INVE AQUACULTURE

Sustainable feed ingredients & packaging for marine aquaculture

www.**inve**aquaculture.com

INVE AQUACULTURE

INVE TECHNOLOGIES (BELGIUM)

INVE AQUACULTURE HEADQUARTERS

NUTRITION
Feed quality in the broodstock and larval stages has long lasting benefits

HEALTH
Microbial management is a must from hatchery to harvest

ENVIRONMENT
Living conditions of the cultured animals need to be carefully controlled

UNIVERSITEIT GENT

www.**benchmark**plc.com

Benchmark®

ADVANCED NUTRITION

GENETICS

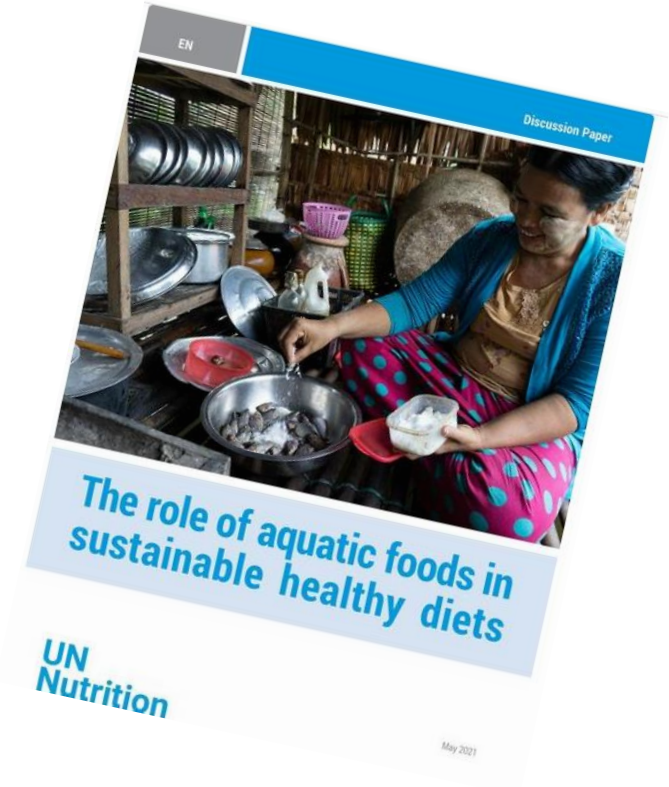
HEALTH

Customer awareness

The rise of the conscious food consumer

Sustainability
Leaving the world better than I found it

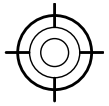
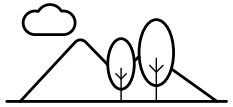
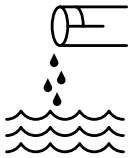
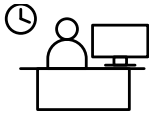
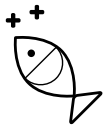
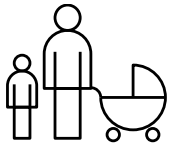
Human Nutrition
Food as both preventative and curative health tool



