



Sustainable Development Report 2023

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CEO view

Omega-3 is not just an important component in our own diets; it is also vital for fish health and welfare. And in recent years, the aquaculture industry has faced challenges in tackling the health and welfare of fish and shrimp. Feed composition – and EPA & DHA – are part of the solution to this problem.

Partly because of this increased awareness of the health benefits derived from Omega-3, global demand for these essential fatty acids is on the rise. Yet, in 2023, the aquaculture industry encountered a problem. Our oceans' already finite supplies of fish oil, which are the principal source of EPA & DHA, became even more uncertain following the effects of El Niño.

This led to a 21% decrease in total cumulative output of fish oil compared to the previous year.

But this supply gap was not entirely unforeseen. The industry has long predicted the need for a fish oil alternative that doesn't put pressure on marine resources. And that's where Veramaris algal oil comes in.

**Gertjan
de Koning**
CEO, Veramaris



In 2023, alongside a rapidly widening EPA & DHA supply gap, global demand for aquaculture and Omega-3 continued to grow. The market price of fish oil rose exponentially, increasing interest in our product. Many of our customers had already tested and approved our algal oil in their fish feed formulations, so the scene was set for us to ramp up our operations to meet this demand.

We are proud to address some of the aquaculture industry's increased need for algal oil, bringing relief to the world's oceans while helping our customers and partners to ensure fish health in a sustainable way. If it weren't for our alternative source of EPA & DHA, the supply gap would be bigger still.

Our algal oil is now a mainstream ingredient used by major aqua-feed producers, as well as in petfood and human supplements.

Knowing our supply chain partners rely on us to continuously reduce our product's carbon footprint, we were also proud this year to register an impressive 27% lower product carbon footprint with the release of an updated Environmental Product Declaration. This was possible thanks to the many initiatives we have been taking to simultaneously decarbonize and improve the efficiency of our operations, resulting in only a small increase in our absolute

GHG emissions. At the same time, we have substantially increased our production volume, leading to a reduction in the product carbon footprint per unit of algal oil produced.

2023 marks a pivotal year for Veramaris, as we not only achieved a record increase in production volumes but also solidified our market position. Now, we are looking to scale up sustainably, streamlining our production processes and forging new partnerships, such as our regenerative agriculture supply chain partnership with Cargill.

Veramaris is no longer just a start-up with an idea – we're here to stay. We have a tangible, proven product that is making a difference for the aquaculture industry.

This fills me with pride, and I am grateful for the work all our Veramaris employees and owners have done to get this far.

In the year ahead, I look forward to our continued sustainable growth journey.



2023 by numbers



100%

Utilization of installed capacity

In 2023, we were able to run our facilities at maximum capacity and prepare for a future scale-up in operations.



50%

Increase in production volume*

Scaling up our production volume to meet growing industry demand was not easy, but we rose to the challenge.



3%

Increase in absolute GHG emissions*

Proving that it doesn't cost the earth to scale up our production, because we're taking action to decarbonize our operations.



16,000+

Views of our Powering blue food with nature's source of Omega-3 film, produced together with Ocean Titans

We're proud of each and every one of our value chain partnerships, and this production showcased our collaborative efforts with Grieg Seafood and Skretting in action.



3

Scientific papers published documenting performance of algal oil and essentiality of EPA & DHA

We take proof of concept seriously, and with the demand for fish oil alternatives steadily growing, we are committed to showcasing the benefits of our product.



27%

Reduction in product carbon footprint**

We're committed to ensuring we reduce our product's GHG emissions wherever we can, and in 2023, our efforts paid off.



22.5%

New science-based Scope 3 reduction target*

With this new target, we strengthened our commitment to being as sustainable source of Omega-3 (EPA & DHA) as we can be.

* Compared to baseline year 2021

** Compared with the Environmental Product Declaration (EPD) Version 1 published in May 2022

Progress update 2023

Progress update 2023



Our commitment

→ To manage our absolute energy use and GHG emissions to reduce the product carbon footprint and achieve our SBTi (Science Based Targets Initiative) commitment by 2030.

To improve the potency and fatty acid profile of our product, while further strengthening applied research documentation and maintaining our ASC-MSC certification.

2023 Update

-
- Our absolute GHG emissions increased by less than 3%, whilst our product volume increased by almost 50%, compared to the baseline year 2021.
 - We registered an incredible 27% reduction in our product carbon footprint compared with our previous Environmental Product Declaration (EPD) in 2022.
 - Adding to our SBTi commitments, we announced our first Scope 3 GHG emissions reduction target to reduce absolute Scope 3 emissions by 22.5% by 2030, compared to a 2021 baseline.

→ **For more details, read: Our emissions.**

- We attained 64.3% weighted average EPA & DHA potency across all batches produced in 2023, meeting our target for 64-66% peak area.
- We renewed our ASC-MSC certification at our Blair site for a further three years.
- We renewed our external FAMI-QS and ISO9001 certifications, so customers can be sure that our product meets strict safety and quality feed manufacturing standards.
- We obtained a Kosher certification.

- We published three new peer-reviewed scientific publications, documenting the benefits of Omega-3 (EPA & DHA) for aquaculture.
- **For more details, read: Healthier feed for healthier fish and shrimp.**



Progress update 2023



Our commitment

→ To optimize efficiency in the use of utilities and raw materials in our production process, ensuring our team is trained to operate and maintain the assets safely and smartly, accompanied with an open mindset for continuous improvements.

To support our value chain partners to put more ‘powered by algae’ seafood products on supermarket shelves and restaurant menus across the world.

2023 Update

-
- We committed to optimizing our utilities through technology improvements, resulting in 50% lower specific steam consumption, 25% lower specific electricity consumption and 5% lower specific raw material consumptions.
 - We began our efforts to attain the ISO 50001 certification, which will be a structured approach for continuous energy reduction in the years to come.
 - We invested in additional monitoring equipment (e.g. flowmeters on chillers), enabling improved tracking of equipment efficiency to aid smart operational decisions.
-
- We saw the benefits of our continuous investment in R&D.
→ **For more details, read: Advancing our climate commitments.**
 - We participated in the **NON-Fôr project** examining alternative sources of Omega-3 (EPA & DHA) in fish feed.
 - We joined Cargill’s **RegenConnect program** to work towards decarbonizing our value chain.
 - We joined forces with our partners for the **sustainable shrimp value chain collaboration**, bringing more sustainable shrimp to European consumers.
 - We worked with Manolin to instigate a first-of-its-kind **Big Data study** to understand more about the effects of dietary Omega-3 in Norwegian salmon farming.
 - We took part in the **Fish for Health** study to examine the performance of Veramaris’ algal oil in shrimp feed.
 - We published a **landmark study** on the inclusion of algal oil in Atlantic salmon feed, partially and fully replacing fish oil.
 - We partnered with Blumar and Skretting to support Walmart’s ambition for **ocean regeneration.**

A partner for **sustainable growth**

The 2030 Agenda for Sustainable Development – adopted by UN member states in September 2015 – lays out 17 Sustainable Development Goals (SDGs) for creating a world where

“consumption and production patterns and use of all natural resources – from air to land, from rivers, lakes and aquifers to oceans and seas – are sustainable.”

Reaching these goals is an important challenge for us all. And at Veramaris, we're ready to meet this task head on.

For this reason, six key SDGs are ingrained in our short and long-term business goals, acting as a guiding framework for our sustainability commitments.

In line with SDG 17, we see partnerships as one of the key ways to expand our impact. Collaborating with partners up and down our value chain is the backbone of our efforts to achieve our climate goals and contribute to more sustainable aquaculture.

➔ **See 5 more**
sustainability focus areas.



**SUSTAINABLE
DEVELOPMENT
GOALS**

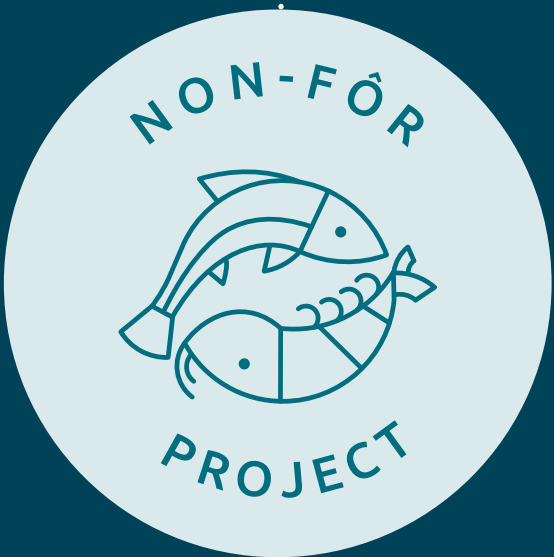


Partnerships for the goals

With relationships
based on trust and

respect, Veramaris is partnering with all stakeholders along the value chain who are committed to growing aquaculture as a healthy and sustainable food system, while respecting planetary boundaries and striving for healthy nutrition.

How we fostered partnerships in 2023



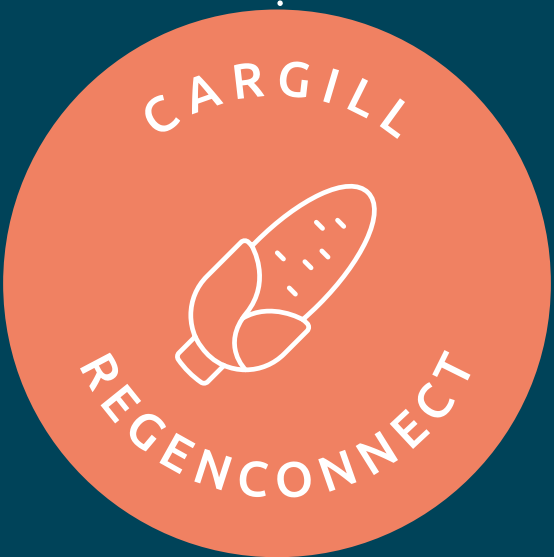
We took part in the NON-Fôr project, launched to develop high-performance solutions for the sustainability of aquafeed.

➔ [Read the spotlight story](#)



We joined forces with Blumar and Skretting to support Walmart's ocean regeneration goals by using algal oil in feed, reducing the dependency on wild fish stocks.

➔ [Read the spotlight story](#)



We partnered with Cargill as part of their RegenConnect program to reduce the environmental impact from our corn supply chain.

➔ [Read the spotlight story](#)



We worked with Manolin to leverage their expertise in Big Data collection and analysis, to clearly demonstrate the impact of EPA & DHA.

➔ [Read the spotlight story](#)



To increase the availability of sustainable shrimp in European supermarkets, we collaborated with Klaas Puul, Skretting, Protix and Albert Heijn – all key players across the shrimp value chain, from feed supplier to supermarket shelves.

➔ [Read the spotlight story](#)



As part of the Fish for Health project, aiming to promote consumption of healthy fish, researchers at the Universidad de São Paulo studied the benefits of including Veramaris algal oil as an alternative source of Omega-3 in shrimp feed.

➔ [Read the spotlight story](#)



Sustainability focus areas



Zero hunger

Human population growth and better living standards across the globe are increasing demand for animal protein, including farmed fish and shrimp. Aquaculture is part of the solution, but its expansion places growing pressure on wild fish stocks and bycatch caught for the production of fish oil needed to supply farmed animals with Omega-3 (EPA & DHA). Our unique algal oil solution can help aquaculture grow to meet that increased demand and close the supply gap.



Responsible consumption and production

By including algal oil containing high concentrations of Omega-3 (EPA & DHA) in their fish feed, fish farmers can ensure the nutritional requirements for the animals they are farming, hence protecting their health and welfare. Healthier animals offer better yields with less waste and more sustainable farming. At the same time, we reduce dependency on wild fish stocks as a source of fish oil for these critical nutrients.



Good health and well-being

Health authorities recommend the regular intake of Omega-3 Long Chain Polyunsaturated Fatty Acids (LCPUFAs), with suggested doses of up to 250 – 500mg/day. Oily fish, such as salmon, are considered one of the best dietary sources of Omega-3 (EPA & DHA). Maintaining high levels of Omega-3 fatty acids in aquaculture products is crucial for enhancing the overall health and well-being of people.



Climate Action

By committing to SBTi and taking actions to decarbonize our operations and reduce our product carbon footprint, we recognize the critical role the private sector can play in the world's transition to a low-carbon economy. Reducing dependency on wild fish stocks as the primary source of Omega-3 (EPA & DHA) will help to avoid overfishing in our oceans, which [regulate the global climate](#) and serve as the world's largest store of carbon.



Life below water

Our algal oil helps to reduce dependency on wild caught fish as the primary source of Omega-3 (EPA & DHA) for aquaculture feed, creating opportunities to avoid overfishing. Forage fish dependency is a key marine metric for the [WWF Sustainable Basket Metrics](#), which aims to halve the impact of UK shopping baskets by 2030, and also for the [Earthworm Foundation Aquafeed Initiative](#): A collective ambition to shift the French market towards aquaculture using responsibly sourced aquafeed ingredients.

