

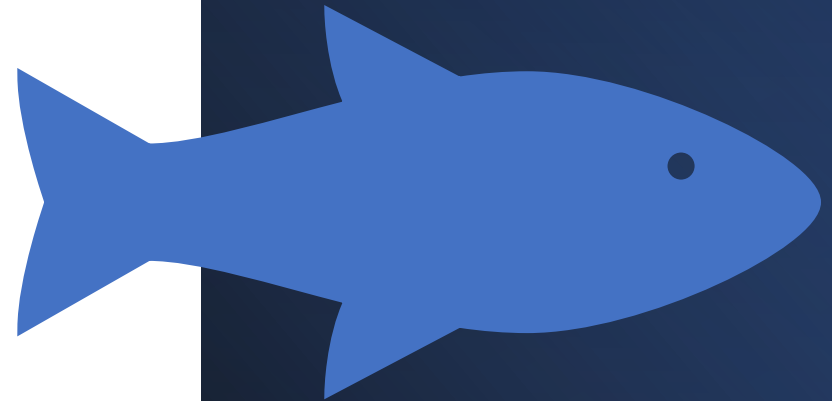
BLUE ECONOMY AQUACULTURE FORUM



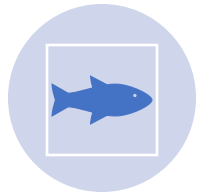
Fish nutrition/sustainability

Dr. Petter Arnesen
Fish Farming Matters

Blue Economy Aquaculture Forum
Grand Hyatt Abu Dhabi Hotel 24th May 2023



Topics to be discussed



Short status on global aquaculture



Feed and raw material composition



Stakeholder influence



Reducing dependency on imported feed raw materials



Examples of novel raw materials



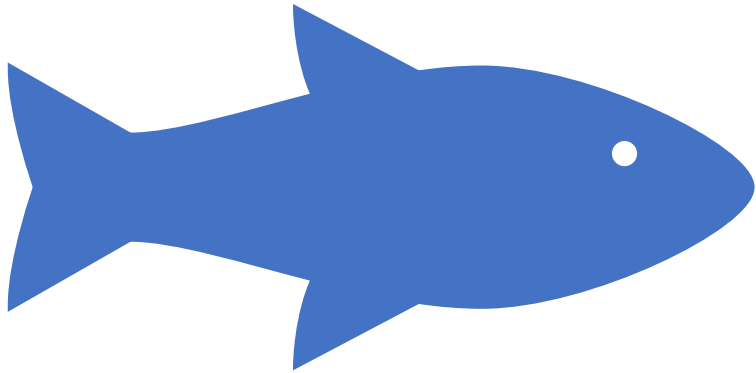
Use genetic engineering?



Certification

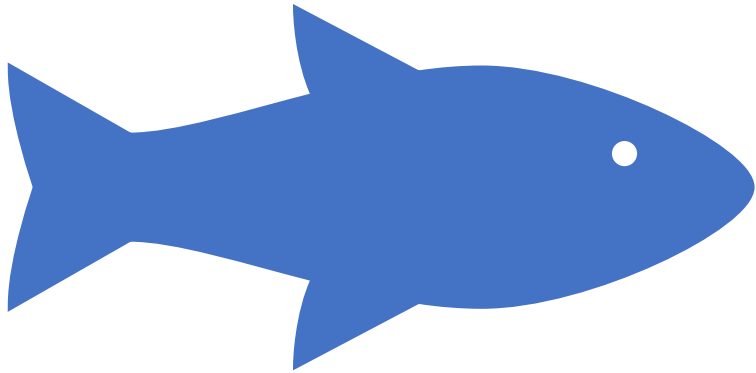


Take home messages



“Blue foods can play important roles in our diets, societies, and economies, but what exactly this looks like will differ greatly from one country and local setting to another”

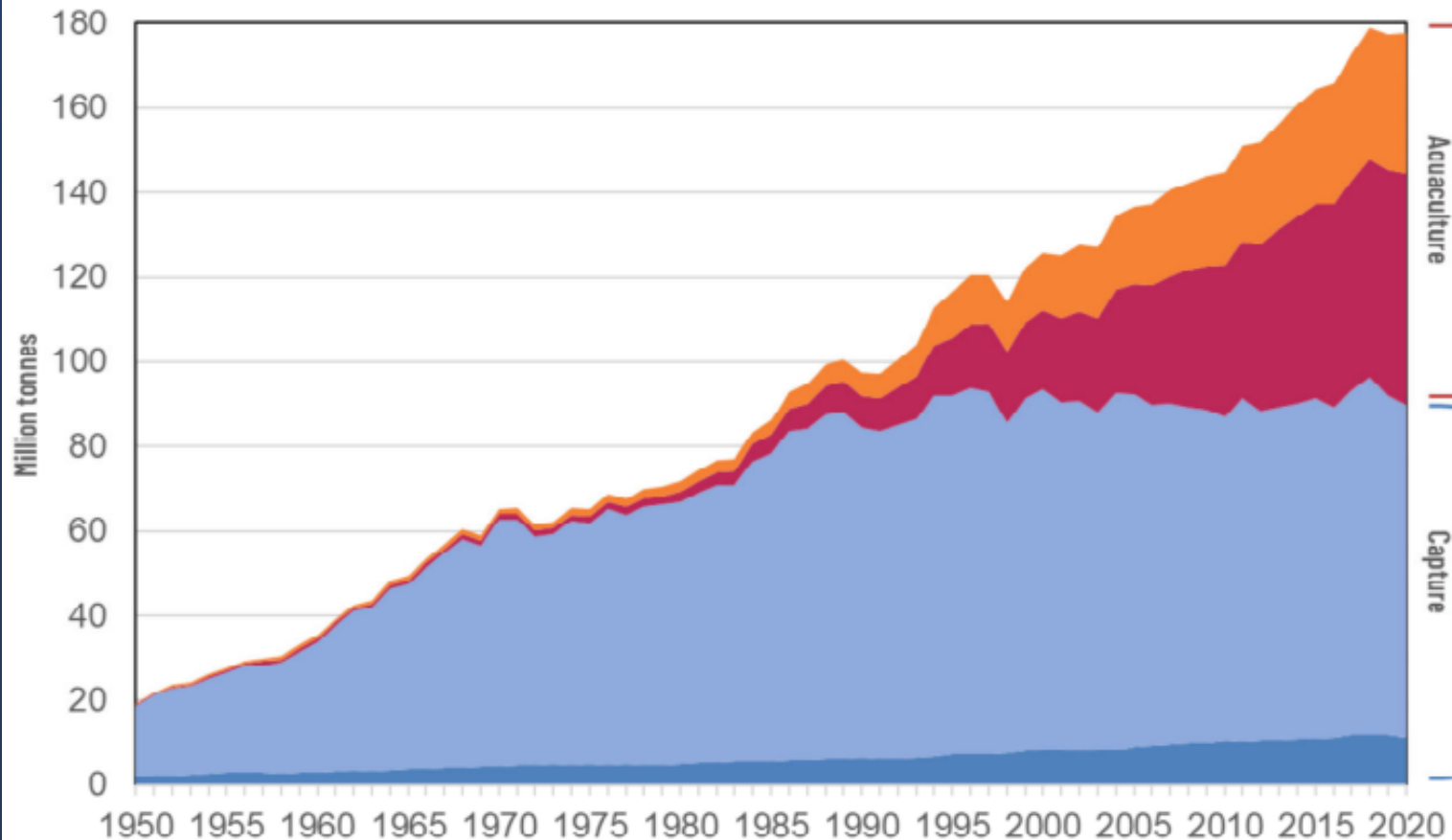
Beatrice Crona, lead author, professor at the Stockholm Resilience Centre at Stockholm University, and co-chair of the Blue Food Assessment



