SUPPLEMENTARY MATERIAL

to Chapter 5 Robustness of business models for insect production for feed and food in Europe. In: Economic viability of insect production for feed and food in Europe (thesis).

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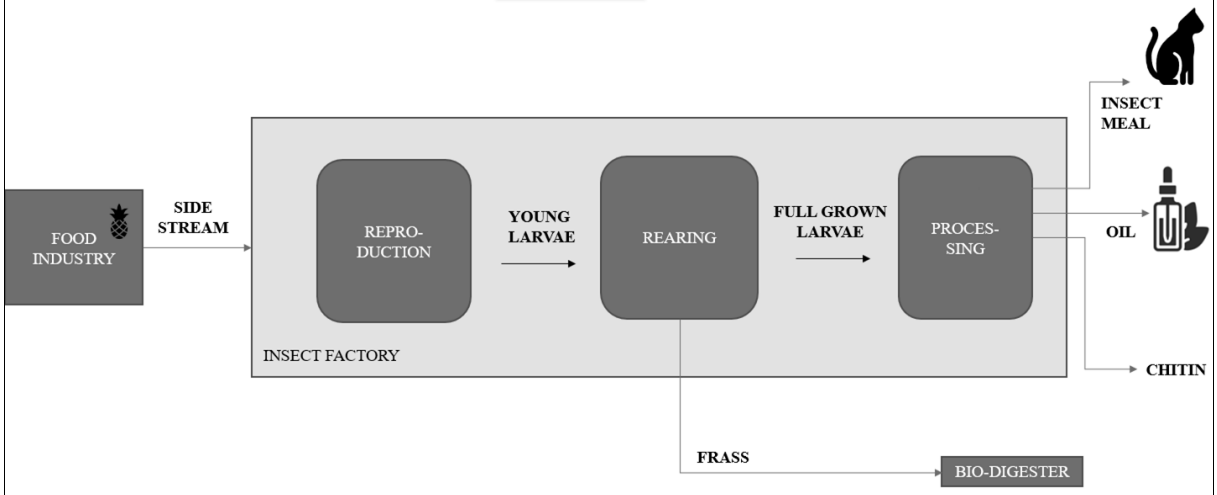
Supplementary material 1: Information provided to participants

S.1.1 Information provided to participants of the focus group on the business model full-liner BSF production for pet food

Business model 1: Full-liner BSF production for pet food



Supply chain structure

- Reproduction, rearing, and processing on one (central) location.
- Storage capacity needed for side streams.
- No transportation (outside factory) of larvae during their lifecycle.
- Full-liner protein producer, managed by one organisation.

Substrates

- Supplied from food industry.
- Purchased and sourced from further distances (due to the large amount needed).
- Quality is a priority for optimal growth of the larvae, and the best nutritional quality of the end product.

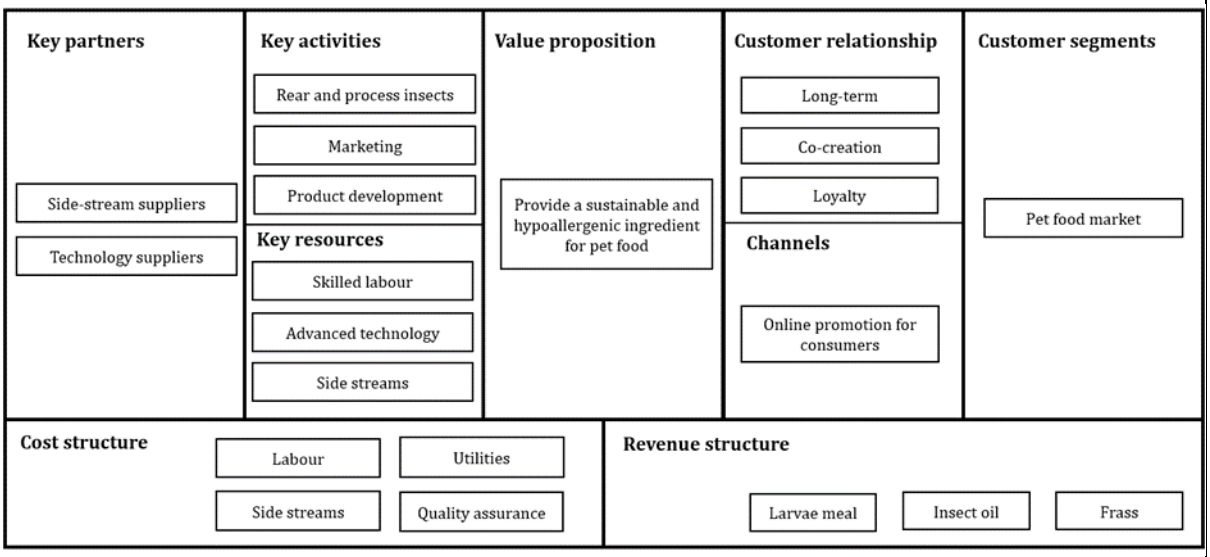
Inputs

- Start colony of BSF (one-time cost).
- Substrates (purchased externally).
- Utilities (mainly electricity).
- Mainly skilled labours; rearing and processing requires a high degree of mechanisation.
- Health management.