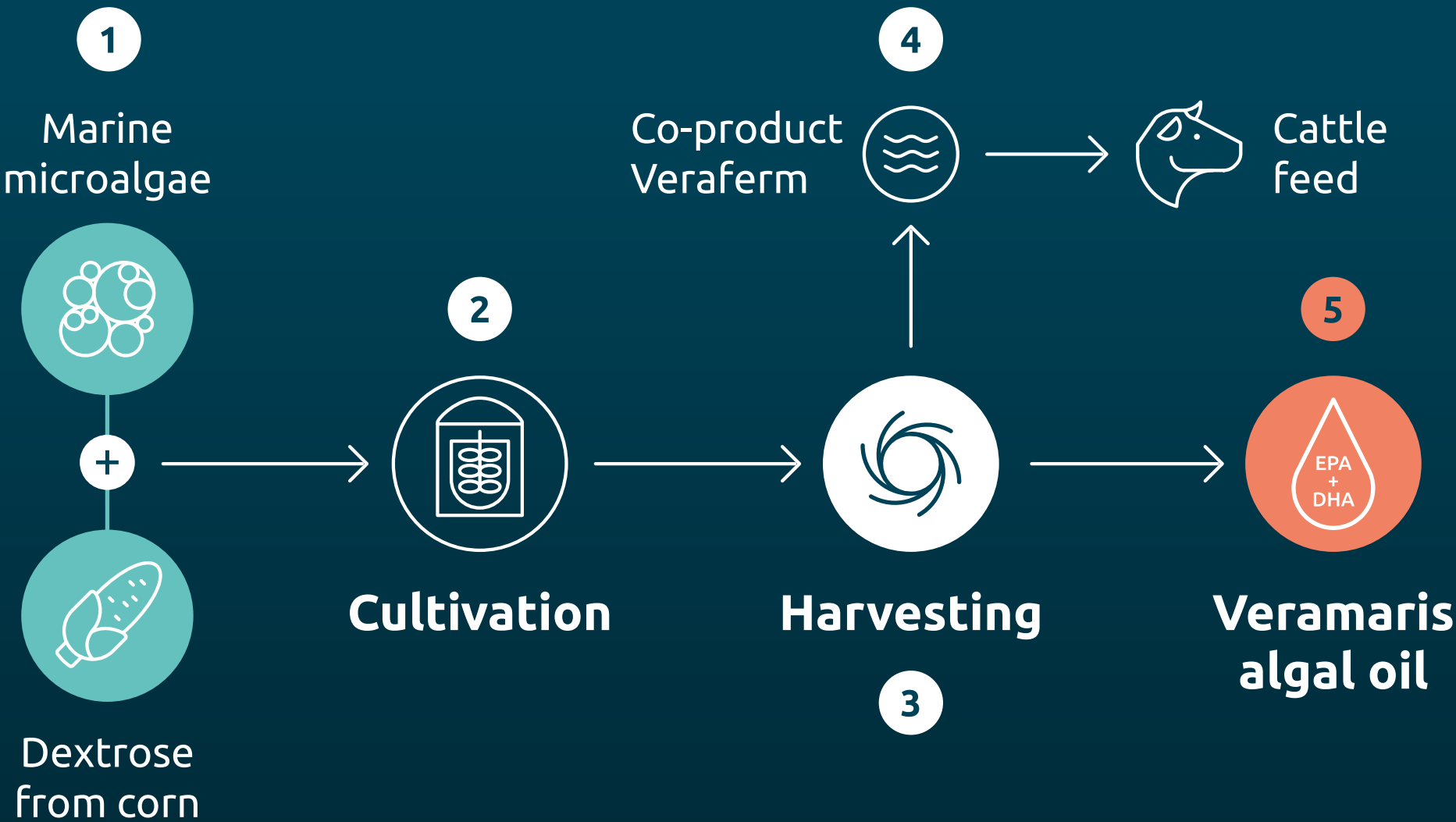
How it's made

How it's made

Veramaris ferments natural microalgae at a state-of-the-art facility in Blair, Nebraska, to yield a nutrient-rich oil full of essential Omega-3 EPA & DHA fatty acids. The zero-waste process includes cultivation, harvesting, and an efficient extraction method that not only yields nutrient-rich oil but also generates Veraferm, a valuable co-product for cattle feed.



Watch the “How it’s Made” video to learn more.



1 Nature’s source
We need just 2 key ingredients to make our algal oil: natural marine microalgae found deep in the ocean and locally produced corn, a source of dextrose. This is a result of 35 years of intensive research, including the study of some 6,500 different microalgae, and a sophisticated biotechnology.

2 Cultivation
We begin cultivating the algae by mixing raw material with water and pumping it into a series of fermenters that contain the precise balance of nutrients and vitamins necessary for the microalgae cells to flourish and to accumulate high levels of EPA & DHA.

3 Harvesting
When the algae cells are brimming with oil, they are carefully opened and the highly concentrated algal oil is separated from the liquid co-product Veraferm.

4 Co-product Veraferm
The liquid co-product generated during this waste-free process is used to feed cattle, supporting the circularity of production. Studies, including one published in *Applied Animal Science*^{*}, indicate that using Veraferm as feed can even provide health benefits for cattle.

5 Algal oil
The result is Veramaris algal oil. With a concentration of 65% EPA & DHA, Veramaris algal oil delivers a potency that is up to five times that of traditional fish oil sources. This not only helps to reduce the reliance on wild fish stocks, but also provides a consistent and scalable supply of these nutrients.

^{*} J. C. Gibbons,1 B. M. Boyd,1 H. C. Wilson,1 J. W. Wilson,2 K. H. Wilke,3 PAS, G. E. Erickson,1 PAS, and A. K. Watson,1 * PAS, 2023, Evaluation of condensed algal residue solubles as an ingredient in cattle finishing diets and the effects on digestibility and fatty acid flow, *Applied Animal Science*, 39:133–145

Climate commitments

Climate commitments

In August 2022, Veramaris committed to reducing its greenhouse gas (GHG) emissions by setting a science-based target to achieve a 38% reduction in absolute Scope 1 and Scope 2 emissions by 2030 (from a 2021 base year).

In 2023, we were pleased to strengthen our climate commitment by announcing our first Scope 3 reduction target. This new target aims to reduce our absolute Scope 3 emissions by 22.5% by 2030 (compared to a 2021 baseline), solidifying our commitment to the science-based target we set in August 2022. The Science Based Targets initiative (SBTi) is leading the way to a zero-carbon economy, driving ambitious climate action in the private sector by enabling companies to set science-based emissions reduction targets.

Through our own commitment to decarbonize, we help our customers throughout the value chain address their Scope 3 emissions, while also creating additional transparency in their downstream supply chains. In the food sector, retailers recognize that Scope 3 emissions account for the majority of their GHG emissions, and therefore rely on supply chain engagement to help them meet their reduction targets.

Our new targets will lead to lower emissions for partners all along the value chain and ultimately, a more sustainable product for consumers. By engaging with suppliers at various stages of our production process, including suppliers of steam and corn sugar ([see RegenConnect](#)), we are also working to ensure energy efficiency and reduction throughout our supply chain.



A full version of the Veramaris GHG emissions report is available [here](#).

SCOPE 3 TARGET

–22.5%

We aim to reduce our Scope 3 emissions by 22.5% by 2030 (Baseline 2021).

Our emissions in 2023

In 2023, we did more than just set ambitious climate targets – we also began to make headway in achieving them. This year saw Veramaris register an incredible 27% lower product carbon footprint in an updated Environmental Product Declaration (EPD).

As we do not disclose our production volumes and revenues at facility level, we share our product footprint data directly with our customers, via our EPD.

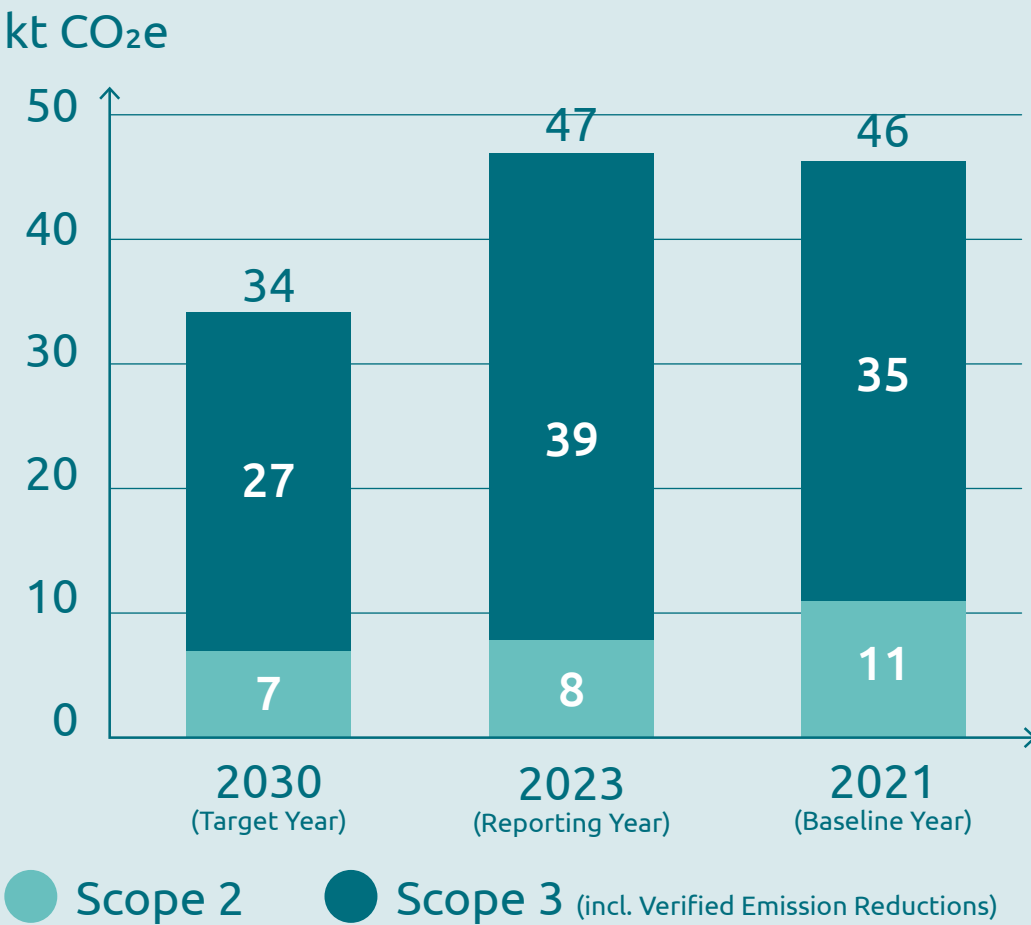
“We know how important it is for our customers to reduce the carbon footprint of the seafood value chain, and we’re pleased to help through our climate actions.”

Gertjan de Koning,
CEO Veramaris

Due to our efforts to make our production process more efficient, we were able to reduce the specific CO₂ emissions for each kilogram of product by implementing process efficiencies to reduce both steam and dextrose demand.

In 2023, our absolute GHG emissions increased by less than 3%, whilst our product volume increased by almost 50%.*

Absolute Emissions* of Veramaris (kt CO₂e):



* Compared to baseline year 2021.

* See GHG report for details

Our key emissions drivers

Aligning with the UN’s 2030 Agenda for Sustainable Development is ingrained throughout our business operation. One of the six key SDGs Veramaris has identified as part of our sustainability commitments is UN SDG 13 – Climate Action. Taking actions to decarbonize our operations wherever possible is an important challenge that we’ve been tackling through two main drivers: our corn supply, and our energy usage.

KEY DRIVER #1:

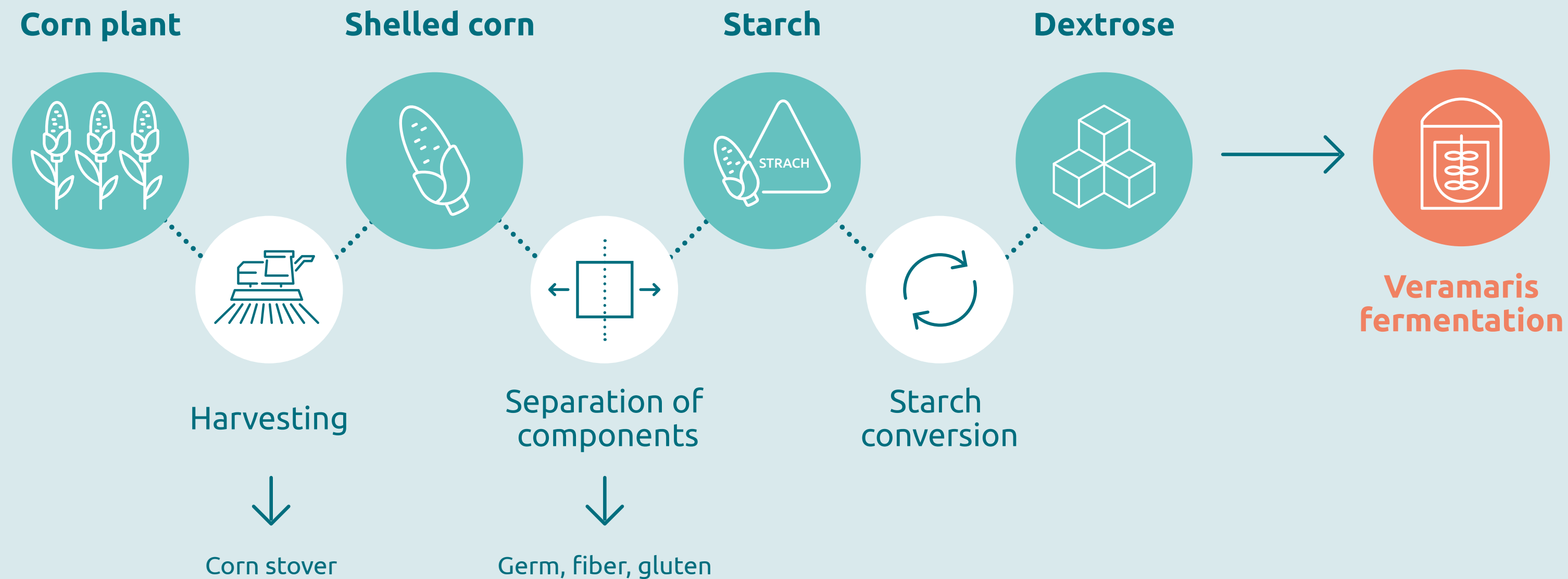
Our corn supply



KEY DRIVER #2:

Our energy usage





Key driver #1: **Our corn supply**

Veramaris' production facility benefits from its strategic location in Nebraska, enabling direct access to locally produced corn, a source of dextrose and an essential substrate for our fermentation process. We procure this corn from a network of 16 counties – half in Nebraska and half in Iowa – ensuring high-quality dextrose for our operations.

