Global Salmon Feed Sourcing Criteria

Near-term, feasible actions that maximize impact for resilient salmon supply chains

February 2025

The Nature Conservancy

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With steady growth over the past decade and continued expansion ahead, the salmon industry is an ideal testing ground for scalable change

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By 2050, the global population is expected to grow by 21%, **doubling protein demand**

Salmon production is set to **surge by 40% by 2033,** and continue its growth trend

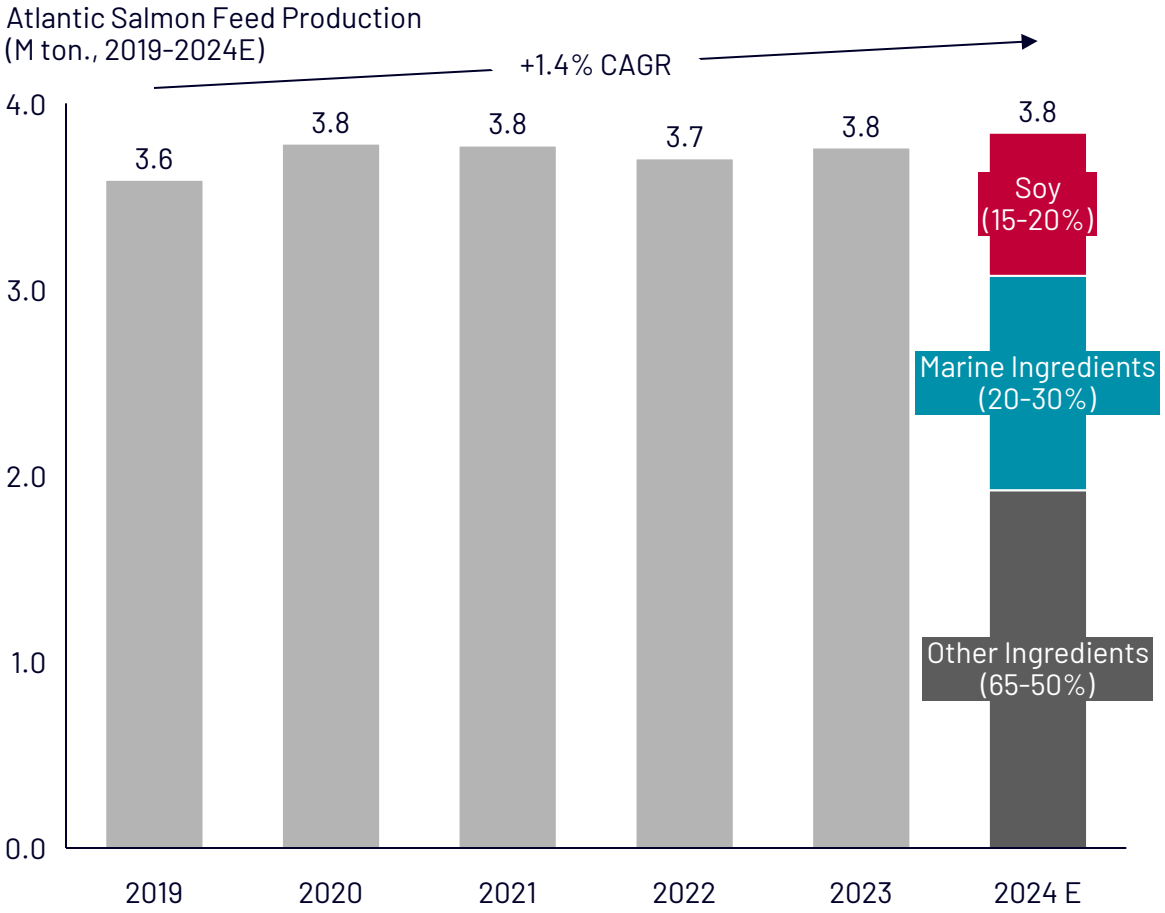
Salmon **production is highly concentrated** (~75% Norway and Chile), while **consumption is primarily clustered** in the U.S. and Europe (~50% of exports)

The salmon industry is an **ideal testing ground** to achieve **change at scale**

Source: Mordor Intelligence, OECD, FAO

Salmon feed production is growing, with practices related to soy-based ingredients and marine products posing sustainability challenges

As demand for salmon grows, so does the demand for feed



Salmon feed practices can carry sustainability challenges

Soy-based ingredients

Soy agriculture can contribute to **land conversion** in critical South American biomes

Marine ingredients

Not all fisheries are managed sustainably, and sustainable production levels may not meet future aquaculture demand

Carbon emissions

In salmon production, **feed is the largest contributor to GHG emissions,** representing ~72% of at-harvest footprint

Source: Kontali, Lit. Research

To enhance sustainability in the salmon industry, buyers naturally focus their efforts on advancing sustainable salmon feed in Norway and Chile

TNC has identified sustainability challenges in salmon production; addressing feed is a top opportunity

Feed production

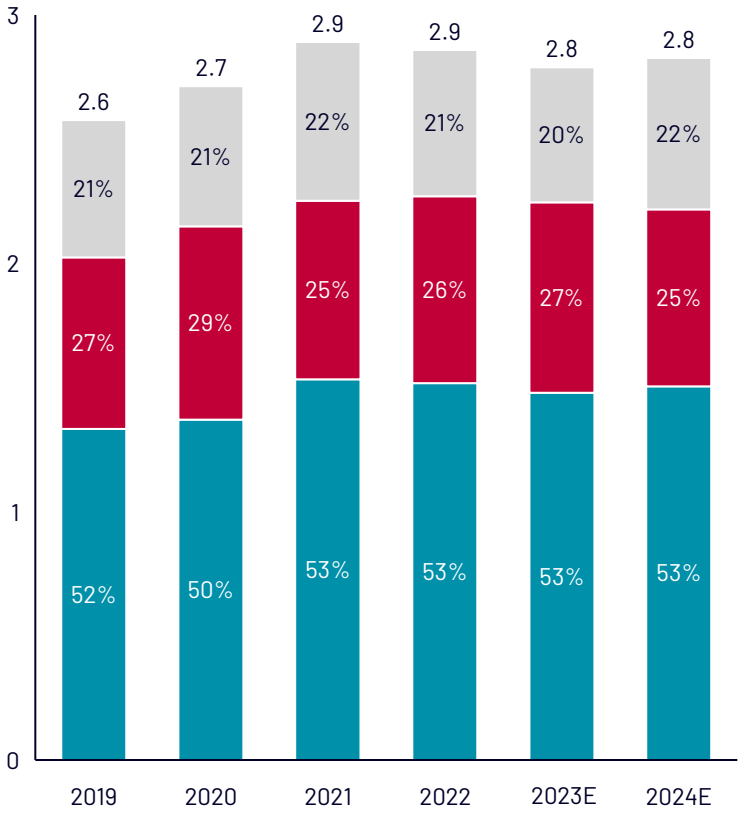
- **~72%** of total salmon production emissions[1]
- Potential **overfishing** of fish required to make **FM/FO**
- By-catch of **vulnerable species** and **biodiversity & habitat** impacts in FM/FO fishing
- Potential **land deforestation and conversion** for soy production

