

Collaborate

Create

Innovate

# Automated insect rearing



Filip Wouters, M.Sc., ing.

Researcher and lector (animal nutrition,  
beekeeping and wildlife management )

[Filip.wouters@vives.be](mailto:Filip.wouters@vives.be)

katholieke hogeschool  
associatie KU Leuven

vives

EAAP, 29th of August, 2018

# Automated insect rearing

- VIVES?
- Insect production : cost effective?
  - Our question: “... “
  - Farmer: ”... ”
  - Industry: ”... ”
- Your questions or suggestions

# VIVES

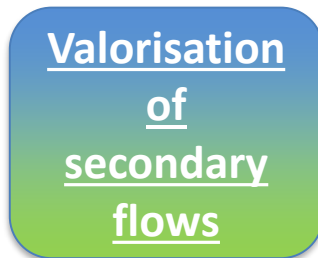
= university of applied science  
(NOT a firm!)



Association of University of Leuven (KUL)



3 research focusses based on socio-economical needs



# Some facts & figures

- Ca. 100 on – going research projects
- + 150 researchers (55 FTU)
- + 7 million euro (Research, Valorisation & Services)
  - Subsidised and private research

## Insect research colleagues :

### *Campus Roeselare*

- An Callens
- Sharon Schillewaert
- Thomas Spranghers

### *Campus Kortrijk*

- Tijl Anthone
- Lieven Malfait
- Philippe Vanloofsvelt
- (Geert Furniere )



Collaborate

Create

Innovate



# References



# Automated insect rearing

- VIVES?
- Cost effective / insect production

– Question to the industry:

**“What to tackle first?”** (2014 – 2015)

1. Upscaling of production = downscaling labour  
= automatisisation
2. What to feed insects?
3. Pathologies and pests?

– Farmer: “ ... ”

– Industry: “ ... ”

- Your questions or suggestions

**Entomatisation  
(TETRA – VLAIO )**

AGENTSCHAP  
INNOVEREN &  
ONDERNEMEN



Vlaanderen  
is ondernemen

**Entomation**

**entomo SPEED**



**Interreg**  
EUROPESE UNIE  
Vlaanderen-Nederland



**BioBoost**

Accelerating biobased horticulture

**Interreg**  
EUROPEAN UNION  
2 Seas Mers Zeeën

katholieke hogeschool  
associatie KU Leuven



EAAP, 29th of August, 2018

# Entomatisation (2016 – 2018) (TETRA – VLAIO )

- Focus on 1 species: **Tenebrio molitor**
- Focus on 2 steps in proces: **feeding and sieving**
- Labour : hours of feeding: goal : - 75%
- Upscaling =
  - From nowadays industrial scale (**50 ton/year**) to ...
    - Kok, R. (*Insects as food and feed, 2017*):  
mass production: 6000 ton/year
  - From lab scale to ... midscale to ... industrial scale  
(**modular** concept)

AGENTSCHAP  
INNOVEREN &  
ONDERNEMEN



Vlaanderen  
is ondernemen

katholieke hogeschool  
associatie KU Leuven



# Entomatisation (2016 – 2018) (TETRA – VLAIO )

- Proces window:
  - Start from nowadays traditional production:
    - **Crates** with meal/ wheat bran and carottes, apple ...
    - Maximum height of housing (no warehouse system)
  - **Compartmentation:**
    - Heat preferences during life phases
    - Hygiene : larvae versus adults (pests)
  - Inside climate room:
    - Minimale structures (cleaning)
    - No active components (dust)

