Fermentation, a cutting edge Technology?

Workshop & Matchmaking

15th June 2023

Questions?

Do you have any questions to our speakers?
Please raise them in the Q&A box in Zoom and we will address them during the session.

Please state the following in the Q&A-box:
Your name, company name, speaker to address the question to & question itself.

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Globalfoodture
15/Jun/2023

Japanese fermentation food

Satoshi SUZUKI
Food Research Institute, NARO

NARO

Institute of Food Research, NARO (NFRI)

National Agriculture and Food Research Organization (NARO) is the core institute in Japan for conducting research and development on agriculture and food. NARO is one of the agencies of Japanese government.

Institute of Food Research, NARO (NFRI) is one of the 22 institutes belonging to NARO, carrying out comprehensive food research from basic to applied. We study food safety, food function and food processing.

About collaboration:
NARO is non-profit organization. We welcome donation of research funding from private companies. Collaborations with corporate funding is also welcomed.
In NFRI, 100 permanent scientists and a few hundreds of part time researchers are working. There are hundreds of collaboration subjects and chances.

More information about NFRI, please visit,
https://www.naro.go.jp/english/laboratory/nfri/index.html

Fermented foods in Japan

Sake (rice wine)

Miso (soybean paste)

Shoyu (soy sauce)

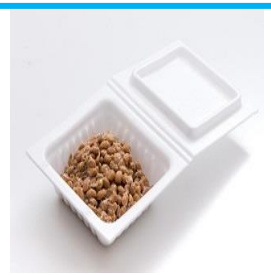
Pickles

Natto (fermented soybean)

There are similar fermented foods in Asian countries.

kecap manis
Indonesia*

Shoyu (soy sauce)



Natto (fermented soybean)

Kinema
Nepal, India*

Miso (soybean paste)

Doenjang
Korea*

*reference, Tamang edit. Ethnic Fermenetd Foods and Alcoholic Beverages of Asia, Springer 2016

the National Fungi

	National animal (From Wikipedia)
Thailand	Asian elephant 
Belgium	lion 
Germany	Black eagle 
Japan	Japanese green pheasant 
Denmark	Red squirrel 

Floral emblem, National plant, National bird……

Declaration

We, The Scientific Conference of Brewing Society Japan authorize "Koji fungi (Kōji-kin)" as the National Fungi.

The National Fungi are, (1) **Aspergillus oryzae**, "Kikōji-kin" in Japanese. (2) **Aspergillus sojae** belonging to the A. oryzae group and their albino mutant strains. (3) Black Aspergilli group, namely **Aspergillus luchuensis** (Aspergillus luchuensis var. awamori), "Kurokōji-kin" in Japanese, and its albino mutant Aspergillus luchuensis mut. kawachii (Aspergillus kawachii), "Shirokōji-kin" in Japanese.

As far as I know, Japan is only one country which has “national fungi”.

Koji Fungi (Koji mold)

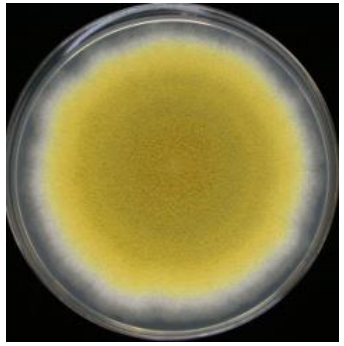
Koji-fungi is used to make ***sake*, *miso*, *soy source*, etc.**

Sake

Miso

Soy source

Koji-fungi growing on steamed rice



Koji(麹) is a **solid culture** of koji fungi **Aspergillus** on steamed grains, such as **rice, barley, soybeans. T**he variation of Japanese fermented foods partly reflect the variation of Koji and Koji-fungi.

Koji-fungi (麹菌) produces wide variety of **enzymes** such as amylase, protease, lipase, etc. and secrets them into **Koji(麹)**.

Koji(麹) is an enzyme source for food processing invented by ancient people. In an ancient document compiled in 715 A.D., it is described that Japanese people brewed Sake by using Koji. Several extant Koji starter culture companies were founded in the 15th century and are still in business.

Fermented grain in Asian countries

Country	Name	Ingredients commonly used	Shape	Microorganism
China	Qu	Wheat, barley, millet, rice(whole grain, grits or flour)	Granular or cake	Rhizopus, Amylomyces
Korea	Nuruk	Wheat, rice, barley (whole grain, grits or flour)	Large cake	Aspergillus, Rhizopus
	Meju	Soybean (whole seed)	Large ball	Aspergillus, Bacillus
Japan	Koji	Wheat, rice	granular	Aspergillus
Indonesia	Ragi	Rice (flour)	Small cake	Amylomyces
Malaysia	Ragi	Rice (flour)	Small cake	Amylomyces
Philippines	Budbod	Rice, glutinous rice (flour)	Small cake	Mucor, Rhizopus
Thailand	Loogpang	Bran	Powder	Amylomyces
India	Marchaa	RIce	Flat cake	Hansenular, Mucor

Lee, C. H. (2009) Food science and technology: Wiley-Blackwell

Koji fungi produces high amount of enzymes

Koji fungi secretes large amount of enzymes into media
(20-40 g / L)

Enzyme is a kind of proteins

Mycelial mass of Koji fungi doubles in 2.4 hr.

Koji fungi is highly efficient protein producer

Koji fungi is safe protein producer
(Japanese people has eaten Koji fungi over thousand years)

Suit for alternative protein production

Alternative proteins made of Koji fungi

Unfortunately, there has been already commercialized alternative proteins made of Koji fungi.

primeroots （https://www.primeroots.com/）

I have not yet contacted with them. So, I have few information with exception of information available from their website.

Summery

- Koji fungi has been used for Japanese fermented food over thousand years.
- Safety of Koji fungi is proved by thousand years of history.
- Koji fungi is highly efficient protein producer.
- If you plan to use Koji fungi for alternative protein production, you should carefully consider Intellectual Property Rights, because an American company has already commercialized it.

Thank you for your attention!

Global FOODTURE

ODS PROTEIN

Fermented fungi-based proteins start-up

ALBA GONZÁLEZ - R&D PRODUCT DEVELOPER

ODS PROTEIN

ODS Protein spanish B2B protein manufacturer.

Transforms food waste into protein thanks to the action of filamentous fungis which grow in a continuous fermentation process, ensuring the availability of proteins and being able to boost nutritional value while being cost efficient.

INGREDIENTS VALUES

RESSOURCES NEEDED

ANYWHERE

Fungi based proteins upcycling food waste by fermentation

STRAINS

BROTHS

UPSTREAM

PRE- CULTURE

SEED CULTURE

MAIN FERMENTATION

DOWNSTREAM

DOWN STREAM PROCESSING (DSP)

MYCELLIUM

POWDER

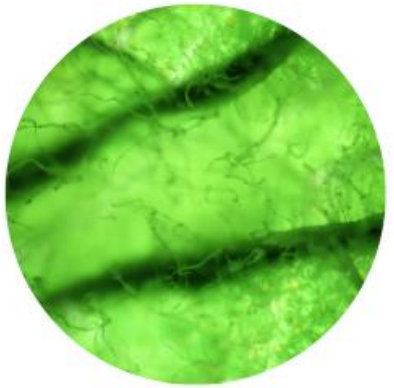
FOOD PRODUCT

Alternative proteins: *Microorganism-based*

Why Fungi?

