Innovator Exchange

Session 3 – Exploring Sustainability

PROJECT X

11th November 2020

16:05 GMT Start (16:00 Open)

Topic 3

- Environmental Impacts – How well do alternative proteins and oils improve environmental performance and how best to measure it?

Start the meeting
https://us02web.zoom.us/j/89965060409?pwd=YUEwK05CMnpNakpDU3pjSmFLandoZz09

ID of the Meeting: 899 6506 0409

Password: 163561

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Does it Reduce our Impact on the Environment?

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Topic 3

16:05 Meet the Innovator Introduction

- Entocycle – 2 min

16:10 Introduction to the Topic

- Recent Study shows: Global adoption of novel aquaculture feeds could substantially reduce forage fish demand by 2030
- Project X report: Identifies four common LCA Indicators
- Innovafeed – Video presentation

11 November 2020

16:35 Discussion and Questions: Environmental Impacts

- How well do alternative proteins and oils improve environmental performance?
- How well do they perform from an LCA perspective?
- What LCAs have been done- are they expansion LCAs/will such be done? Perhaps a benchmark beyond ISO standard would help retailers etc make informed comparisons and decisions (R)
- How close are they to being carbon neutral?
- What are the key areas of improvement to look for?
- QUESTIONS

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The session will be recorded.

Innovator Exchange

Topics – Exploring Sustainability

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29 October 2020 **Topic 1**	15:00 GMT (14.45 open)	• What is the value add that alternative proteins and oils bring to sustainably fed food?
04 November 2020 **Topic 2**	12:15 GMT (12:00 open)	• Social Acceptability – What do Consumers want from their seafood and how well can alternative proteins and oils deliver?
11 November 2020 **Topic 3**	16:05 GMT (16:00 open)	• Environmental Impacts – How well do alternative proteins and oils improve environmental performance and how best to measure it?
12 November 2020 **Topic 4**	15:10 GMT (15:15 open)	• Ethical performance – what do we need to consider and how might alternative proteins and oils help deliver better performance?

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Meet the Innovator Introductions

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16:05 GMT

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Entocycle

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Insects on food by products

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ENTOCYCLE

Founded in 2016 - $9.5m

- 22 people across Biz, Eng & Nutrition
- HQ London Bridge
- 2 Pilot Facilities
- 2 Global Patents Filed

Computer Vision Systems

Precision Accuracy on Breeding, Mating and Production

THE INSECTRIAL REVOLUTION

£10m UK Gov Funding

- **First Industrial** Facility in the UK -2,000T
- **Full Supply Chain** - Partners
- **2 Licencing Opportunities** - Pipeline
- Salmon + Crop trials

Introduction to the Topic

16:10 GMT

Thank You

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Does it Reduce our Impact on the Environment?

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Key Concepts – Environmental Impact Conundrums

https://planetbaseddiets.panda.org/

Footprint verses Planetary Boundaries

Does it consider Biodiversity – Static, Loss, Zero sum, Net gain

Comparing like with like – Substitution Value – Aggregation Value

Measure CO_2 equivalent tonnes – is it: Static, Reducing, Zero sum - Carbon neutral, Net gain,

Product Carbon Footprints – *two different approaches*

- How much of the footprint value is associated with that product (Attributional)
- Measure the environmental consequences of product substitution (Comparative consequential)

- System Boundaries – what is included in the boundary of your product
- Co-Products – is the use or creation of co-products included
- Displacement – what alternative has been replaced or moved elsewhere
- Benchmarking – compared with the performance of what it is replacing

What about using Sustainably sourced fish meal/oil?
How well do novel ingredients perform?

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Sustainability of Using Rendered Forage Fish?

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Conundrums continued …*Cottrell et al 2020*

Fishmeal and oil is traditionally rendered from small pelagic 'forage fish' (e.g. herrings, sardines, anchovies), as sources of inexpensive and palatable protein and lipid in compound feeds – but supply has been diminishing whist demand has been increasing

Modelled 3 Aquaculture growth scenarios used for future forage fish demand calculations for 2030 based on 2015 baseline 1) 2030 – 37% BAU, 2) 2030 – 56% growth, 3) 2030 – 98% growth (China is included)

- BAU growth will meet 100% of allowable supply in 2030 – other scenarios demand outstrips supply
- Fishmeal replaced with novel ingredients (maximum inclusion), aquaculture global forage fish demand reduces between 8 to 10 million tonnes for all three 2030 growth scenarios,
- Fish oil replacement with micro-algae (100% inclusion) reduces demand as much as 33 million tonnes by 2030.