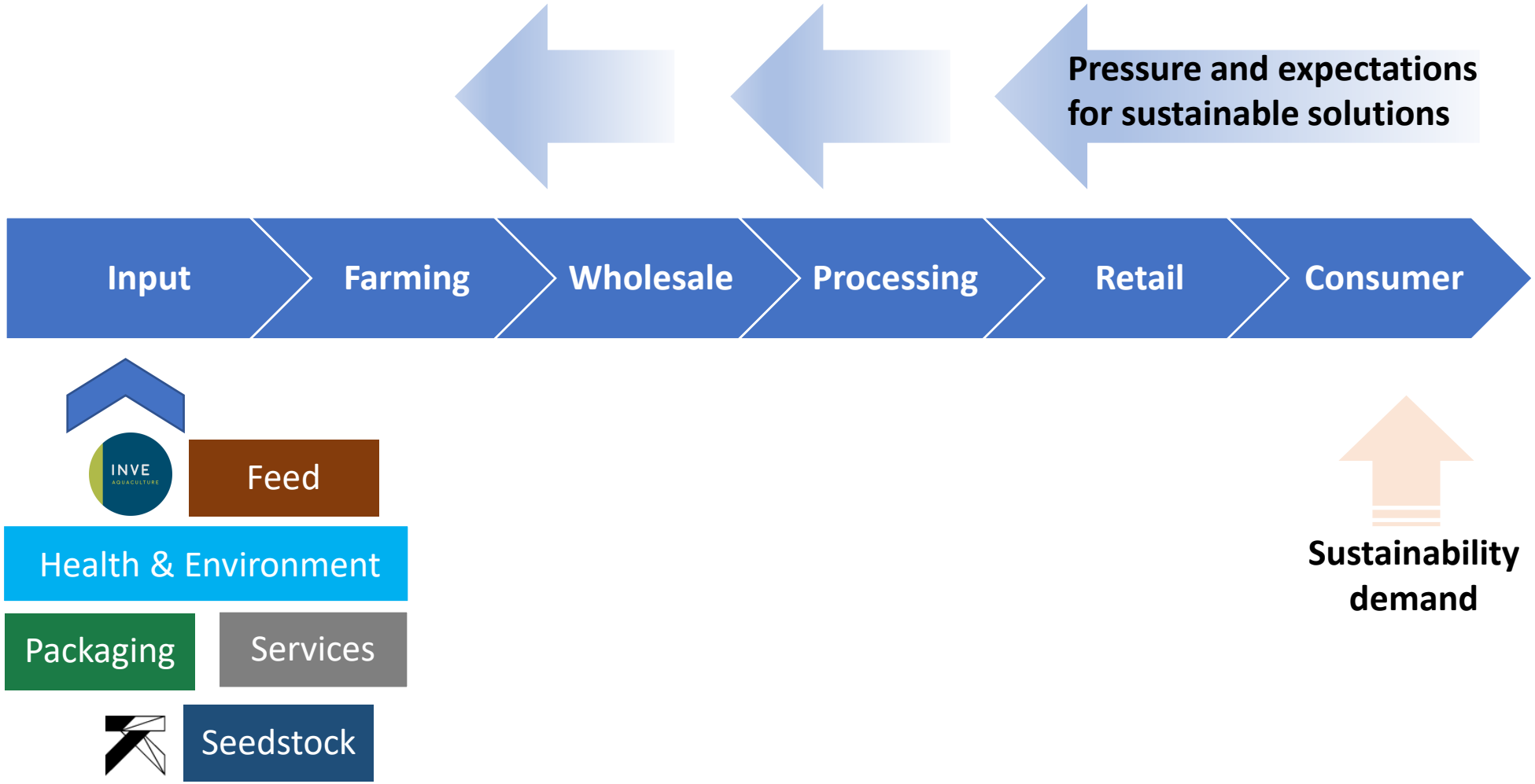
Sustainability demand

- Consumer organisations
- Media
- NGOs
- Environmentalists

Sustainability Issues

1	 Antibiotic use	6	 Transparency and food fraud
2	 Disease	7	 Habitat destruction and biodiversity loss
3	 Greenhouse gas emissions	8	 Effluents
4	 Fish Welfare	9	 Working conditions
5	 Fish feed supply	10	 Community resistance