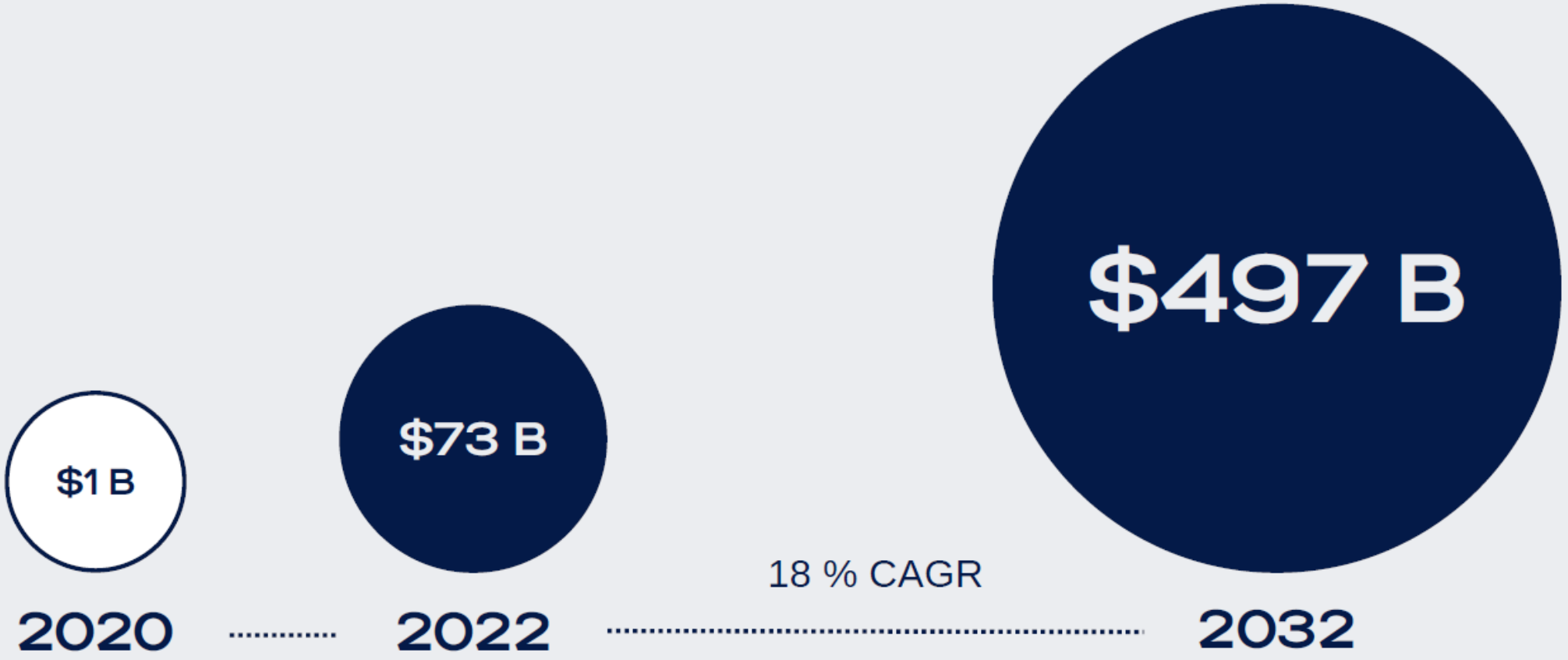
FUNGI

YEAST

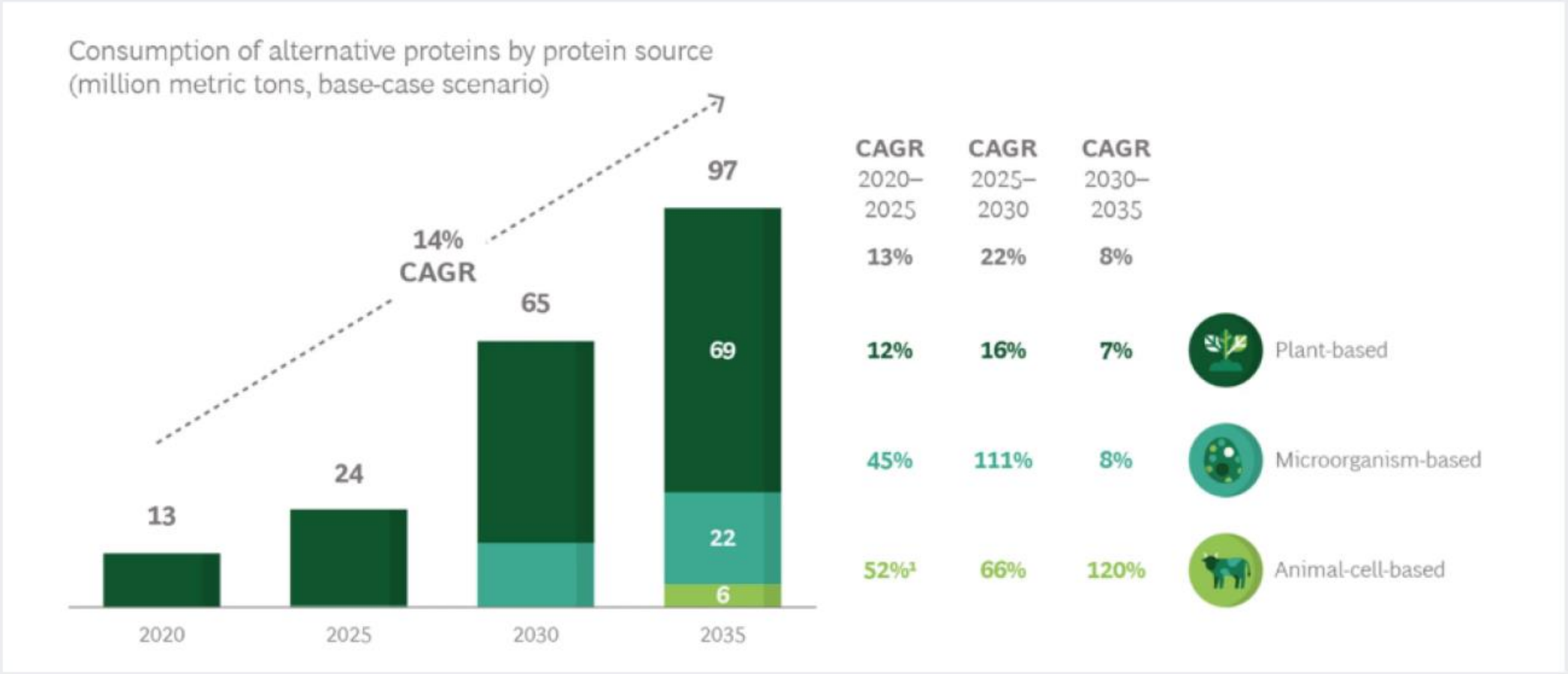


MICROALGAE

GLOBAL ALTERNATIVE PROTEIN MARKET SIZE



Future Market Insight (August, 2022)



Sources: US Department of Agriculture; Euromonitor; UBS; ING; Good Food Institute; experts; interviews; Blue Horizon and BCG analysis.

