Novel proteins

Upscaling & market acceptance challenges

June 21th 2018, Linda de Bie

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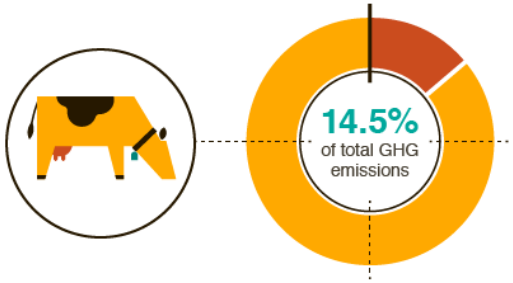
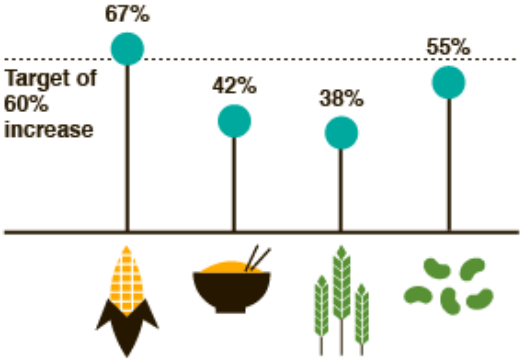
The challenge in our protein world

Global food demand expected to rise 60% by 2050



Livestock contributes 14,5% of total global GHG emissions



Current growth in yield are falling short. About a third of all food is lost.

Which novel protein sources are playing a role?

Leaf protein sources

Aquatic biomass

Insects

Single cell proteins

Novel proteins in animal feed

	Nutritional	Health	Economic
Seaweed	• Variable in protein • Moderate digestibility	• Could have health benefits	• Higher market segments
Algae	• High protein yield potential • Varying effects on protein digestibility	• Could have health benefits	• Increasing production • Decreasing costs
Insects	• Feeding value promising but variable in protein content	• Could have health benefits	• Could compete in higher segment (fishmeal, petfood) • Market is there, upscaling needed • Legislation is barrier

Consumer acceptance of novel proteins

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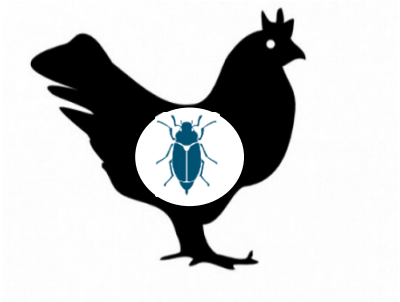
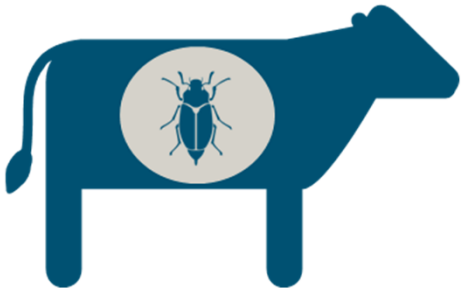
Added value for food from insect fed animals

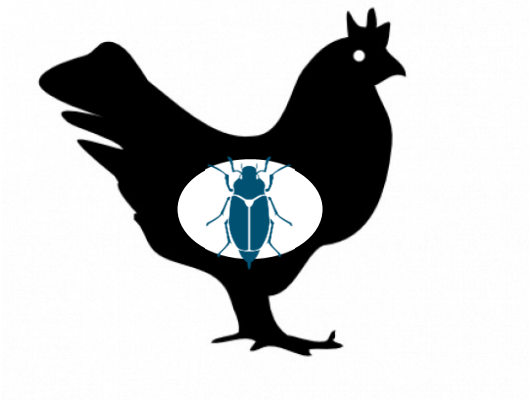




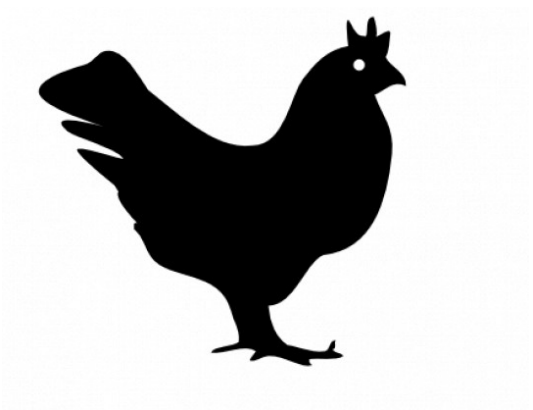
- Burgers from chicken or cows fed with insects can be considered to be more healthy and sustainable
- Intention of buying chicken burgers (fed with insects) just as high as normal chicken burgers
- But intentions for beefburgers from cows that ate insects insect are low

