

Technology #4 Insect larvae farmed on biowaste or agri-food by-products

Description

Some insects can be safely included in feed and food formulations. Species like *Tenebrio Molitor* (yellow mealworm) and *Hermetia Illucensis* (black soldier fly - BSF) are farmed with different substrates, including residual streams of human food. Their bodies provide high-quality nutrients and chitin with a much lower environmental impact than traditional value chain processes. Moreover, their excreta (frass) is a valuable and marketable fertiliser.

Innovation keys for the environment

- Combination of larval rearing and waste management (potentially lucrative business).
- Proteins production with a up to 10 times lower land use than meat proteins. ⁽¹⁾
- Lauric acid produced from an alternative source to coco and palm seeds.
- Alternative fertiliser as side-stream.

Biowaste feedstocks

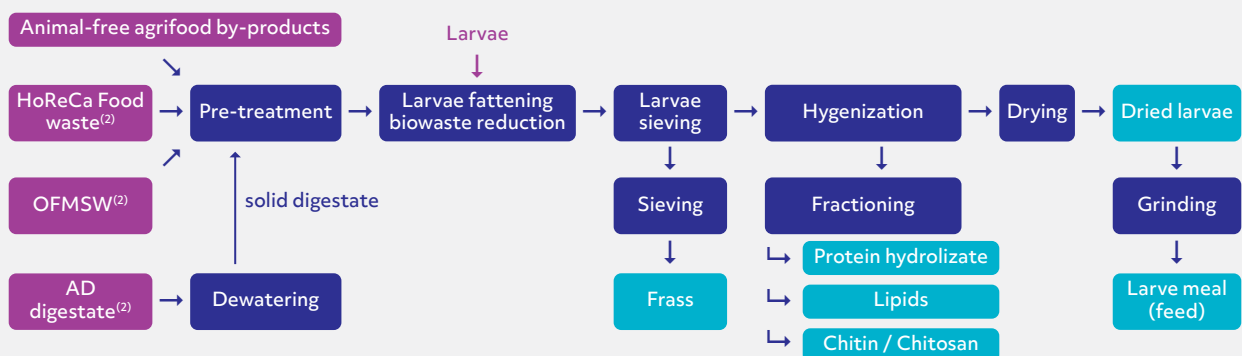
- Agri-food by-products
- Brewery by-products
- Market leftovers (animal free)
- Households or HORECA food waste ⁽²⁾
- Digestate from anaerobic digestion ⁽²⁾



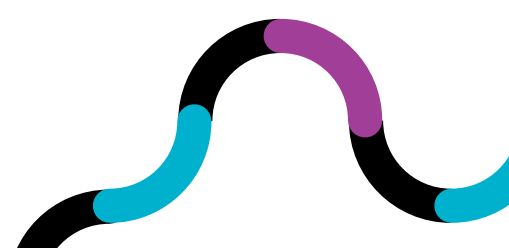
Market price [EUR] Business 2 Business or Business to customer

Bioproduct(s)	Market sector	Market price
Larval meal (grinded larvae)	feed for domestic and exotic animal	10 €/kg for BSF [B2C]
	Livestock feed (cattle, aquaculture)	1.5-2 €/ kg [B2B]
Frass (larvae excreta)	agriculture	30 €/ ton [B2B]
Hidrolised Insect Protein	Livestock and pet feed	6'500 €/ ton dry matter [B2B]
Chitosan (from chitin)	Agrochemicals, water treatment	40'000 – 50'000 €/ ton [B2B]
Fats / oils		1'600 €/ ton [B2B]
Lauric Acid	Cosmetic	1'900 – 2'100 €/ ton [B2B]
Live larvae	feed for domestic and exotic animal	7-8 €/kg [B2C]

Process flowchart



Legend: Biowaste feedstock Process input Process step Bioproduct



Existing production plants

	Production plant location ⁽³⁾	Feedstock	Bioproduct	TRL	Production capacity (t/year biowaste processed)	Production capacity (ton/year bioproducts)	CAPEX	OPEX
1	Spain (digital twin)	Biowaste or by-products	BSF Larvae and derivatives	9	73'000	9'000 frass 15'000 larvae = 2'500 hydrolyzed protein + 1'000 oil + 47 chitosan	15 M €	6.5€/ton biowaste
2	Cehegín, Spain [ValueWaste]	Biowaste and Digestate	BSF Larvae and derivatives	7	365	60 larvae	N.A.	N.A.
3	Voss, Norway (digital twin)	Agri-food by-products, market biowaste	Dry mealworm larvae and frass	8	10'000	1'200 dried larvae 5'400 frass	10M - 20M USD	Confidential
4	Bergen op Zoom, The Netherlands	Agri-food by-products, market biowaste	BSF Larvae and derivatives	9				
5	Fuente Alamo, Murcia, Spain	Agri-food by-products	defatted BSF Larvae and derivatives	9				
6	Cape Town, South Africa	Food waste	BSF Larvae and derivatives	9	40'150			
7	Maysville, KY, USA	Pre-consumer product streams	BSFL Larvae and derivatives	9				
8	Kuala Lumpur, Malaysia	Agriculture, agri-food, canteens waste, including animal by-products	BSF Larvae and derivatives	9				
9	Navan, Ireland	Pre-consumer product streams	BSF Larvae and derivatives	9				
10	Talca, Chile	Food waste	BSF larvae feed and frass	9				
11	Baruth/Mark, Germany	Pre-consumer product streams	BSF larvae feed and frass	9				
12	Nesle, France	Starches and biomass	BSF meal and frass	9				
13	Johor, Malaysia	Organic waste	BSF Larvae and derivatives	9	11'000	1'700 dried larvae 3'200 frass	0.9-1.1 M USD	0.6-1.2 M USD/year
14	Singapore	agritech and food by-products	defatted BSF Larvae and derivatives	9				

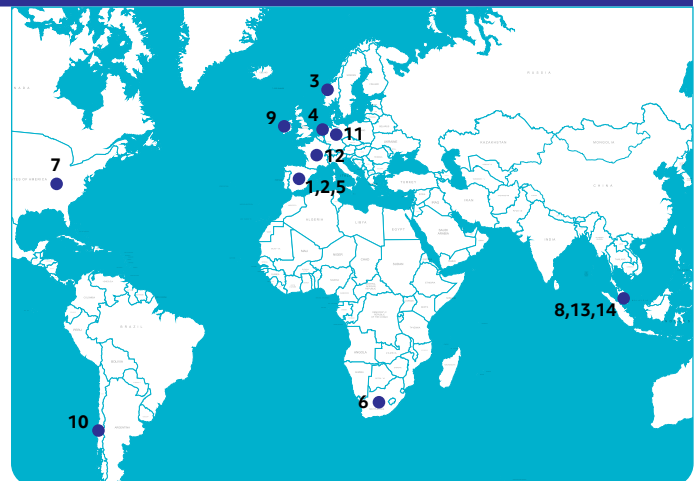
Acknowledgements

H2020 ValueWaste
valuewaste.eu



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Further information

(1) Nitrogen and food production: proteins for human diets - PubMed ([nih.gov](https://pubmed.ncbi.nlm.nih.gov/))

(2) Not legal in the EU

(3) this a non-exhaustive list. Insect farms are already a solid business worldwide serving different market sectors, mainly feed and agriculture.



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