



# Innovation needs - Developing fish meal and fish oil



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# Main challenges



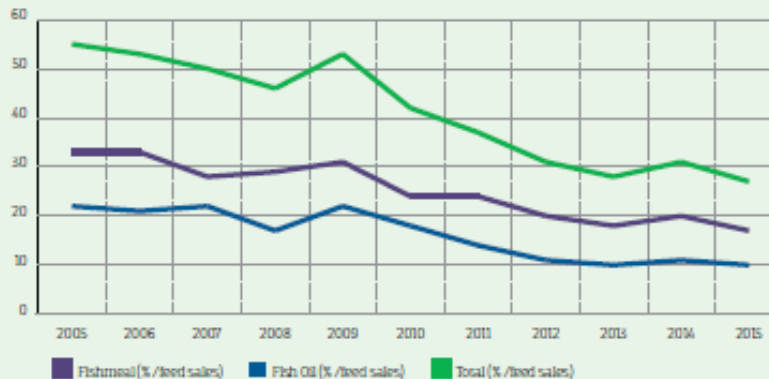
- Availability
  - Implement new resources
  - Taking care of what is already available
- Performance
  - Fish growth
  - Fish health and robustness
  - Quality of feed pellets
- Homogeneity
  - Huge number of variables

# Use of marine products in salmon feed

(From EWOS sustainability report 2015)

## EWOS Marine Index in Salmon feeds

Per cent (marine ingredients/ feed sales)



Compared to 2005, EWOS has decreased its marine raw materials (sum of fish meal and fish oil) by half, from 55 per cent in 2005 compared to 27 per cent in 2015. The use of fish meal and fish oil was slightly lower than 2014.

## Share of trimmings and byproducts in fish meal and fish oil in salmon feeds

Per cent

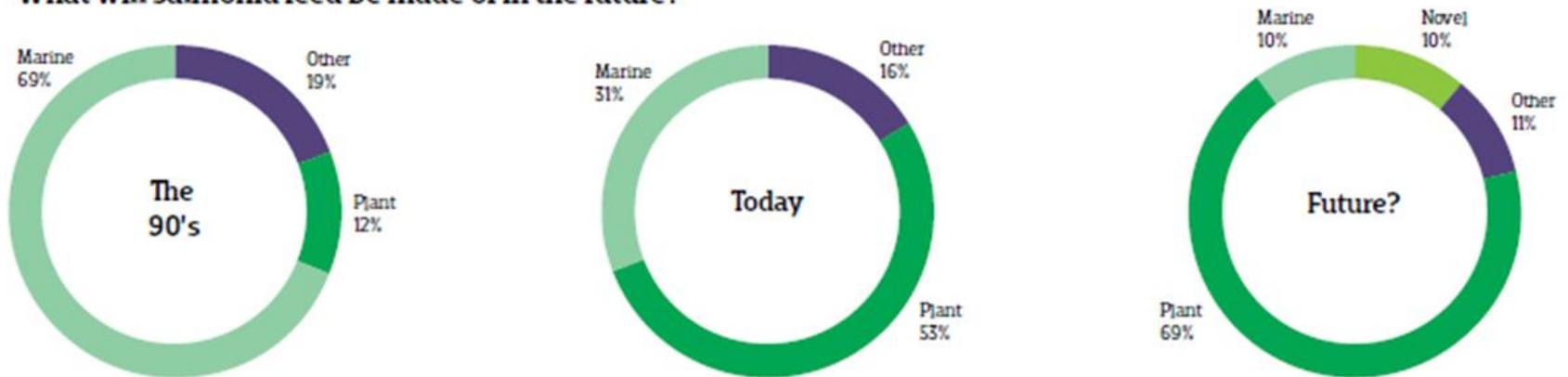


The use of trimmings and by products for EWOS salmon feeds as a source of marine ingredients has increased from 21 per cent in 2010 to 30 per cent in 2015. EWOS UK has the highest use of by-products and trimmings at 48 per cent of the marine ingredient use in 2015.

# Use of marine products in the future

(From EWOS sustainability report 2015)