Farming

- **~12%** of total salmon production emissions[1]
- **Fish escapes** that could imbalance ecosystems
- **Disease** and subsequent **use of antibiotics & parasiticides**
- Some regions have low or decreasing **social license to operate**

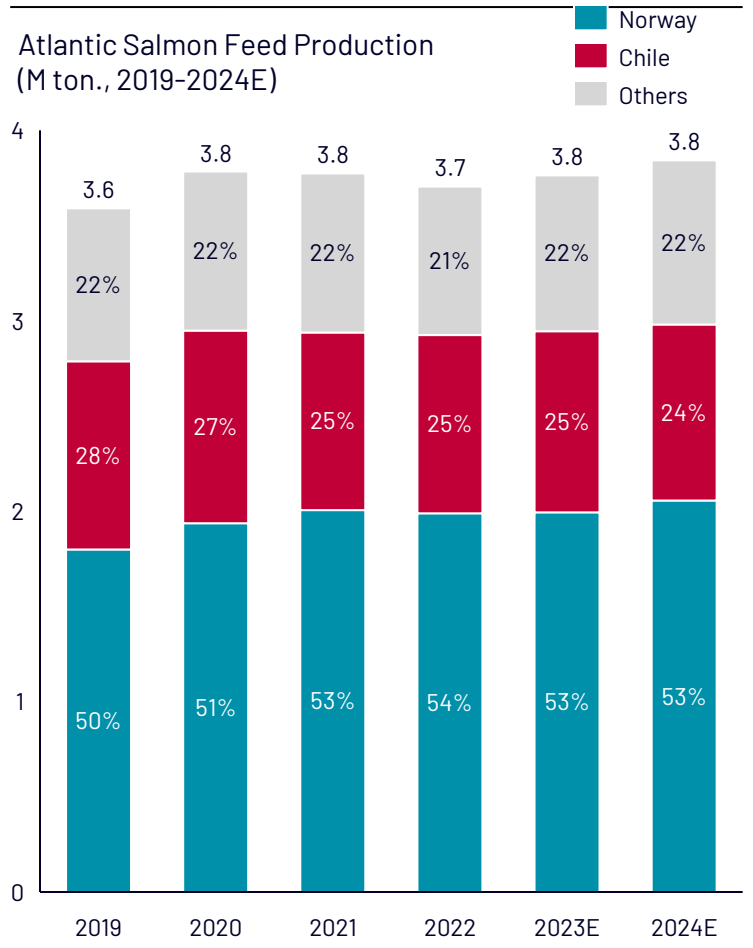
The broader market is highly consolidated in Norway and Chile both in production…

Atlantic Salmon Global Production
(M ton., 2019-2024E)



…and feed production, making large-scale change possible

Atlantic Salmon Feed Production
(M ton., 2019-2024E)



Note: Other producers include Canada, Australia, Faroe Islands, Iceland, Russia, Ireland, USA, Denmark, Switzerland, Korea, Spain, Sweden and Turkey. Note: Atlantic salmon represents 98% of Norway salmonid production and 80% of Chile salmonid production; 1. Approximate percentage of emissions using as reference an LCA assessment for Scottish Atlantic salmon
Source: Kontali data, Lit search

Players across the value chain have made commitments that, in theory, should improve the sustainability of salmon feed

/ NON-EXHAUSTIVE

Increased sourcing of deforestation- and conversion-free or certified soy

Increased ingredient traceability

Adoption of marine ingredient certifications

Reductions in fish forage dependency ratio

Reductions in carbon footprint

Adoption of aquaculture industry standards (BAP, ASC)

70% of market share with commitments

68% of market share with commitments

25 of top 30 players with commitments

Source: Company reports

Nonetheless, despite good faith efforts, misalignment across the value chain hinders the broader adoption of sustainable feed practices

/ NON-EXHAUSTIVE

- **Variation in requirements from different customers** regarding sustainability priorities

- Unclear **how feasible** new requirements are for upstream suppliers

- **Unclear cost implications** of implementing sustainable feed specifications and their **potential impact across the value chain**
- **Unclear incentives for adopting sustainable feed specifications** (will they command market premiums or be required as a 'right to play'?)
- Lack of clarity on the **effort required** and **time needed** to meet the specifications
- Long **revision timelines** for aquaculture feed standards

Value chain players must align to develop consistent expectations on sustainability to reach the necessary scale for significant impact

Source: Company reports

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To support value chain commitments, TNC has identified the highest-impact feed criteria that companies can integrate into their specifications

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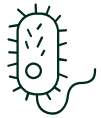
1 Soy-based ingredients

- **Soy supplier:**
  - Suppliers with **2025 DCF commitments** with defined cut-off date that includes high-risk geographies
  - **Progress reporting** against commitments (% traced to farm and % DCF)
  - **Third-party verification** of traceability and DCF data
- **Soy product:**
  - **100% verifiable DCF soy** (no credits) with cut-off date of December 2020
  - 100% **legally-produced**

2 Marine ingredients

- **100%** FM/FO sourced from **MSC-certified fisheries, MarinTrust, or other GSSI recognized standards**
  - If MarinTrust certified, fisheries must make progress according to ASC's minimum sustainability level (MSL) framework
  - Credible FIPs making demonstrable progress are accepted as stepping-stone
- **100%** of vessels with **electronic monitoring** systems in place



3 Alternative ingredients

- Feed with an **FFDR<1** for both **FM and FO** through increased use of byproducts and **sustainable novel and alternative ingredients**
- **LCA required** at regular intervals for all new ingredients, and **feed footprint factored into formulation decisions**

4 Carbon footprint

- **LCA measurements** for feed and novel ingredients, including carbon footprint, and conducted via globally-recognized methodology*
- **Carbon footprint** for feed must not exceed an absolute upper limit per kilogram**

*Note: For example, PEFCR. **Note: For example, the forthcoming BAP Vanguard standard will establish and absolute emissions limit for salmon feed.
LCA: Life Cycle Assessment. FFDR: Forage Fish Dependency Ratio; FFDR for feed is calculated as fishmeal or fish oil inclusion in feed divided by its yield from whole fish. For FFDR of harvested fish, this number is multiplied by the FCR.