Our choice of corn as a source of dextrose is intentional: it is a high-yielding crop that generates minimal waste. Almost every part of the corn kernel is utilized, reflecting our commitment to efficiency and waste reduction.

The production of raw materials like dextrose constitutes the largest share of Veramaris' carbon footprint, categorized under Scope 3 emissions. Recognizing this, we prioritize collaboration with suppliers who are equally committed to sustainable practices.

SPOTLIGHT
PROJECT



RegenConnect

At Veramaris, we source 100% of our dextrose from Cargill, a leading global agribusiness company. In early 2023, we joined Cargill’s RegenConnect program, aimed at mitigating climate change, regenerating soil, and improving water use.

Cargill RegenConnect promotes regenerative agricultural practices among farmers, such as no-till farming, reduced-tillage techniques, and the use of cover crops. These practices help sequester carbon in the soil, improve soil resilience, and minimize water use. Participating farmers receive compensation for implementing these practices which not only helps the environment today, but improves the soil for future generations.

Through our collaboration with Cargill and the adoption of regenerative agriculture practices, we have achieved verified reductions in our Scope 3 greenhouse gas (GHG) emissions. While insetting a portion of our Scope 3 emissions incurs additional costs, we are resolutely committed to reducing our emissions wherever possible. Our participation in RegenConnect represents the first step in this ongoing commitment.



What is regenerative agriculture to Veramaris?

Regenerative agriculture are farming practices that conserve ecosystems, boost soil health, improve biodiversity and “on top” enable the removal of carbon dioxide from the atmosphere via sequestration in the soil. Hence, regenerative agriculture practices lead to long-term benefits for the farmer and the local ecosystem while having the potential to make a substantial contribution to our Scope 3 emissions reduction targets.

The largest share of Veramaris’ carbon footprint is associated with the production of our raw materials, which falls under Scope 3. Collaborating with suppliers who commit to regenerative agriculture practices is an important step towards meeting our SBTi commitments.

“Regenerative agriculture helps Veramaris to reduce its Scope 3 emissions through insetting.”

What benefit does Veramaris' partnership with Cargill bring for the aquaculture value chain?

By promoting regenerative agricultural practices, we are helping farmers not only to revitalize the soil health of their fields but also sequester carbon. This way, the carbon footprint of one of our main raw materials can be reduced.

What's the project's long-term goal?

Cargill is committed to enabling farmers to adopt regenerative agriculture practices across 10 million acres of land in North America by 2030. This, in turn, helps Veramaris to reduce its Scope 3 GHG emissions through insetting – so reducing the emissions within Veramaris' own value chain – and thus to get closer to achieving Veramaris' climate targets.

Why are initiatives like this important for the aquaculture industry?

Not only does this bring positive environmental benefits, which is important as we work to decarbonize our value chain, but it also increases the resilience of farming practices, thereby future-proofing the aquaculture industry.

Are there any challenges in accounting for emissions reductions from regenerative agriculture?

For soil carbon sequestration to have a positive effect on the climate, long-term storage is critical. The GHG Protocol – the main guidance body for carbon accounting – addressed this by integrating a permanence principle into its 2022 [draft of the Land Sector and Removal Guidance](#). By implementing a Reversal Reporting Plan, Cargill aims at ensuring a long-term storage. In 2024, the GHG Protocol plans to publish its Land Sector and Removals Guidance, then the exact requirements for an accurate carbon accounting of carbon sequestration will become clear. This will help Veramaris to pursue its climate strategy in line with the latest carbon accounting guidelines.



Stefan Lübke,
Life Cycle
Management,
Evonik



Key driver #2: Our energy usage

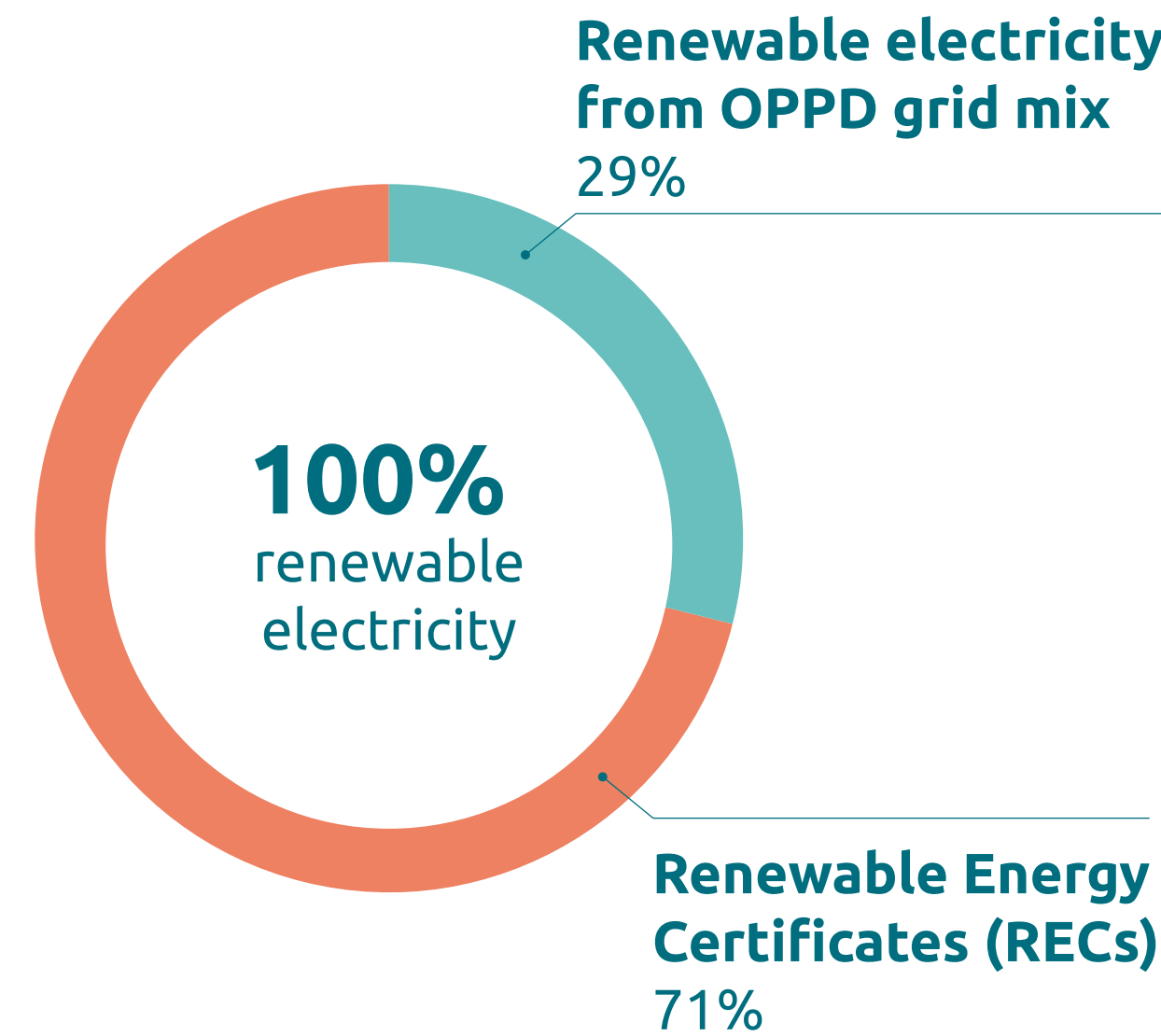
We understand that implementing more energy efficient technologies and practices is an important avenue for reducing our own environmental footprint. This year, we have seen improvements in energy and emissions reductions, respectively.

Reducing our energy usage

We have set goals for reducing energy in our operations and this commitment has led to a significant reduction in consumption. In 2023, specific steam usage decreased by 50%, and specific electricity usage by 25% compared to last year.

When it comes to our operations, we know that our people are our experts. So last year, we held a focused workshop on steam utilization, combining the wisdom from dsm-firmenich,

Evonik and Veramaris. This effort generated a pipeline of over 60 innovative ideas to reduce steam consumption. We have already successfully implemented several of the initiatives, including one on steam trap monitoring and another on maintenance and heat recovery.



Where do we get our electricity?

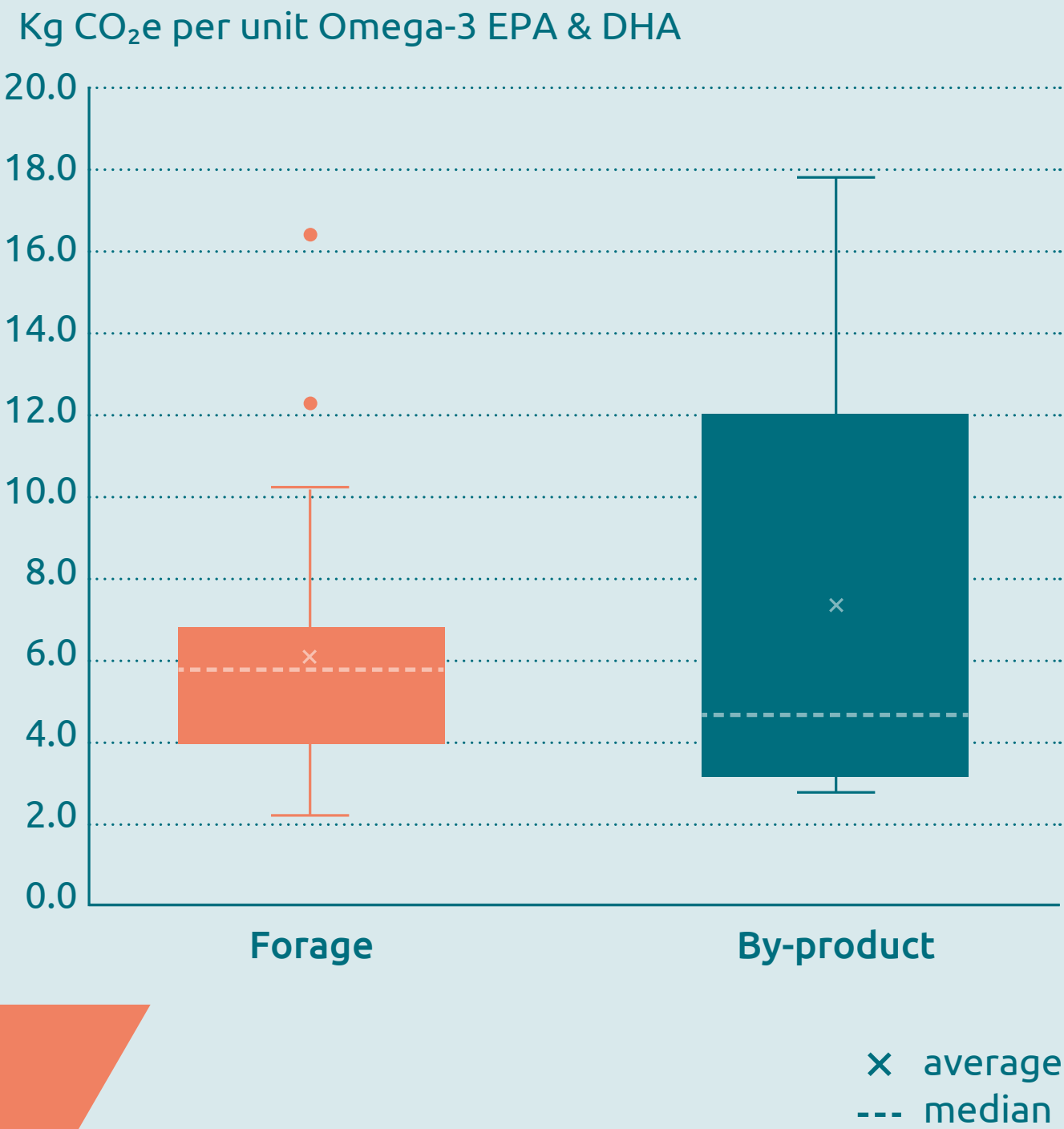
100% of the electricity used in production comes from renewable sources. We source our electricity from the Omaha Public Power District (OPPD), which last year generated 29% of its retail electricity sales from renewable sources. A significant portion of this electricity comes from wind power. OPPD is actively working to expand its renewable electricity portfolio by constructing an additional 1000–1500 MW of solar and wind power by the end of 2030. The remaining 71% of our electricity mix is covered through the purchase of Renewable Energy Certificates (RECs).

