# *Proof of principle fly larvae biorefinery for biopolymer plastic production*

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**The BioLaMer project** seeks to address two significant global challenges, the **increasing food waste** challenge and the petroleum **plastics pollution**, by developing an innovative technology/design/route to produce biopolymers and added-value bioplastic products from low-grade food waste. To realize this goal, BioLaMer will demonstrate a novel proof of principle fly larvae biorefinery by establishing food eating black soldier fly larvae (Hermetia illucens) as a high impact feedstock for cost-effective production of two biopolymers: polyhydroxyalkanoates (PHA) and chitosan.

**The advantages** of the larvae route are that it:
i) is **renewable** and **inexpensive**;
ii) provides **less complexity** as the larvae has invariable chemical composition;
iii) can be used to **mitigate** the food waste problem;
iv) can **reduce raw material** inputs, thus minimizing energy utilization;
v) does not disturb the biodiversity;
vi) can avoid/reduce pre-treatment costs associated with the waste-streams to produce the platform chemicals for **biopolymer production**.

The innovative BioLaMer biorefinery will **improve the bioreactor process efficiency** and **cut down the PHA production** cost significantly compared to existing technologies. BioLaMer will combine its conceptual innovations, complementary interdisciplinary expertise and bioreactor process expertise to develop cost-effective PHA and chitosan production technologies, supported by life cycle thinking/analysis and hybrid models developed using machine learning platform.

Further, the significant environmental, economic, and societal impacts (that supports the EU Circular Economy, Green Deal, Food Waste, and Plastic strategies/initiatives) of BioLaMer will be demonstrated through the involvement of scientific stakeholders, communication and circularity demonstration partners.