+ 20 YEARS

TECHNOLOGY AND REGULATORY READINESS

TEAM

Iria Varela

CEO & COFOUNDER

Hugo Varela

CCO

Alba González

PRODUCT MANAGER R&D

Nadia Cambra

PRODUCT DEVELOPER R&D

Adrián Agraso

CHEMICAL ENGINEER R&D

ADVISOR BOARD

Jesús Izco

VISCOFAN

BIOPRODUCTS DIVERSIFICATION MANAGER

Carmen Sieiro

UNIVERSITY OF VIGO

PI INDUSTRIAL MICROBIOLOGY

ODS

- COMPLETING PREINDUSTRIAL SCALE
- GO-TO-MARKET
- INTERNATIONAL ALLIANCES

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Global Foodture Workshop

Fermentation a cutting edge technology

Phycom process and challenges

June 15th 2023, Wageningen The Netherlands & Zoom

The algae creators

phycom

Thank you!

Want to join our journey?

Contact us!


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a.roes@phycom.eu


Koningsschot 11, Veenendaal

Join our journey

PRECISION FERMENTATION

BUILDING THE NEXT GENERATION ALTERNATIVE PROTEINS, CHALLENGES & TRENDS

Gertjan Smolders

June 2023

SPOT INNOVATION

SUSTAINABLE PRODUCTS OF TOMORROW

https://www.spot-innovation.com/

THANK YOU!

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From Plant-Based Seafood to Microalgae Fermentation

My Surprising Journey with Alternative Protein

Eugene Wang
Co-Founder & CEO
Sophie's BioNutrients Pte Ltd

SOPHIE'S BIONUTRIENTS

Coming from a family ...

4-GENERATION
BUDDHISM

3-GENERATION MAKING
VEGETARIAN FOODS

I always tell people …

It all started when my daughter, Sophie, suffered an allergic reaction to seafood.

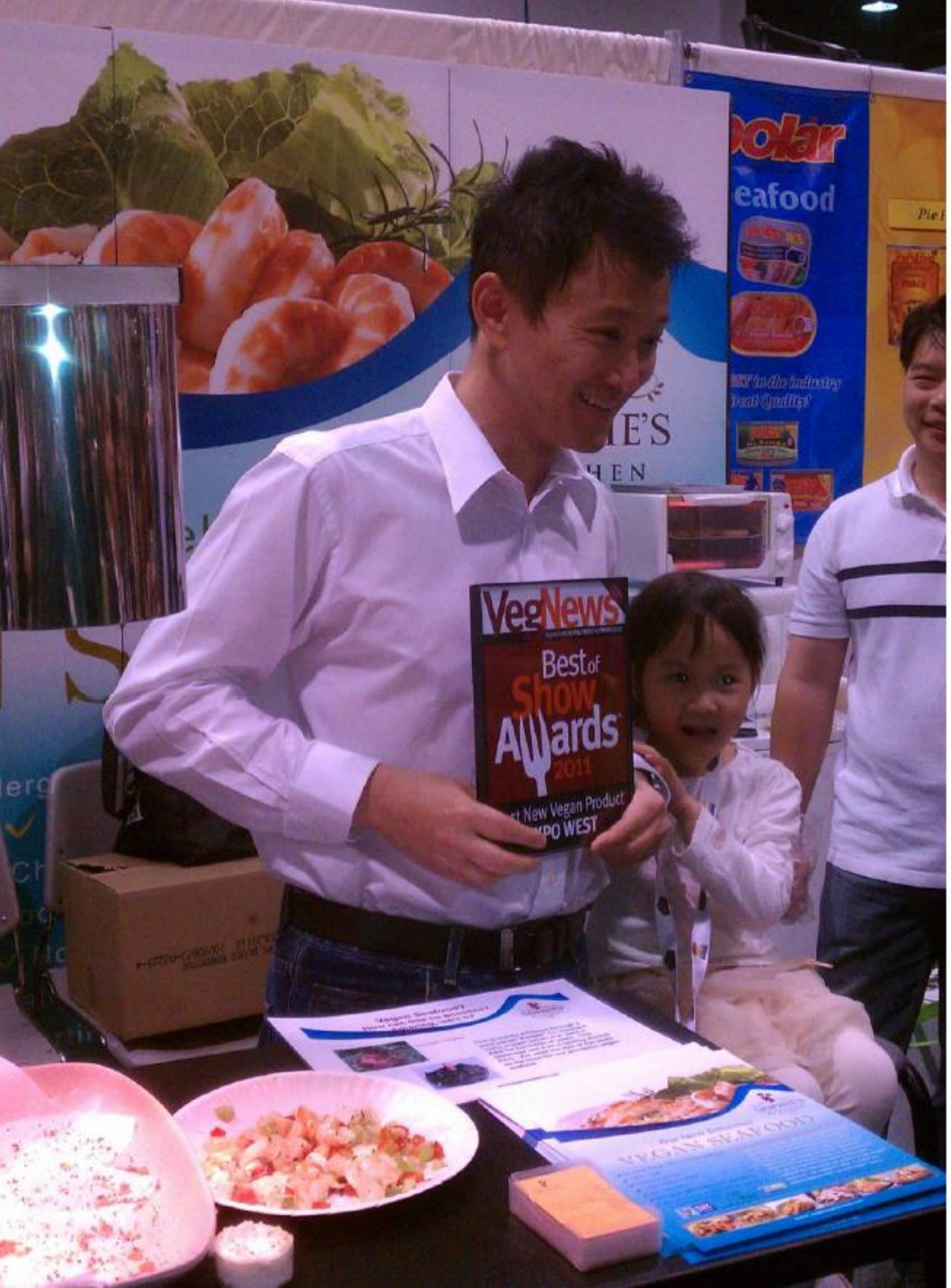
It began with a SCUBA lesson

But in fact

We use our patented
(Pub No. US- 2020-0054052 A1) technology

To make a line of plant-based seafood alternatives

- Soy-Free
- Gluten-Free
- Non-GMO Project Verified
- Kosher



So, the journey began …

Challenges with plant - based seafood alternatives

Plant-based seafood

accounts for just $9.5 million (1%) of total plant-based meat dollar sales - **Plant-based seafood is a market white space.**

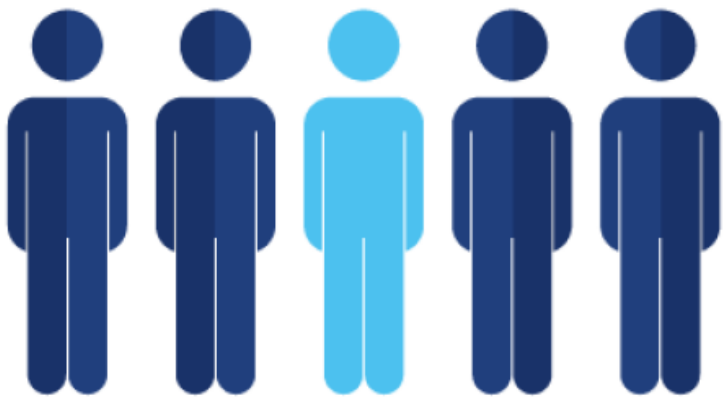
SPINS®

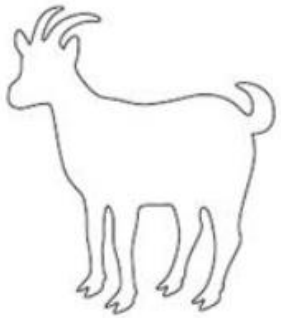
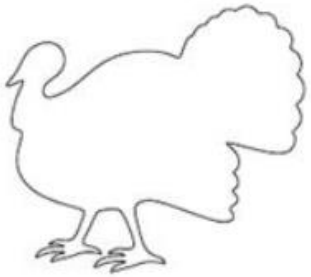
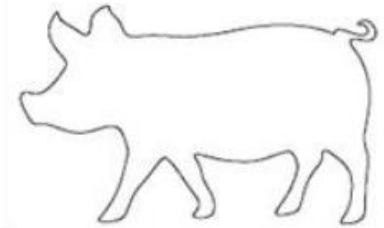
THE GOOD FOOD INSTITUTE