AGENTSCHAP  
INNOVEREN &  
ONDERNEMEN



Vlaanderen  
is ondernemen

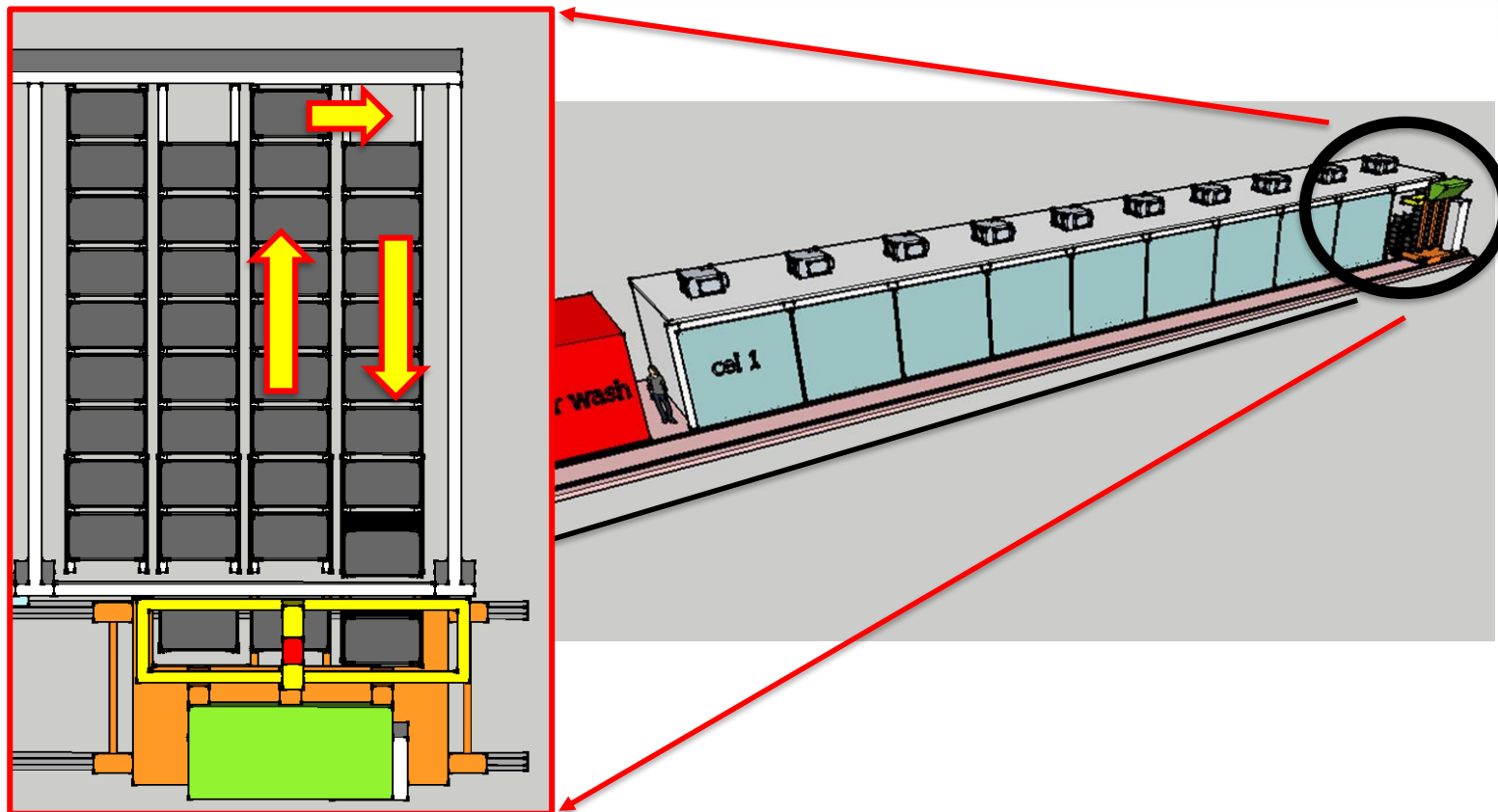
katholieke hogeschool  
associatie KU Leuven