“The assessment has also shown that blue food consumption is set to increase by 80 per cent in edible weight by 2050, with blue foods already supporting the livelihoods of up to 800 million people worldwide. Yet the opportunities to take advantage of the positive contribution of blue foods to healthy and sustainable diets have not yet been fully realized”

Blue Food Assessment paper “Four ways blue foods can help achieve food system ambitions across nations” (Nature 22 February 2023)

TOTAL FISHERIES AND AQUACULTURE PRODUCTION 2020 = 214 Mt, A NEW RECORD



ANIMAL PRODUCTION = 178 Mt

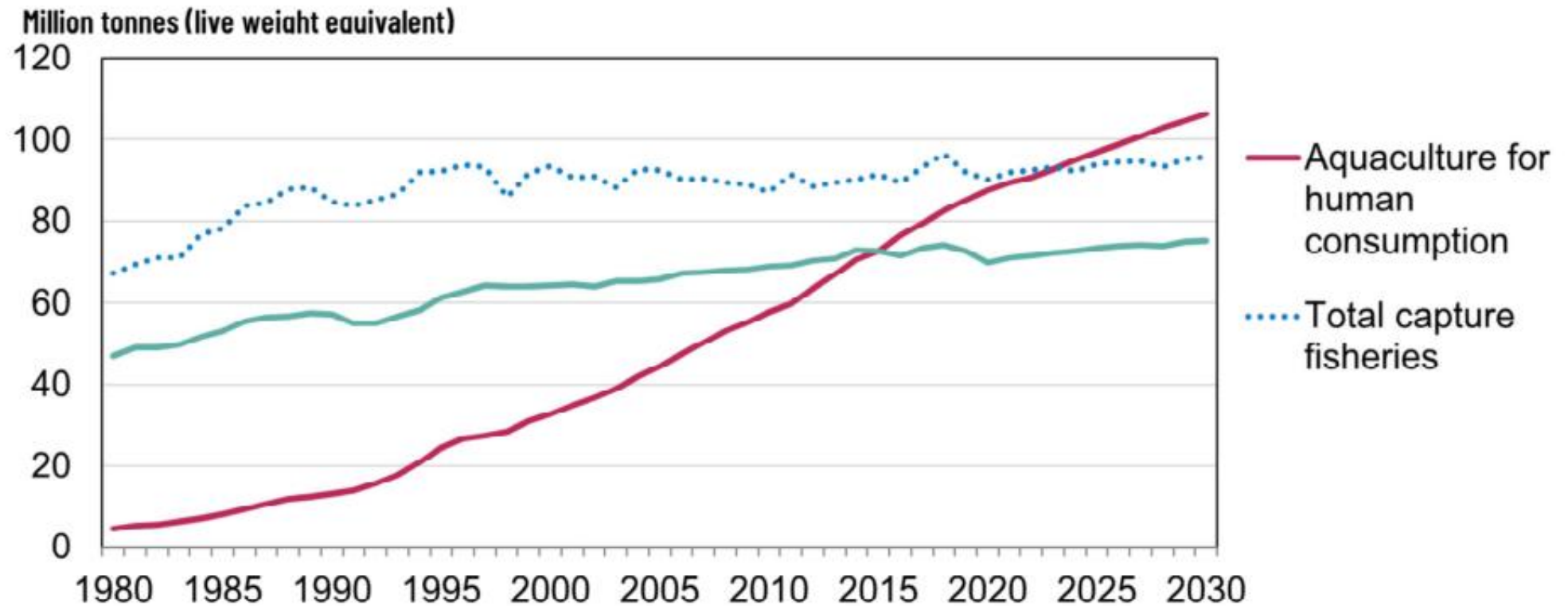
Capture fisheries = 90.3 Mt ↓ 2.1%
(12.7% Inland)

Aquaculture = 87.5Mt ↑ 2.7%
(62.2% Inland)

ALGAE PRODUCTION = 36 Mt ↑ 1.4%

PRODUCTION OF AQUATIC ANIMALS EXPECTED TO GROW BY 14% BY 2030, TO REACH 202 Mt

Global capture fisheries and aquaculture production, 1990-2030



SECTOR INCREASINGLY IMPORTANT IN CONTRIBUTING TO LOCAL ECONOMIES

TOTAL FIRST SALE VALUE =
USD 424 BILLION



AQUACULTURE
USD 281 billion

CAPTURE FISHERIES
USD 143 billion

STATES AND TERRITORIES THAT TRADE IN THE
SECTOR = **225**

TRADE VOLUME AND VALUE (Aquatic Animals)