Outputs

- Output of the full-liner producer are pet food products.
- Frass is sold to a digester, for a competitive price.

Business Model Canvas for full-liner BSF production for pet food



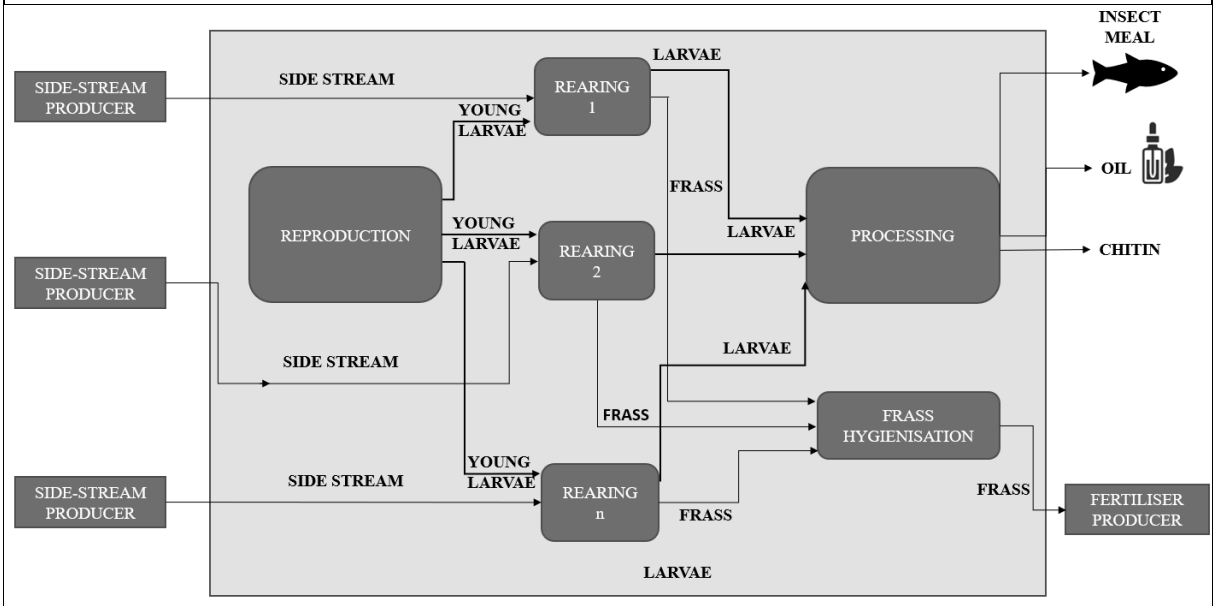
Explanation Business Model Canvas

The Business Model Canvas is a template and a tool which is used to visualise all the building blocks needed for good operation of a business and how a business generates value for its customers. The Business Model Canvas consists of nine building blocks which are explained below.

1. Key partners: *key partners needed to optimise operations.*
2. Key activities: *the most important activities to execute the company's value proposition.*
3. Key resources: *the resources which are needed to create value for the customer.*
4. Value proposition: *the main value which the business offers to its customers (unique selling point).*
5. Customer relationship: *the relationship a business builds with its customers.*
6. Channels: *the way how the product (value proposition) is delivered to the customers.*
7. Customer segments: *the type of market for which the product is produced.*
8. Cost structure: *the most relevant cost components for the business.*
9. Revenue structure: *the revenue streams which create income for the business.*

S.1.2 Information provided to participants of the focus group on the business model decentralised BSF production for aquafeed

Business model 2: Decentralised BSF production for aquafeed



Supply chain structure

- Central reproduction, decentralised rearing, central processing.
- Frequent transport of larvae from and to decentralised rearing locations is needed.
- All processes and locations are being managed by one organisation.

Substrates

- Side streams from food industry.
- Locally produced (i.e. close to decentralised rearing locations).
- Are not purchased; the side-stream producer pays for the offtake and processing of side streams.
- Quality varies per supply, in general the quality of substrate is not most optimal for rearing.
- Are being stored at decentralised rearing locations and need to undergo a treatment before use.

Inputs

- Starter colony BSF (one-time cost).
- Side streams.
- Utilities (mainly electricity).
- Mainly technical skilled labour (rearing and processing require high level of mechanisation).
- Health management.