# Entomatisation (2016 – 2018)

## FEEDING LINE



AGENTSCHAP  
INNOVEREN &  
ONDERNEMEN



Vlaanderen  
is ondernemen

katholieke hogeschool  
associatie KU Leuven



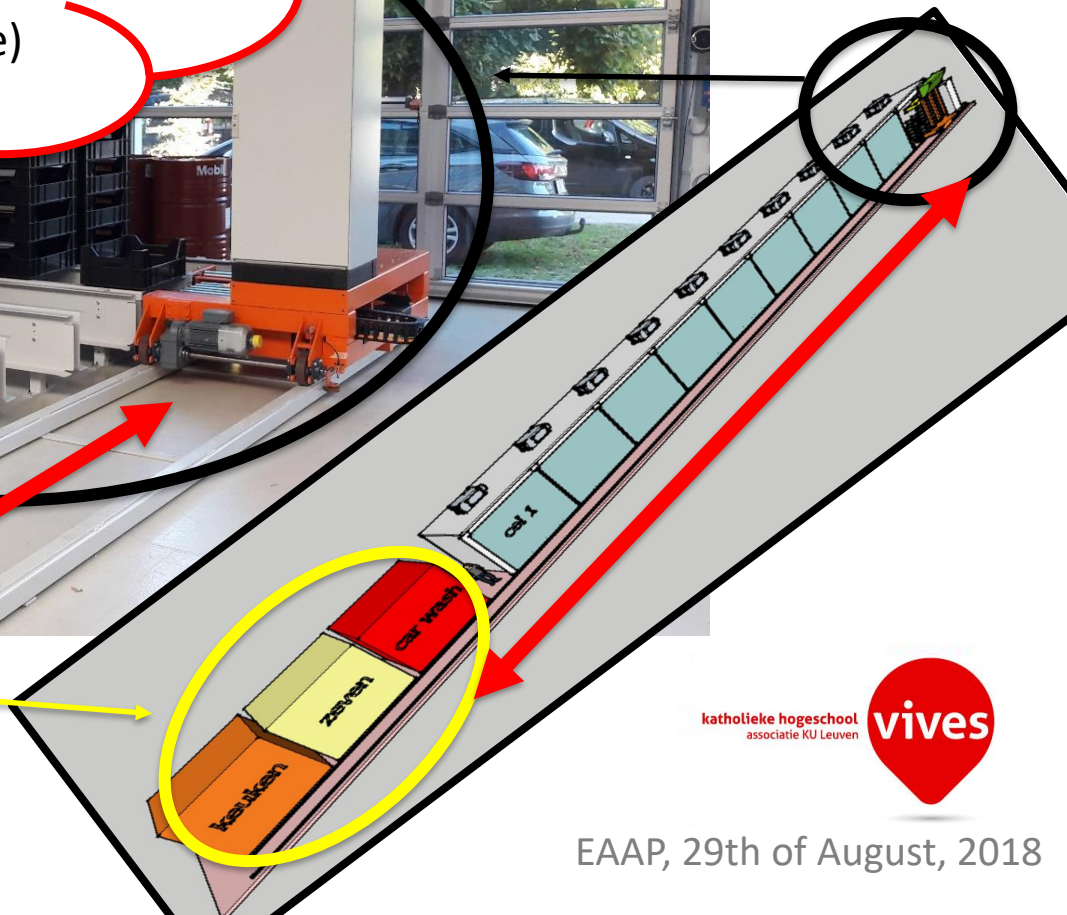
EAAP, 29th of August, 2018

# Entomatisation (2016 – 2018)

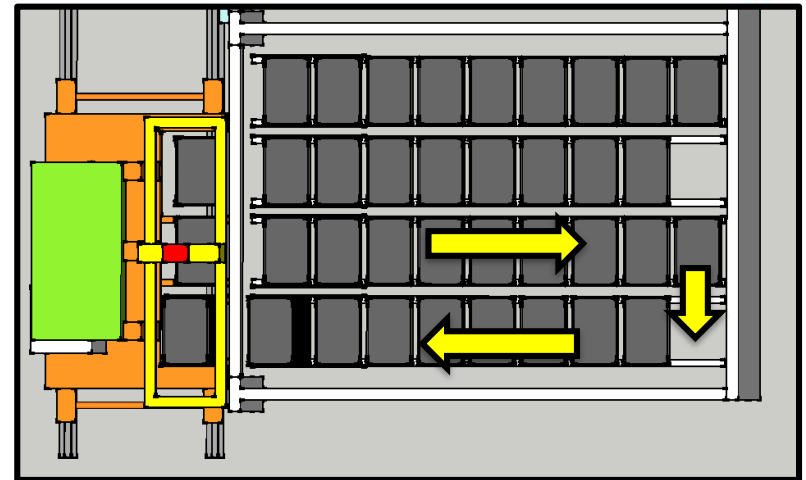
## FEEDING LINE

**Rollers? No!**

1. Damage to crates :  
= shorter longevity  
+ plastic into crates (safety issue)
2. Higher risk to fall over



# Entomatisation (2016 – 2018) FEEDING LINE



Options:

- single mouth versus multihead
- consistency of feed
- patterns (size larvae )
- crates (bar code, chip ... )
- sensors ...

**What instead? 2 CATs**

(notice: 1 empty place/compartment)

AGENTSCHAP  
INNOVEREN &  
ONDERNEMEN



Vlaanderen  
is ondernemen

katholieke hogeschool  
associatie KU Leuven

vives

# Automated insect rearing

- VIVES?
- Cost effective / insect production
  - Our question: “... “
  - Farmer: “Nice, but what does it cost?”
  - Industry: “I’m a believer. I have a warehouse of 40 by 60 meter. How much can I produce?”