Treatment groups: Comparison **between** product categories

Insect burgers



Chicken burgers from chicken fed with insects



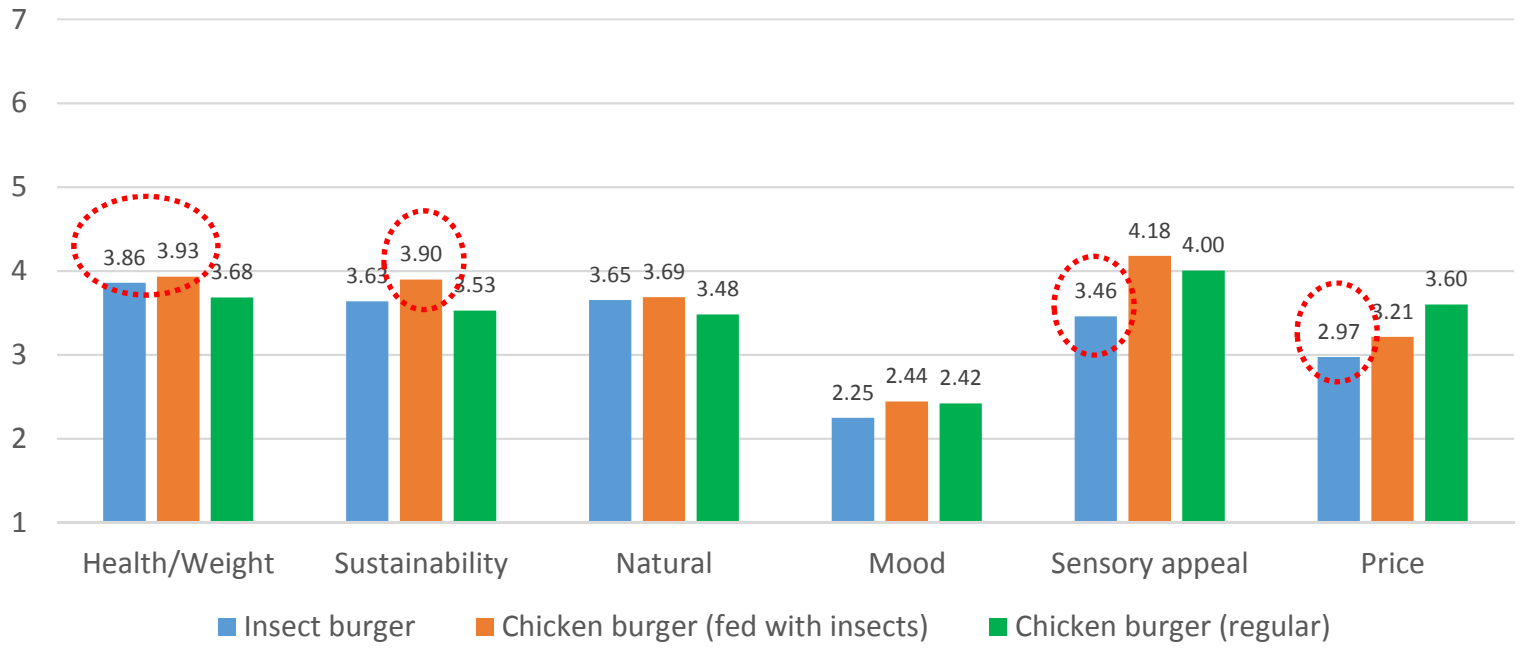
Chickenburgers

Intention to consume insect burgers is lower

	Product category*	Intentions (Mean, std)
1	Insect burgers	1.25[a] (1.29)
2	Chicken burgers (fed with insects)	2.49[b] (1.49)
3	Chicken burgers (regular)	2.37[b] (1.40)

