Mowi Emerging Feed Raw Materials Policy

Mowi aims to produce robust, sustainable, high quality salmon using the widest available spectrum of raw materials in the most efficient way. Mowi's inhouse R&D activities are strongly focused on finding and developing a diverse and effective raw material pallet that optimizes salmon health, wellbeing and quality using the most sustainable options wherever possible. As such, emerging feed raw materials play an important role to increase raw material flexibility. Mowi has also in place a policy on sourcing feed raw materials sustainably which can be found at https://mowi.com/sustainability/policies/

Defining Emerging Feed Raw Materials

Emerging feed raw materials are those that have the potential to become part of the feed composition but require further development before full commercialisation. For example elements of the risk-assessment (such as scalability, price, climate footprint etc.) are still a challenge by comparison to existing alternatives.

Target

By 2030, Mowi aims to achieve an inclusion of 10-15% ingredients from emerging feed raw materials[1].

Selection of Emerging Feed Raw Materials

We continuously search for improved feed formulation through R&D. The outcomes of R&D[2] and risk assessment guide our decisions regarding all feed raw materials. Suppliers of emerging feed raw materials are expected to comply with Mowi's Code of Conduct and be assessed by Mowi's Relationship Management Tool.

Today's list of emerging feed raw materials is as follows: krill and krill products; oil, oil-rich and non-oily biomass from heterotrophic and autotrophic microalgae; macroalgae e.g. seaweeds; insect meal and oil; single cell proteins derived from bacteria and yeasts; GM vegetable oils with traits for the production of LC omega-3 fatty acids e.g. those derived from canola or camelina; zooplankton e.g. Calanus; mesopelagic finfish species; pea protein concentrate and isolate; concentrates made from faba beans, sunflower seeds and guar products; barley protein concentrate; and protein enriched co-products from brewing and distilling. This list is not exhaustive and classifications of ingredients will change with time.

The following categories are used in Mowi's risk assessment based on a 5-year timeline:

Nutritional value

Risk is assessed based on R&D and nutritional profile of emerging feed raw materials as compared to existing alternatives. A poorer nutrient profile will lead to poorer FCR, poorer fish performance, health and welfare which have a negative impact on sustainability.

Price competitiveness

Average price (when products are commercially available) of emerging feed raw materials is compared to existing alternatives. When products are not yet commercially available, price is estimated based on dialogue with potential suppliers or other relevant stakeholders. Mowi's formulation program is used to provide feedback on the commercial value of candidate raw materials using templates constructed with real data for new materials supplemented with tried and tested assumptions for the nearest equivalent ingredient to fill in any knowledge gaps.

Certification
Linked with the likelihood that new certification will need to be developed to ensure sustainable and safe sourcing. This risk assessment is based on dialogue with several stakeholders including scientists and potential suppliers.

Climate impact
Linked with the GHG emissions of emerging feed raw materials as compared to existing alternatives. It is important that emerging feed raw materials do not lead to an increase in the scope 3 emissions of Mowi's climate footprint.

Market readiness/availability/scalability
The scalability of emerging feed raw materials is assessed based on available knowledge of current production capacity

Reputation and market acceptance
Linked with the market, including consumers and customers perception of emerging feed raw materials.

Our risk-assessment is evaluated on an annual basis.