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Global adoption of novel aquaculture feeds could substantially reduce forage fish demand by 2030, Richard S. Cottrell, Julia L. Blanchard, Benjamin S. Halpern , Marc Metian , and Halley E. Froehlich
Nature Food| VOL 1 | MAY 2020 | 301–308 | www.nature.com/natfood

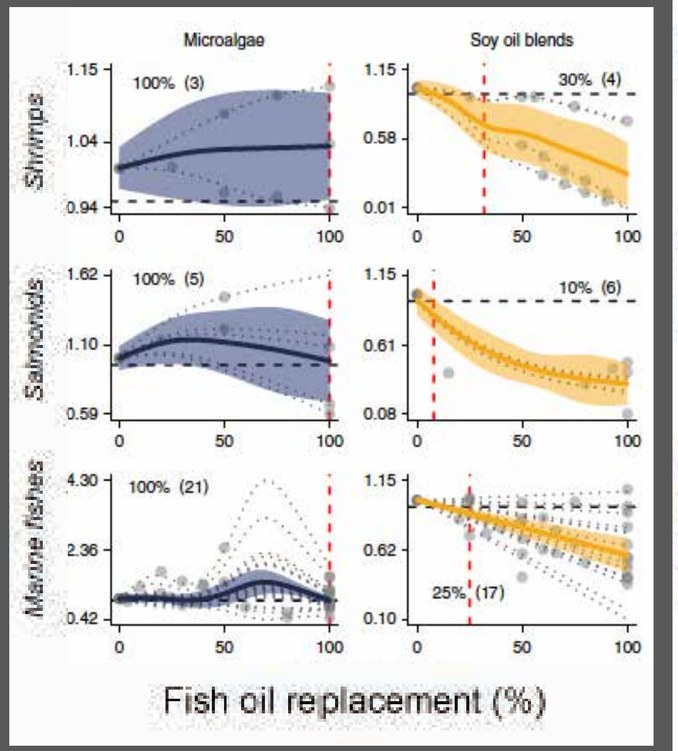
https://doi.org/10.1038/s43016-020-0078-x

The session will be recorded.