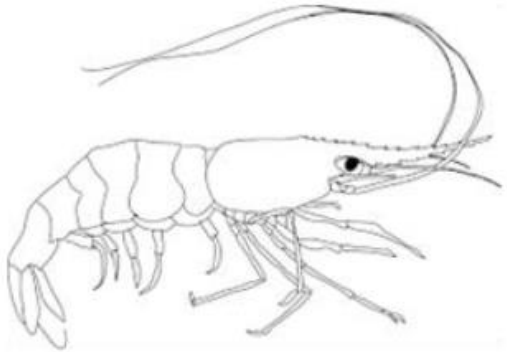
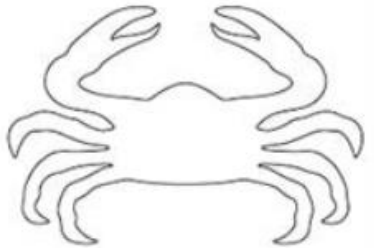
Photo courtesy of Hungry Planet

1 IN 5

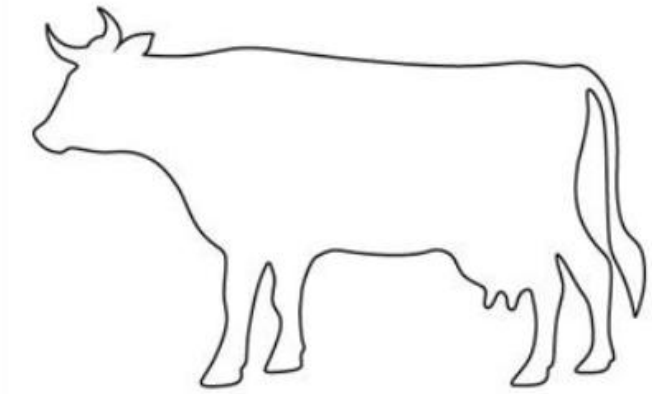
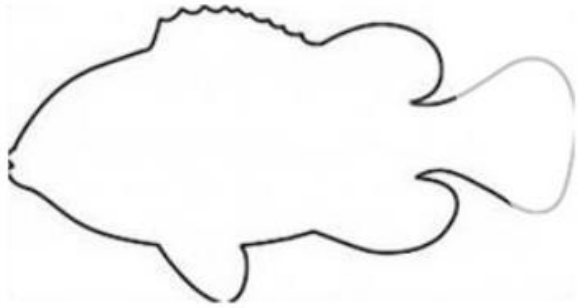
People on this planet depend on fish
As their primary source of protein