**Note that the manipulations of the information (in terms of content and in terms of emotion vs cognition) are ignored here. No significant differences were found in intention between communication threatment within the three product categories.*

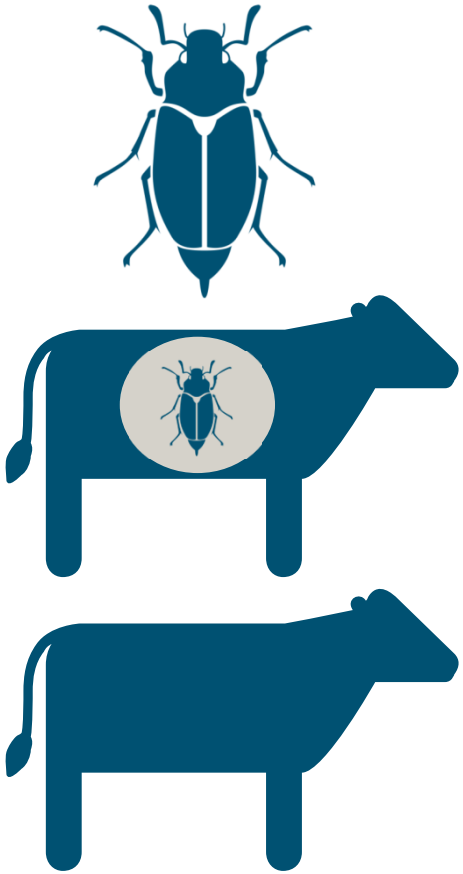
Healthy and sustainable vs. Expensive and disgust



(1='totally not agree' and 7='totally agree')

Results can be grouped in 3 categories

	Condition
1	Insects
2	Freeze-dried insects
3	Fried insects
4	Processed insects
5	Beefburgers (cow fed with insects)
6	Beefburger (cow fed with insect-based feed)
7	Beefburger



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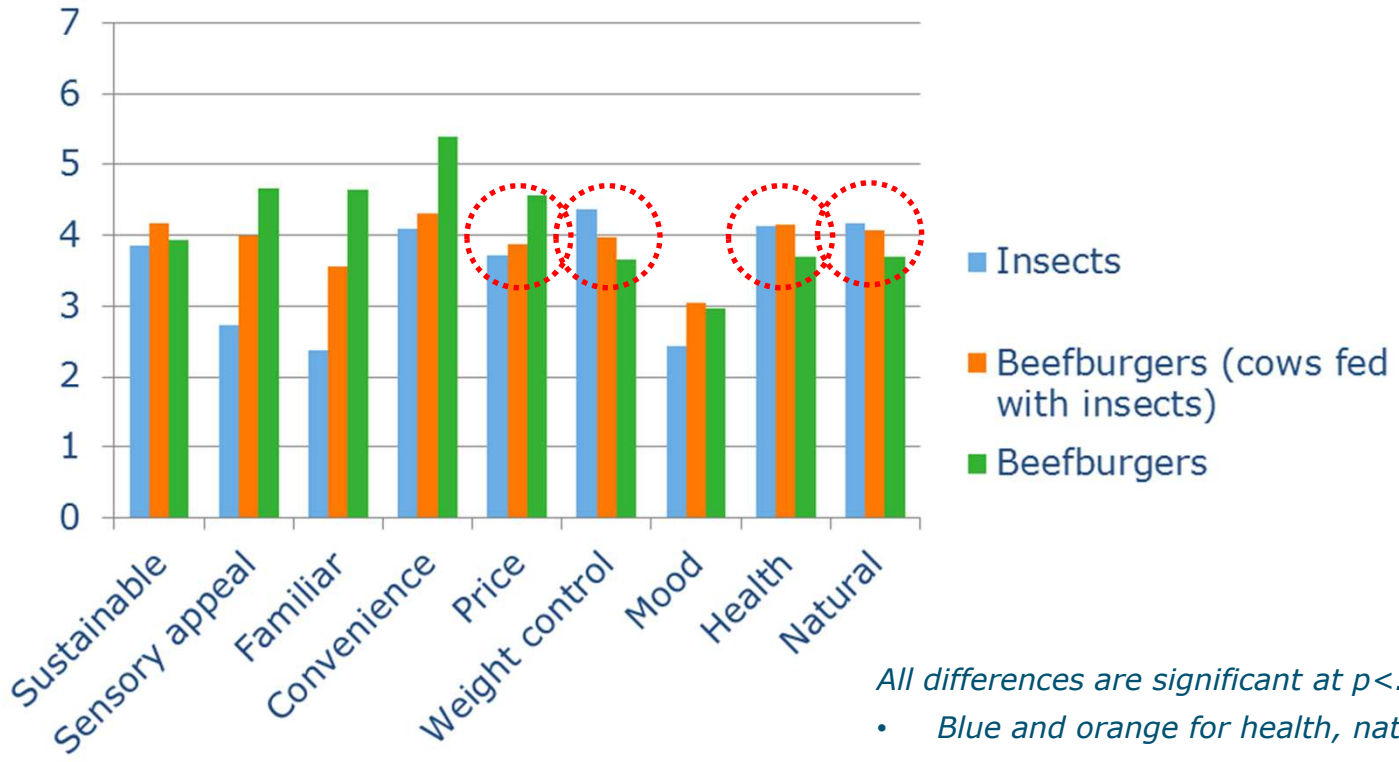
Source: Arthur Shlain/Noun Project