It is ambitious—and achievable—for the industry to set goals for wide implementation of these criteria

TNC would like to see:

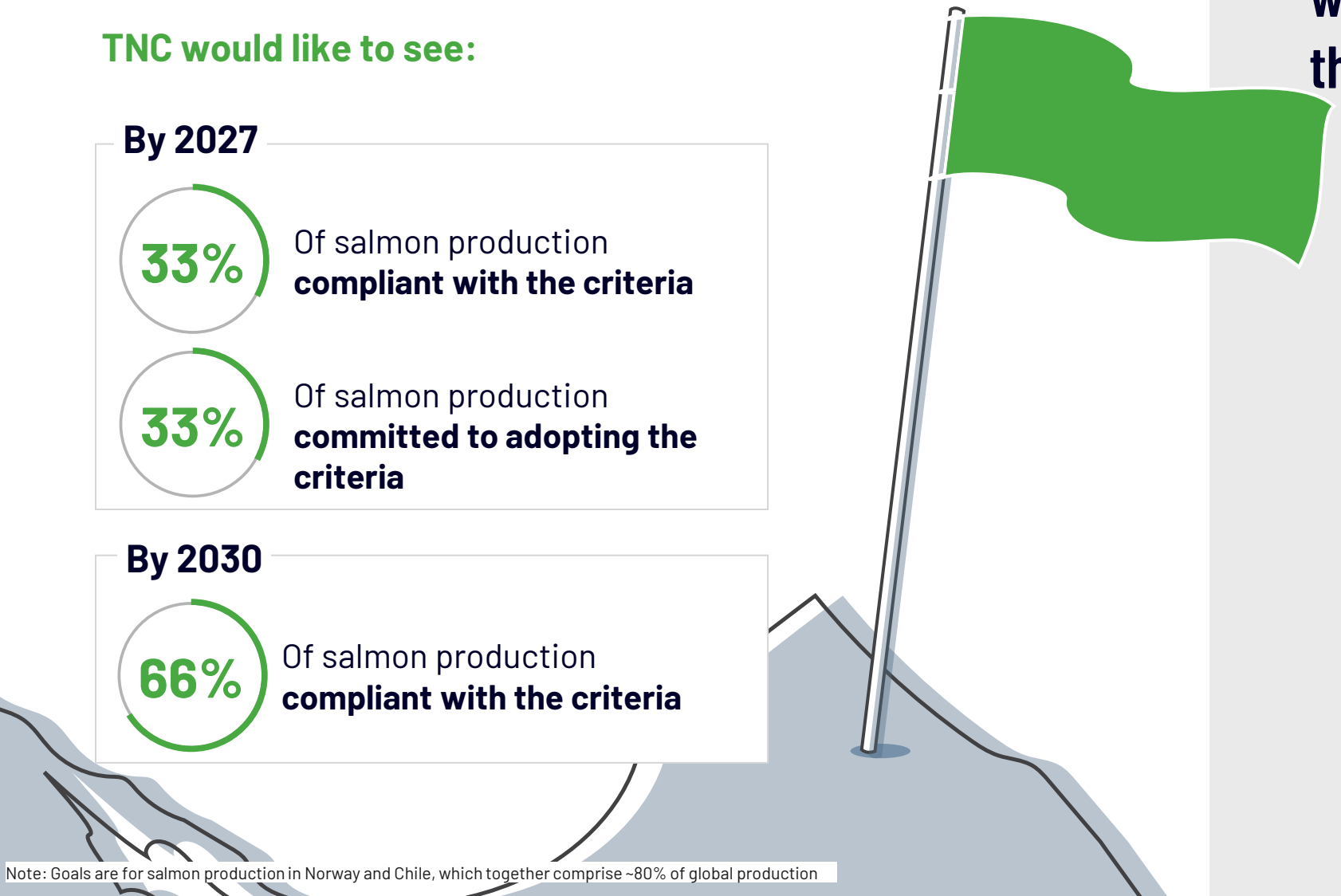
By 2027

33% Of salmon production **compliant with the criteria**

33% Of salmon production **committed to adopting the criteria**

By 2030

66% Of salmon production **compliant with the criteria**



Note: Goals are for salmon production in Norway and Chile, which together comprise ~80% of global production

TNC sees opportunity to work with stakeholders to drive widespread implementation of the criteria

We recognize that stakeholders may face **region- or ingredient-specific challenges** in criteria implementation

However, we believe the criteria are feasible and can drive significant **conservation outcomes**

Compliance with the criteria by 2030 drives significant transformation in the salmon industry and contributes to global conservation outcomes

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Soy-based ingredients

66%

goal for salmon feed
to be using DCF soy

This accounts for
0.5M tons
of DCF soy sourced from
0.3M ha.
managed with environmental responsibility

Marine ingredients

66%

goal for salmon feed
to be using certified & EM marine ingredients

10% increase in certifications – additional **2.9M tons** of certified forage fish

16% increase in electronically monitored forage fish – additional **4.8M tons**

Novel ingredients

11%

expected reduced demand of forage fish for salmon feed – reducing usage of **3.2M tons**

Life Cycle Assessment

11%

expected reduced CO_2e emissions vs current industry average – avoiding **635 Mt CO_2e**

Note: Benefits of Electronic Monitoring are estimated based on large-scale adoption in Peru. Benefits of novel ingredients are calculated assuming a 5% inclusion rate. Life Cycle Assessment benefits are projected with the assumption that 66% of the industry complies with the BAP Vanguard ceiling. EM: Electronically Monitored. Goals are for salmon production in Norway and Chile, which together comprise ~80% of global production

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Through research, financial modeling, stakeholder outreach, and volume analysis, we tested the feasibility of the criteria across multiple categories

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	Volume		Cost		Implementation at scale			Overall assessment
	Feasibility of volume fulfillment (2030) 1	Ease of sourcing (2030) 2	Cost-to-Price impact 3	Reduction potential 4	Scaling consideration 5	Ease of tracking progress 6	Role of regulation 7	Summary evaluation
Deforestation and Conversion Free Soy	Ability to efficiently **source the required volumes at the necessary scale** to achieve the TNC target for 2030	Degree of **complexity feed companies** encounter when **sourcing the necessary volumes** by 2030	Impact of compliance with criteria **on the cost of salmon feed** and **overall salmon production**	Potential for **cost to decrease over time** (e.g., through economies of scale, market dynamics)	**Key challenges and considerati-ons** for criteria implementa-tion	Ability to **monitor and track progress** of the implementa-tion	Potential for **current regulation** (regional, country-level, or local) to support implementation	**Overall assessment of feasibility**
Marine Ingredients Certifications								
Marine Ingredients Electronic Monitoring								
Novel Ingredients								
Life Cycle Assessment								

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Feasibility assessment: DCF soy