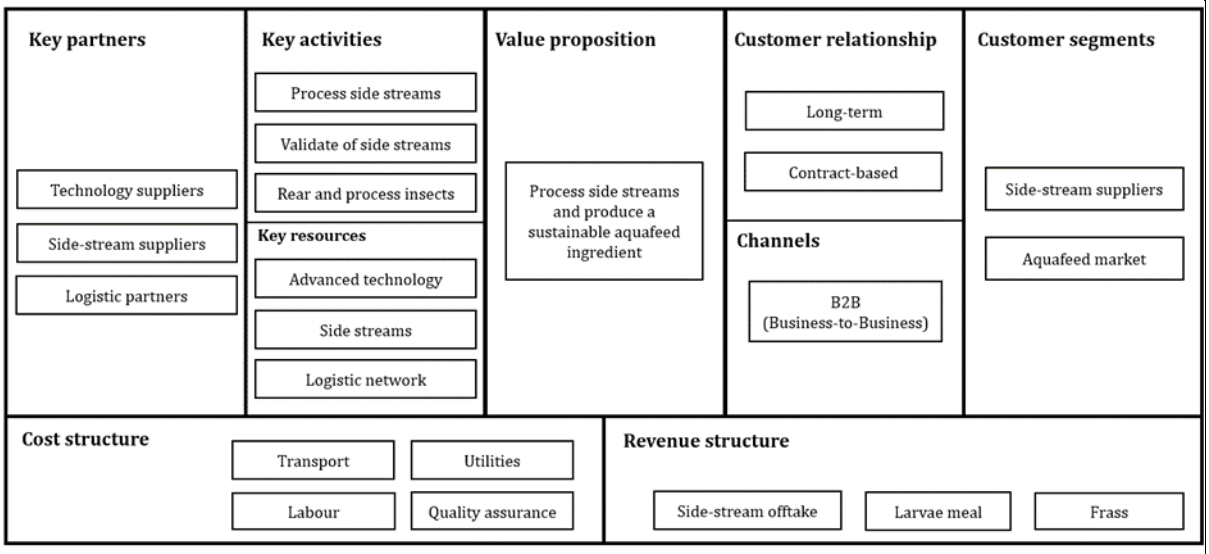
Outputs

- The output of decentralised locations are full-grown larvae and frass.
- The output of the processing unit is a protein rich meal (varying quality) destined for aquafeed market.
- Side-products are insect oil and chitin.
- Frass is being sold for a low price.

Costs and revenues

- Most important cost components include the purchase of young larvae, mechanisation, transport, and processing.
- Revenue streams originate from side streams, purchase of insect meal for aquafeed, and purchase of frass as fertiliser.

Business Model Canvas for decentralised BSF production for aquafeed



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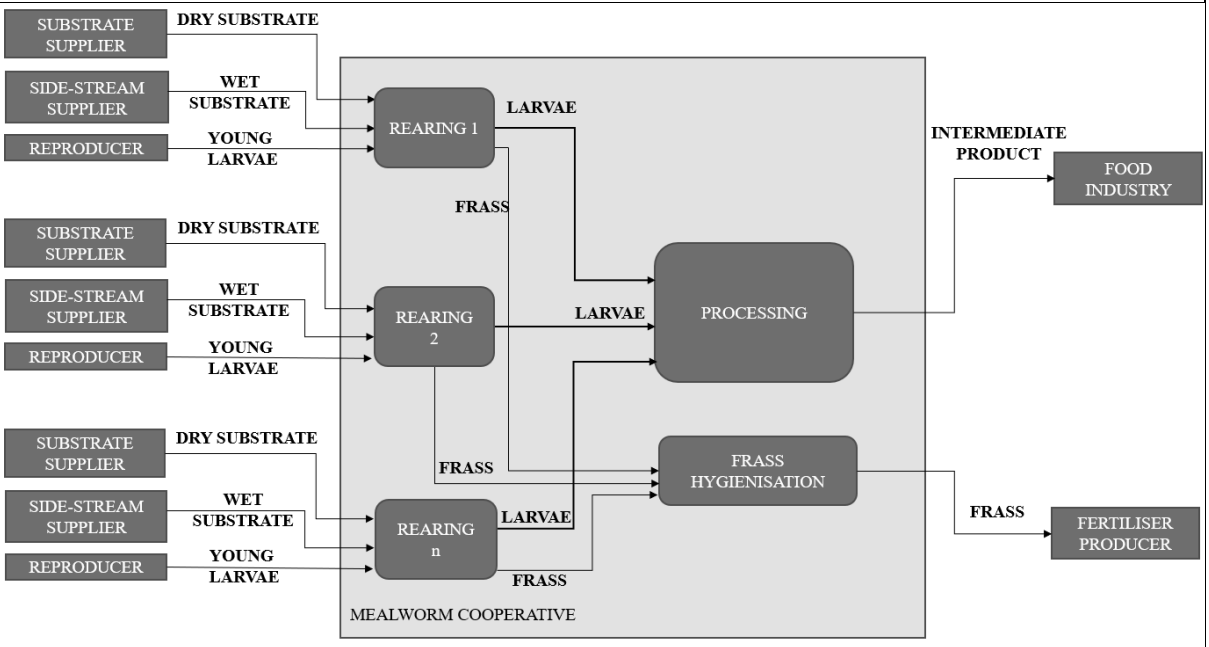
S.1.3 Information provided to participants of the focus group on the business model mealworm processing cooperative for food