Differences within category

- Disgust is sig. higher for beefburgers from cows fed with whole insects than for beefburgers from cows fed with a source of insects.

Perceptions



All differences are significant at p<.05, except for:

- *Blue and orange for health, natural, price*
- *Orange and green for mood*
- *Blue and green for sustainability*

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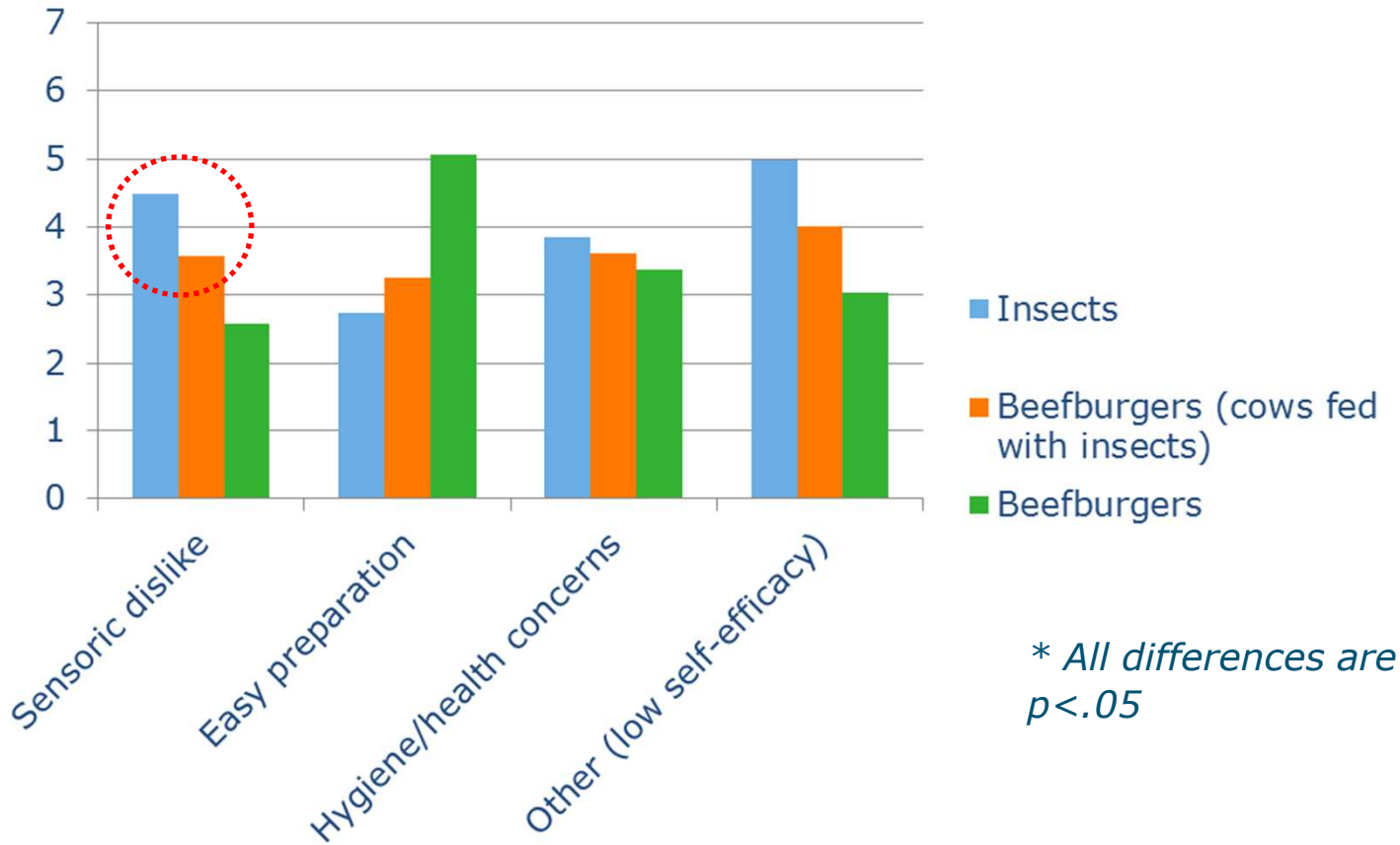
Barriers