What language do they understand? **Key parameters?**

*Cost and gain of insects versus piglets versus parking space ...*

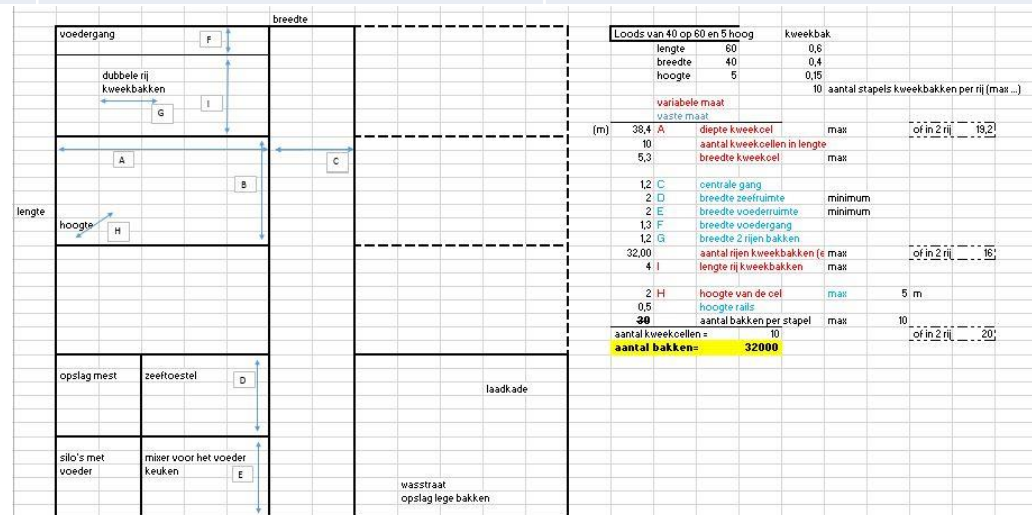
- Your questions or suggestions

# Automated insect rearing: Key parameters : space versus production

Case study of warehouse of 40 by 60 meter

Key parameters	Hyg. (pilot at Inagro)	Centr. (design)
Crates in total	32000	53690
crates/m <sup>2</sup>	13,333	22,371

Simulation:



# Automated insect rearing:

## Key parameters : space versus production

Case study of warehouse of 40 by 60 meter

Key parameters	Hyg. (pilot at Inagro)	Centr. (design)
Crates in total	32000	53690
crates/m <sup>2</sup>	13,333	22,371
<b><i>From housing to production</i></b>		
<i>(2 kg live weight/crate and have 5,7 cycles/year crate)</i>		
Production (kg live weight/m <sup>2</sup> year)	152,00	255,03
Total production (live weight/year)	365 ton	612 ton
<b><i>Insects or cars?</i></b>		
Profit (€ /m <sup>2</sup> year)	?	?

# Automated insect rearing: Key parameters : what does it cost?

If: (understanding between different farmers, experienced investors and industrialists )

- 15 year return and interest = 2,5%
- Inclusive washing installation, sieving, silo, forklift, heating&cooling, building ...

Production (live weight/year)	50 ton	50 ton	350 ton (hyg.)	600 ton (central)
Feeding line (k€)	0	200	500	625
Investment/year (€)	41.417	58.083	112.750	147.388
Cost of feed (k€)	56	56	390	669
Minimum average selling price (€/kg live weight)	5	3,71	2,58	2,47

# Automated insect rearing: Key parameters : cost effective?

- Ok for *Tenebrio molitor* or also suitable for other insects?
- Automatisisation not the only solution:

Production (live weight/year)	350 ton (hyg.)	600 ton (hyg.)	600 ton (central)	600 ton (central)
Feeding line (k€)	500	500	625	625
Investment/year (€)	112.750	113.775	147.388	147.388
Cost of feed (k€)	390	669	334,5	669
Minimum selling price (€/kg live weight)	2,58	2,221	1,726	2,469





## Questions? Suggestions?

Infoloket:

[www.insectinfo.be](http://www.insectinfo.be)

[insectinfo@vives.be](mailto:insectinfo@vives.be)

+ 32 51/ 23 23 39 )

Partners:



EAAP, 29th of August, 2018

entomo **SPEED**



**Interreg**   
Vlaanderen-Nederland  
Europees Fonds voor Regionale Ontwikkeling