Carbon intensity in focus: fish oil vs algal oil

In the past, one concern about using algal oil as a replacement or as a supplement for fish oil in aquafeed was its comparative carbon footprint. But this thinking often overlooked one key differentiator between these ingredients: Omega-3 potency.

Since fish oil supplies are limited, there is a clear need for alternative sources of essential Omega-3 fatty acids. Veramaris algal oil is proven to have a particularly high concentration (65%) of these fatty acids, whereas fish oil potency typically ranges between 15% to 28%. When adjusting for Omega-3 potency the carbon footprint of algal oil can already match that of some blends of fish oil.

Global Warming Potential (GWP) of fish oil sources per 1 kg Omega-3 EPA & DHA



Source: Veramaris analysis of published data

Fish oil has high variability of the carbon footprint and depends on source, fishing method, oil yield and other factors.

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Ocean Relief

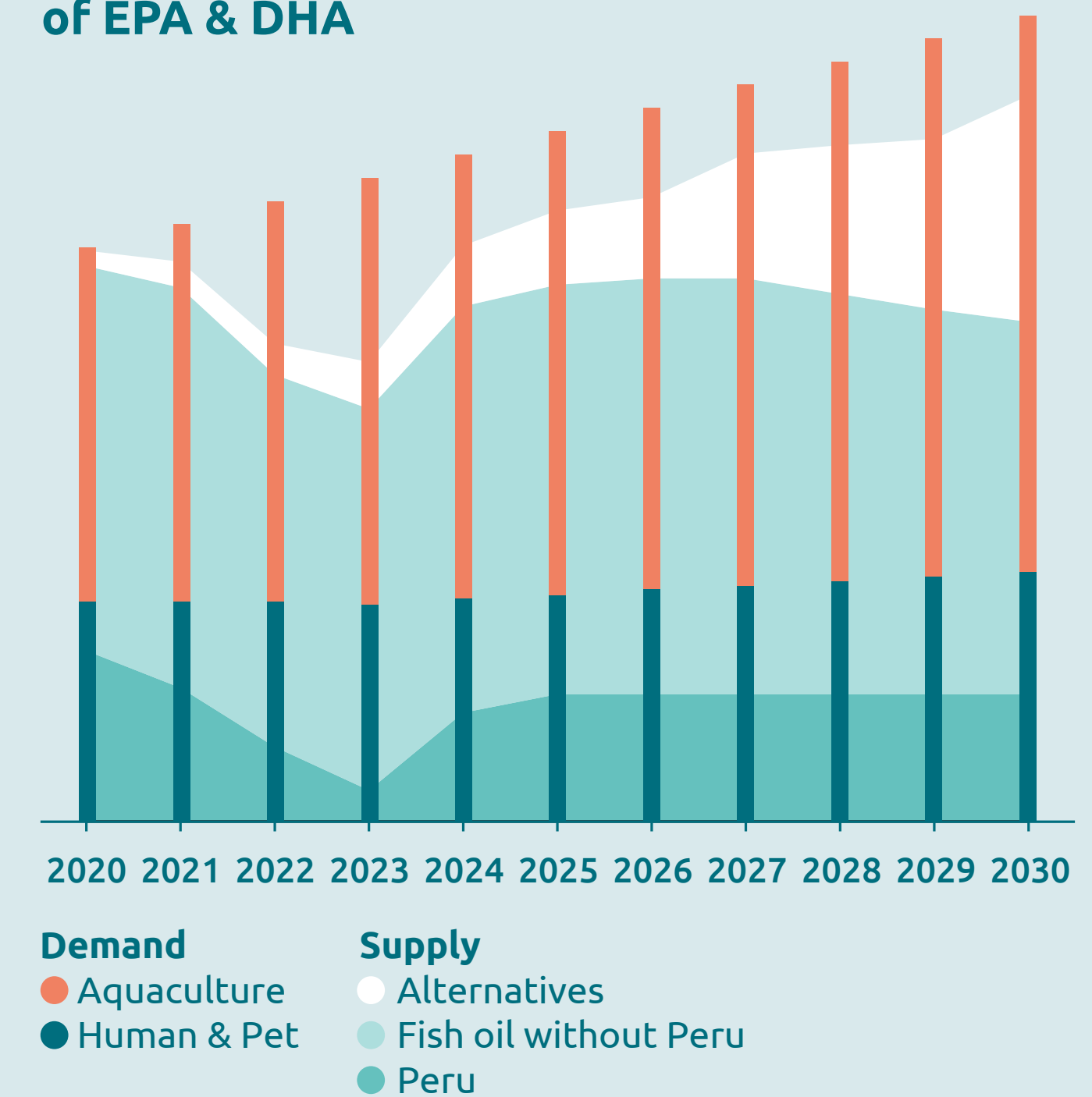
Ocean relief

The future is blue. **By 2050, the world is likely to eat twice as much blue food** – fish, shellfish and algae that are caught or cultivated in fresh or saltwater – than in 2015.

At its core, Veramaris aims to provide for the future by supporting aquaculture growth, while also providing relief for the oceans wherever possible. In 2023, we have seen that there are not enough sources of certified sustainable fish oil to support the global growing demand for seafood.

With the global fish oil supply uncertain due to uncontrollable circumstances, including El Niño, the supply and demand gap is only growing bigger. That is why companies are pursuing initiatives like **Earthworm's aquafeed project**, which aims to shift aquaculture towards using more sustainable feed ingredients by bringing supply chain stakeholders together around collective objectives, such as reducing the forage fish dependency ratio for fish oil to FFDRoil <1.

Supply and demand dynamics of EPA & DHA



Source: Veramaris analysis

Measuring how algal oil can reduce forage fish dependency in aquafeed

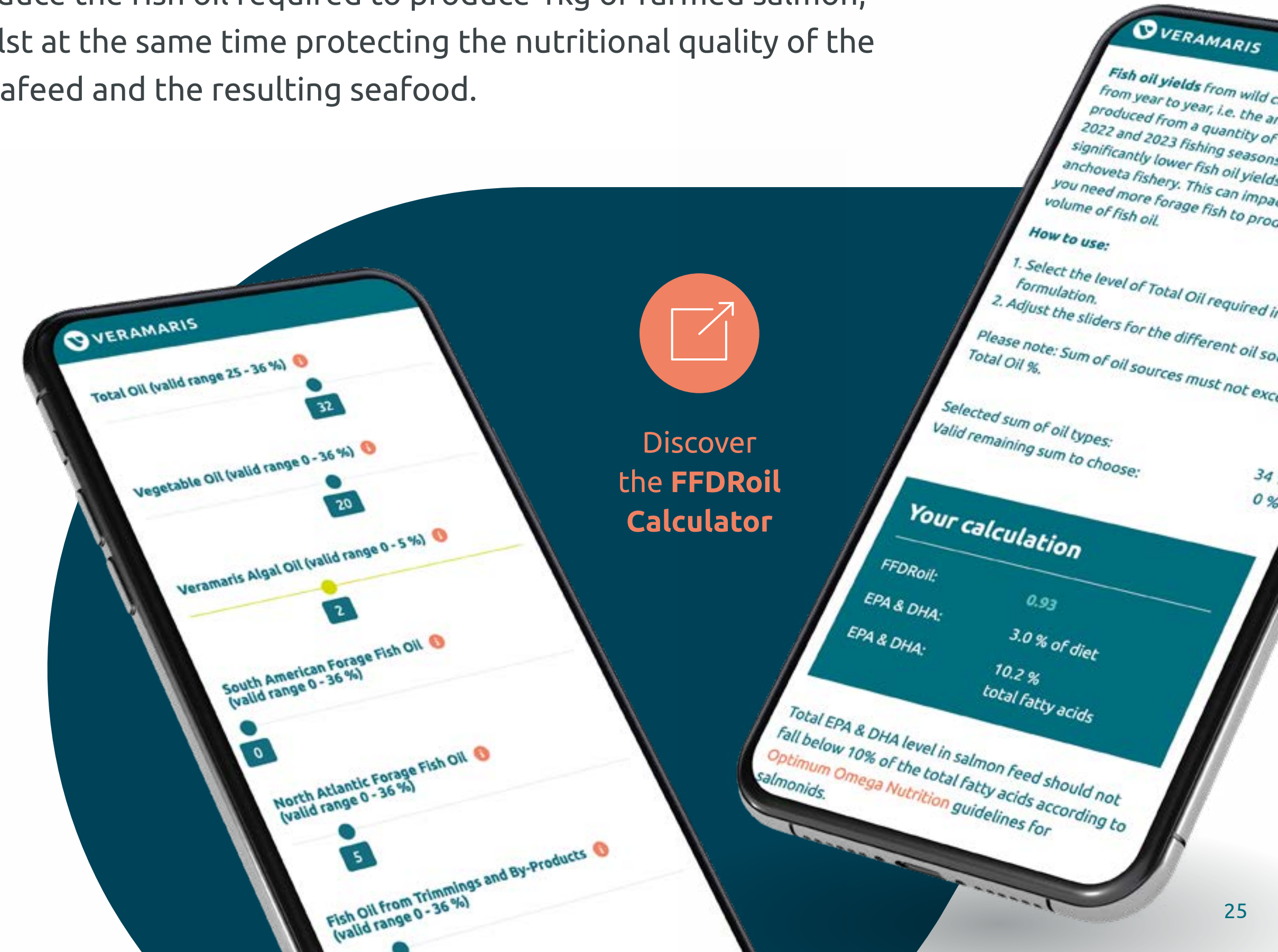
Veramaris algal oil has repeatedly shown itself to be a reliable alternative to fish oil, and now, thanks to our [FFDRoil Calculator](#), we can quantify how algal oil can help the aquaculture sector reduce its reliance on the finite resources of the marine environment.

The forage fish dependency ratio for fish oil (FFDRoil) calculates the quantity of fish oil sourced from forage fish used to produce a quantity of farmed salmon. WWF set a FFDRoil <1 target in their [WWF Basket](#) metrics, an initiative that is supported by several retailers.

The [Earthworm Foundation Aquafeed Initiative](#) also targets FFDRoil <1 as a way to decrease aquafeed's reliance on reduction fisheries. But aquafeed formulators have long since relied on fish oil as a valuable source of essential fatty acids for farmed fish.

So, how can algal oil help to meet these targets?

The partial substitution of fish oil with algal oil and vegetable oil enables aquafeed producers to use less than 1kg of forage fish to produce the fish oil required to produce 1kg of farmed salmon, whilst at the same time protecting the nutritional quality of the aquafeed and the resulting seafood.



SPOTLIGHT PROJECT

**i**

Read an extract from our study:

“The utilization of algal oil also minimizes dependency on marine resources as measured by the forage fish dependency ratio for fish oil (FFDRoil), thereby improving the sustainability of aquafeeds. The FFDRoil decreased from 2.54 to 0, demonstrating that the inclusion of algal oil instead of fish oil can improve the marine footprint during the grow-out phase.”*

* Page 876 from: Santigosa, E., Olsen, R. E., Madaro, A., Trichet, V. V., & Carr, I. (2023). Algal oil gives control of long-chain omega-3 levels in full-cycle production of Atlantic salmon, without detriment to zootechnical performance and sensory characteristics. *Journal of the World Aquaculture Society*, 54(4), 861–881. <https://doi.org/10.1111/jwas.12947>

Algal oil enables the sustainable growth of Atlantic salmon aquaculture

There is an urgent need to scale up supply of alternative sources of Omega-3 (EPA & DHA). Currently, global demand for seafood is increasing, but the marine resources used to produce fish oil are limited and consequently, the levels of EPA & DHA in salmon fillets have decreased. Algal oil contains high levels of both of these Omega-3 fatty acids and is a cost effective and proven alternative that increases supply without taking more fish from the sea.

In 2023, Veramaris published a [landmark scientific paper](#) in the [Journal of the World Aquaculture Society](#), demonstrating how algal oil gives control of long-chain Omega-3 levels in full-cycle production of Atlantic salmon.

Our results confirmed that algal oil can partially and fully replace fish oil. Its inclusion in fish feed can enable the sustainable growth of Atlantic salmon aquaculture by helping to maintain and control a level of EPA & DHA in the fish fillet – without detriment to zootechnical performance and sensory characteristics, while simultaneously contributing to a reduced marine footprint for aquafeeds.

This research is of great importance to the aquaculture industry as up until now, the replacement of fish oil with algal oil has not been studied comprehensively over the full life cycle of the fish. The demand for seafood will only continue to grow, and algal oil is paving the way as a healthy, sustainable replacement for uncertain sources of fish oil in feed.

SPOTLIGHT
PROJECT

“Data obtained here reinforces the fact that algal oil can effectively be used as a primary source of EPA & DHA in salmon feed.”

What are some of the most interesting findings from the study?

The paper closed an important gap in the research of alternative ingredients, for the first time assessing the impact of algal oil in diets covering the full production cycle of farmed salmon. Moreover, the maintenance of zootechnical performance and sensory characteristics combined with a higher nutritional value of the fillet for the consumer, show that the ingredient can support the sustainable growth of salmon farming within planetary boundaries.

What long-term impact could the study have on the industry?

This study is helping to promote the commercial adoption of algal oil as a standard part of the formulation, helping to reduce the reliance on marine resources and driving positive long-term impacts on sustainability and product quality.