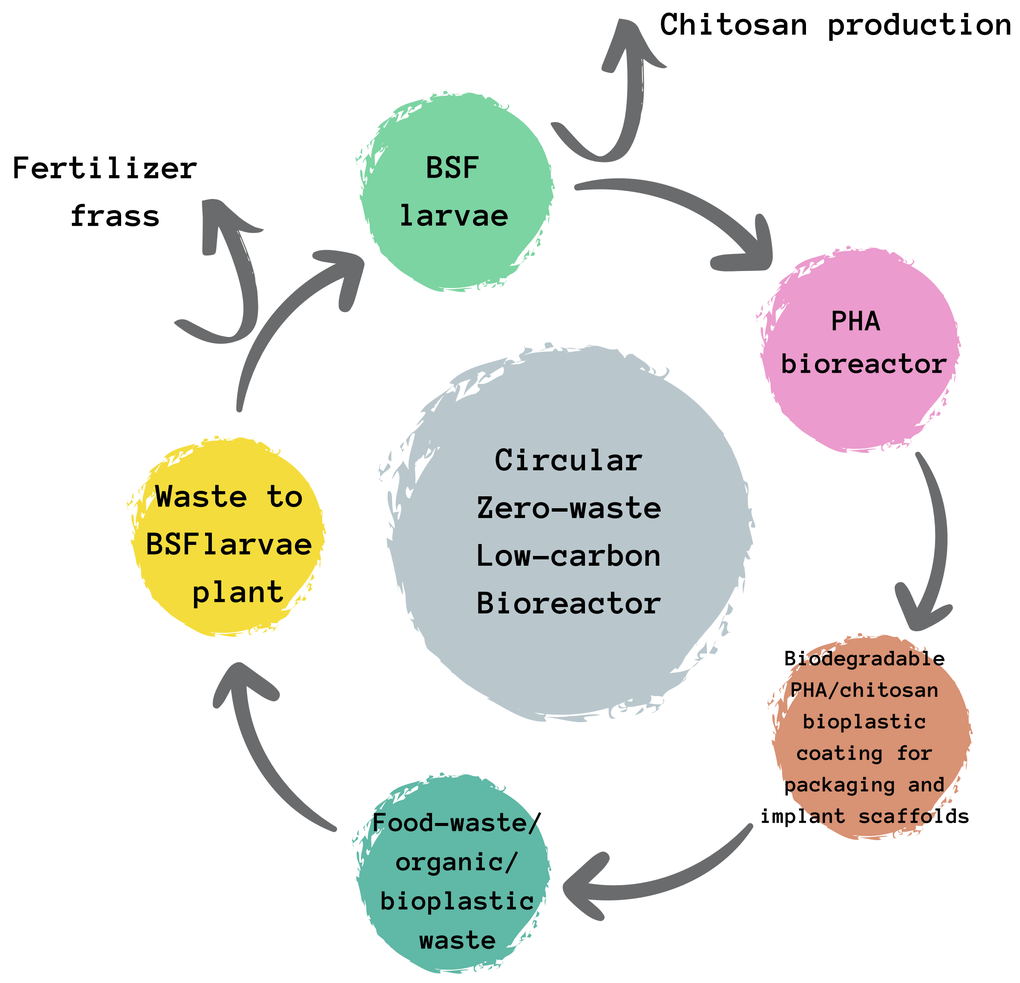


*Image 1. Schematic depicting circularity and zero-waste generation potential of the BioLaMer bioreactor*

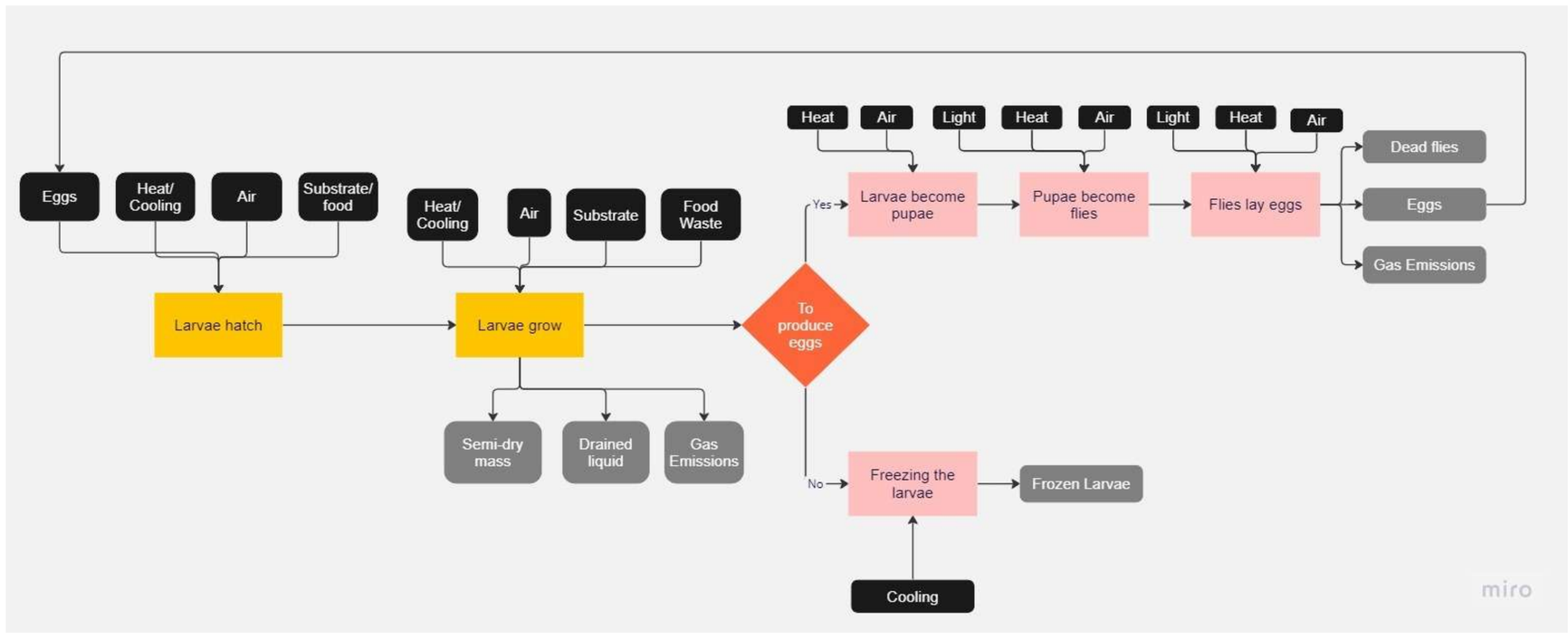


*Image 2. Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) of the Bioreactor*

At **TrasnsoLAB BCN**, we are currently working on a fully working prototype of a locally deployable **fly larvae cultivation plant**, which has been designed and implemented with provision to control temperature, relative humidity & suitable lighting to provide adequate hatching and growth conditions for the larvae. This first prototype will allow us to **demonstrate the circular process** and evaluate behind the fly larvae cultivation solution the design in terms of functionality, efficiency and environmental footprint, and implement any improvements.