High → Low

	Volume		Cost		Implementation at scale			Overall assessment
	Feasibility of volume fulfillment (2030)	Ease of sourcing (2030)	Cost-to-Price impact	Medium-term reduction potential	Scaling considerations	Ease of tracking progress	Role of regulation	Summary evaluation
DCF Soy								
Marine Ingredients Certifications								
Marine Ingredients EM								
Novel Ingredients								
LCA				Not applicable				

Note: DCF: Deforestation and Conversion Free. EM: Electronic Monitoring. LCA: Life Cycle Assessment. MI:Marine Ingredients. (1) Premium over regular MI prices, without peaks like in 2023, (2) Percentage depends on inclusion scenario (1% or 10%)

DCF-certified soy volumes are enough to support 100% of salmon feed sourcing, making the criteria's feasibility at scale achievable

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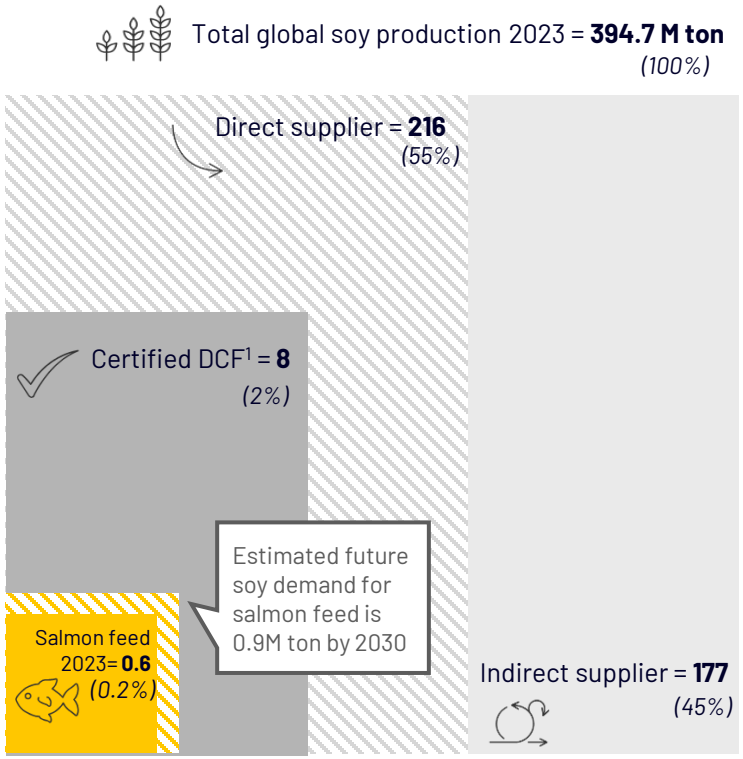
The soy industry is vast; salmon feed represents a small fraction of total supply



Note: not to scale

Feed criteria – Soy suppliers and product

1. Soy supplier:

Suppliers with **2025 DCF commitments** with **defined cut-off date** that includes high-risk geographies

Progress reporting against commitments (% traced to farm and % DCF)

Third-party verification of traceability and DCF data

&

2. Soy product:

100% verifiable DCF soy (no credits) with cut-off date of December 2020

100% legally-produced

Soy sustainability challenges beyond the criteria's scope

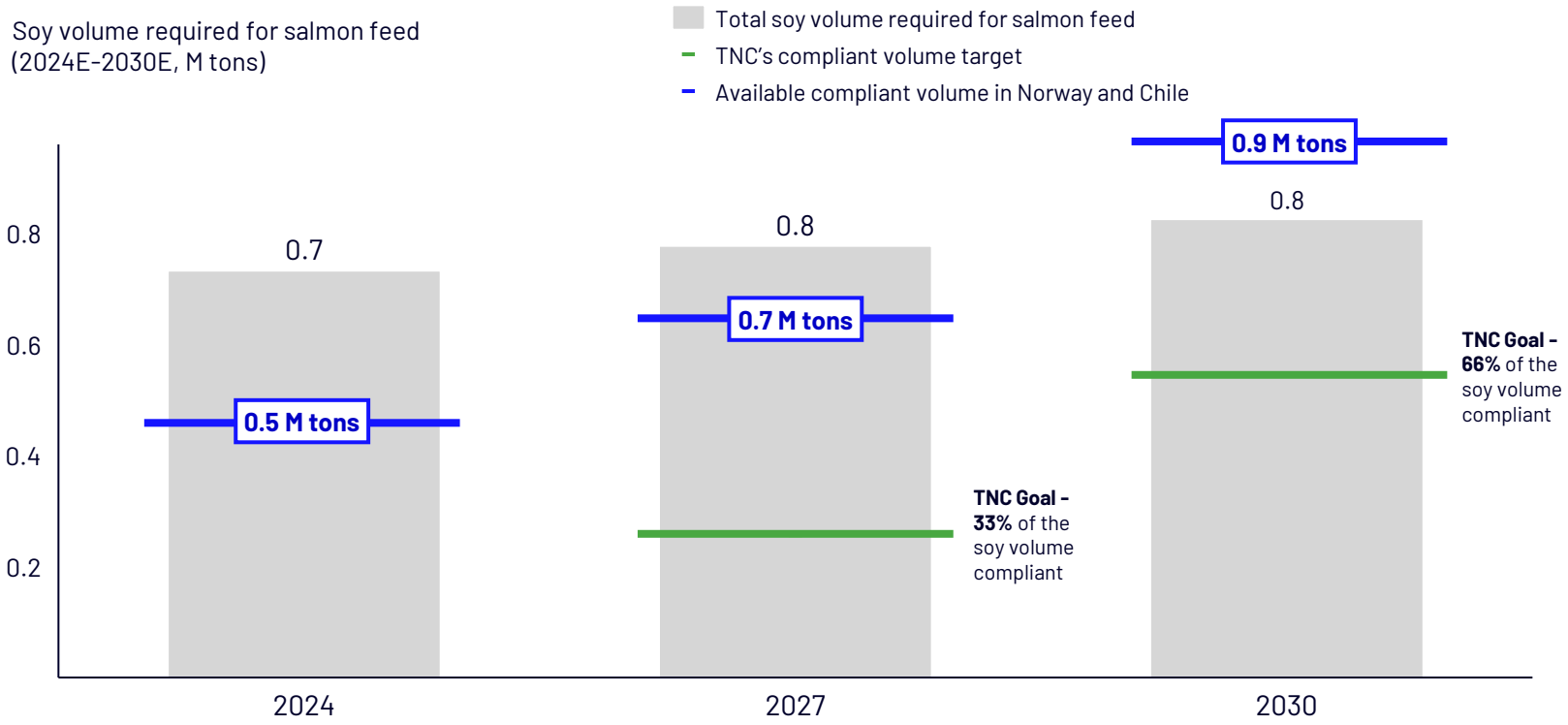
- **Full physical segregation and third-party verification** is the preferred approach, though it is not currently feasible at scale
  - This could be established as a **goal for the medium or long-term**
  - Current criteria **accepts mass balance**
- The **lack of visibility in indirect supply chains and verification at FOB** remains unaddressed by the current criteria requirements
- These are **highly complex challenges** that demand a **more mature industry framework** for effective resolution