Why is research into alternative feed ingredients important?

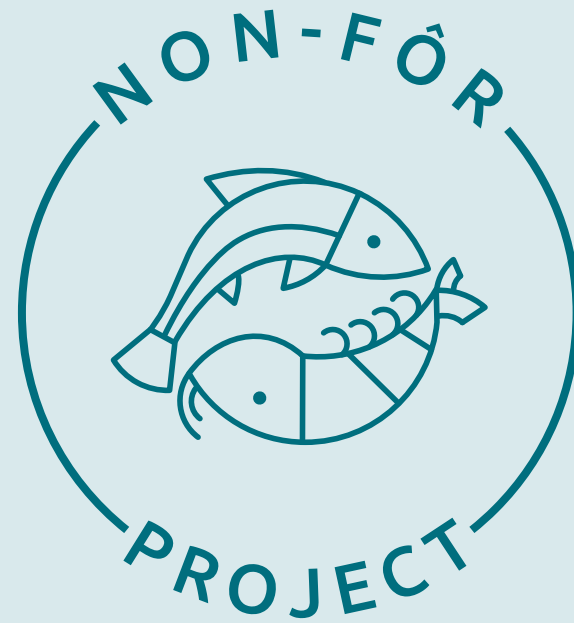
It's essential for promoting sustainability, minimizing environmental impact, and ensuring the long-term viability of the industry. Controlled use of alternative ingredients can enhance precision farming by reducing batch-to-batch variability. This empowers farmers to maintain nutritional standards in the feed, resulting in fewer downgrades at harvest and food losses.



Ester Santigosa
Global Innovation Lead
Aquaculture,
dsm-firmenich



SPOTLIGHT PROJECT



The NON-Fôr project

The NON-Fôr project was launched to gather knowledge and find sustainable solutions for aquafeed within the Nordic aquafeed community. Researchers in the NON-Fôr project conducted a feeding experiment in Northern Norway to develop and examine various high-quality, high-performance fish feed types. The aim was to reduce dependency on wild fish stocks and to assess the impact of novel feed ingredients on fish health and sustainability. The feed ingredients were analyzed in terms of adaptability for commercial production facilities.

Veramaris was proud to be one of the key feed ingredient suppliers taking part in the project. Three diets were used in the experiment, a control diet with fish oil, and two others replacing 50% and 100% of fish oil with Veramaris algal oil. As expected, after a nearly two-year-long commercial-like feeding study, spanning from the freshwater to seawater stages of Atlantic salmon,

results showed the efficacy of feeds containing Veramaris oil.

Pre-adaptation to smoltification, growth and welfare of the fish and the produced fillet quality were neither positively nor negatively impacted by the diets. The outcome of the study is that a modest inclusion of 2–3% Veramaris oil, which is rich in EPA & DHA, in combination with a plant oil can potentially reduce dependency on fish oil in salmon feeds. The project's tasting panel also noted added benefits of including algal oil in fish feed on the sensory performance of the fish fillet.

Building upon [earlier scientific studies](#)^{*}, the project provided further evidence that Veramaris algal oil is an effective, reliable ingredient in feed formulations. The project's findings will be distributed over the coming year at conferences and in peer-reviewed publications.

* Algal oil improves control of long-chain omega-3 levels in Atlantic salmon, without detriment to zootechnical performance and sensory characteristics – Veramaris

“With the quality of Veramaris algal oil, it is preferable to include it as an ingredient.”

What were the key issues that this project aimed to address?

We wanted to address the main concerns around sustainable feed ingredients and drive the push that we need to find new alternatives because the ingredients we're using today are taking a toll on fish health and are not seen as sustainable.

Why is it necessary to find new sources of Omega-3 fatty acids, from a health perspective?

On the health side, we are using less and less fish oil, so the fish has an imbalance between Omega-6 and Omega-3 fatty acids. This, in turn, has a negative effect on fish health.

Were there any highlights within the project's results?

The project's results show that mealworm and black soldier fly meal are very good sources of protein for fish – and combined with Veramaris' algal oil, we had some very promising results. It is a good solution for future fish feed.

What does this mean for Veramaris' algal oil in particular?

Doing this kind of research, if there is a problem you aren't aware of, you're going to find out about it. And one of the promising things about Veramaris is that now, there have been many studies done where their algal oil has been used to replace fish oil, and we haven't seen any of these problems. With the quality of Veramaris algal oil, it is preferable to include it as an ingredient.



Prof. Mette Sørensen
Project leader,
Nord University,
Bodø, Norway



SPOTLIGHT PROJECT



Veramaris, Skretting and Blumar support Walmart on Atlantic salmon sustainability initiative

Last year, we collaborated with the salmon company Blumar and their feed producer Skretting to innovate a feeding protocol for [Optimum Omega Nutrition \(OON\)](#) with feeds that were rich in Omega-3 (EPA & DHA) using Veramaris algal oil. This approach helped to meet the nutritional requirements of Blumar's salmon for improved health, welfare and quality outcomes.

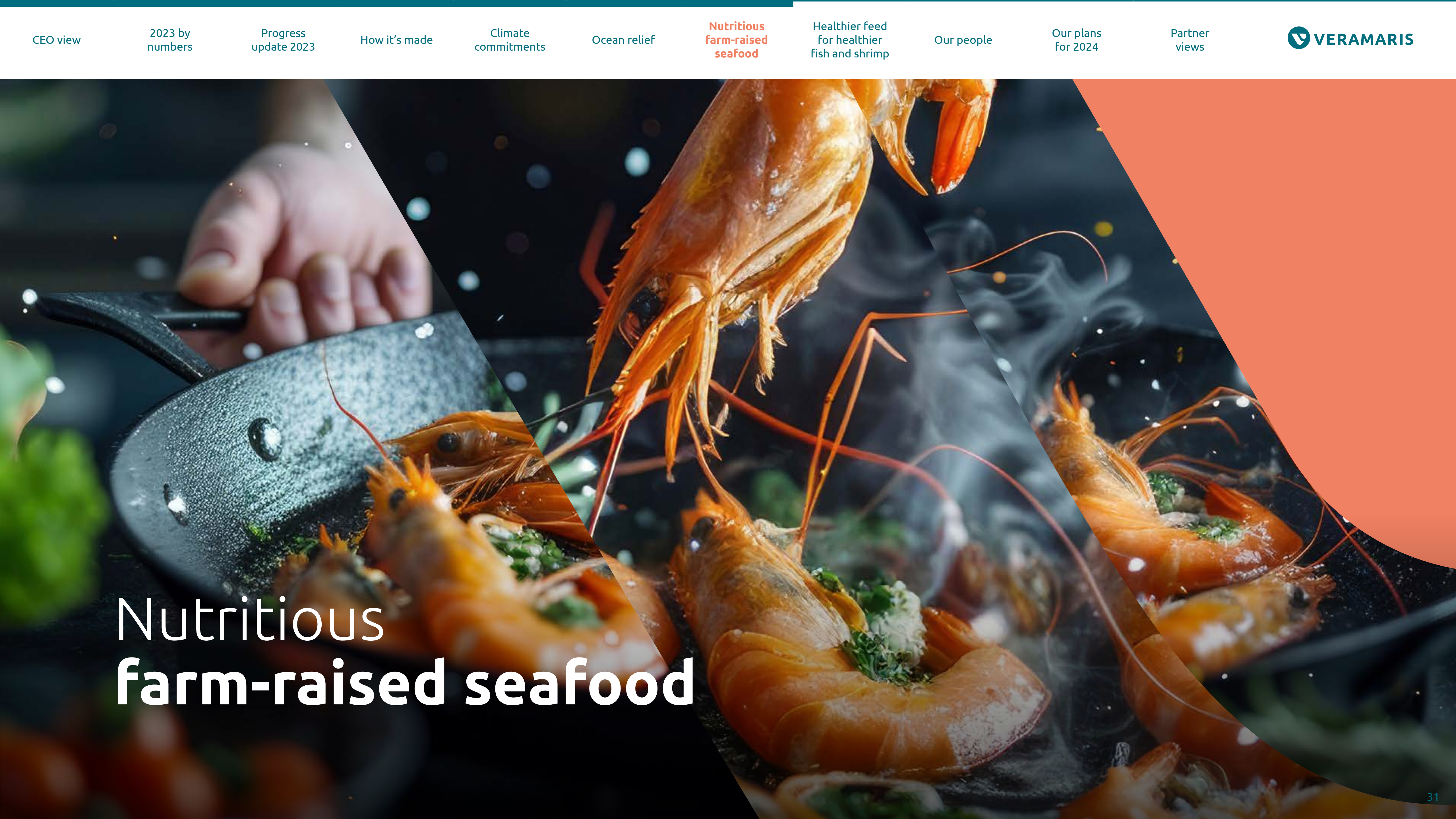
Thanks to this collaboration, Blumar is advancing its environmental goals and taking action to reduce reliance on marine ingredients as the primary source of essential fatty acids in feed.

At the same time, in alignment with their global sustainability ambitions, Walmart were considering what actions they could take towards becoming a [regenerative company](#), one dedicated to placing nature and humanity at the center of its business practices. Together with the Walmart Foundation they had already established an

ambitious goal: to protect, manage more sustainably, or restore at least 50 million acres of land and 1 million square miles of ocean by 2030. But to achieve this, Walmart needed to take action with place-based initiatives to bring their sustainability objectives to life.

One such action was unveiled at Walmart's 2023 Sustainable Seafood Summit, where they announced a collaboration for their Atlantic salmon supply chain together with Blumar, Skretting, and Veramaris. This partnership was designed to reduce the dependency on wild fish stocks by implementing a feed formulation strategy that includes natural marine algal oil, sourced from Veramaris, as an alternative to traditional sources of Omega 3 (EPA & DHA).

Actions such as this are so important for enabling the growth of more sustainable aquaculture to provide good food that doesn't cost the earth.



Nutritious farm-raised seafood

Nutritious farm-raised seafood

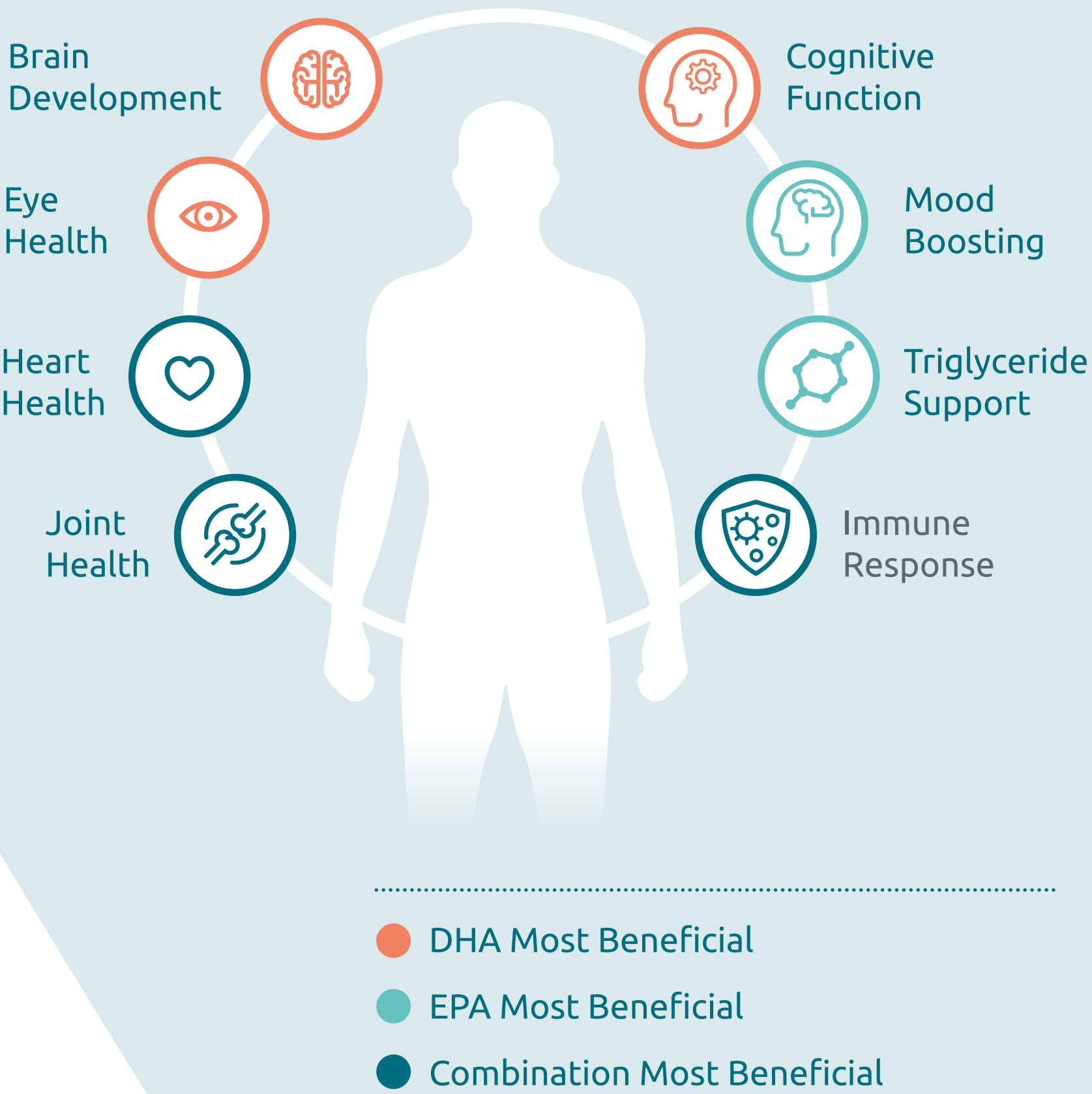
Just like people, fish and shrimp also embody what they eat. Veramaris is working hard to give farmers the tools to determine the amount of Omega-3 (EPA & DHA) that their fish and shrimp will contain.

