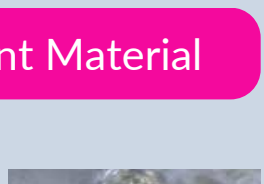
PHA production

PHA membrane produced from biomass

Super-absorbent Material



BioLaMer super-absorbent as prepared

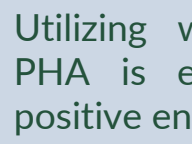


Super-absorbent after water absorption

All natural super-absorbent material developed within the project can soak up water over **3000 times** its own dry weight.

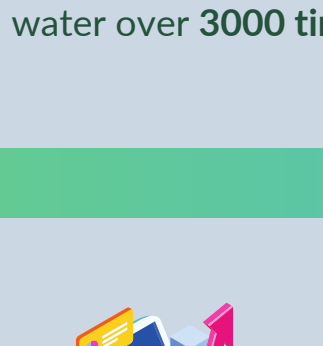
Environmental Assessment

Utilizing waste streams to produce PHA is expected to result in net positive environmental benefits.



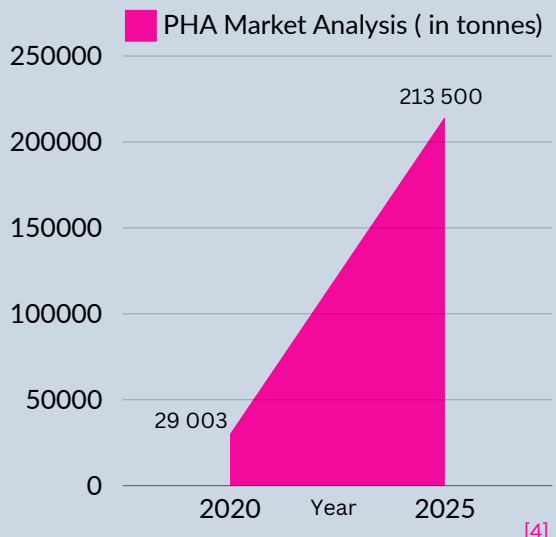
Life Cycle Assessment (LCA) has been applied to evaluate the environmental performance.

Optimizing production processes can make PHA a sustainable alternative offering lower greenhouse gas emissions.



PHA Market Analysis

The global PHA market forecast is expected to grow at a compound annual growth rate (CAGR) with an average estimate of approximately 11.68% over the next five years.[3]



BioLaMer LCC Review Analysis[4]

PHA Cost Analysis

- PHA production cost can vary between 2.3 €/kg and 4.3 €/kg, depending on the feedstock, production strategies and scale.[4]
- The market price for PHA typically ranges between 4-6 €/kg.[4]

Zero Waste

BioLaMer technology contributes to reducing food waste and mitigating pollution caused by petrochemical plastics. Additionally, both the larvae's shells and biomass are utilized as feedstocks for biopolymer production, supporting a zero waste approach.

Climate Change Mitigation

Sustainable valorization processes from these feedstocks for producing PHA and chitosan, and optimized energy consumption, can result in a net reduction of greenhouse gas emissions, thereby reducing the overall impact on environment.

Circular Economy and Sustainability

The project embraces circular economy principles by promoting the continuous reuse of materials, contributing to a closed-loop system and also supporting long-term sustainability through the production of eco-friendly bioplastics-based products.

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