The aquafeed value chain

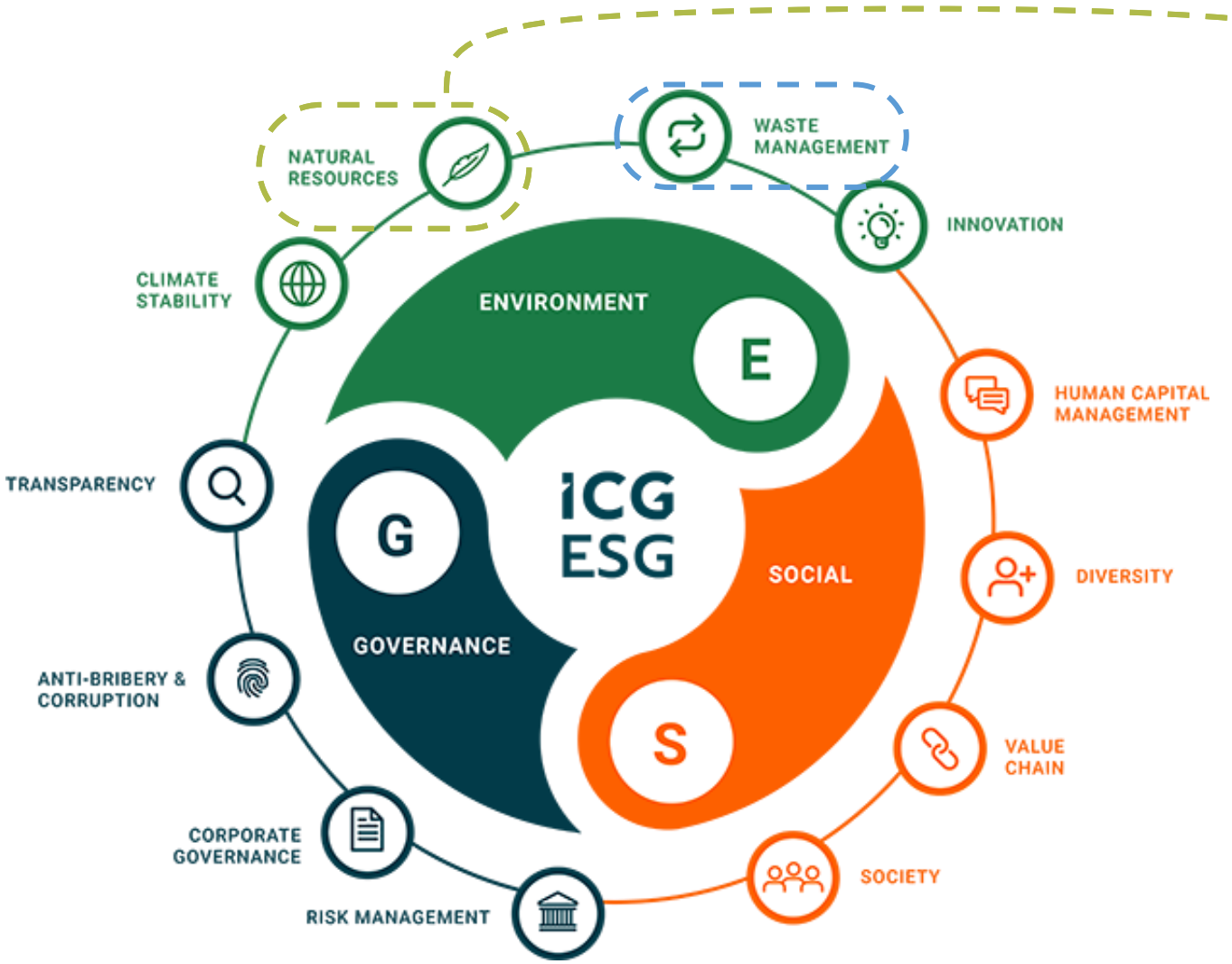


Companies engage

Our mission is to enable aquaculture producers to improve their sustainability and profitability.

Environment
Social
Governance
ESG

Conservation of Natural Resources



Natural resources

sustainable

raw materials

- Fish meal – Fish oil (FMFO)
- Deforestation-free soy
- Local sourcing
- Plastic-free oceans

Sustainability certification

Marine ingredients & Seafood

Plant ingredients

Aquafeeds

BAP

Global G.A.P.