Farmed seafood is becoming an increasingly important source of protein as global demand is at an all-time high. However, one significant constraint on the growth of the farmed seafood industry is its reliance on marine ingredients in aquaculture feed. To ensure and promote healthy food supplies to meet this demand, alternatives to marine ingredients need to be included in feed.

Healthy farmed fish and shrimp, like humans, rely on essential fatty acids levels. Higher levels of Omega-3 (EPA & DHA) translate at the farm and the seafood counter into less waste, increased product quality, and optimum nutritional values that live up to seafood's long-standing healthy reputation.

By providing farmers with alternative sources of EPA & DHA for fish fillets, Veramaris is ensuring that consumers are provided with products that contain the nutrition recommended for a healthy diet.

Clinical Benefits of EPA & DHA



Source: Adapted from Metagenics Fact Sheet

SPOTLIGHT PROJECT



Sustainable shrimp

Increasingly, supermarkets across Europe are sourcing sustainable fish and shrimp from Ecuador to meet the growing global demand for seafood. Veramaris' algal oil not only alleviates farmers' dependency on marine ingredients in feed, but it is also ASC-MSC certified, allowing shrimp importers and supermarkets to meet sustainability criteria.

This growing demand provided the perfect opportunity for a value chain partnership. Sustainable ingredient suppliers, Veramaris and Protix, joined forces with Klaas Puul, the Dutch shrimp importer, and Skretting, the largest shrimp feed manufacturer in Ecuador, to supply European supermarkets with more sustainable shrimp.

In addition, Albert Heijn, the largest supermarket chain in the Netherlands and part of global retailer Ahold Delhaize, has become the first retailer to

commit to this project. Since doing so, they have highlighted algal oil as an important part of their [new sustainable fish policy](#).

In 2023, the Ecuadorian shrimp farmer and partner in the project, Cofimar, grew the first shrimp according to Albert Heijn's new specifications. Albert Heijn intends to launch this new range of sustainable shrimp in supermarkets across the Netherlands in early 2024.

Over the next three years, the value chain partners will work to further reduce their dependency on marine ingredients and improve their shrimp feed formulation, in line with both shrimp nutrition guidelines and their own sustainability commitments. Their aim is to expand this project and recruit additional retailers, with the common goal of improving the shrimp supply chain and increasing access to healthier, more sustainable shrimp.

“Value chain partnerships like the one we have with Veramaris, Skretting, Klaas Puul and Protix are important for so many reasons.

They don't just work towards a sustainable solution for the aquaculture industry.

They also bring healthier, more sustainable products to the supermarket shelves, so consumers benefit as well.”



Emiel Beekwilde
Quality Manager
Meat, Seafood,
Cheese Albert Heijn



SPOTLIGHT PROJECT



Healthier shrimp

It's well known that seafood is an important part of a healthy human diet. But not all fish and shrimp are created equal. In fact, the concentration of Omega-3 fatty acids varies depending on the seafood you choose to include in your diet. Healthy, farmed seafood are leaner than red and processed meats, with a higher mineral and vitamin content. Research shows that including seafood in your diet has proven health benefits, especially for the heart and brain.

Fish for Health are endeavouring to promote and increase the consumption of farmed fish and shrimp with optimal nutrition levels within the State of São Paulo and Brazil – and as part of these efforts, researchers at the Universidad de São Paulo examined the benefits of including Veramaris algal oil as a replacement for fish oil in shrimp feed.

Their study* showed how increased dietary EPA & DHA resulted in higher Omega-3 (EPA & DHA) levels in the tail muscle of shrimp, opening up opportunities for shrimp producers to improve the nutritional quality of their shrimp products for consumer health. At the same time, the data also showed that the use of algal oil can eliminate the need for fish oil in shrimp feeds because plant-based diets supplemented with algal oil may result in the highest performance, lowest eFCR and improved sensory quality.

These conclusions open up opportunities for healthier shrimp, not just in Brazil, but globally. With the soaring demand for healthy, farmed seafood, Veramaris' algal oil is a reliable, high-performance alternative source of EPA & DHA in fish and shrimp feed.

*Publication pending

“Outputs from our research nucleus Fish for Health shows the nutritional quality of shrimp raised under high performance can be improved with supplementation of algal oils with no loss of sensorial attributes.”

What is the importance of this study for the future of shrimp feed?

This study is playing an important role in demonstrating the importance of alternative sources of Omega-3 in feed formulations. Through our work, we're able to showcase the use of different feed ingredients and sources of essential nutrients.

What are the wider implications for using Veramaris algal oil as an alternative source of Omega-3?

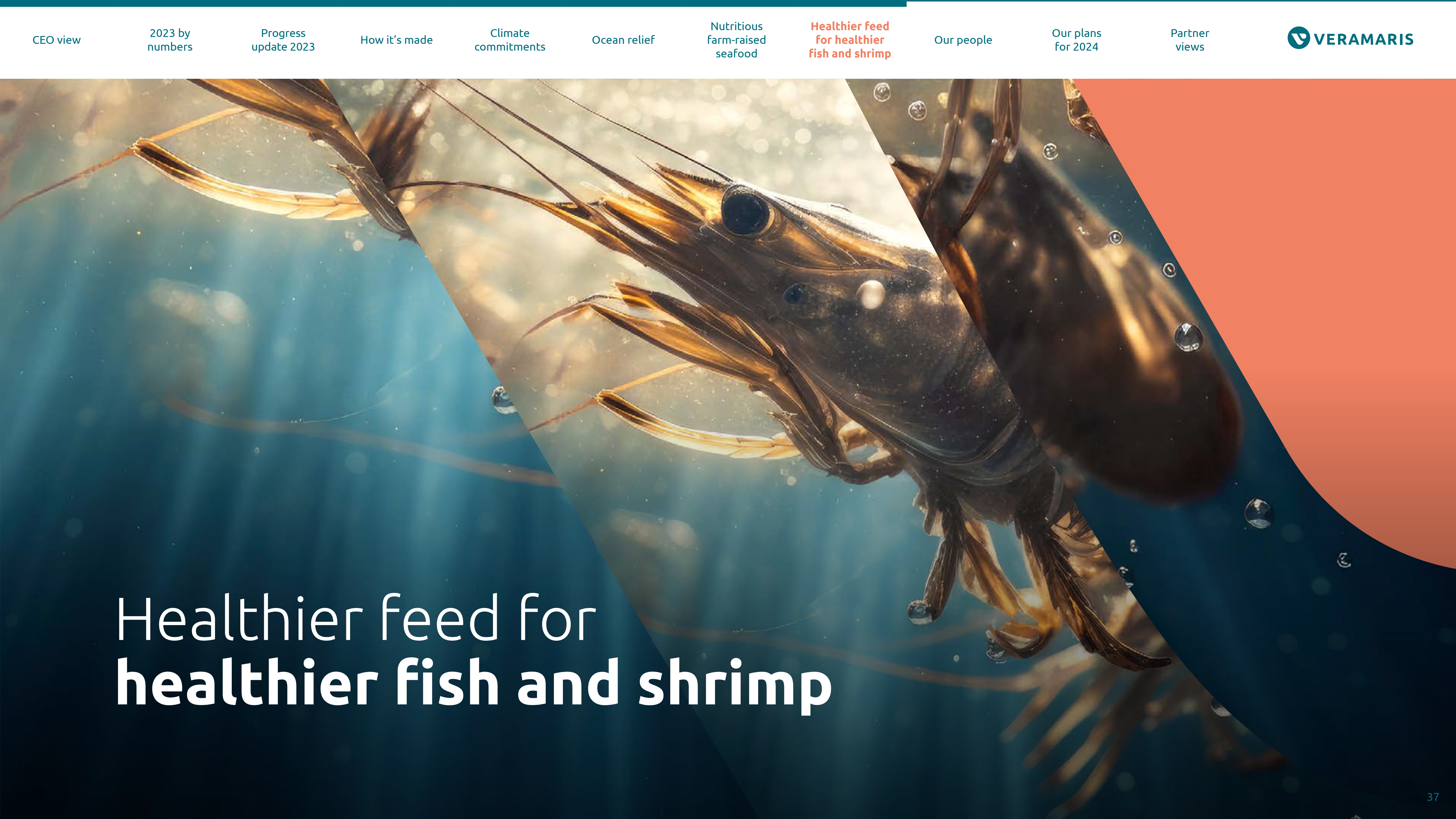
Using algal oil as an alternative source allows for the diversification of feed formulations for shrimp. This, in turn, has nutritional benefits for shrimp performance and health, which improves the nutrient content of the farmed shrimp.



Daniel Lemos

Professor Associado,
Laboratório
de Aquicultura (LAM)
Universidade de São Paulo,
Instituto Oceanográfico





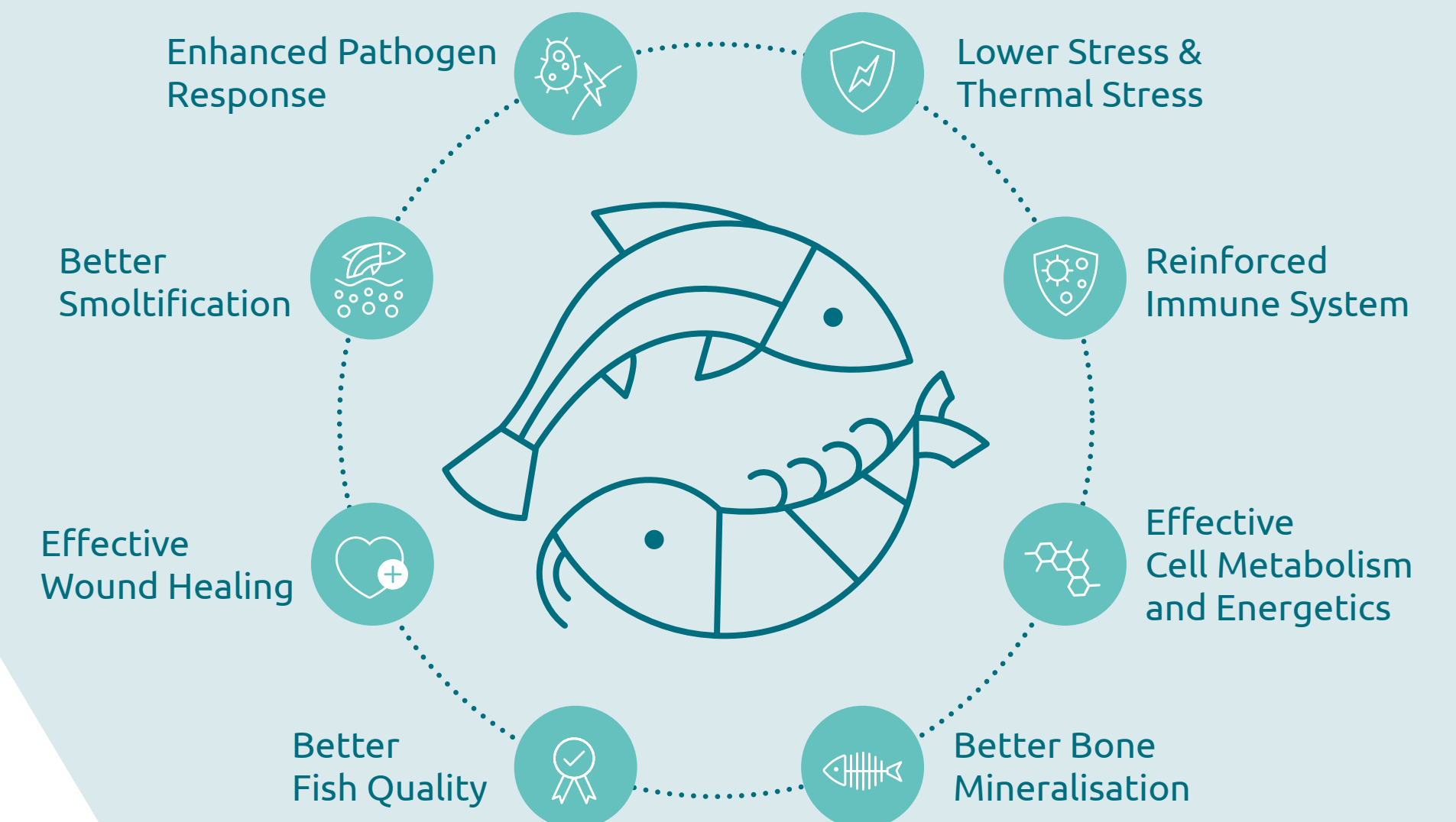
Healthier feed for healthier fish and shrimp

Healthier feed for healthier fish and shrimp

As a source of protein and Omega-3, fish is important for a balanced diet. Global demand for seafood as a primary source of protein is on the rise, but in 2023, output of fish oil fell by more than 20%. This means that healthy seafood, with high levels of EPA & DHA, is increasingly at risk. Veramaris ASC-MSC certified natural marine algal oil provides a sustainable alternative that is high in EPA & DHA and doesn't depend on forage fish sources.