59.8 Mt

Live weight equivalent

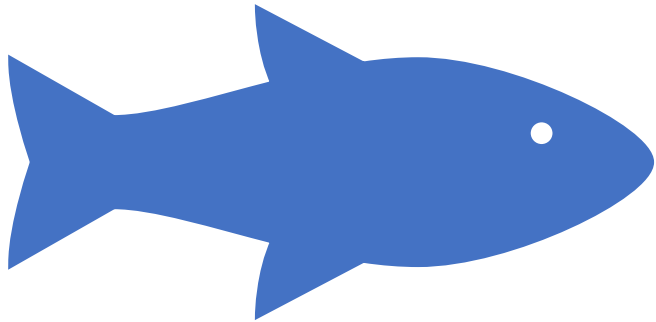
USD 151 Billion

In value

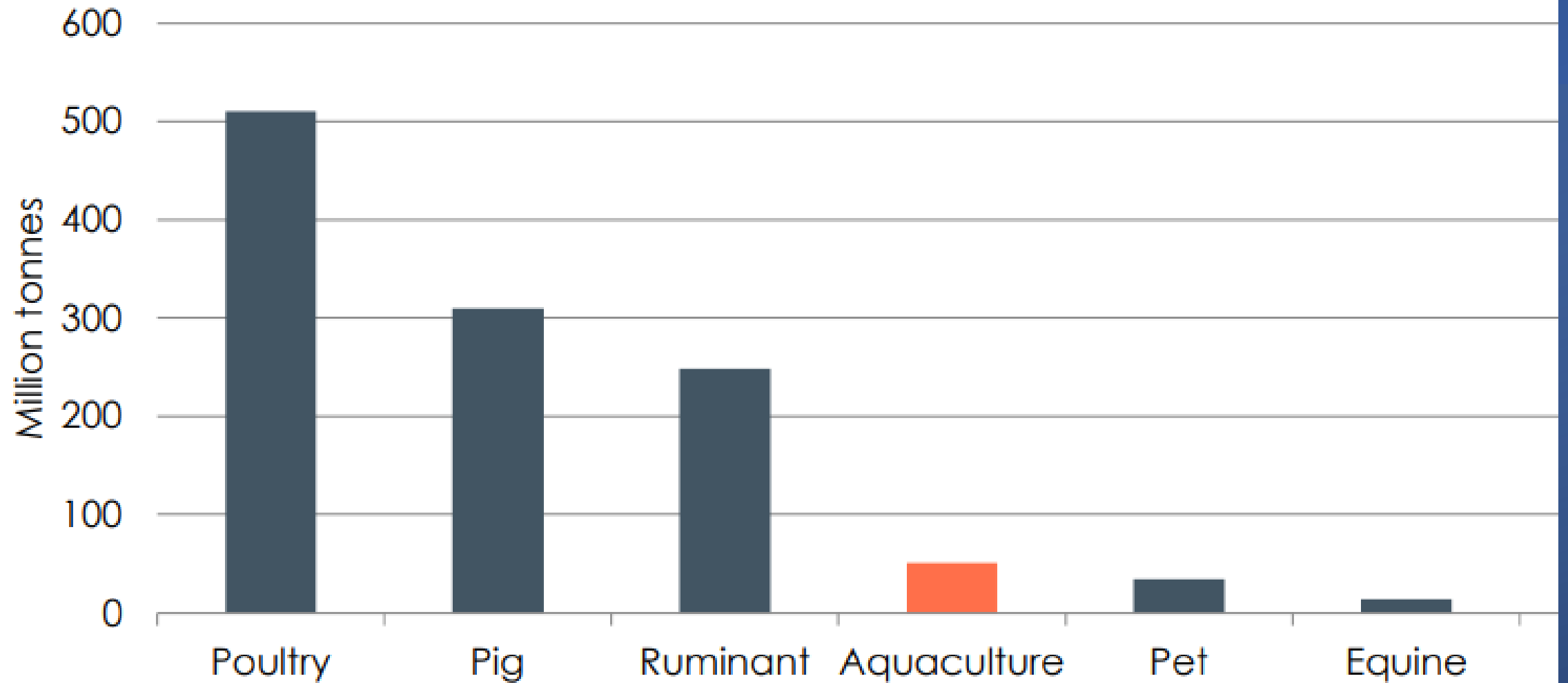


7% decline