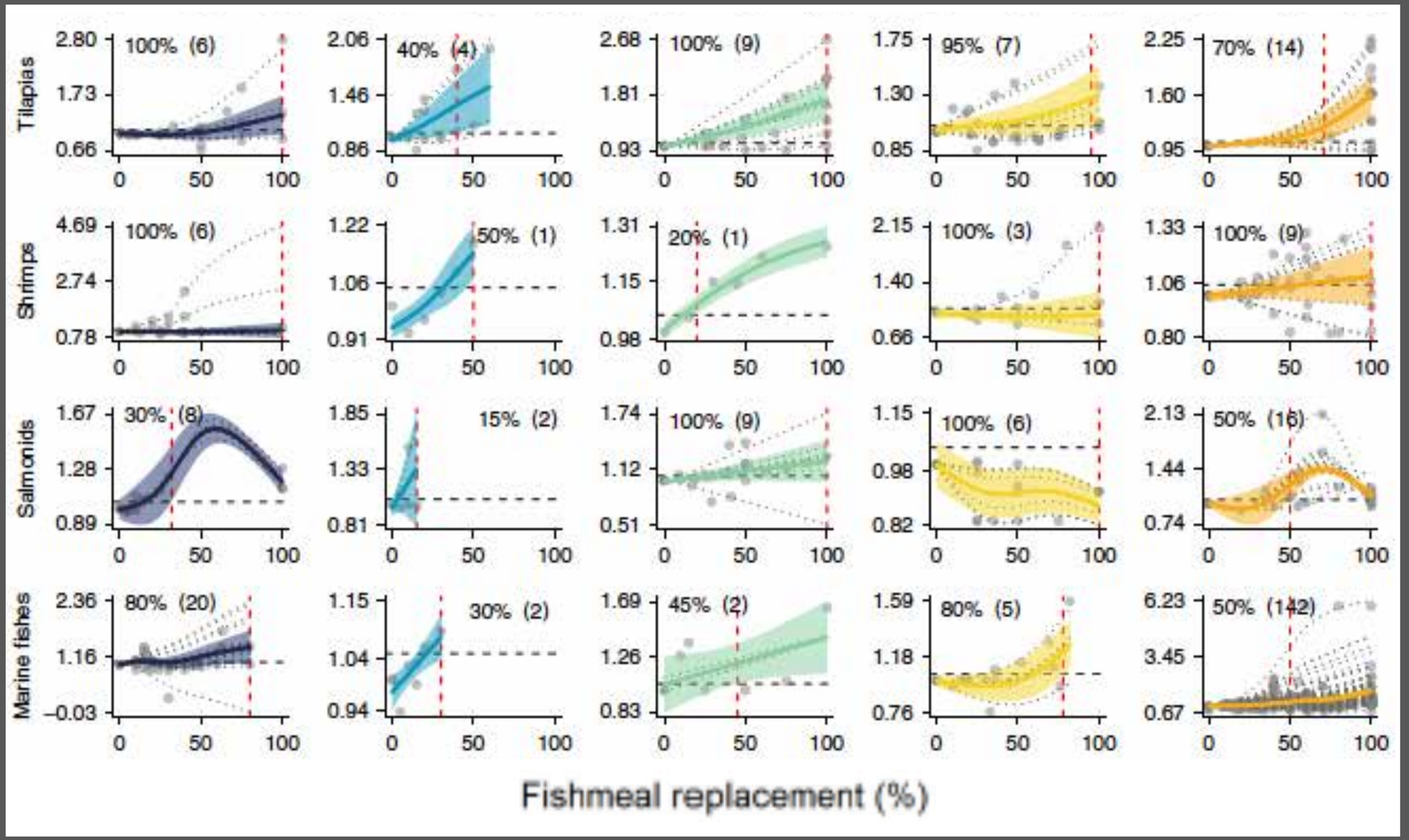
Relative Feed Conversion Ratios

Relative Change to Fatty Acid ratio in tissues

Micro-Algae Soy



Micro-Algae Seaweeds Yeasts &Bacteria Insects Soy



Environmental lens - Category De-Risking (CDR)