For feed millers, our algal oil provides confidence, ease of use, and scalability of feed supply to farmers looking for a dependable, high-quality source of essential fatty acids for animal and human health. Not only do we help our partners to reach [**Optimum Omega Nutrition \(OON\)**](#), giving better control of fish health, reduced waste, and quality outcomes to farmers, but our algal oil is reliable and renewable, ensuring reduced dependency on our oceans. This, in turn, provides a route for retailers and consumers to reduce their own environmental impact.

Supporting performance, health, welfare and quality of farmed seafood



SPOTLIGHT PROJECT



Optimum Omega Nutrition for salmon farmers

We're always seeking ways to translate science into reality. By combining existing scientific knowledge with large scale commercial trials and novel big data sets, we have demonstrated that using Veramaris algal oil with the **Optimum Omega Nutrition (OON) guidelines** offers salmon farmers the ability to improve productivity, product quality, and yield, while also lowering marine footprint.

In commercial trials with our previous partnerships, we were able to test 0.6 million fish, but these numbers were dwarfed by our study with Manolin. Partnering with Manolin to leverage their expertise in Big Data collection and analysis, as well as their AI capabilities, allowed biological performance responses to be compared across generations of salmon raised on various levels of EPA & DHA.

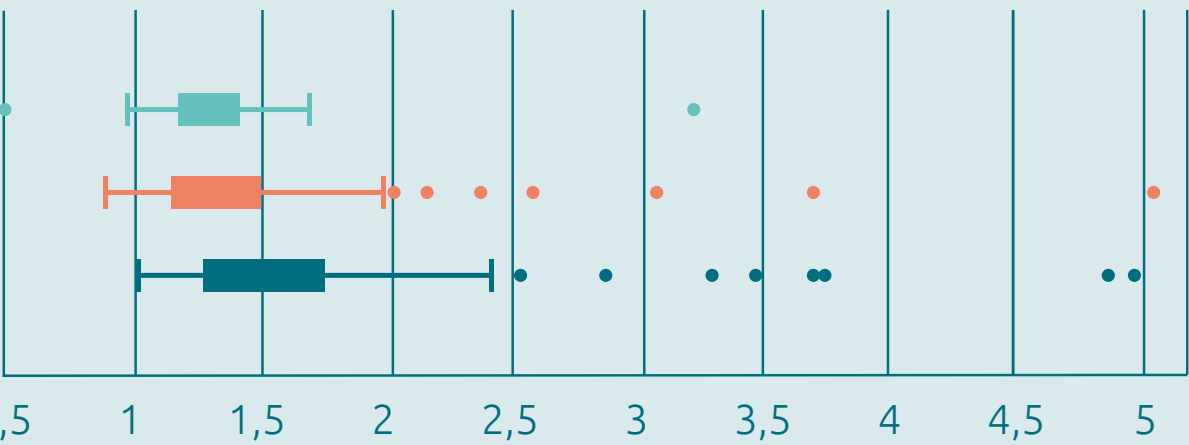


Read more about the Big Data study

Diets richer in EPA & DHA are better for salmon performance

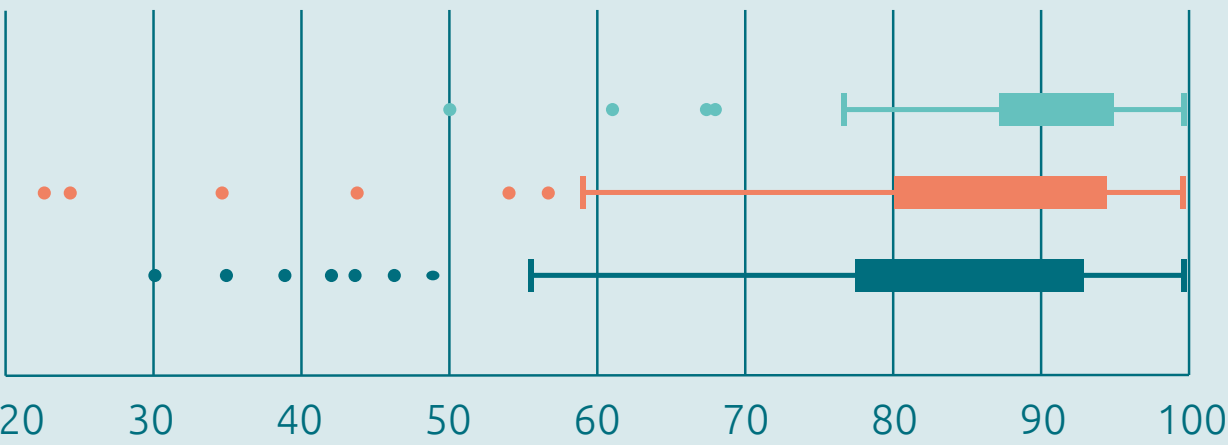
Sample size: 232 600 000 fish from 291 generations

Economic Feed Conversion Ratio (eFCR)



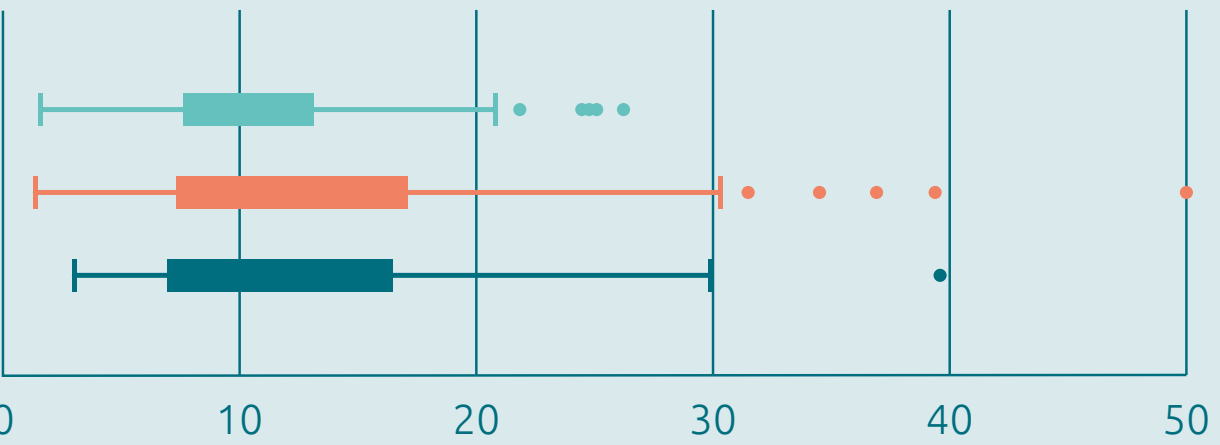
Feed with higher levels of EPA & DHA resulted in an **11% decrease in Economic Feed Conversion Ratio (eFCR)**.

Superior Harvest Percentage [%]



Using above-average levels of EPA & DHA increased farmers' **chance of a superior harvest above 90% by +27%**.

Mortality Percentage [%]



Generations with higher levels of EPA & DHA showed **21% less variability in the total mortality for the generation**.

- EPA & DHA Category
- Above average
 - Average
 - Below average

“Our platform has collected data from more than 900 generations of farmed salmon, producing insights for the aquaculture industry and demonstrating the immense potential of leveraging data intelligence in aquaculture research.”

How does Manolin’s platform work?

Manolin uses advanced AI and Big Data to tackle the aquaculture industry’s most challenging questions, providing unparalleled insights into aquaculture operations. Our platform translates complex, unstructured data into actionable intelligence, enabling stakeholders to understand their farms and products with an unprecedented level of detail, speeding up research from years to weeks.

What is the benefit of using Big Data and AI in aquaculture?

Implementing Big Data and AI in aquaculture offers transformative benefits, including the ability to conduct in-depth analysis and gain insights at an unprecedented scale and speed. It enables companies to make well-informed decisions based on solid data that reflects the realities of complex farming environments.

What’s next? How are you going to build on this work?

Looking forward, our ambition is to expand the scope and scale of collaborative research globally, leveraging our current foundation of over 232 million data points to gain deeper insights into the benefits of EPA & DHA in salmon feed. By partnering with more industry stakeholders, we aim to broaden our collaborative research efforts, enhancing our understanding of Omega nutrition’s role in aquaculture. This global expansion will not only enrich our data set but also forge new pathways for innovation in aquaculture nutrition and sustainability.



Tony Chen,
CEO,
Manolin



SPOTLIGHT
PROJECT



ASC-MSC certification renewal

In 2021, Veramaris became the first microalgae oil producer to achieve certification to the joint ASC-MSC Seaweed/Algae Standard. This year we were pleased to see that Veramaris’ ASC-MSC certificate was renewed following a thorough recertification process.

In 2023, ASC released their Feed Standard. This standard is the first globally to cover environmental and social impacts of manufacturing operations, as well as the ingredients being used in feed. To achieve ASC certification, feed producers are required to responsibly source all major feed ingredients. As an ASC-MSC certified source of Omega-3 (EPA & DHA), Veramaris’ algal oil qualifies as an ‘eligible ingredient’ and offers feed producers and farmers a stable and reliable means of formulating their feed.

During the recertification of Veramaris’ algae facilities, no critical concerns were raised (for details see the publicly available [audit report](#)). Veramaris’ product remains the only independently certified algal oil on the market.

According to the Food and Agriculture Organization of the United Nations (FAO), aquaculture plays a vital role in global food security and is instrumental to meeting increasing global demands for nutritional food. It is therefore vital that this growth happens sustainably and so the renewal of Veramaris’ certificate comes at a crucial time.



SPOTLIGHT PROJECT

“ASC-MSC certified algal oil can be a key ingredient in responsible feed.”

What effect does ASC-MSC Seaweed certification have on the aquaculture industry?

More than half the seafood eaten around the world is farmed. Aquaculture is a large, growing industry. When done responsibly, it provides one of our biggest opportunities to feed a growing population. While Veramaris' recertification against the ASC-MSC Seaweed Standard seems a modest milestone on this global scale, it shows Veramaris' commitment in contributing to a more sustainable future for aquaculture.

How does ASC help to ensure farmed fish are responsibly fed?

ASC envisions a world where seafood farming plays a major role in supplying healthy and responsible food, in supporting local communities while protecting and restoring biodiversity and the environment. For many species, responsible farming requires responsible feed. Through our ASC Feed Standard, we are driving feed mills to assure that every feed ingredient is risk assessed for impacts on people and our planet, and are meeting sustainability requirements.

Why is it important for alternative sources of EPA & DHA to be ASC-MSC certified?

MSC-ASC certified algal oil can be a key ingredient in responsible feed. It is encouraging to see how this opportunity is increasingly being recognised by many others within the industry!



Esther Luiten,
Global Director
Programme Development,
Aquaculture Stewardship
Council (ASC)



Our people



Our people

People are at the heart of our company's story. Throughout our operations, we care for our employees by pursuing safety excellence at work and become an intrinsic part of the communities where we operate.

"The people working in our operations, they're running marathons, not sprints. We know the value of ensuring their health, safety and well-being for the long-term. None of our achievements would be possible without their dedication."

Joanne Pedall,

General Manager of the Veramaris
Production facility in Blair, Nebraska



Safety excellence at work

Ensuring our employees' safety at work is our number one operational priority. We're proud of the work we have done to build a culture of safety excellence at our site in Blair, Nebraska. In 2023, Veramaris' lost time injury rate (LTI-R) and process safety incident rate (PSI-R) were both 0 (zero).

In light of this excellent safety performance, this year we won 3 awards related to occupational health and safety: For the 5th year in a row, Veramaris received the Nebraska's Safest Companies Award, with Distinction. Veramaris received the Bronze Evonik Safety Award, as the site has had zero Lost-Time-Accidents over the past 6 years. In mid-2023, we were also notified that we received the Responsible Care Facility Safety Award Certificate of Achievement from the American Chemical Council (ACC).

A safety-first culture doesn't just happen by accident. We believe in continuous training and reminders to prevent complacency, starting meetings with safety moments, and dedicating time to quarterly safety training sessions. Safety is not just a quarterly

focus, but an ongoing conversation that is integrated into our daily operations and communication meetings. We emphasize that safety is everyone's responsibility and tie it into our bonus system to reinforce its importance. This consistent messaging reinforces our dedication to a strong safety culture. To reinforce this culture, the site also participates in the National Safety Day, and has Fit for Work representatives present at the site every week to work with employees. In 2023, we continued to optimize the ESHQ software, ESTER (Evonik Standard Tool ESHQ and Reporting), a professional platform functioning as a central database to make workflows leaner and help improve our safety performance.

“Our motto is ‘if you can’t do it safely, don’t do it at all.’”

Neil Leininger,
Principal Engineer, Veramaris

Collaboration with communities

As a company, we look not only to create value for the aquaculture industry, but also for our employees and the communities where we live and work.