Business model 3: Mealworm processing cooperative for food



Supply chain structure

- Reproduction outsourced, decentralised rearing by members of cooperative, central processing.
- Frequent transportation of young larvae and full-grown larvae is needed from and to the decentral rearing locations of members.
- Young larvae are purchased externally, rearers (members of cooperative) are responsible for the rearing process, processing is done on one central location.

Substrates

- Include dry and wet feed, only wet substrate is a side-stream from the food industry.
- Purchased by the rearer.
- Substrate is stored at the rearing location, no 'treatment' is needed.

Inputs

- Young larvae (purchased externally).
- Substrates (purchased externally).
- Utilities (electricity).
- Manual labour for rearing, processing requires a low degree of mechanisation.
- Health management.

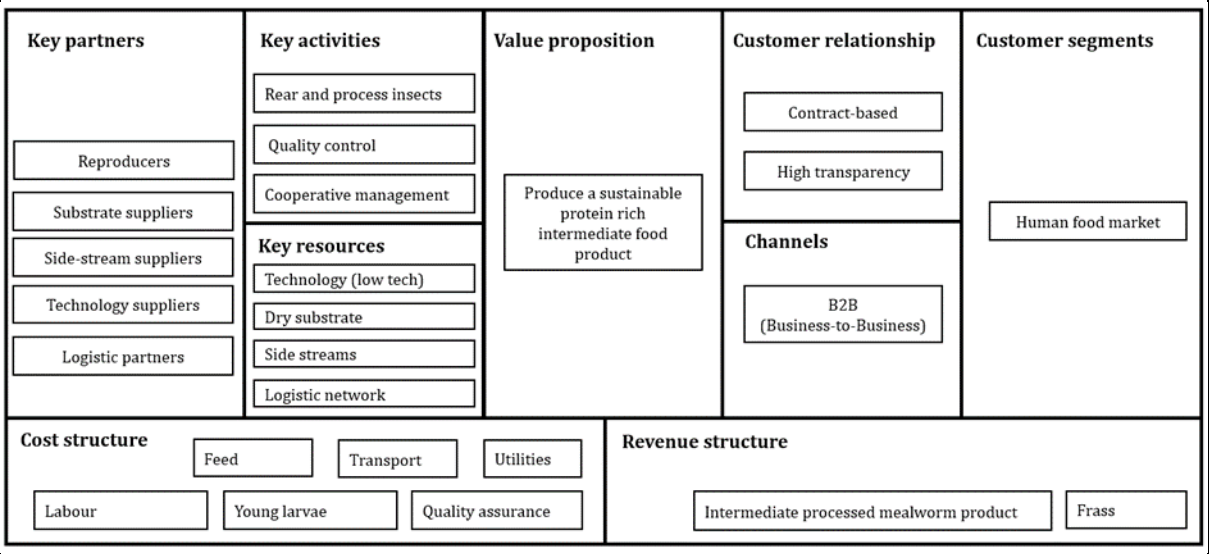
Outputs

- Full-grown larvae and frass are the end product of rearers.
- Processed larvae are the end product of the processing destined for the human food market.
- Frass is stored at the rearers' farms and collected regularly to be processed and sold as fertiliser.

Costs and revenues

- Revenues are shared among members of the cooperative according to their contribution.
- Costs made for central processing of larvae and frass are shared among members of the cooperative.
- Depreciation for the processing investments are deducted from revenues.
- Rearers purchase inputs.

Business Model Canvas for a mealworm processing cooperative for food



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Supplementary material 2: Instructions give to participants

S.2.1 Detailed instructions given to participants on colours used in the BMST

Table 1 Detailed instructions given to participants on colours used in the Business Model Stress Test.

Colour	Detailed instructions
Green	Select the option "green" if you expect that this scenario affects the feasibility or viability of the BM component, but not in a negative way. In this case, this scenario may even positively influence the feasibility or viability of choices regarding the BM component.
Orange	Select the option "orange" if you expect that this scenario makes a BM component no longer viable. In this case, this scenario requires revisiting choices regarding the BM component.
Red	Select the option "red" if you expect that the outcome of this scenario makes a BM component no longer feasible. In this case, this scenario becomes a potential show-stopper for the Business Model.
Grey	Select the option "grey" if you expect that this scenario does not affect the BM component in any way.