Strategic supplier selection will be essential to ensuring full compliance with criteria going forward

Note: (1) Certified DCF soy quantity considering both ProTerra and RTRS volumes for 2020
Source: USDA FAS; International Institute for sustainable development soybean report

The available volume of compliant soy in Norway and Chile is sufficient to meet criteria with no major challenges

Soy volume required for salmon feed
(2024E-2030E, M tons)



Summary of stakeholder engagement insights

① Sourcing feasibility:

Sourcing from fewer suppliers increases cost volatility; feed companies are more willing to narrow their supplier base in regions with higher profits (i.e., easier in Norway than in Chile)

② Cost impact:

Meeting DCF soy requirements adds a premium of 3-8% to feed companies' costs

Reaching the target volume for 2030 requires mobilizing additional suppliers to comply with the criteria; there could be additional compliant volume outside of the players currently trading in Norway and Chile

Note: We assume 100% of the volumes from compliant suppliers are compliant, as batch-level compliance is feasible due to suppliers' large production capacity and the relatively small demand from Chile and Norway. Source: Expert interviews

Achieving 100% DCF compliant soy could potentially increase salmon production costs ~0.1-0.2% for Chile and Norway

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/PRELIMINARY

DCF soy costs reflected in premium

Land Origination Costs
- Farmer registration
- Land mapping and monitoring
- Admin work and communication

DCF Protocol Implementation
- Protocol design
- Internal training
- Information systems
- DCF supplier registry

Verification Costs (Soy Suppliers[1])
- Satellite mapping[2]
- Internal audits
- External audits

Segregation Costs
- Warehouse certification

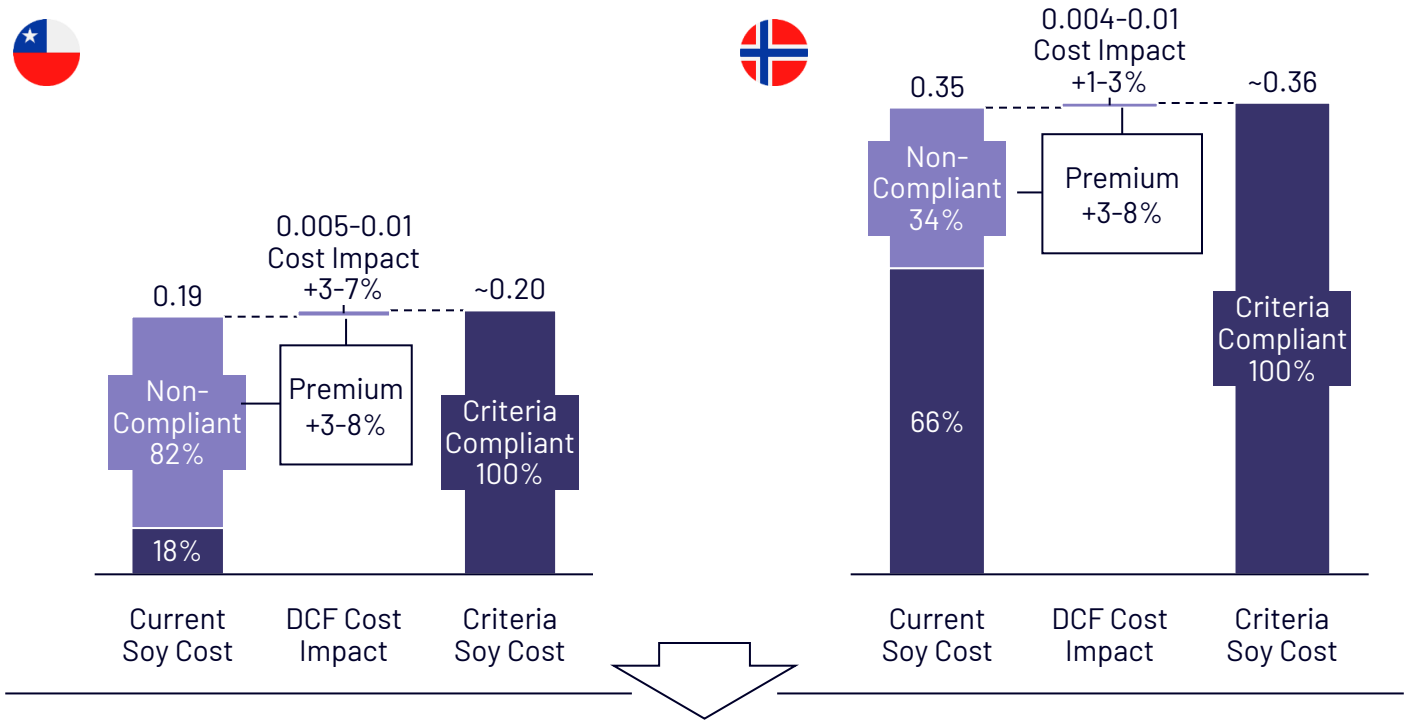
Opportunity Costs

Verified DCF Market Premium **~3-8%**

Varies based on the certification type and the degree of segregation

Average[3] increase in soy cost (US$) per kg of salmon

DCF soy cost increase
(US$/kg of salmon, average[3] baseline)



An increase of 1–7% in soy costs, depending on geography and segregation levels, could lead to a 0.2–0.6% rise in feed costs, ultimately resulting in a ~0.1–0.2% increase in salmon production costs

Note: Assumption: Volumes from compliant suppliers at the company level are considered 100% compliant; Rationale: Batch-level compliance is feasible given suppliers' large production capacities and the small share of demand from Chile and Norway; DCF – Deforestation and Conversion Free, (1) Suppliers/Traders, (2) GIS Company Check on Farms with satellite images, (3) Min Cost Based on Average 2019-2023, Max Cost based on Max cost/prices in same period; Source: WWF, CDP Forests, Macronutrient Companies Commitments, Feed Companies Commitments

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Feasibility assessment: Marine ingredient certifications