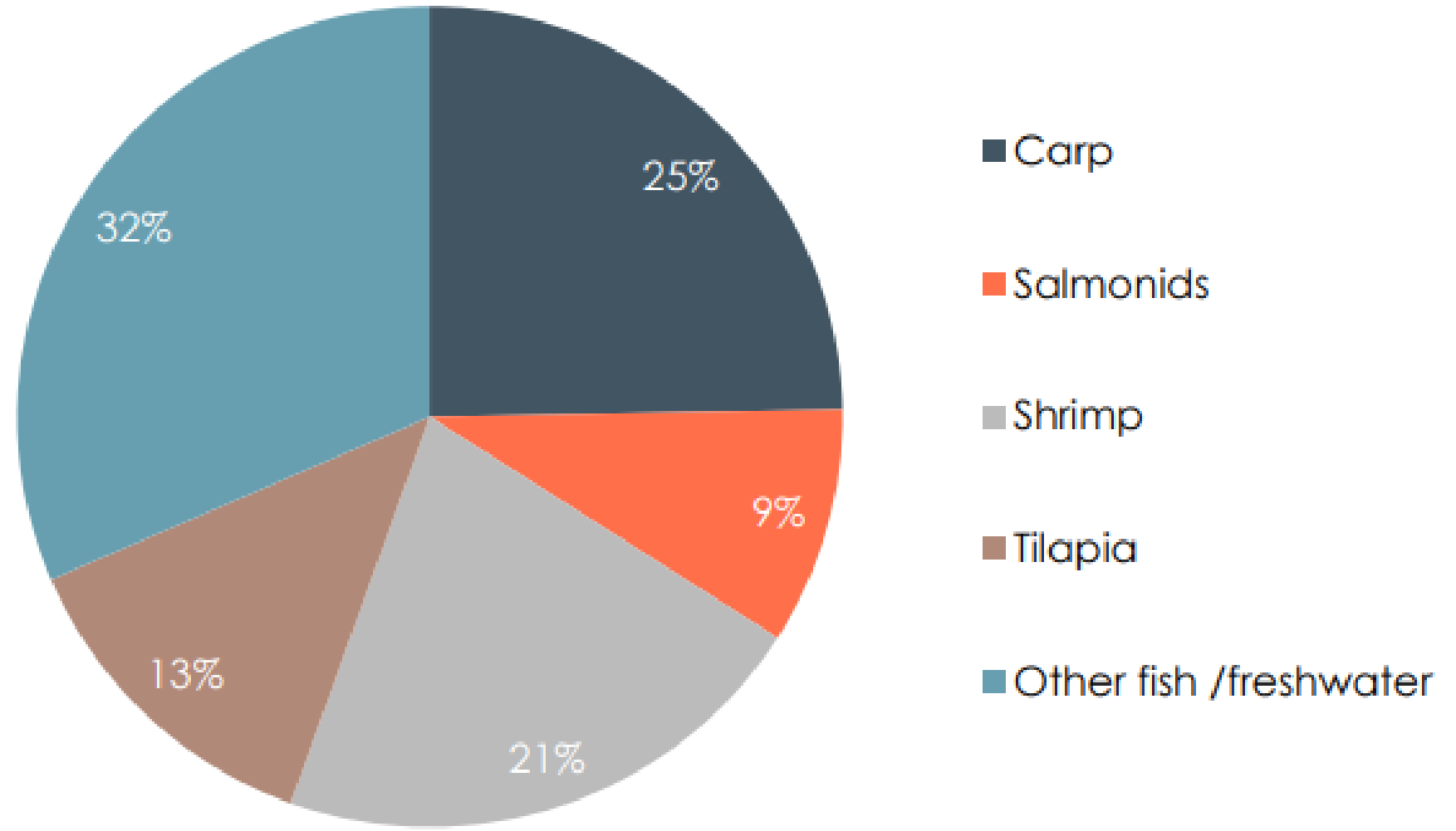
More aquaculture > more formulated feed



Global production of manufactured feed (2021)



Global production of aquatic feed (2021)