**Next steps** involve identifying and introducing local suppliers of food waste and consumers of larvae in the circular process, such as households, urban gardens and restaurants and establishing relationships to feed the locally deployed fly larvae cultivation plant.

**BioLaMer** is a project in collaboration with Trinity College and SocLineTech Solutions and Services Ltd from Ireland, Universidade Nova, Cofac Cooperativa de Formacao e Animacao Cultural CRL and AquaInSilico Lda from Portugal, University of Bologna from Italy

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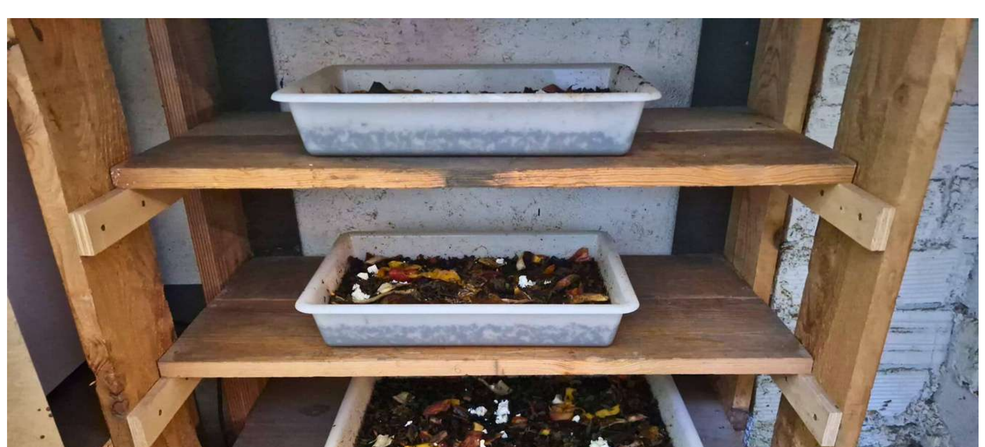

*Image 3 & 4. BSF larvae rearing and egg hatching*

*Image 5. TransfoLAB BCN BSF larvae bio lab*

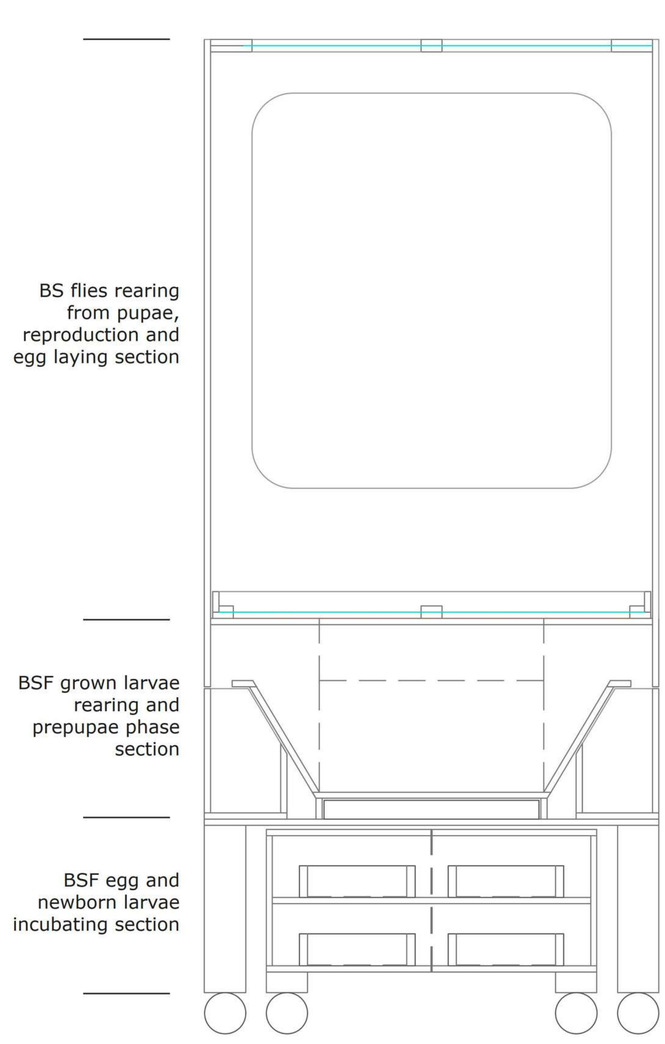


*Image 6. BSF larvae bioreactor - first prototype scheme*

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