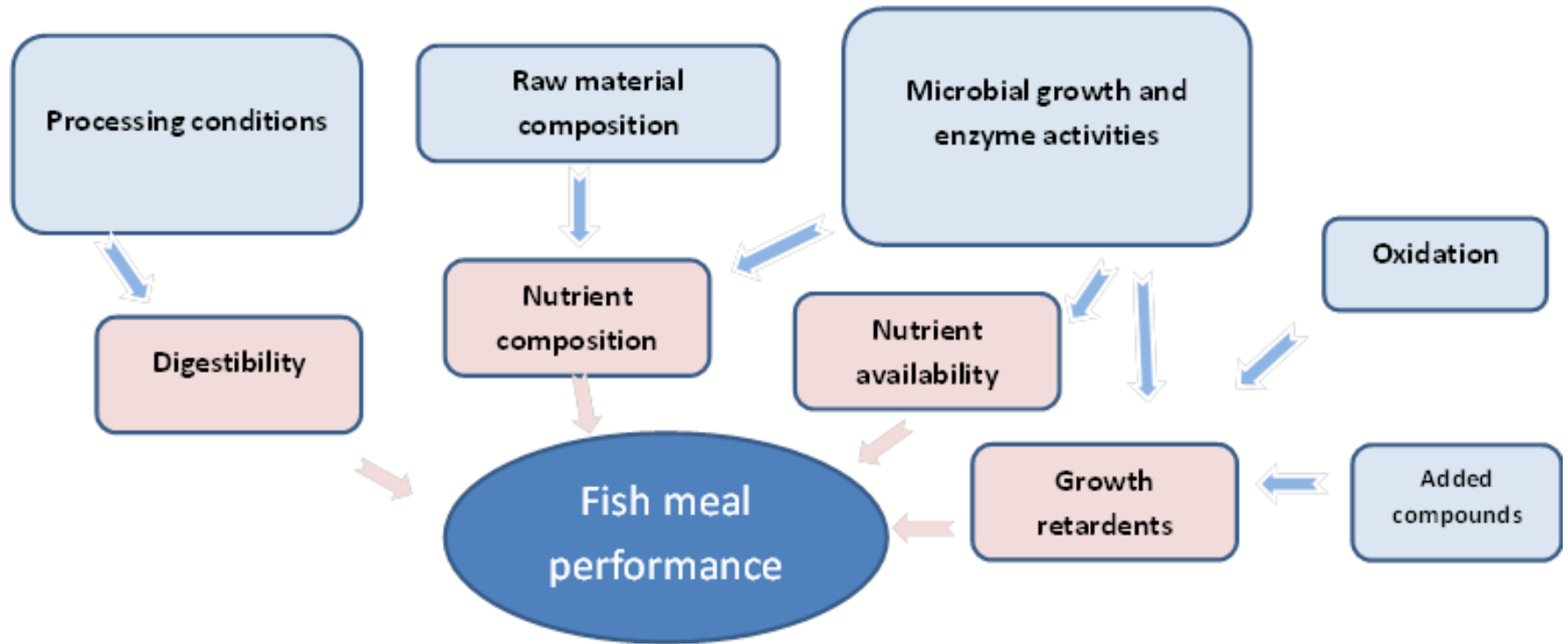
## What will salmonid feed be made of in the future?



This figure shows how the use of raw materials has changed in the past - and how it may look in the future.

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# Factors affecting fish meal performance



# FM criteria

The commercial criteria used to evaluate and price fish meal as **protein, biogenic amines, TVN,** do not necessary correlate to fish meal performance with regard to fish growth and fish health.

# Raw material composition

## Goal

- High protein
- Low ash
- All fish dry matter included in the fish meal

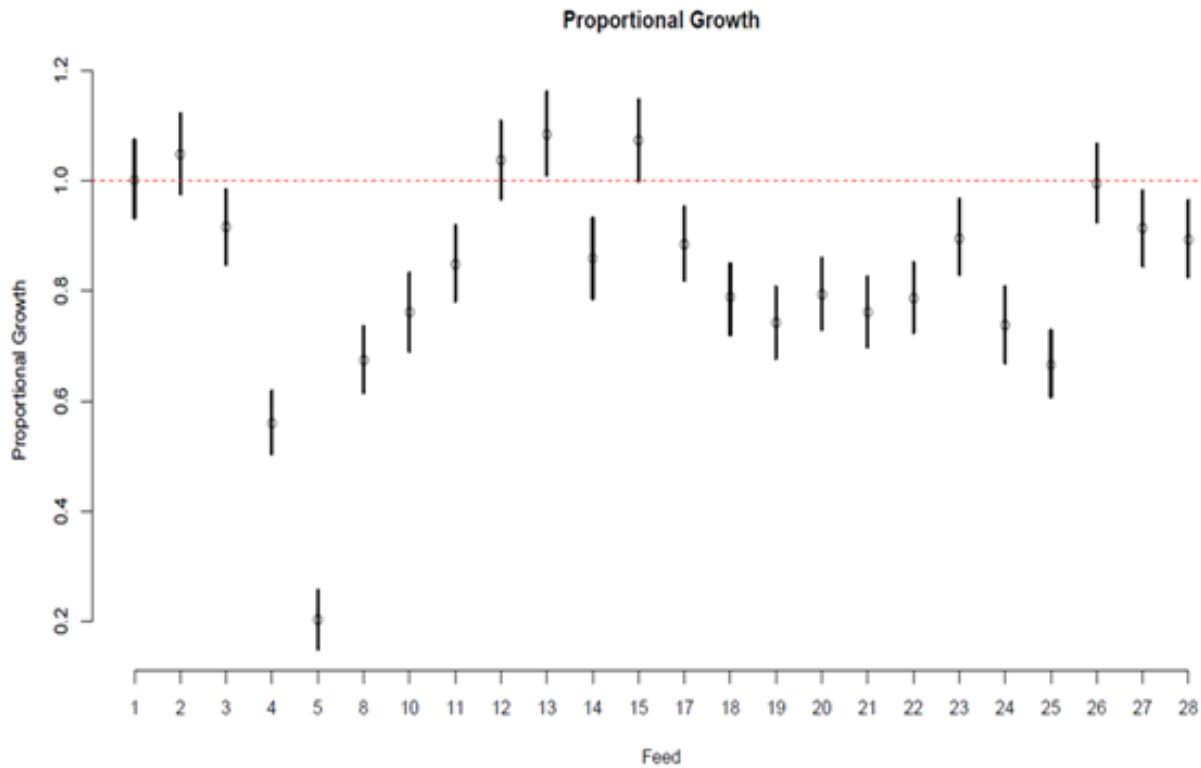


# Freshness of fish raw material


- Microbial growth utilize the nutrients and reduce the nutrients left in the fish meal.
  - Reduce protein level
  - Reduce amino acid content
  - Microbial growth potentially produce growth retarding components.
  - Reduce digestibility







**Great variation in FM performance.**

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- No single parameter describes the performance of the FM. Several parameters have to be known to define FM performance or a model that consider several factors by experience.
  - **There is a need for direct parameters to measure performance**



**Thank you for your attention**