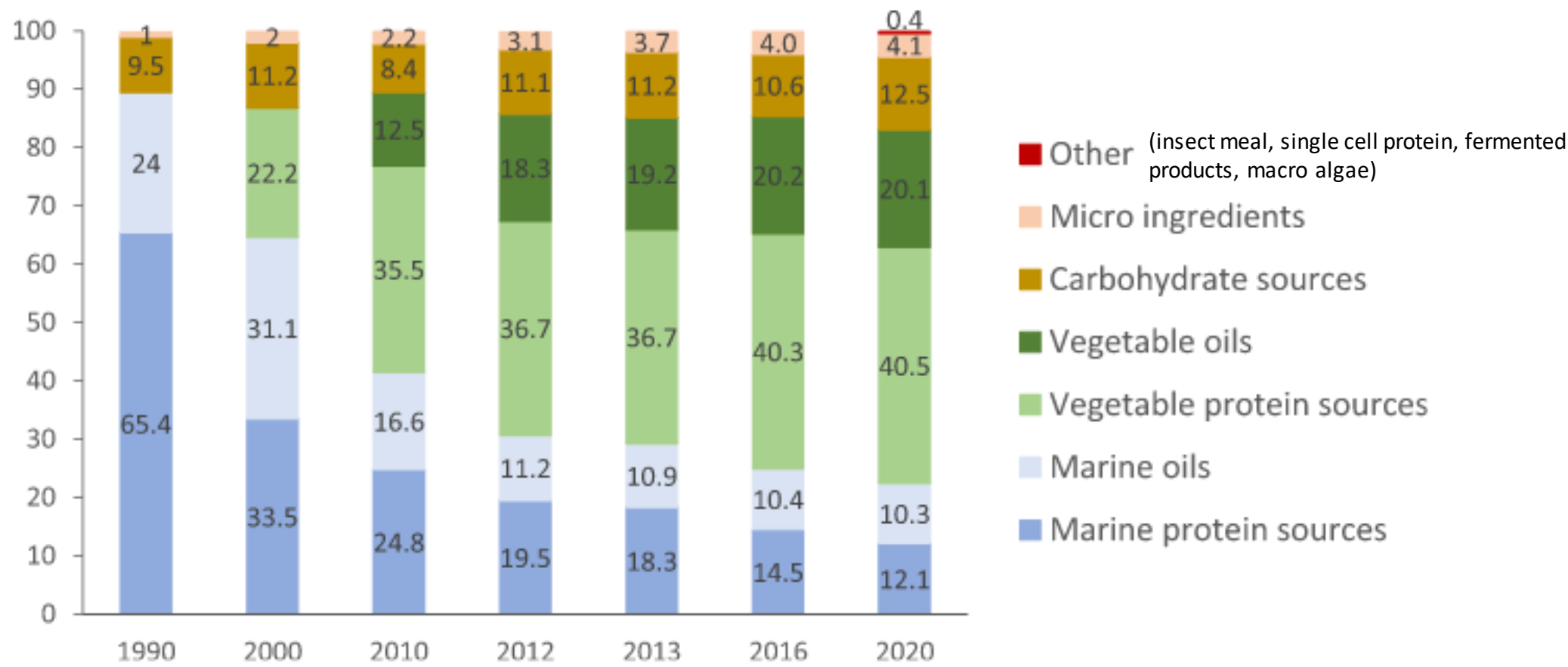


Fish feed has become less marine

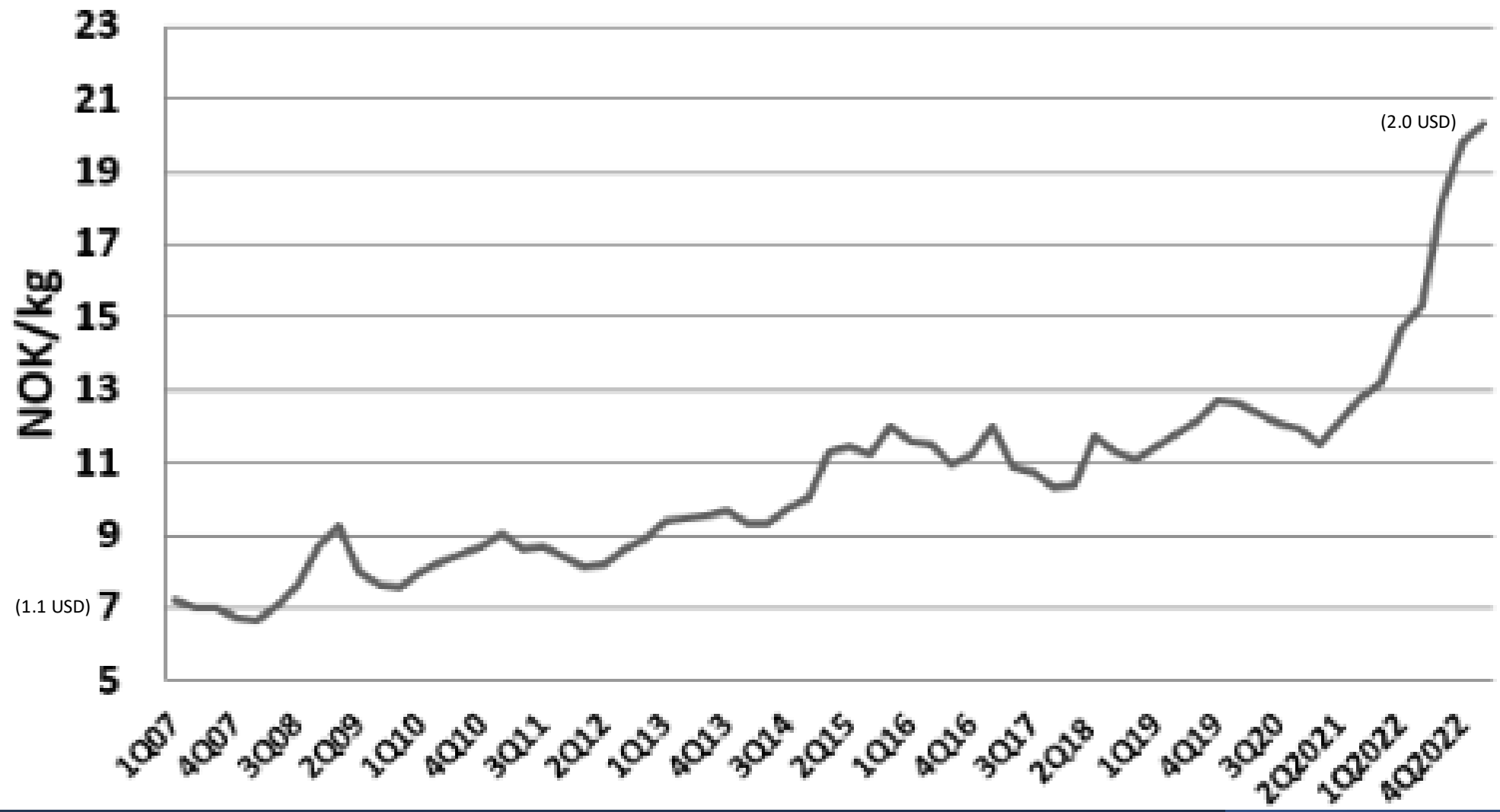
Over the last 30 years fish feed has gradually become less marine. Fish meal and fish oil have been substituted with vegetable or other types of raw materials. Mainly for cost reasons, but partly also due to pressure from NGOs and consumers

Historic changes in salmon feed formulation (Norway)