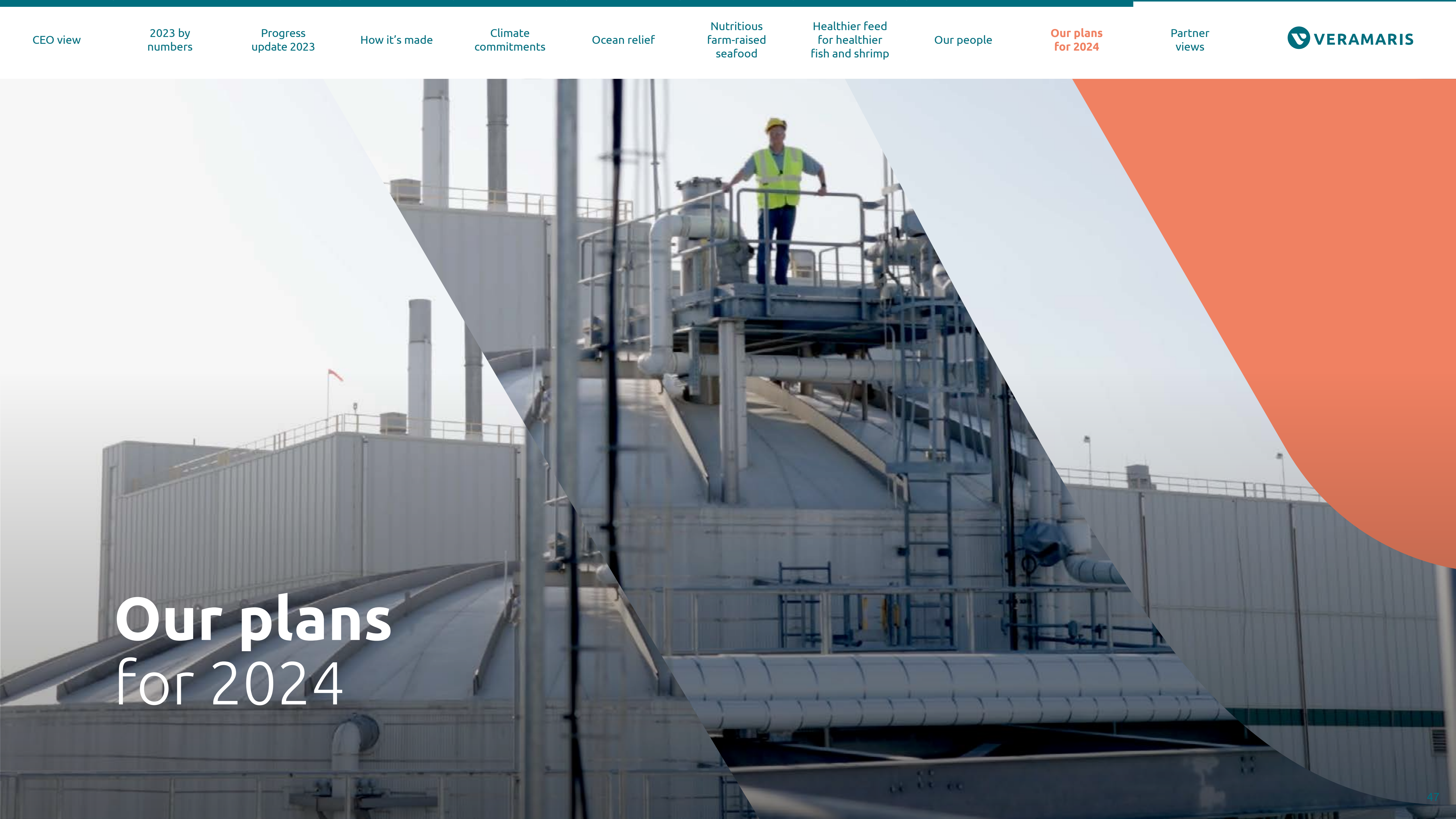
We aim to be an integral part of the community surrounding our production facility in Blair, Nebraska, as well as build connections with local city councils and the state's Chamber of Commerce and Industry.

In 2023, we took part in food and clothing drives including the Washington County Food Pantry Spring Donation Drive, the Blair Optimist International Christmas Program Drive, as well as the Blair Charitable Giving Campaign.

We also participated in the American Red Cross Blood Drive.

The joint Veramaris-Evonik 2023 Engagement Committee provided funding for our Holiday Giving Challenge, which challenged our employees to direct projects giving holiday assistance to those in need.





Our plans for 2024

Our plans for 2024

This year, we saw clearly the value that each and every one of our people bring to our company, and now together we look to a future where we can improve the sustainability of aquaculture, and by extension, the world's oceans.

Yet, we can only do so much without growing our operation. Limited scope means limited impact. That's why we are actively exploring all options to expand our operations and further increase our capacity for algal oil production to meet growing market demand.

We know that our growth must be respectful of the environment, our people, supply chain partners, and the communities where we live and work. Our achievements and highlights over the past year show that our targets are already carefully aligned with the actions that we are taking to deliver meaningful change. We're proud of the impact we've had helping the aquaculture industry on its path towards sustainable growth by ensuring the health and welfare of salmonids, shrimp and marine fish. The seafood products fed with algal oil are typically richer in Omega-3 and can have a lower marine footprint too.

We're helping the industry reduce their reliance on the limited, fragile supply of fish oil from wild-caught fisheries as the primary source of Omega-3. But that's not all we've achieved in 2023. We have reduced the environmental impacts of our operations through our actions on climate change, leading to a lower product carbon footprint that benefits the whole seafood supply chain. And, through our projects and partnerships, ranging from regenerative agriculture to scientific research, and bringing healthier fish to consumers, our impact on the aquaculture industry has been profound.

Nevertheless,

**we can still do more
to improve!**

For 2024, we have identified a portfolio of

13 Key Business Initiatives

that are governed by our Veramaris leadership team.

Each of these initiatives falls into five categories, and will help us reach new levels of performance for our business.

1

Future-proofing our supply chain will integrate our business planning processes to ensure we remain a reliable supplier.

2

Aqua Resilience will ensure that we integrate our sustainability projects into everything we do, bringing our partnerships with feed mills and farmers to the next level.

3

Operations and Technology will ensure that our product quality remains consistent and reliable as we increase our production volume to meet growing demand.

4

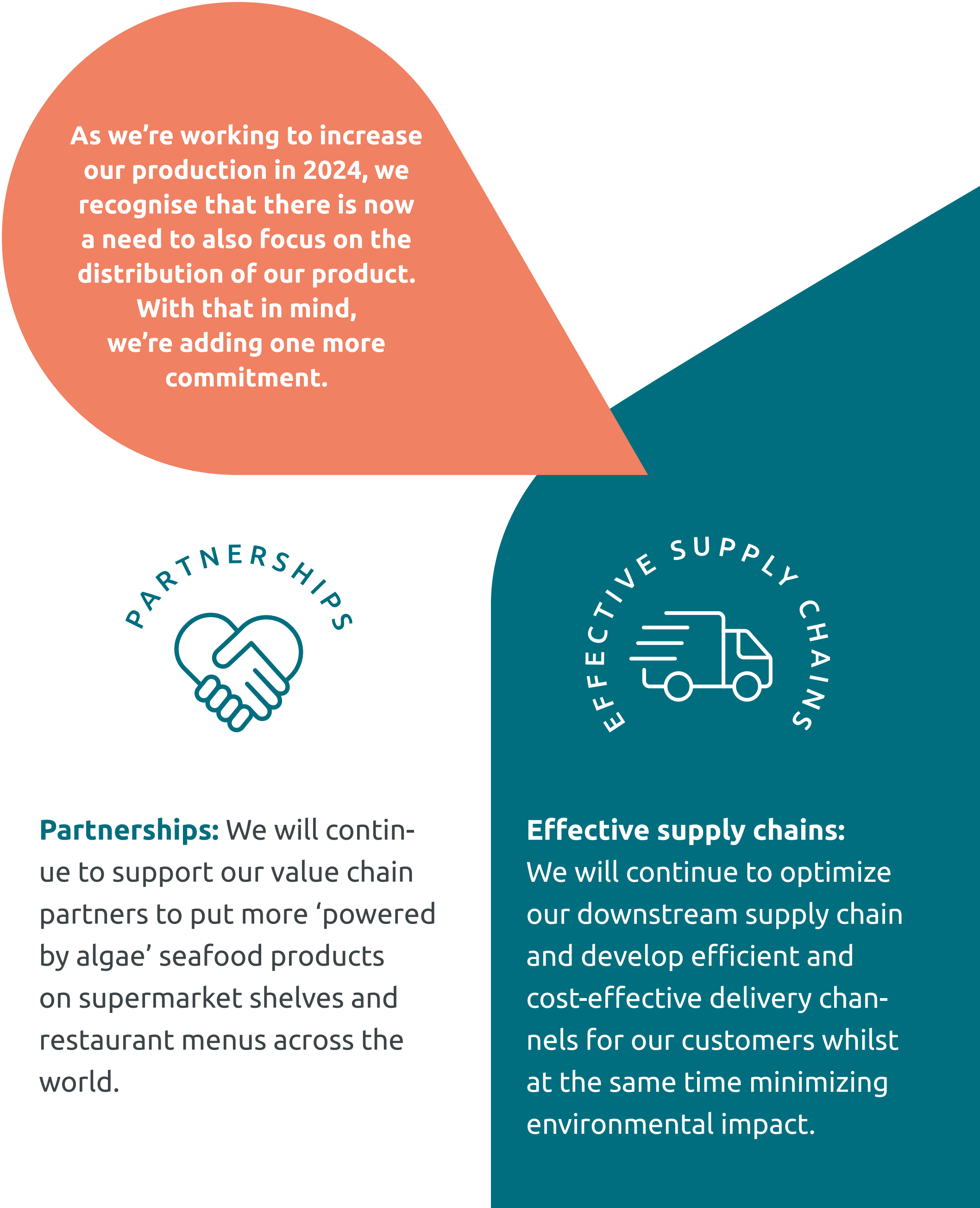
Non-Aqua Growth is of equal importance to the rest of our business. Aquaculture is not our only market, and so we need to maintain a steady focus on the increase in demand from the pet food and human nutrition markets.

5

Expansion. With our installed capacity at our Blair site already utilized, how do we grow? We have many exciting plans for expansion in the years ahead.

And with our focus on growing our business operations comes a commitment to upholding our sustainable development commitments.

In 2024, we will
continue to focus on:



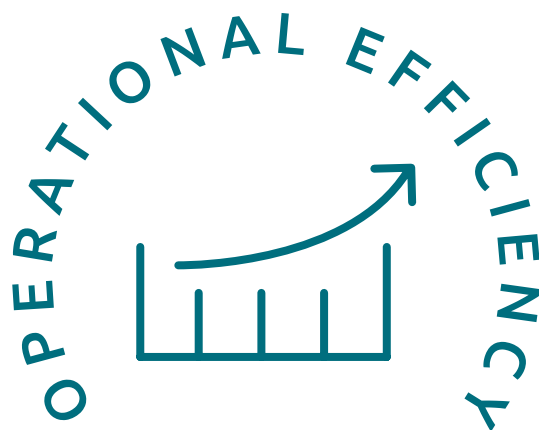
As we're working to increase our production in 2024, we recognise that there is now a need to also focus on the distribution of our product. With that in mind, we're adding one more commitment.



Climate action: Through managing our absolute energy use and GHG emissions, we will continue to reduce our product carbon footprint and achieve our SBTi (Science Based Targets Initiative) commitment by 2030.



Product quality: We will continue to improve the potency and fatty acid profile of our product, while further strengthening applied research documentation and maintaining our ASC- MSC certification.



Operational efficiency: We will continue to optimize efficiency through the use of utilities and raw materials in our production process.



Partnerships: We will continue to support our value chain partners to put more 'powered by algae' seafood products on supermarket shelves and restaurant menus across the world.



Effective supply chains: We will continue to optimize our downstream supply chain and develop efficient and cost-effective delivery channels for our customers whilst at the same time minimizing environmental impact.

Partner views



Evonik's Sustainability Report 2023 can be found [here](#)

Evonik is one of the world's leading specialty chemical companies, present in more than 100 countries. At the forefront of many innovative business areas, including industrial biotechnology, the company plays a key role in developing solutions to global challenges and improving health and quality of life, today and tomorrow.

"I'm proud to be part of Veramaris' impactful journey towards meeting the growing global demand for sustainable Omega-3 EPA & DHA."

Gaetano Blanda,
Veramaris Board
and Head of
Animal Nutrition,
Evonik



André Bos,
Veramaris Board and
EVP Global Products &
Strategic Alliances,
dsm-firmenich

"I'm delighted to have witnessed Veramaris' rapid growth from an idea to full market penetration, demonstrating our commitment to sustainable development."

dsm-firmenich has over 150 years of experience in the research and development of innovative nutrition and health solutions. The company is committed to supporting the sustainable production of healthy, nutritious, and affordable animal protein to meet the demands of a growing global population.



dsm-firmenich's 2023 Integrated Annual Report can be found [here](#)

About Veramaris

Veramaris is committed to supporting the growth of aquaculture by offering the world's richest source of Omega-3 EPA & DHA through its ASC-MSC-certified algal oil for fish and shrimp feed.

By harnessing nature's original source of Omega-3, Veramaris helps to ensure the nutritional quality of aquaculture feed, for better animal health and performance, and less waste. This helps to meet the growing demand for more nutritious and higher-quality seafood without increasing the pressure on fisheries.

From our headquarters in Delft, Netherlands to our advanced production facility in Blair, Nebraska, we collaborate with value chain partners to support the seafood industry in both creating and capturing value through sustainable practices and innovative solutions.