Elena Koukouna

Blonk Consultants

First
Presented
London
07/03/2019

Goal and objectives

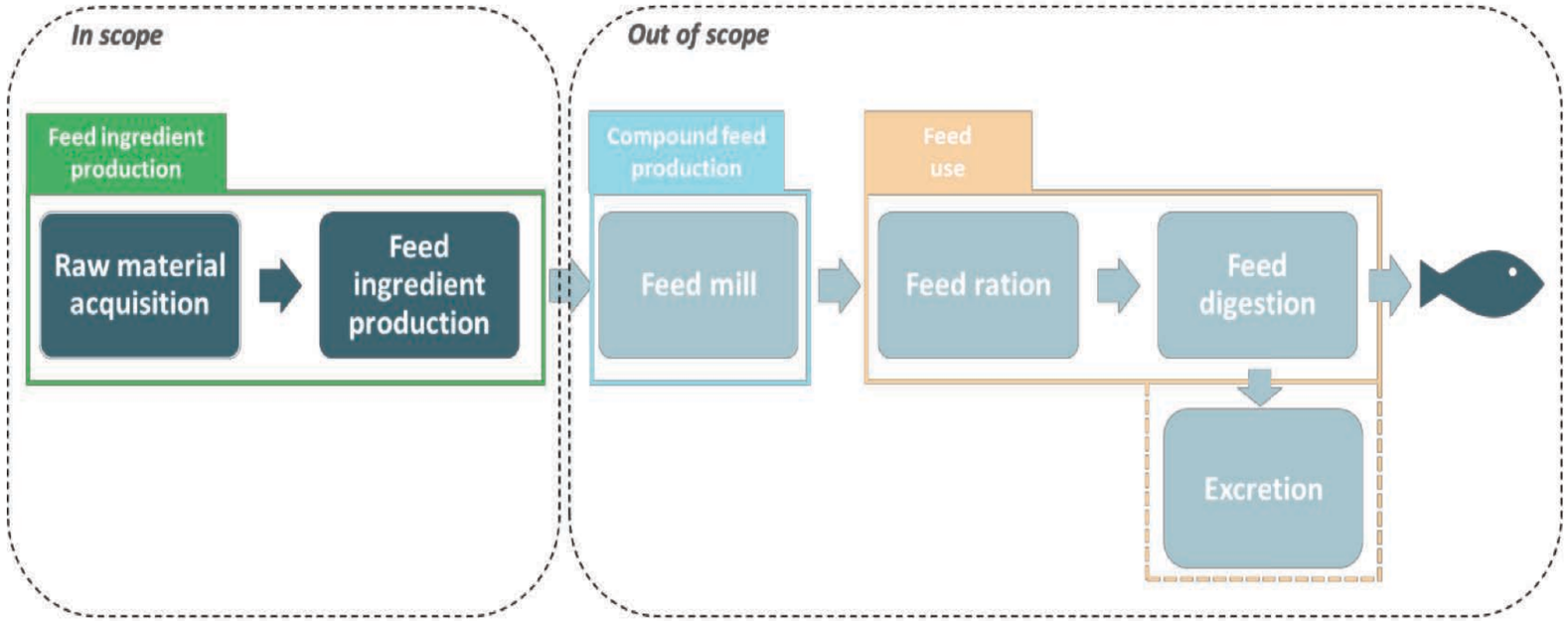
Environmental de-risking

Goal:

- To highlight potential environmental risks associated with novel ingredients in the fish feed value chain

Objectives:

- “Novel” feed ingredients were benchmarked against conventional ingredients in terms of their environmental performance.



Methodology

Life Cycle Assessment (LCA)

Feed ingredient production

4 Key Criteria used to assess 89 feed ingredient solution options

- Land use
- Greenhouse gas emissions (GHG emissions) *
- Water use
- (Fossil) Energy use

** Greenhouse gas emissions induced by land use change should be reported separately*

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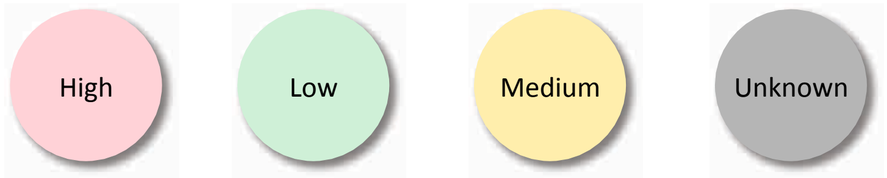
Methodology

Weighing and aggregation

Example

All environmental criteria had equal weight.

- Final ‘traffic light’ score per option is assigned by aggregating results (Low,Medium,high,unknown)



Novel ingredient	Conventional ingredient	Land use	GHG emissions	Water use	Energy use	Final Risk Level
Seaweed	**Fish oil**					Red