Aas et al., Aquaculture Reports, vol. 26 October 2022

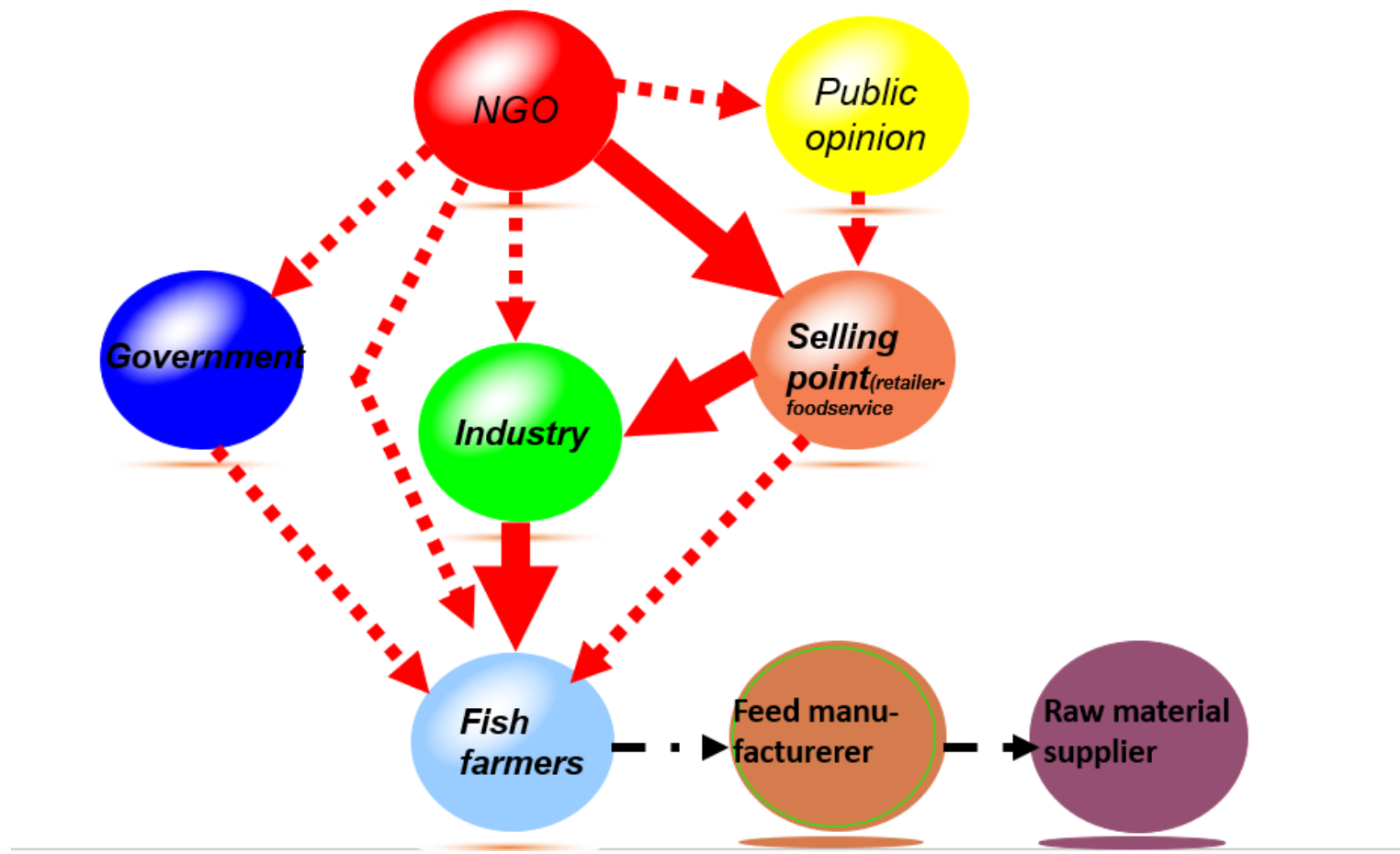


Price fish feed





Many stakeholders influence feed composition



Consumer assurance

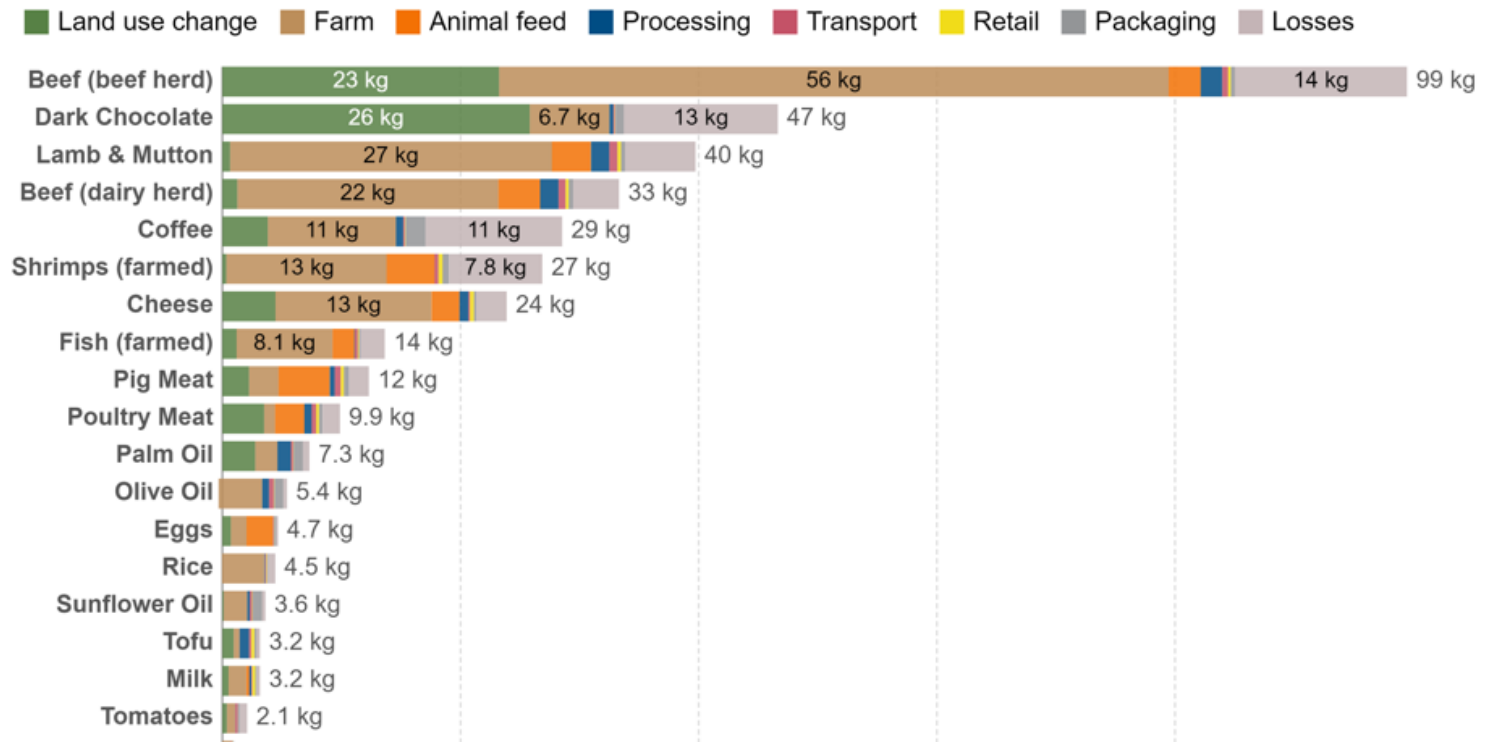
- Food safety
- Sustainability
(ecological and social)
- Climate impact