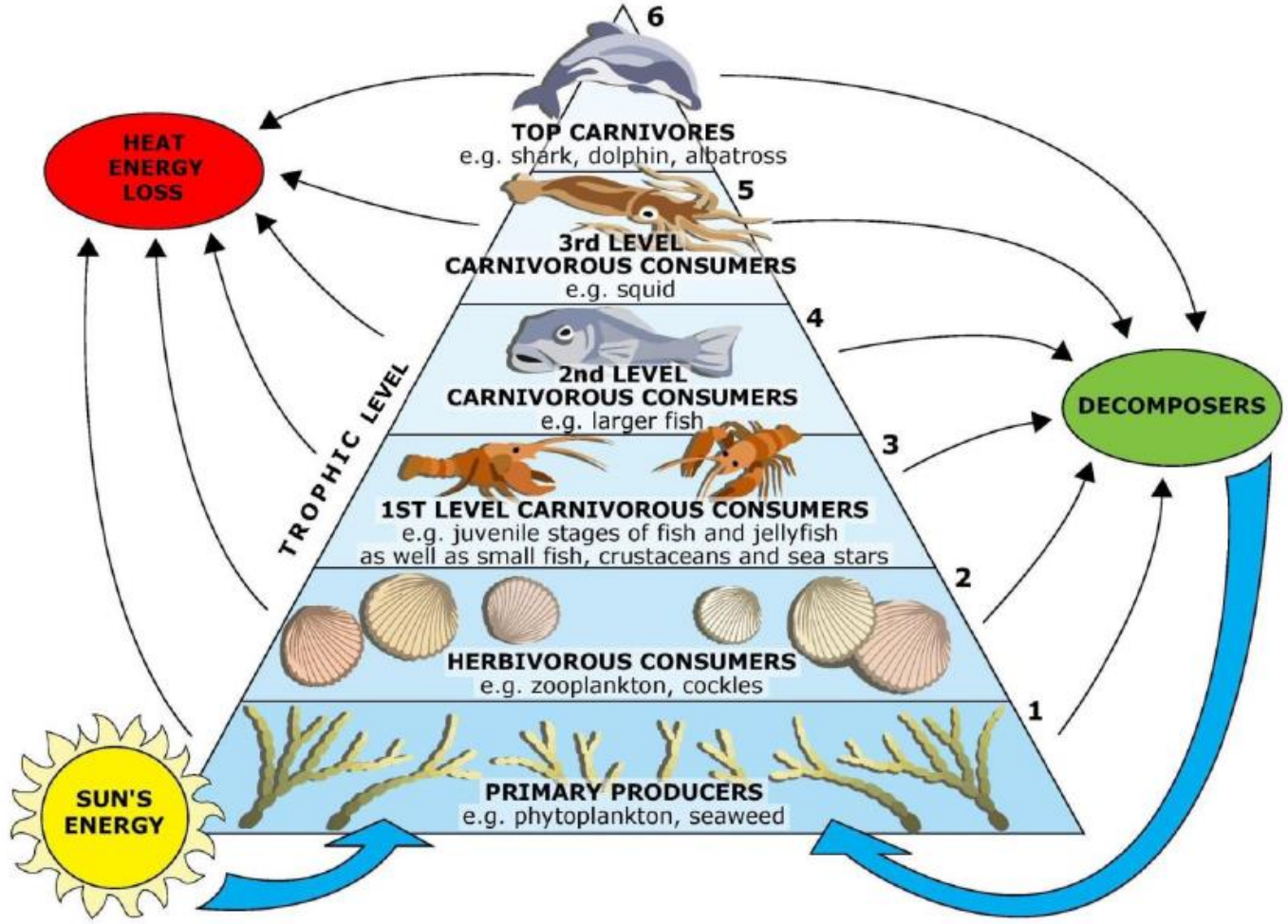
Varieties


Freshness &
Presentation
are not likely to
happen


The tricky flavor from
Blood
Microbes
Heavy Metal
Micro-plastic

Nutrition is KEY reason why people choose to eat seafood

The best alternative to seafood should be the food of these sea animals




Fermentation of algae
(Macro or Micro) will be
the BEST solution

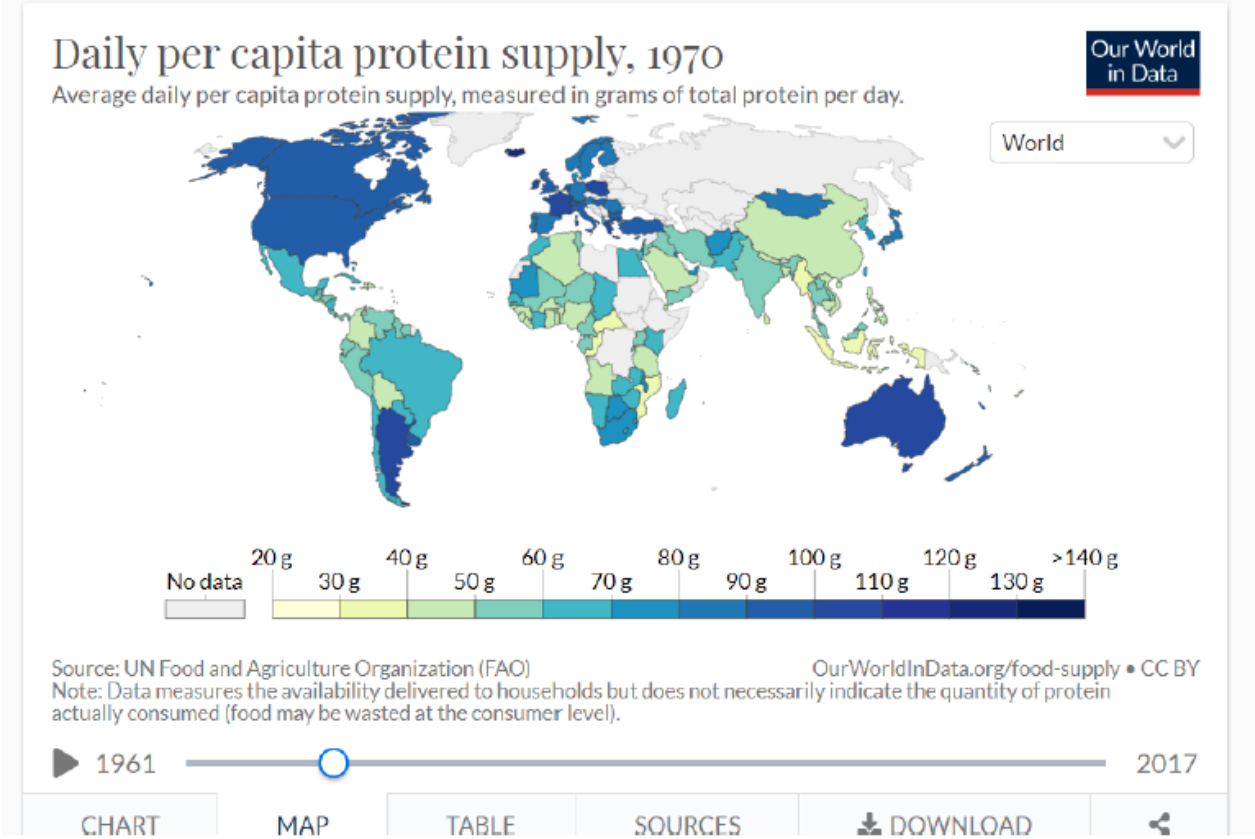
Cost is going to be the hurdle for a long long time.

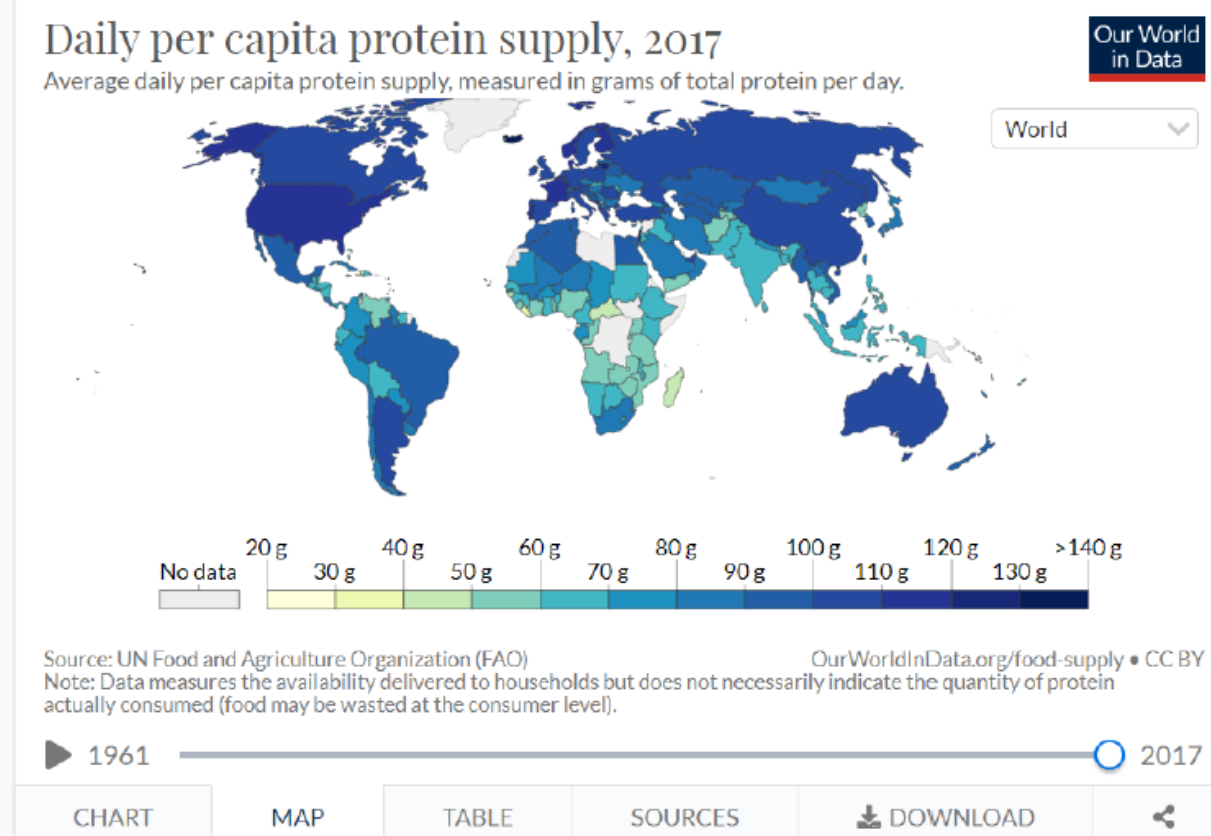
And fermentation really is the only way to address this issue