Key findings – FEED INGREDIENTS

Category solutions

Priority solutions	Evaluated options	Benchmark Product	General conclusions
Food industry by-products	Food industry by-products		Low (or moderate) risk for the majority of ingredients, assuming that availability is not a limiting factor.
Land animal protein	Land animal protein		Low risk for the majority of ingredients, due to low economic value of slaughterhouse by-products.
Insects	Insects (larvae & adults)	Soybean meal Fish meal	Unknown risk due to the unknown parameters related to optimal rearing (i.e. diet optimization, climate control etc.). Insects fed on organic waste may have positive implications.
Microbial protein (MP) from sustainable carbon sources	Bacteria (fed on methane)	Soybean meal Fishmeal	Unknown risk, due to lack of data on system's configurations with regards to water and energy requirements. (Obtaining a concentration of bacteria in the medium that is high enough for profitable production is an important factor to consider.)
	Microalgae (cyanobacteria)	Soybean meal Fishmeal	High risk due to material and energy intensity. However the use of 'waste' substrates should be further investigated.
Microbial protein sources fed on food industry by-products	Single cell proteins And Fungi grown on sugar	Soybean meal	Unknown risk, due to lack of system's configurations but with low land use compared to conventional ingredients. Yeast grown on cheese whey is moderate risk option, is worth further investigation (with reported benefits on BOD reduction).
	Heterotrophic algae (as microalgae protein powder)	Fishmeal	Unknown risk. Overall performance depends on system's configurations, microalgae strain and overall efficiency. Lipid, oil and carotenoids content can be determinant to commercialization.
	Brewer's yeast	Soybean meal	Unknown risk as an overall performance, but with low risk on land and water use. Handling due to short shelf life and risk of contamination constitute limitations.
Protein from using energy waste	Sludge or manure protein concentrate	Soybean meal	Unknown risk, lack of data to back up the potential of this option. An alternative would be the use of fast-growing photosynthetic algae and bacteria to recover mineral nitrogen into cell biomass.
	Waste heat for flocculation of proteins from waste streams (e.g. effluent)	Soybean meal	Low risk option to decrease the dependence on fossil energy sources.

Key findings – FEED INGREDIENTS

	Priority solutions	Evaluated options	Benchmark Product	General conclusions
Category solutions b/c	Microbes (for Omega 3)	Bacteria	Fish oil	Unknown risk, due to lack of data on system's configurations with regards to water and energy requirements. (Obtaining a concentration of bacteria in the medium that is high enough for profitable production is an important factor to consider.)
		Microalgae	Fish oil	High risk due to material and energy intensity. However the use of 'waste' substrates should be further investigated.
		Yeast	Fish oil	Unknown risk as an overall performance, but with low risk on land and water use. Handling due to short shelf life and risk of contamination constitute limitations.
	Seaweed (for Omega-3)	Seaweed (no distinction among species)	Fish oil	High risk due to energy intensity related to harvesting, transport, storage and drying. Geographical scope is particularly important for the availability of aquatic land.
	Genetically modified plants (for Omega-3)	Oil extracted from GM camelina sativa or canola		High risk is foreseen on GHG emissions and water use based on oil extraction from conventional oil seeds compared to fish oil. Consultation of experts and specific data available for modified extract oils are lacking.

Key Reflections

- Functionality of novel ingredients was reflected on a mass basis (i.e. 1kg ingredient)
- Attributional approach was taken
- Secondary data was used (e.g. commercial LCA databases and literature)
- Product availability and accessibility was not considered

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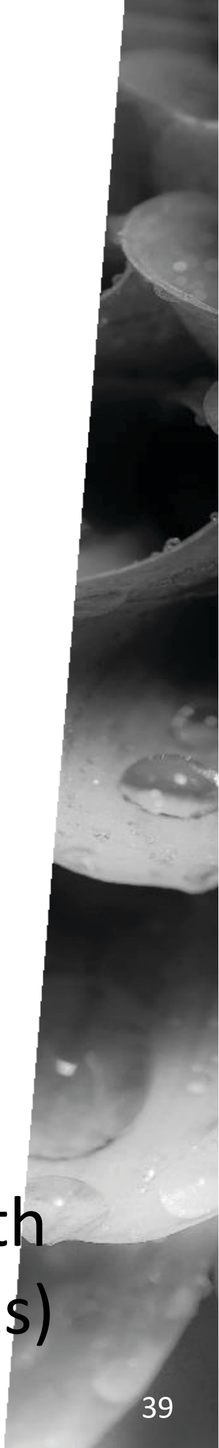
Conclusions

Future environmental assessment

- Majority of novel ingredients were unknown, micro-algae was high risk due to high energy use
- Consideration of compound feed formulation and inclusion rates is needed
- Implementation of consequential type of analysis recommended
- Need to access high quality data with the involvement of innovators (SMEs) and feed formulators



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FOR A SUSTAINABLE AQUACULTURE