Carbon footprint is increasingly influencing food choices

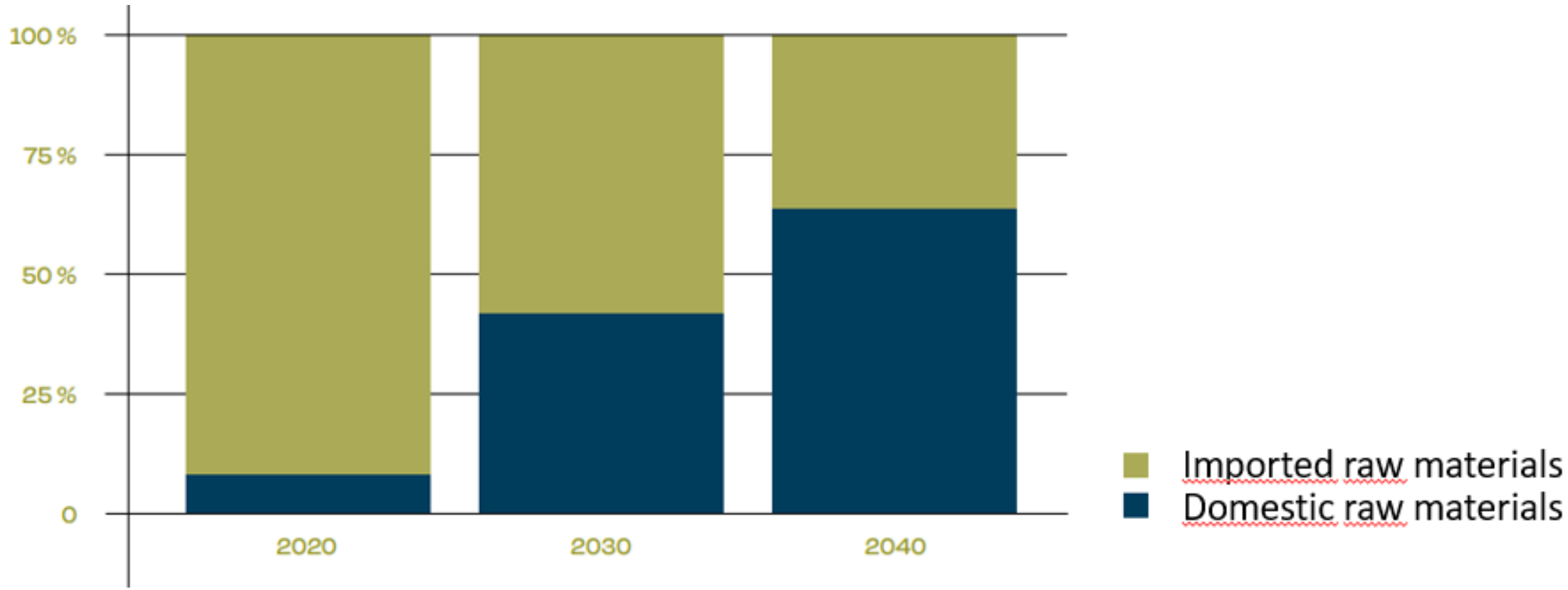
Food: greenhouse gas emissions across the supply chain

Greenhouse gas emissions¹ are measured in carbon dioxide-equivalents (CO₂eq)² per kilogram of food.

Our World
in Data



National initiative on reducing the dependency on imported raw materials (Norway)



From the report «Råvareløftet» by Bellona & collaborators (November 2022)

Avoiding competition with raw materials that can be used directly for human consumption

Norwegian farmed salmon is currently fed soybeans imported from Brazil. Foods of Norway wants to replace the high-mileage soybeans with Norwegian spruce. “We have been working with Borregaard of Norway since 2015 to produce yeast based on Norwegian spruce,” - Professor Margareth Øverland (Foods of Norway/NMBU)



Farmed salmon can grow on
Norwegian spruce trees instead
of Brazilian soybeans



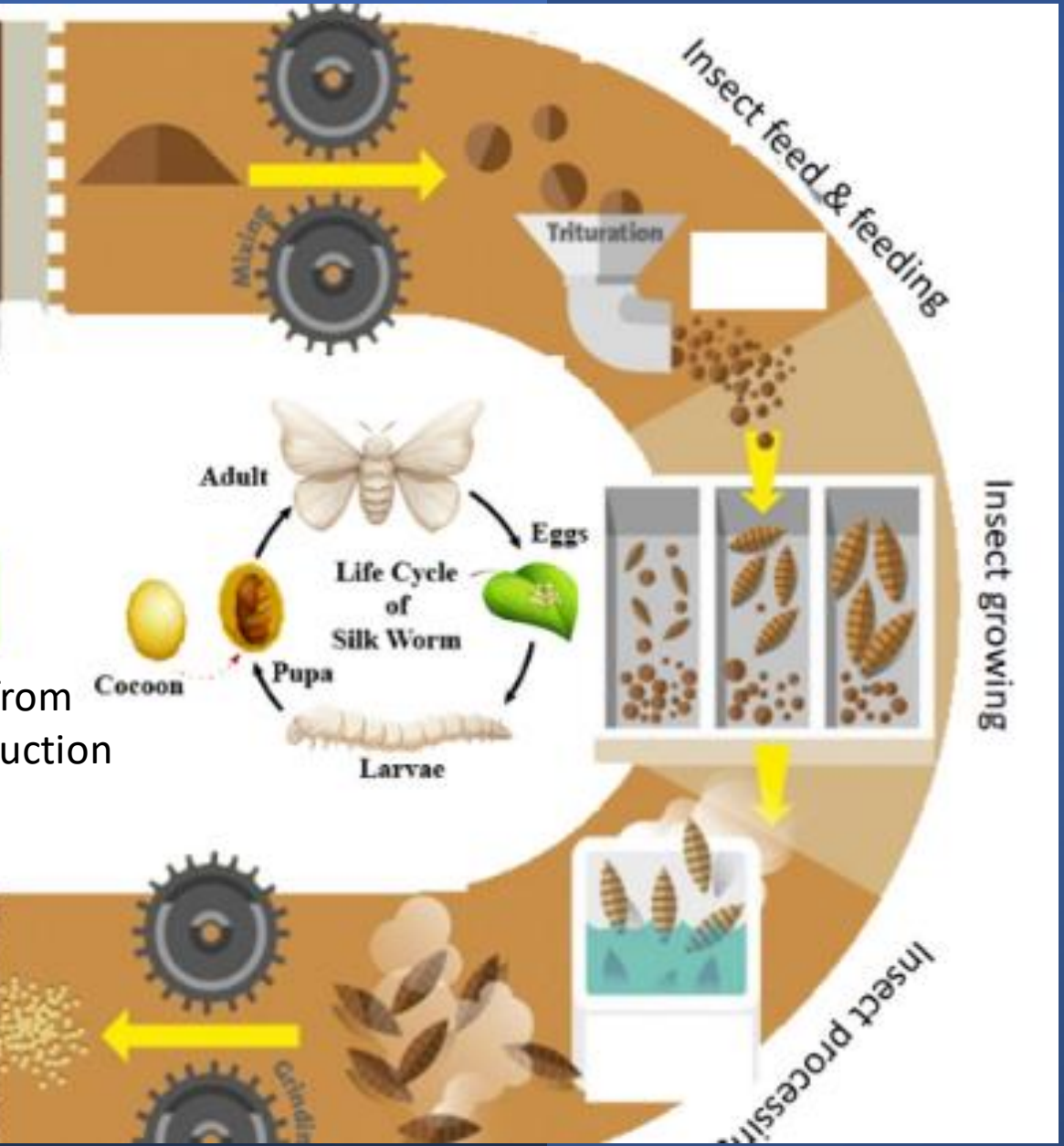
“It is certain that in the near future, large-scale insect farming and processing to produce insect meals as an ingredient of fish feeds will have positive impact on the sustainability and profitability of aquaculture”