With fermentation, we can produce …

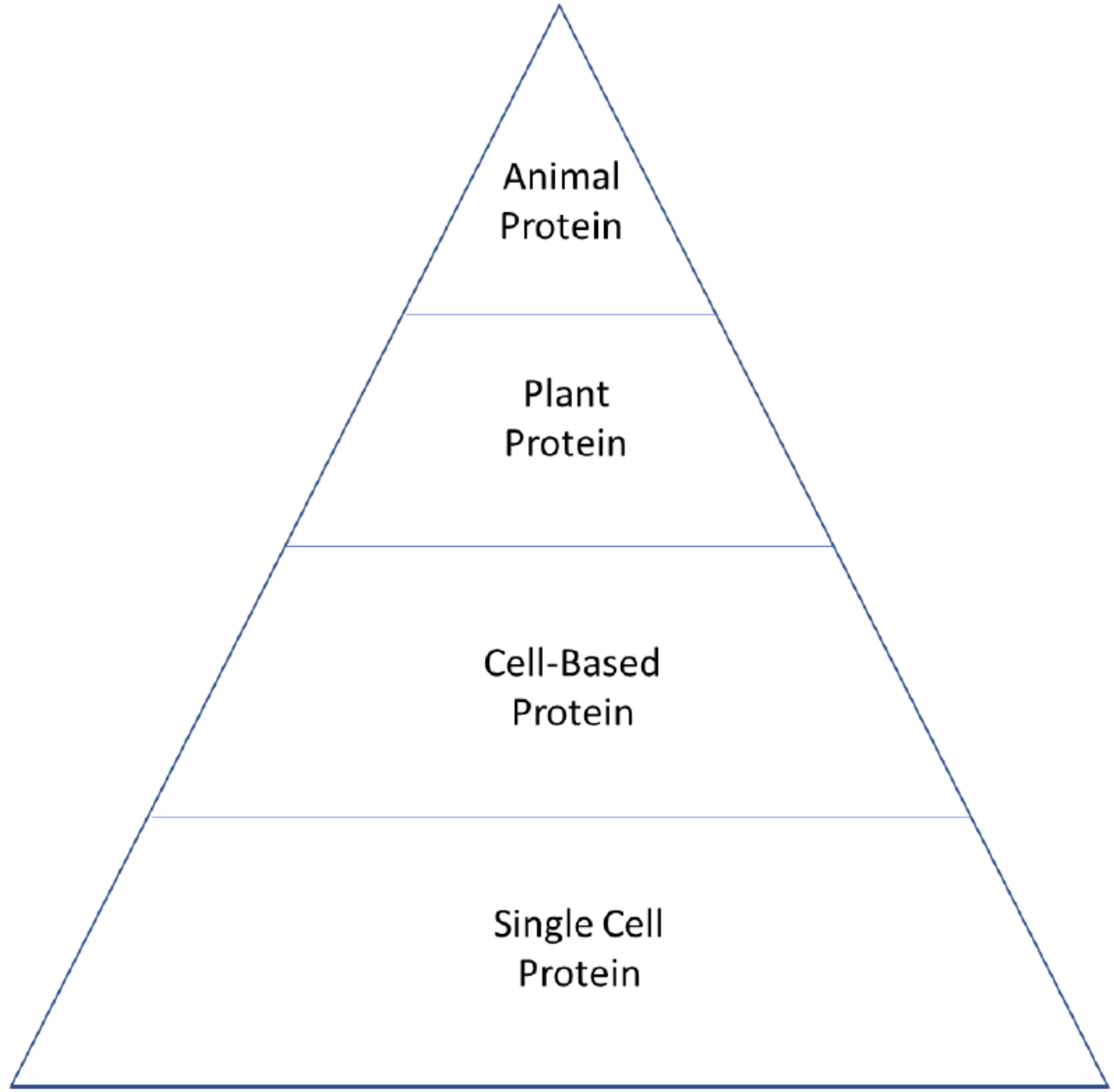
- Protein (include key essential amino acids)
- Fatty Acids like Omega 3, DHA, and EPA
- Astaxanthin

The protein consumption is on the rise and non-stop…





The future we envisioned …



And that’s how I end up working on food-grade protein from microalgae using fermentation process

SOPHIE’S BIONUTRIENTS

We have developed a cutting-edge process to create an optimal flour

Strain Selection Process

Protein Induction Process

Industrial Food Waste

Protein Isolation Process

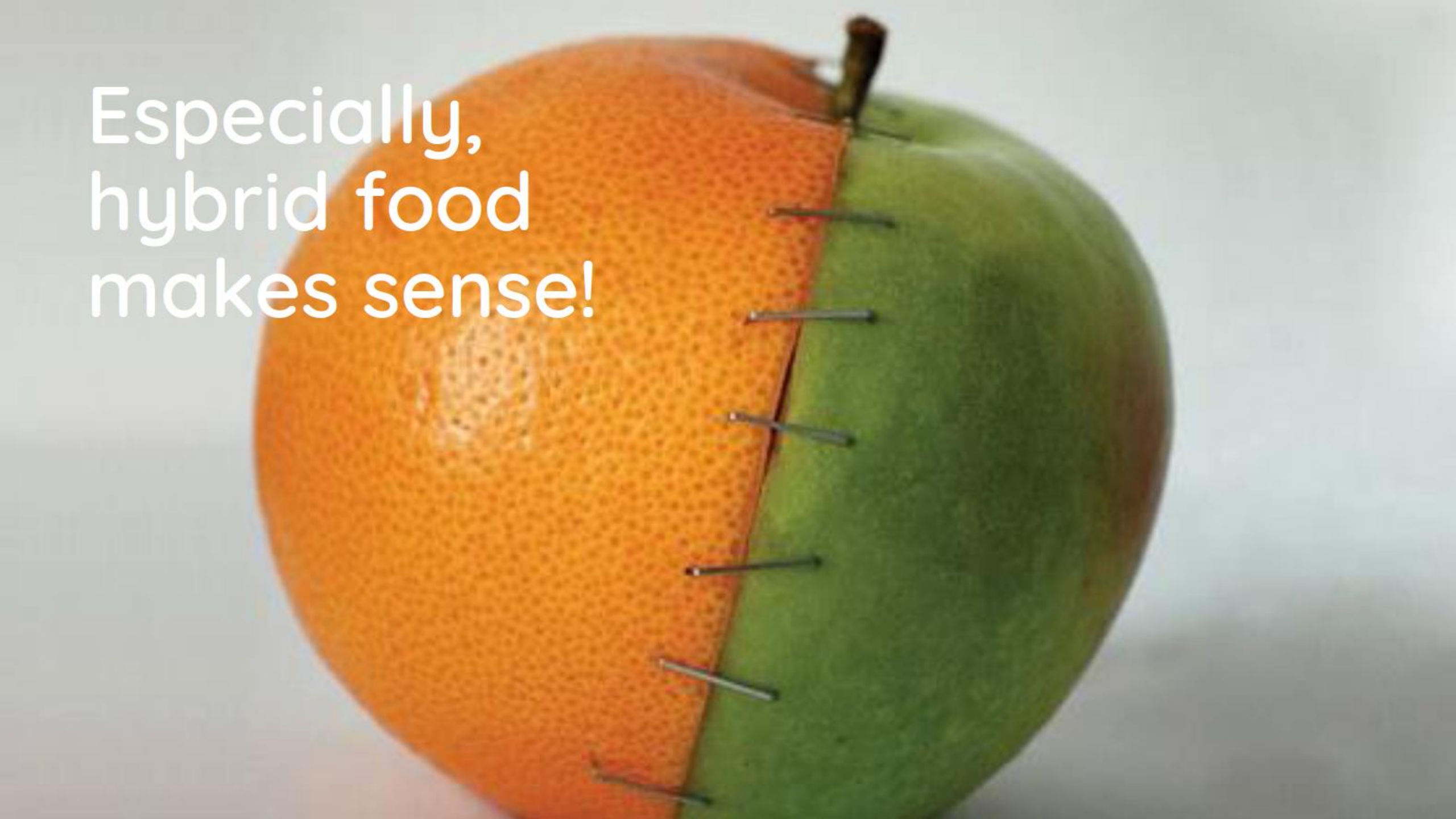
- Unlike predecessors, our protein has **pleasant smell** & **color**
- **Lower cost** than soy or pea protein in the future
- **Circular Economy**

What is the future of seafood?