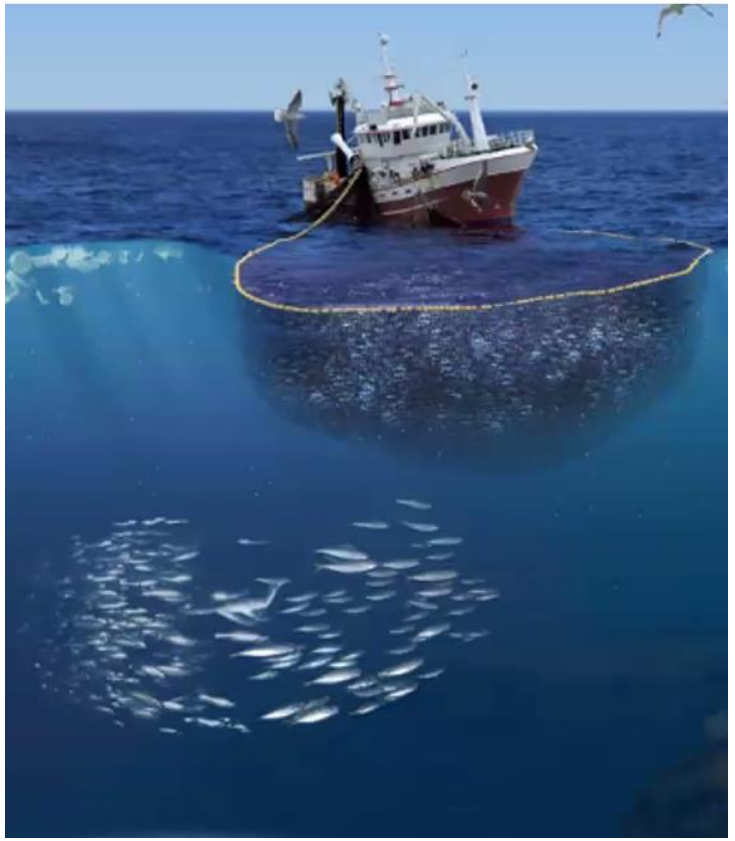
Criteria:

Sourcing / traceability	Fish by-products	Social accountability
Manufacturing	Environment accountability	Community engagement

Use of ‘green’ ingredients

Aquaculture has to reduce its dependency on fish oil and meals from fish, squid, krill, … . Why?

- to support better utilization of aquatic resources
  - *only a fraction of fisheries and agriculture link with sustainability certification programs*
  - *the sum of sustainability certified + non-certified RM is causing huge pressure on our oceans and seas*
- to be future proof
  - *fish stocks are in decline, FM and FO are capped by quota*
- to not compete with food for human consumption



Green ingredients

Desired characteristics

suitable candidates

	Protein content	Environmental sustainability	Consumer acceptance	Feasibility
Fishery and aqua-culture by-products	+	+	+	+
Insect meals	+	+	+	+
Microbial biomass: Bacteria and dry bio-floc	+	+	+	−
Microbial biomass: Yeast	+	+	+	−
Microbial biomass: Microalgae	+	+	+	−
Macroalgae	−	+	+	+

Use of green ingredients

Insects

The biggest facility in the world has a capacity of 15,000 tons a year

Innovafeed opened the world's largest insect protein production site in Nesle, France this year. A US site will be 4 times its size

Flies are the lords of the insect-for-food space

The most commonly used insects in animal feed are the black soldier fly which has an amino acid

SCP from fermentation

Single cell protein ingredients (SCP) include gas, microalgae, bacteria and yeast