High → Low

	Volume		Cost		Implementation at scale			Overall assessment
	Feasibility of volume fulfillment (2030)	Ease of sourcing (2030)	Cost-to-Price impact	Medium-term reduction potential	Scaling considerations	Ease of tracking progress	Role of regulation	Summary evaluation
DCF Soy	Enough DCF compliant soy available in Norway and Chile to achieve target	Limited compliant suppliers; key to promote compliance of additional soy suppliers	• 3-8% DCF premium on soy cost • Equivalent to 0.1-0.2% of salmon production costs	**Medium potential reduction** DCF premiums to initially persist. EUDR & market commitments may help reduce premiums by 2030	Limiting soy suppliers creates sourcing challenges and limits the ability to secure the most competitive price	Suppliers must continue publicly reporting on their DCF and traceability progress to ensure compliance Feed producers to require DCF certification / verifiability	**Positive impact of regulation** Current regulatory frameworks encourage the market's organic transition towards DCF – Progress dep. on challenges to Brazil's soy moratorium regulation and EUDR dev.	Sufficient DCF volume is available, with premium offsetting sourcing limitations. Implementation in Chile is harder due to reliance on 10–15 suppliers and lower margins
Marine Ingredients Certifications								
Marine Ingredients EM								
Novel Ingredients								
LCA				Not applicable				

Note: DCF: Deforestation and Conversion Free. EM: Electronic Monitoring. LCA: Life Cycle Assessment. MI:Marine Ingredients. (1) Premium over regular MI prices, without peaks like in 2023, (2) Percentage depends on inclusion scenario (1% or 10%)

There is sufficient certified volume in the market today, with MarinTrust more widely adopted than MSC

PRELIMINARY

Feed criteria – Marine ingredients

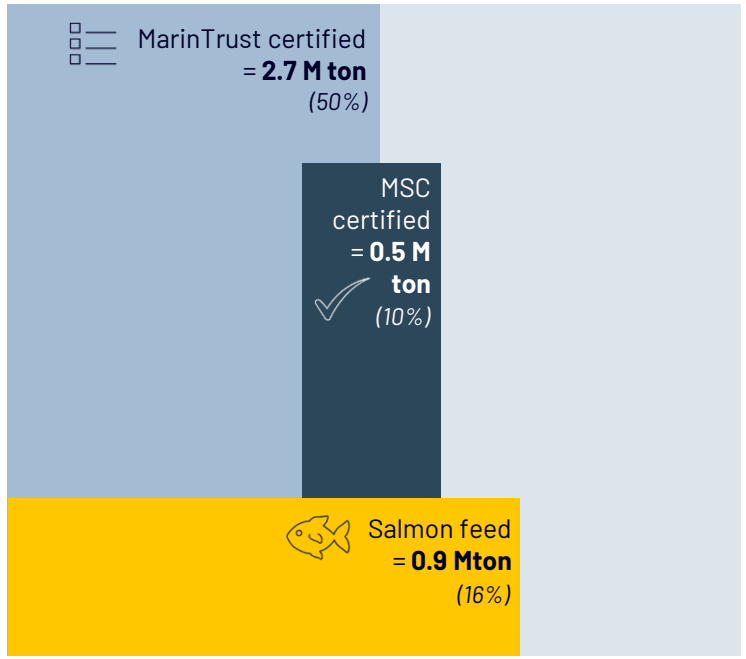
- **100%** FM/FO sourced from **MSC-certified fisheries, MarinTrust, or other GSSI recognized standards**
  - If MarinTrust certified, fisheries must make progress according to ASC's minimum sustainability level (MSL) framework
  - Credible FIPs making demonstrable progress are accepted as stepping-stone

Focus of this section

- **100%** of vessels with **electronic monitoring** systems in place

Marine ingredient certification is predominantly led by MarinTrust (~50%)

Total global FM/FO production 2022= **5.3 M ton** *(100%)*



Note: not to scale

Summary of stakeholder engagement insights

1 Certification feasibility

Industry views MarinTrust as more accessible from environmental performance and cost perspectives, but progress towards MSC is an end goal for many.

2 Market considerations

The market already mandates certifications as a prerequisite for access. Certification penetration is already high (+90% in Chile and Peru for MarinTrust)

3 Cost implications

Market recognizes the value of certified ingredients (3-12% premium)

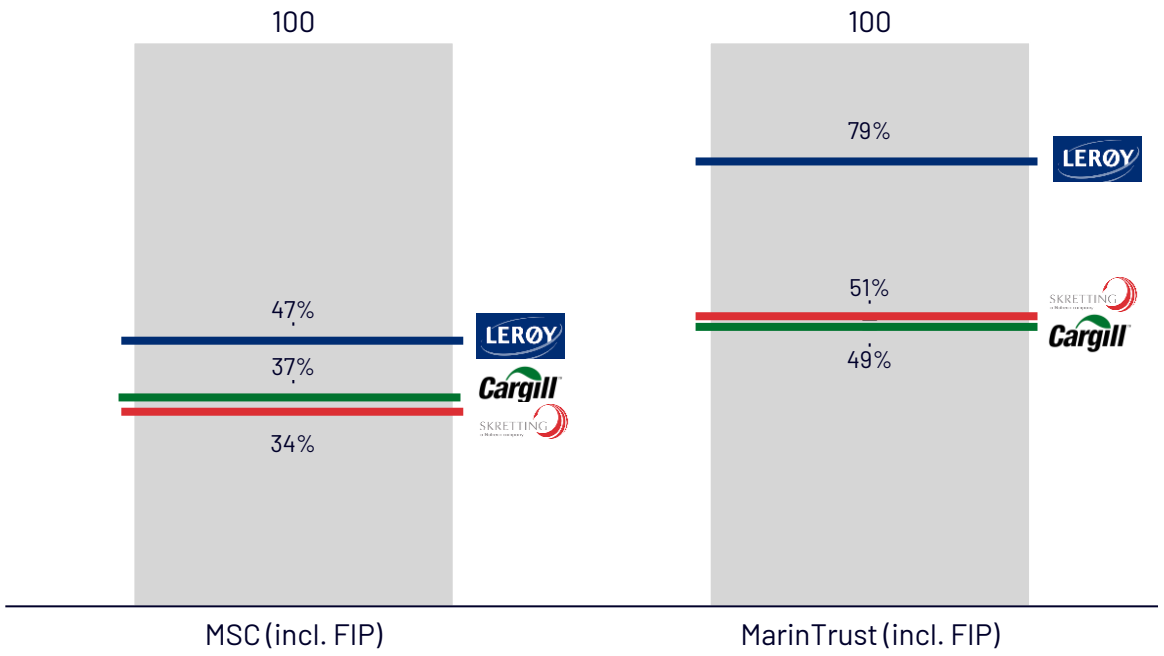
The currently certified supply of marine ingredients seems enough to meet the demand for salmon feed; we anticipate ASC's MSL framework will increase available volumes of MSC-certified marine ingredients