Plant-Based or Cell-Based Seafood CANNOT take-off without protein from microalgae

My prediction ...


Processed food really
is the future!

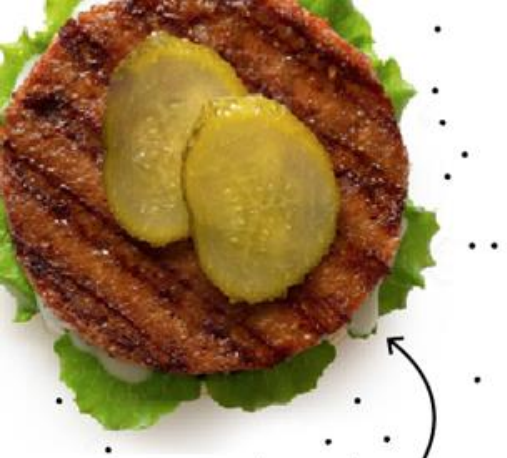

Especially,
hybrid food
makes sense!

Eugene Wang, Co-Founder & CEO
Sophie's BioNutrients Pte Ltd

eugene@sophiesbionutrients.com
WhatsApp +1-714-616-9351

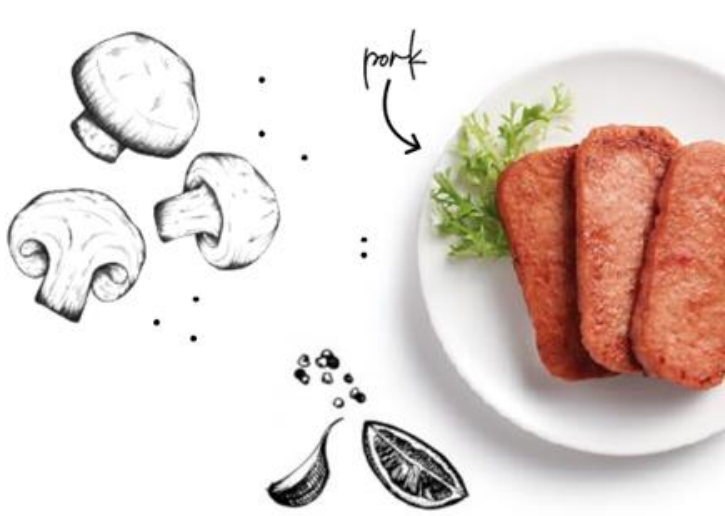
THANK YOU!!

SOPHIE'S BIONUTRIENTS



Innomy

biotech +
mycology
=
Rich and Delicious Food Platforms



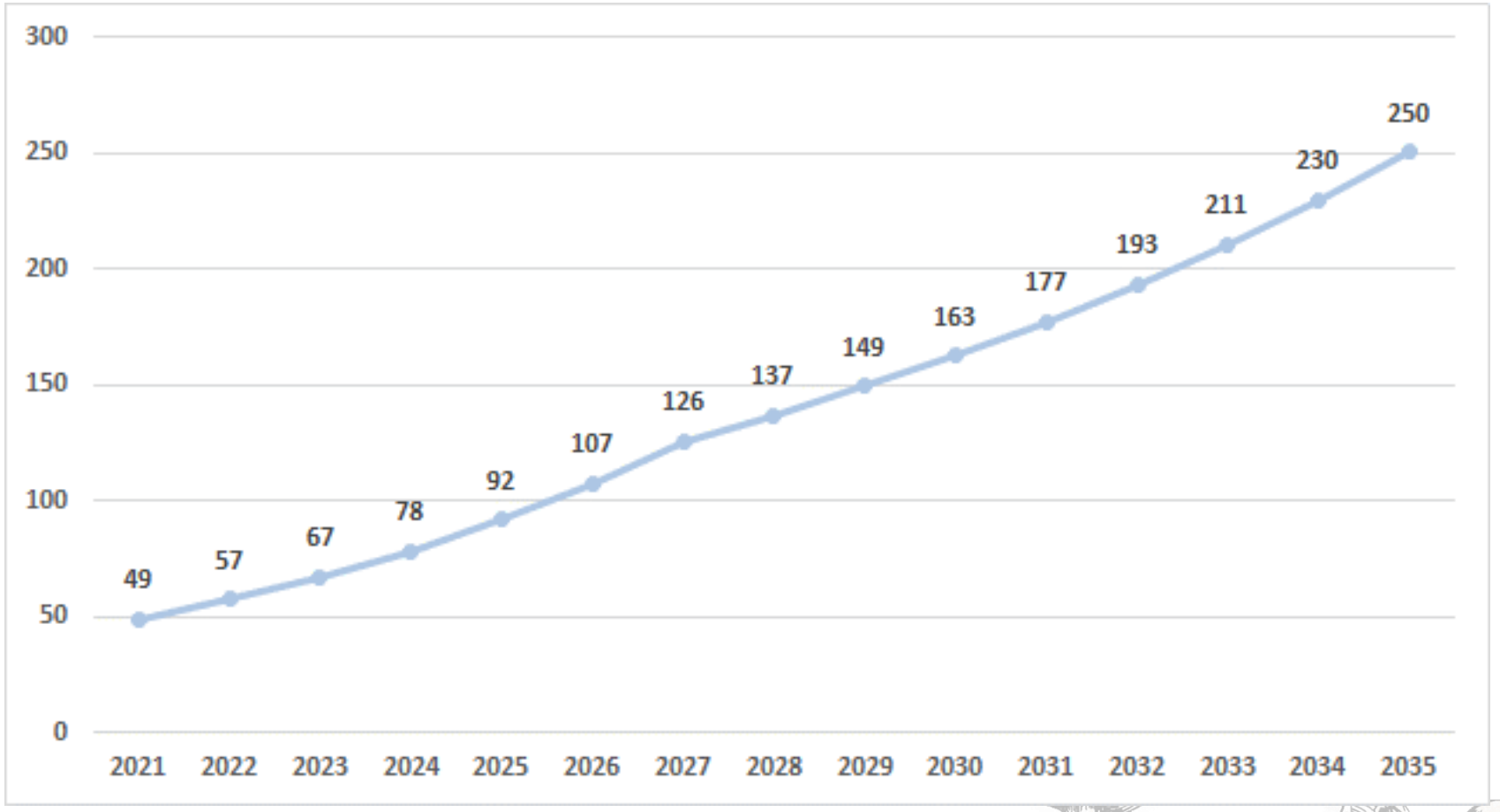
THE GLOBAL PROBLEM

GREENHOUSE GASES

INCREASING DEMAND

ALTERNATIVE PROTEIN

ALTERNATIVE PROTEIN MARKET (USD Bn)



CURRENT (INSUFFICIENT) SOLUTIONS

Plant based meat

- Low in micronutrients
- Ultra processed
- A long list of ingredients
- Unable to replace filamentous muscle structure of meat
- Unsustainable ingredients (soy etc.)