Emerging Feed Raw Materials	Origin	Price competitiveness to current alternatives	Certification risk	Climate impact compared with current alternatives	Nutritional value comparison with current alternatives	Reputational risk	Risk of Availability / Scalability	Market acceptance
Krill	Antarctica	Higher in comparison to fishmeal	Low if MSC certification is retained	Comparable to fishmeal	Comparable to fishmeal, better than some veg-based solutions	Depends on how stakeholders view origin	High availability from scientific perspective	Depends on how stakeholders view origin
Heterotrophic, oil-rich algae	US/Brazil	Comparable to fish oil when fish oil supply limited	Low	Comparable with alternatives	Good / excellent	Low	Currently medium risk but, supply is limited	Positive
Heterotrophic, non-oily algal biomass / meal	unknown	Tending to expensive	Low	Comparable with alternatives	Poorer than most protein sources	Low	Low availability	Positive
Autotrophic micro algae (oil)	unknown	Significantly more expensive than fish oil	Low	Should be lower but, depends on other inputs e.g. light, infrastructure, nutrients and processing	Likely to be acceptable	Low	Low availability	Positive
Autotrophic micro algae (biomass / meal)	unknown	Significantly lower value for money than fishmeal and plant-based choices	Low	Should be lower but, depends on other inputs e.g. light, infrastructure, nutrients and processing	Poorer than most protein sources	Low	Low availability	Positive
Macro algae	unknown	Significantly lower value for money than fishmeal and plant-based choices	Low	Neutral / low in production, could be high in processing / distribution	Very low unless heavily processed	Depends where and how it is grown / harvested	Low availability	Positive
Insect meal	Europe	Significantly lower value for money than fishmeal and plant-based choices	Medium	Comparable / not currently optimal in EU due to feedstock quality requirements	Inconsistent, tending to be weaker in general but, performance risk is small	Medium tending to low	Low availability	Positive
Single cell proteins	unknown	Expect to be high / over-priced	Medium	Comparable	Poorer	Low	Low availability	Neutral
GM veg oils (omega 3 canola or camelina)	US	Expect price to reflect fish oil price with scaling	NA for certification. Approved for feeding in Norway but regulatory approval in EU will be limiting factor	Comparable to vegetable oils	Comparable to fish oil / higher than vegetable oils	Tending to low risk based on high scope to replace fish oil	High scalability if EU regulatory approval is secured	Positive (in markets with no GM limitations)
Calanus (Zooplankton)	Norway	Very expensive	No certification available	Possibly, a bit higher than ordinary fishmeal	Currently available feed materials are of low value / utility	Depends who is campaigning and when	Currently, low availability	Tending to low without certification
Mesopelagic sp	unknown	Likely to be comparable with FM and FO	No certification available	Possibly, a bit higher than ordinary fishmeal	Comparable to fishmeal and oil	High in absence of certification and negligible knowledge of ecosystem	Unknown but the potential biomass is very large	Tending to low without certification
Pea protein concentrate, PPC (Isolate)	Europe / Asia	Good	Low	Comparable to equivalent offerings	Comparable to equivalent offerings	Low	Available but, more needed	Positive
Faba Bean Protein Concentrate	Europe	Potentially good	Low	Comparable to equivalent offerings	Comparable to equivalent offerings	Low	Commercially relevant quantities beginning to emerge	Positive
Sunflower Protein Concentrate	Europe	Potentially good	Low	Comparable to equivalent offerings	Comparable to equivalent offerings	Low	Current product needs development but, scalable in principle	Positive
Guar Protein Concentrate	India / Pakistan	Potentially good	Low, but supply chain requires close attention	Comparable to equivalent offerings	Potentially, comparable to equivalent offerings with right processing	Low, but supply chain requires close attention	Current product needs development but, scalable in principle	Positive
Barley Protein Concentrate	Europe / N America	Potentially good	Low	Comparable to equivalent offerings	Comparable to equivalent offerings	Low	Products becoming commercially available	Positive

Footnotes:

(1) In 2022 and 2023, Mowi Feed included 3 and 4% emerging feed raw materials in its feed composition respectively. These materials included algal oils, krill meal and pea protein concentrate.

(2) Between 2015 and year-end 2023, Mowi Feed spent 5.9 MEUR directed towards research on emerging feed ingredients including insect meal, auto and heterotrophic algae, single cell proteins, krill and pea protein concentrate. Specifically, Mowi Feed spent MEUR 1.51, 1.15 and 1 in full years 2021, 2022 and 2023 respectively.

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