Note: We calculate the FM/FO required for salmon feed as the total tons consumed by Chile and Norway (main feed producers). Source: MarinTrust website; MSC website; Expert interviews

Certification penetration is high among key industry players; sustaining and increasing compliance will be crucial going forward

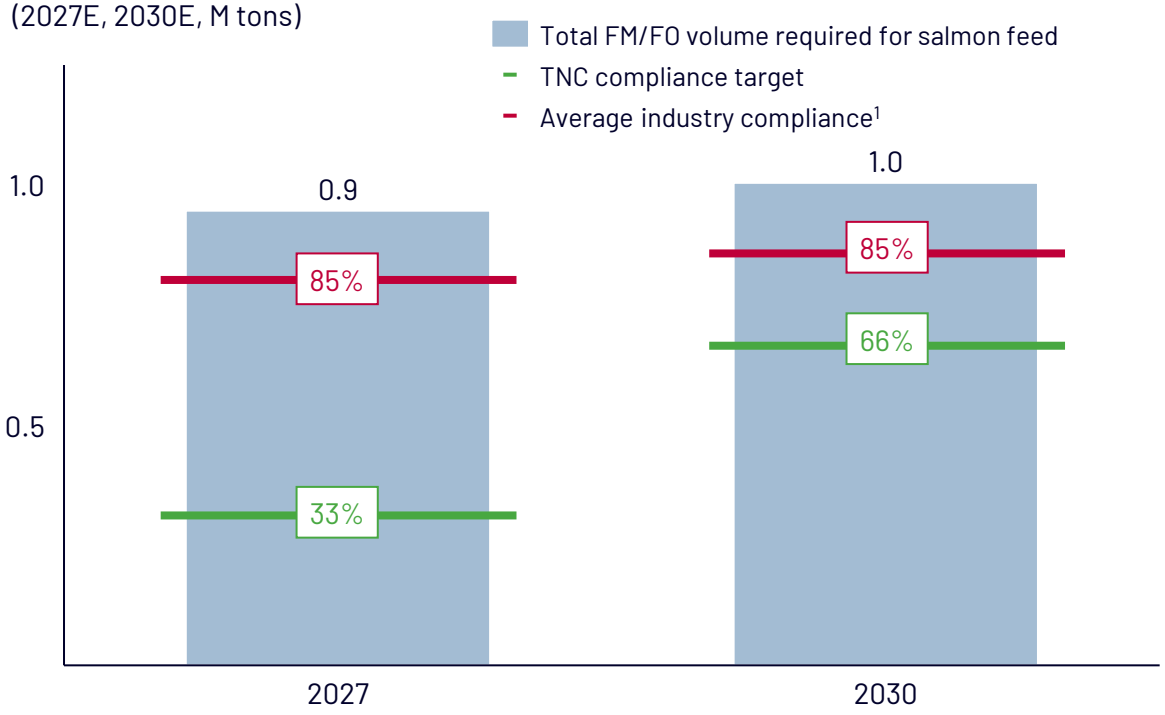
Certification compliance among stakeholders is already high

Certified marine ingredients penetration across players
(2023, %)



Maintaining the reported average of ~85%[1] certified marine ingredients among producers will be sufficient to meet TNC's target

FM/FO volume required for salmon production
(2027E, 2030E, M tons)



Future success will depend on maintaining compliance and addressing barriers to certifications like MSC for forage fisheries

Note: 1. We assume an average industry certification compliance (85%) considering publicly reported percentage of total marine ingredients reported by Skretting (77%), Leroy (95%) and Cargill (89%), some of the biggest salmon feed & producer companies
Source: Expert interviews; Company Websites

MSC-certified product carries the highest premium; even assuming 100% MSC-certified FMFO, salmon production costs could increase ~1.2-1.5% at maximum

/ PRELIMINARY

MSC cost impact based on stages

Pre-Assessment
- Certification body fees
- Data collection & analysis
- Reporting

Consulting
- Consultant fees
- Action plan development
- Data mgmt., analysis and reporting

Improvement Projects
- Investments (e.g., Gear changes)

MSC Assessment
- Certification body fees
- Data collection & analysis
- Stakeholder engagement
- Public reporting & peer reviews

Certification Maintenance
- Annual audits
- Re-assessment every 5 years

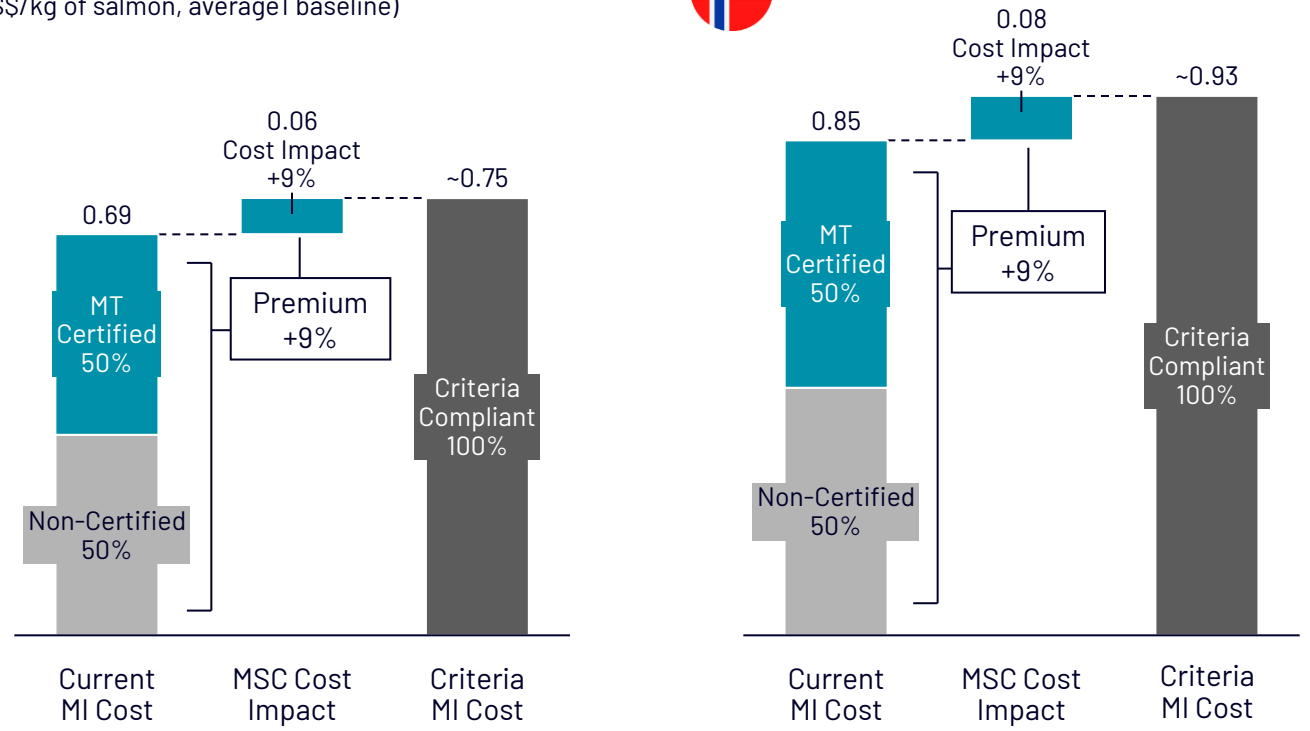
MSC Royalties
- Royalties based on certified volume