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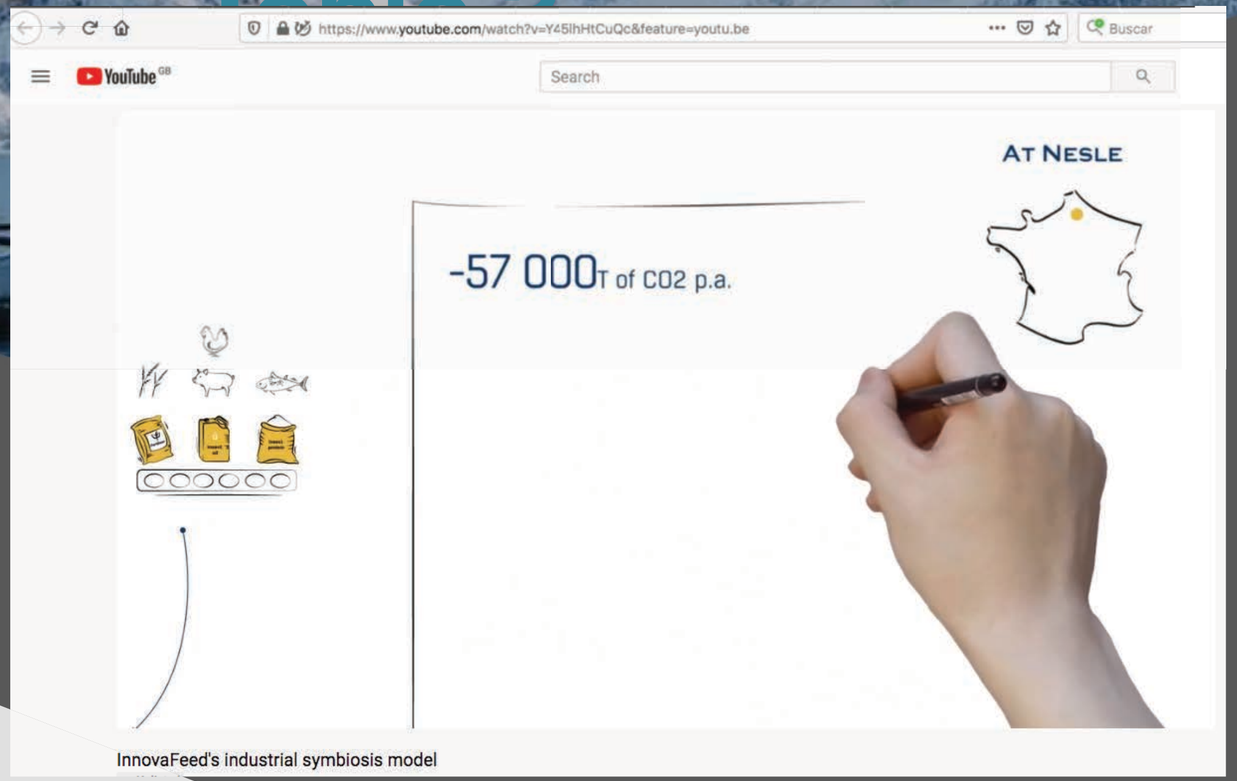
Video

Topic 2



InnovaFeed's industrial symbiosis model

https://www.youtube.com/watch?v=Y45lhHtCuQc&feature=youtu.be

https://youtu.be/Y45lhHtCuQc

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For any funding interest the please refer to Project X team or the SIV Team

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Questions

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More information
info@projectxglobal.com

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Does it Reduce our Impact on the Environment?

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- **16:35 Questions:**
- How well do alternative proteins and oils improve environmental performance?
- How well do they perform from an LCA perspective?
- What LCAs have been done- are they expansion LCAs/will such be done? (R)
- Is there a benchmark beyond ISO standard would help retailers etc make informed comparisons and decisions? (R)
- How close are they to being carbon neutral?
- What aspects of biodiversity gain could we see with alternatives?
- What are the key areas of improvement to look for?
- Should we only support circular solutions? (R)

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s from participants

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Questions

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Thank you, Merci, Grazie, Danke, Gracias

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More information
info@projectxglobal.com

We would be happy to hear from you.

We would be delighted to make available to you relevant Feed-X documentation that you might find of interest. This includes Summary of the **Market Opportunity Report.** Please contact us on Contact: info@projectxglobal.com for more details.