Alfiko et al.,(Aquaculture & Fisheries 7, 2022)



Turning wastes into aquafeeds

➤The main challenges with novel ingredients produced from waste are the cost of the products and upscaling to production of significant amounts.



CLOSING THE GAP ON SUSTAINABLE FISHERIES

BioMar has significantly reduced its consumption of marine ingredients by 70% in the last 30 years. While these ingredients remain a great nutrient for fish and shrimp diets, they must be responsibly sourced from healthy fish stocks.



“ When it comes to fish and shrimp feed ingredients, one of our most fundamental long-term visions is to use materials that wouldn't otherwise be consumed by society.

Dr. Alex Obach, Innovation Director, Skretting



Novel ingredients are unconventional feedstuffs of plant or animal origin that can contribute with protein (amino acids) and essential omega-3 long chain fatty acids for use in aquaculture feeds. The latest technologies include microbial and insect-based protein and oil sources, and some products are already commercially available (e.g. insect meal and algae oil)



Although feed ingredients produced from waste materials can increase sustainability and contribute to a circular economy there are several hurdles to overcome. E.g.

- Inferior nutritional composition compared with “traditional” marine raw materials
- Food safety
- Cost
- Upscaling to production of significant amounts

nature

CRISPR is the biggest game changer to hit biology since PCR.

But with its huge potential come pressing concerns.

bit.ly/CRISPRdisruptor



Bill Gates is championing a revolutionary tool that can fight diseases, keep people from starving, and save millions of lives

Follow @BillNordic 2,472 followers

Kevin Loria 10 Apr 2018 7:28 PM



Susan Walsh/AP

Bill Gates participates in a media availability on agricultural research, Thursday, March 13, 2014.

- Bill Gates is advocating for the use of genetic editing tools like CRISPR.
- CRISPR allows scientists to edit DNA, eliminating undesirable genes and potentially swapping in preferable alternatives.
- Gates thinks we could use genetic editing to make livestock and crops more sustainable and to eliminate malaria-causing mosquitoes.

Gene Editing for Good

How CRISPR Could Transform Global Development

By Bill Gates

"If the world is to continue the remarkable progress of the past few decades, it is vital that scientists, subject to safety and ethics guidelines, be encouraged to continue taking advantage of such promising tools as CRISPR,"

"It would be a tragedy to pass up the opportunity."

5/25/2023

Fishfarming Matters -

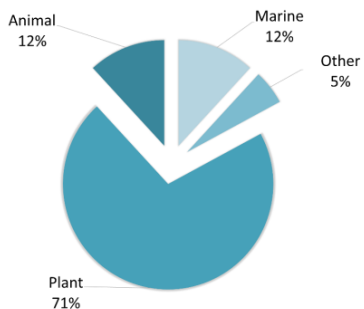
petter.parnesen@fishfarmingmatters.no

Why certification? Exemplified by Aquaculture Stewardship Council (ASC)



AQUACULTURE STEWARDSHIP COUNCIL

Why has ASC created a Feed Standard?



- Environmental & social impacts of feed are a source of concern for a growing number of consumers
- Those concerns have mainly focused in the past on the impacts caused by **marine ingredients**
- But globally, marine ingredients make up just 12% of total feed ingredients – approx. 70-75% of ingredient volume in aquafeed is derived from **agriculture**



- To avoid exchanging one set of environmental impacts for another by substituting raw materials, a **holistic approach** is necessary.
- ASC Feed Standard will be the first Standard to take into consideration **the impacts created across all key ingredient groups and across the entire ingredient supply chain (feed mills & suppliers).**
- Includes all major agriculture crops such as wheat, corn and canola, in addition to soy and palm oil, and marine ingredients.



Take home messages



In addition to satisfying nutritional requirements fish nutrition is about selecting feed raw materials that are sustainable, safe, affordable, traceable and have the lowest possible carbon footprint

Novel raw materials must be developed. The more local the better! Increased focus on national food security should encourage legislators and competent authorities to speed up approval processes

End-user perceptions must be influenced so that the ability of the supply chain to adopt to emerging ingredients like insects, microbes and even genetically engineered ingredients is not upset

We need to make the case that shows clear and tangible benefits to consumers. This is the key to expanding the basket of ingredients to supply the growing aquaculture feed market

A good story can easily be lost in misdirected communication

Thank You!



BLUE ECONOMY AQUACULTURE FORUM