** All differences are significant at p<.05*

Nutritious, healthy and environmental friendly

- Insects and beef from cows fed with insects may be promoted with nutritional value, healthiness, environmental friendliness and contribution to food security
- Beef from cows fed by insects may be promoted as more animal friendly than regular beefburgers
- Sensory aspects may be a barrier to consume insects and beef from cows fed by insects

Novel proteins in a broader view: healthy and sustainable

Differences in perception:

- Fish: healthy & tasty
- Seaweed and pulses: safe, healthy and environmental friendly
- Insects: innovative
- In-vitro meat: innovative and animal friendly

Most popular: fish and pulses

Least popular: insects and seaweed

Onwezen et al. (2015). Consumentenacceptatie eiwitbronnen: Insecten, vis, zeewier, peulvruchten & kweekvlees. LEI, Den Haag

Insects

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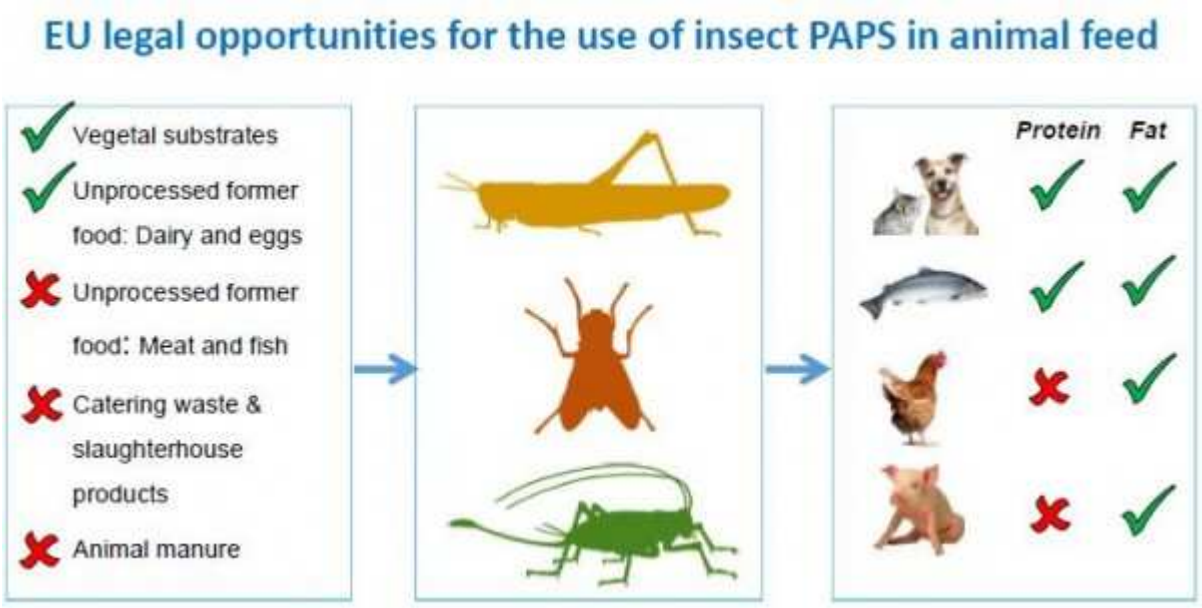
Cost price (protein) different raw materials