FeedKind®

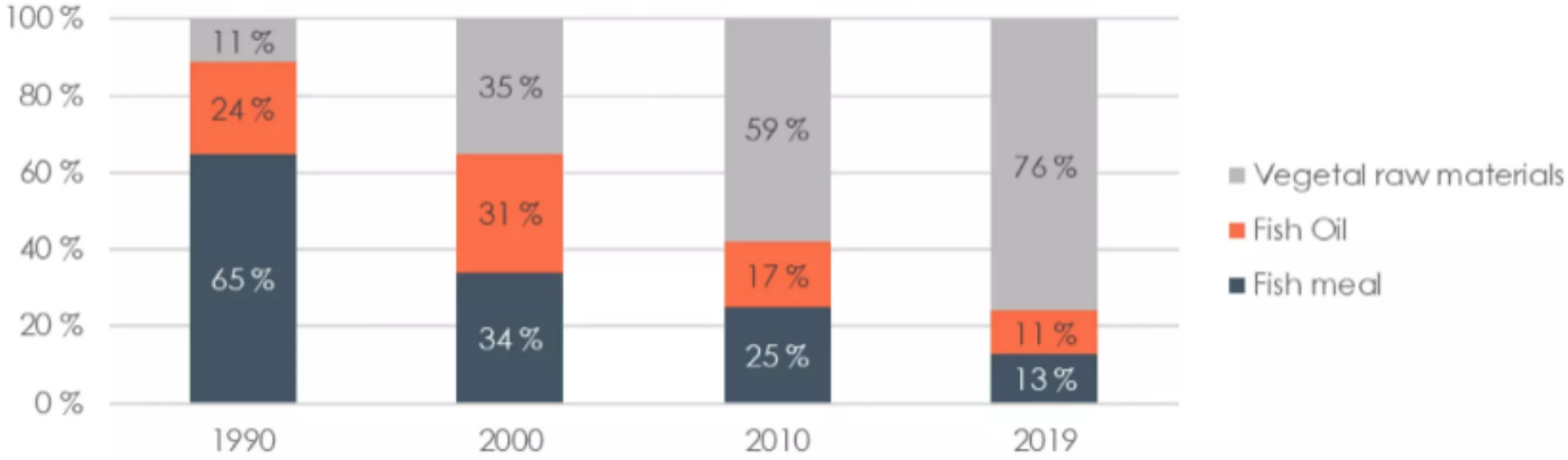
Calysseo, a joint venture between Adisseo and Calysta, will be built in Chongqing, China. The first commercial scale plant of feed ingredients produced by fermentation with a initial capacity of **20,000t** a year annually

KnipBio

Developed a set of naturally occurring microbe strains that convert ethanol, methanol and other abundant, low-cost feedstocks into premium, nutritious single-cell protein

Reduced use of FMFO

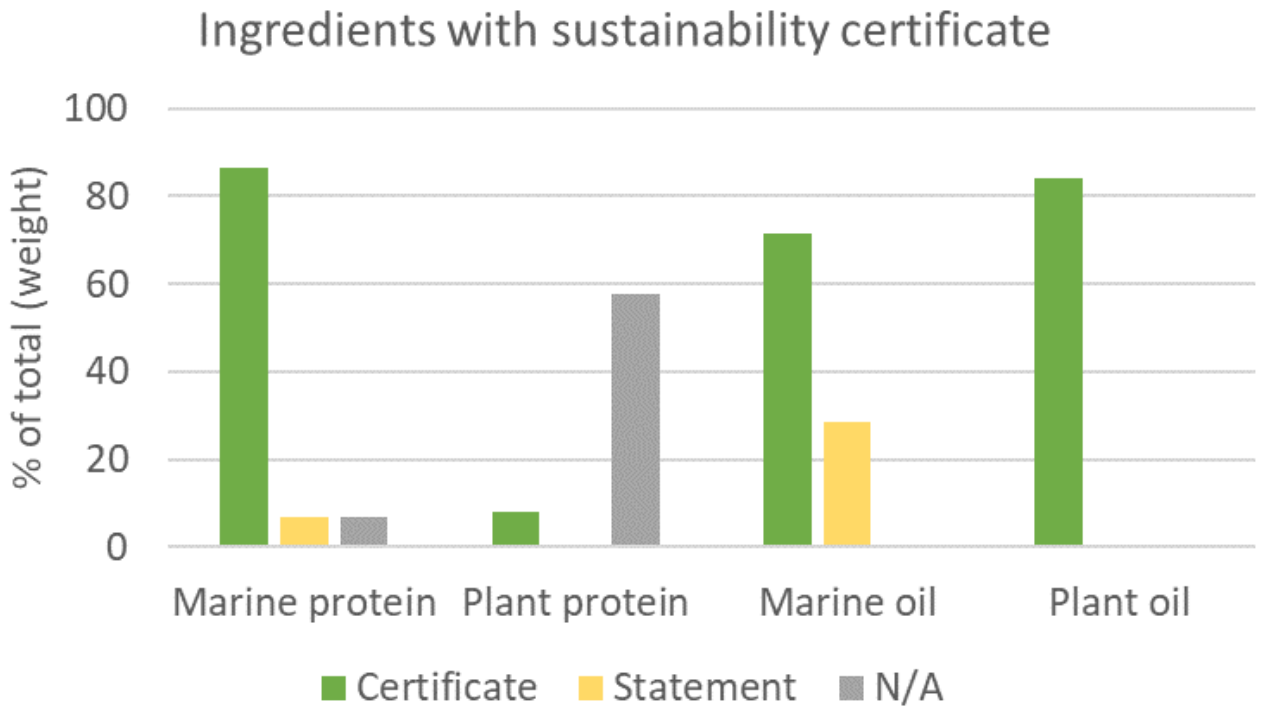
Use of Fish Meal & Fish Oil in salmon feeds in Norway