Cell based meat

- Low in micronutrients
- Projected high prices
- Genetically engineered
- A long time to scale and reach market

3rd way: Mycelium

Grown fungal tissues

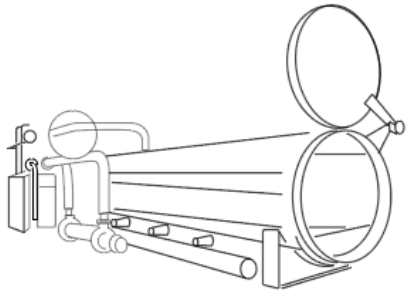
Superior in **taste, texture and nutritional** that current alternatives

Nutritional punch

Meat and protein replacement option

Why Innomy? Solid state fermentation

Substrate sterilization

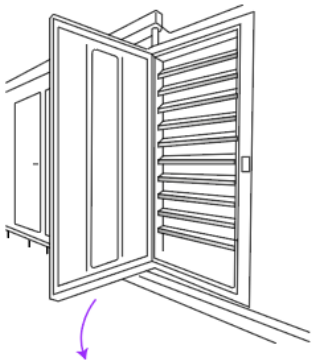


Inoculum

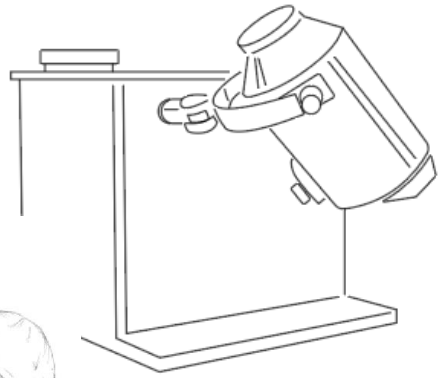
Substrate

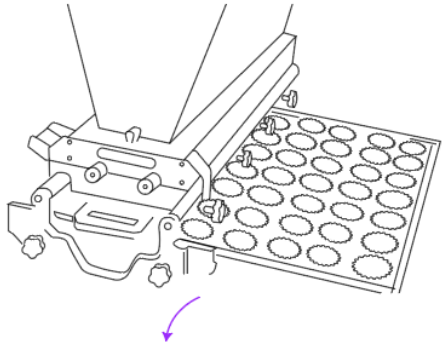
strain

grains

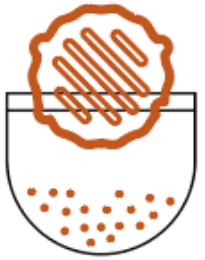


6 days of growth



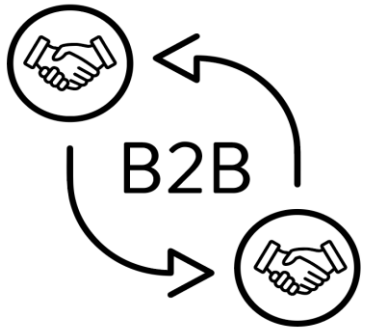


Harvest & Flavouring



B2B BUSINESS MODEL

Innomy

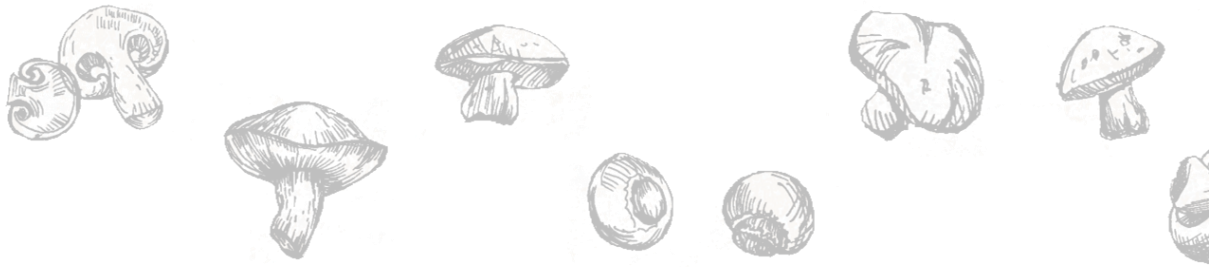


R&D

Industrial partners

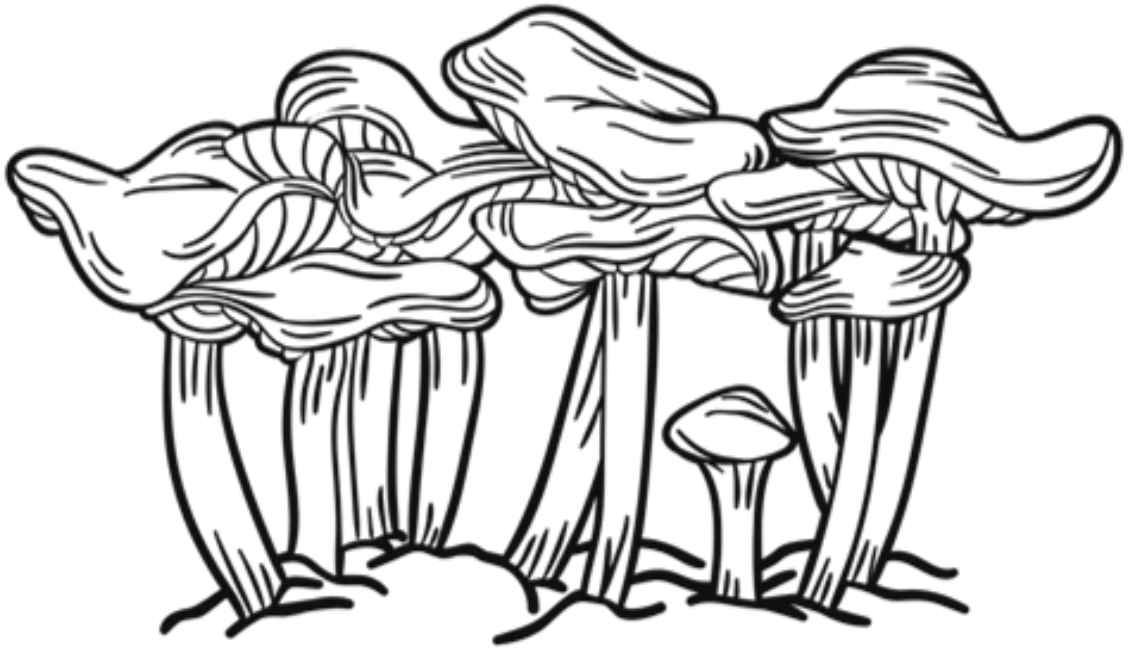
Final Consumer

Inoculum &
Product design



Seeking alliances

WILL YOU *JOIN US*?



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Q&A

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Next activities

Online Activities

6 July
Workshop 10: Packaged food. Food waste reduction solutions in food packaging for take-away and retail

21 September
Workshop 11: Bringing urban farming to new heights through breakthrough technologies and innovative business models

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Matchmaking Events

- Prepare for the event by improving your profile
- Fill in the Marketplace
- Browse through the Participants and/or Marketplace
- Find relevant meeting partners
- Request meetings – or be booked for meetings
- Wait for acceptance – sometimes also no thank you
- Have the meeting on the day

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Thank you and see you around
For more events, visit the Global Foodture community platform

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