Source	Protein (%)	Costs (€/kg product)	Costs (€/kg protein)
Mealworm	50	1.25	2.50
BS Flies intact	50	1.25	2.50
Fishmeal	65	1.54[1]	2.37
Cereals	12	0.16[1]	1.33
Soybean meal	45	0.37[1]	0.82

[1] *Wageningen Economic Research, 2016*

Legislation is a barrier



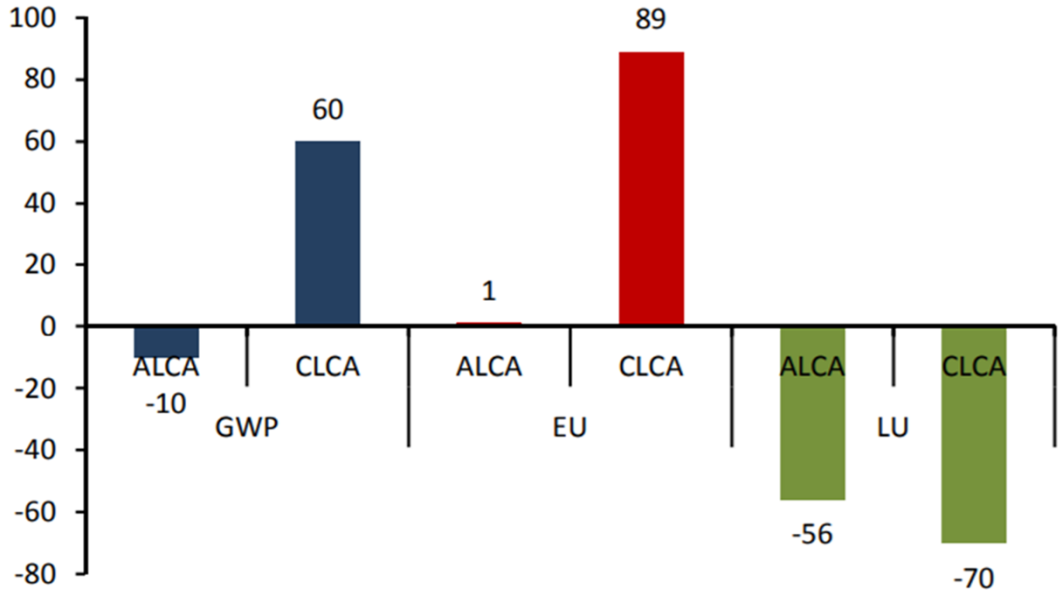
http://ipiff.org/our-positions

Upscaling of insect farming needed

- Market potential:
  - 80.000 tonnes to replace 10% of EU fishmeal
  - 70.000 tonnes to replace 1% of NL Broiler feed
  - 800 tonnes to replace 1% of NL suckling pigfeed
- Only a few industrial-scale enterprises (start-ups) for rearing mass quantities of insects such as black soldier flies.
- Critical elements for rearing: biology, rearing condition control and diet formulas
- Production systems are expensive (patents) and need further development

Insectenkweek: kleine sector, grote kansen, ABN AMRO/BOM, 2016
Edible insects Future prospects for food and feed security, FAO/WUR, 2013

Effect of using waste-fed larvae meal



The environmental impact of replacing SBM with waste-fed larvae meal in pig diets based on the attributional LCA approach and the consequential LCA approach in %.

Feed sources for livestock: recycling towards a green planet. Van Zanten, 2016

High energy use during production

- High energy use in mealworm/larvae production
- If we feed insects food waste, this will not be available for bio-energy
- But great reduction on land use can be achieved if we replace soybean meal with waste-fed larvae meal

Sources: Environmental Impact of the Production of Mealworms as a Protein Source for Humans – A Life Cycle Assessment, 2012; Feed sources for livestock: recycling towards a green planet, 2016; The environmental sustainability of insects as food and feed. A review, 2017

Take aways

- Need for novel proteins to feed the world
- Novel proteins are potential for animal feed
- Added value for food from insect fed animals
- Market is already there, upscaling is needed
- But legislation is a barrier

Thank you

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