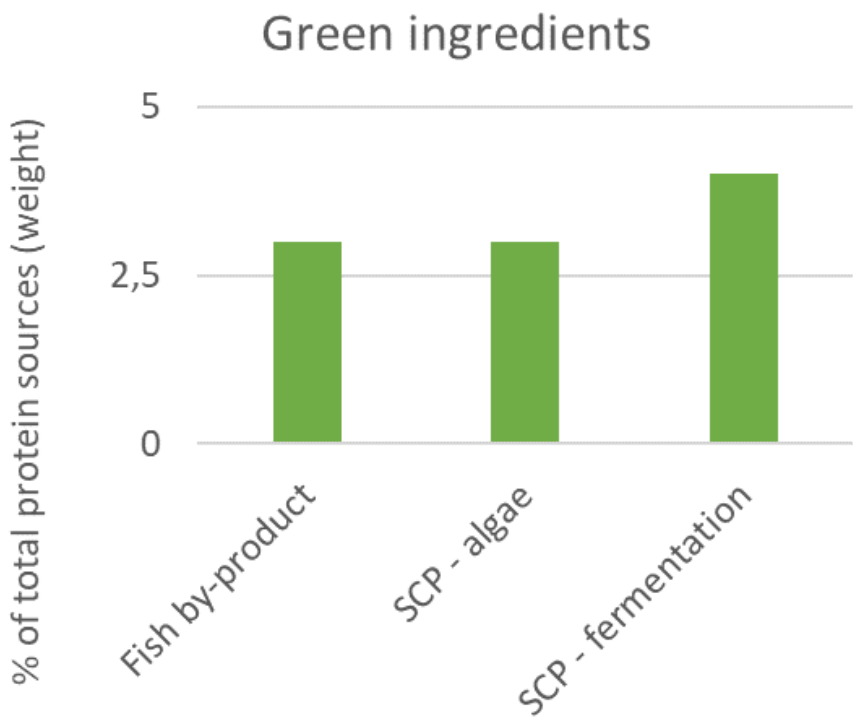


Green ingredients in larval feeds

- seabream, seabass and early stages of shrimp are marine and carnivorous species
  - *FM replacement is much more difficult than in (herbivorous) freshwater fish*
- fish and shrimp larval stages go through drastic ontological changes
  - *changing nutrient requirements*

Certified and green ingredients at INVE Aquaculture





Sustainable packaging of aquafeeds

Recycling that is sustainable

- Using raw material that is already extracted. But to be sustainable, the extraction rate must be lower or equal to the natural replenishment rate.
- Recycling forestry products (paper, cardboard) reduces pressure on forests. In addition, making paper products from recycled fibers is much less energy demanding.

Recycling that is less sustainable

- Downcycling, a process of converting waste materials into new products of lesser quality. The raw material cannot be reused infinitely (e.g. plastic)
- Recycling that requires excessive use of other resources (fuel for transportation, energy for transformation).

Sustainable packaging of aquafeeds

Sustainability certification for wood and paper

Plastic

Plastic takes 400+ years to break down!

3R principle

Sustainable packaging of aquafeeds

Reduce plastic - Replace plastic

- Reduce, reduce, reduce
  - Thin flexible plastic packaging
  - Avoid small packaging volumes
  - Eliminate plastic bags
- Replace
  - Other material than plastic (e.g. tin cans, wooden pallets, cardboard pallets)
  - Biodegradable ‘plastic’


INVE
AQUACULTURE
Thank you!