Opportunity Costs

Market premium of ~9%[1]

Average[2] increase in MI cost (US$) per kg of salmon

MI certification cost
(US$/kg of salmon, average1 baseline)



Cost increase for 100% certified marine ingredients is ~9%. This results in an overall feed cost increase of ~2.8-3.3%, which translates to a ~1.2-1.5% rise in total salmon production costs

Note: MI – Marine Ingredients, MSC – Marine Stewardship Council, MT – MarinTrust; (1) 9% used as proxy for improvements [3% premium for MarinTrust, 12% premium for MSC] (2) Min Cost Based on Average 2019-2023, Max Cost based on Max cost/prices in same period, (3) Assuming sourcing from 50% of global volume compliant; Source: MSC Certification Bodies, Expert Interviews

Feasibility assessment: Marine ingredients electronic monitoring

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High → *Low*

	Volume		Cost		Implementation at scale			Overall assessment
	Feasibility of volume fulfillment (2030)	Ease of sourcing (2030)	Cost-to-Price impact	Medium-term reduction potential	Scaling considerations	Ease of tracking progress	Role of regulation	Summary evaluation
DCF Soy	Enough DCF compliant soy available in Norway and Chile to achieve target	Limited compliant suppliers; key to promote compliance of additional soy suppliers	• 3-8% DCF premium on soy cost • Equivalent to 0.1-0.2% of salmon production costs	**Medium potential reduction** DCF premiums to initially persist. EUDR & market commitments may help reduce premiums by 2030	Limiting soy suppliers creates sourcing challenges and limits the ability to secure the most competitive price	Suppliers must continue publicly reporting on their DCF and traceability progress to ensure compliance Feed producers to require DCF certification / verifiability	**Positive impact of regulation** Current regulatory frameworks encourage the market's organic transition towards DCF – Progress dep on challenges to Brazil's soy moratorium regulation and EUDR dev.	Sufficient DCF volume is available, with premium offsetting sourcing limitations Implementation in Chile is harder due to reliance on 10–15 suppliers and lower margins
Marine Ingredients Certifications	Certification penetration high enough to cover required volume Certifications already a key factor for market access	Key players use a high % of certified ingredients (mainly MarinTrust) Forage fisheries face challenges in attaining MSC	• ~9% premium (MI costs -MSC as proxy) • Equivalent to 1.2-1.5% of salmon production costs	**Low potential reduction** Certified MI premium to persist (compensate implementation costs)	Efforts focus on advancing practices under the ASC MSL framework Players seek market recognition of certification / improvement costs	Feed companies should continue reporting the certification status of their marine ingredients Fisheries to report progress	**Neutral impact of regulation** Certifications not required by regulators	Certifications penetration already high Incentivize improved sustainability through premium Effort required to mobilize ASC MSL framework
Marine Ingredients EM								
Novel ingredients								
LCA				Not applicable				

Note: DCF: Deforestation and Conversion Free. EM: Electronic Monitoring. LCA: Life Cycle Assessment. MI:Marine Ingredients. (1) Premium over regular MI prices, without peaks like in 2023, (2) Percentage depends on inclusion scenario (1% or 10%)

EM-compliant FM/FO volumes appear sufficient for salmon feed demand, but improving compliance in Peru and Norway is vital for long-term sustainability

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Feed criteria address two dimensions of marine ingredients for compliance

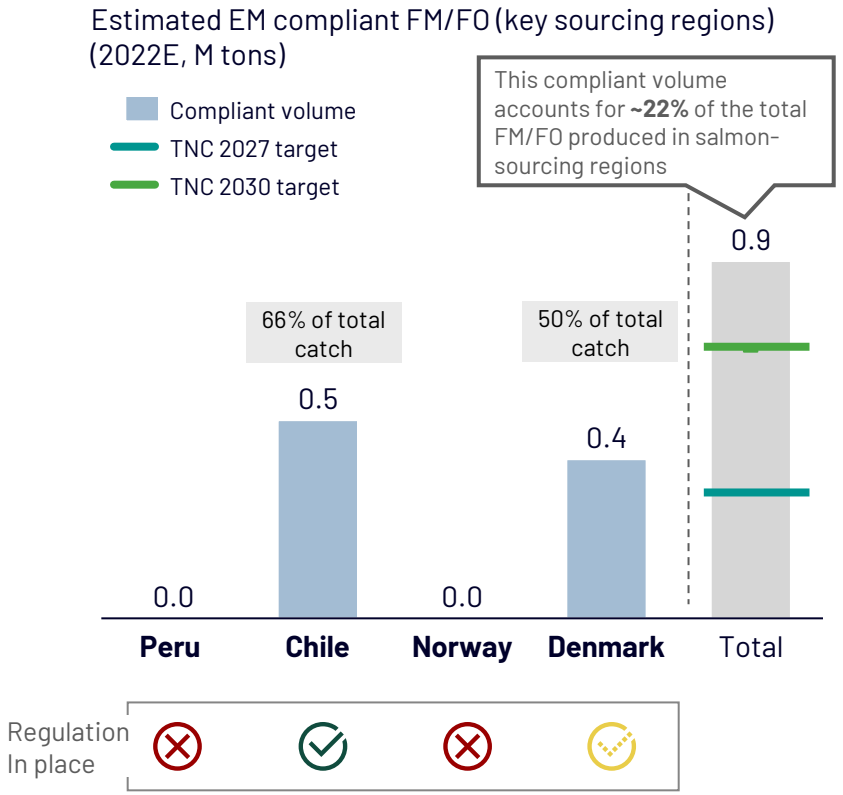
- **100%** FM/FO sourced from **MSC-certified fisheries, MarinTrust, or other GSSI recognized standards**
  - If MarinTrust certified, fisheries must make progress according to ASC's minimum sustainability level (MSL) framework
  - Credible FIPs making demonstrable progress are accepted as stepping-stone
- **100%** of vessels with **electronic monitoring** systems in place

Focus of this section

Salmon feed demand of FM/FO is a small percentage (16%) of the global production

Note: not to scale

EM adoption varies significantly across regions where we source for salmon

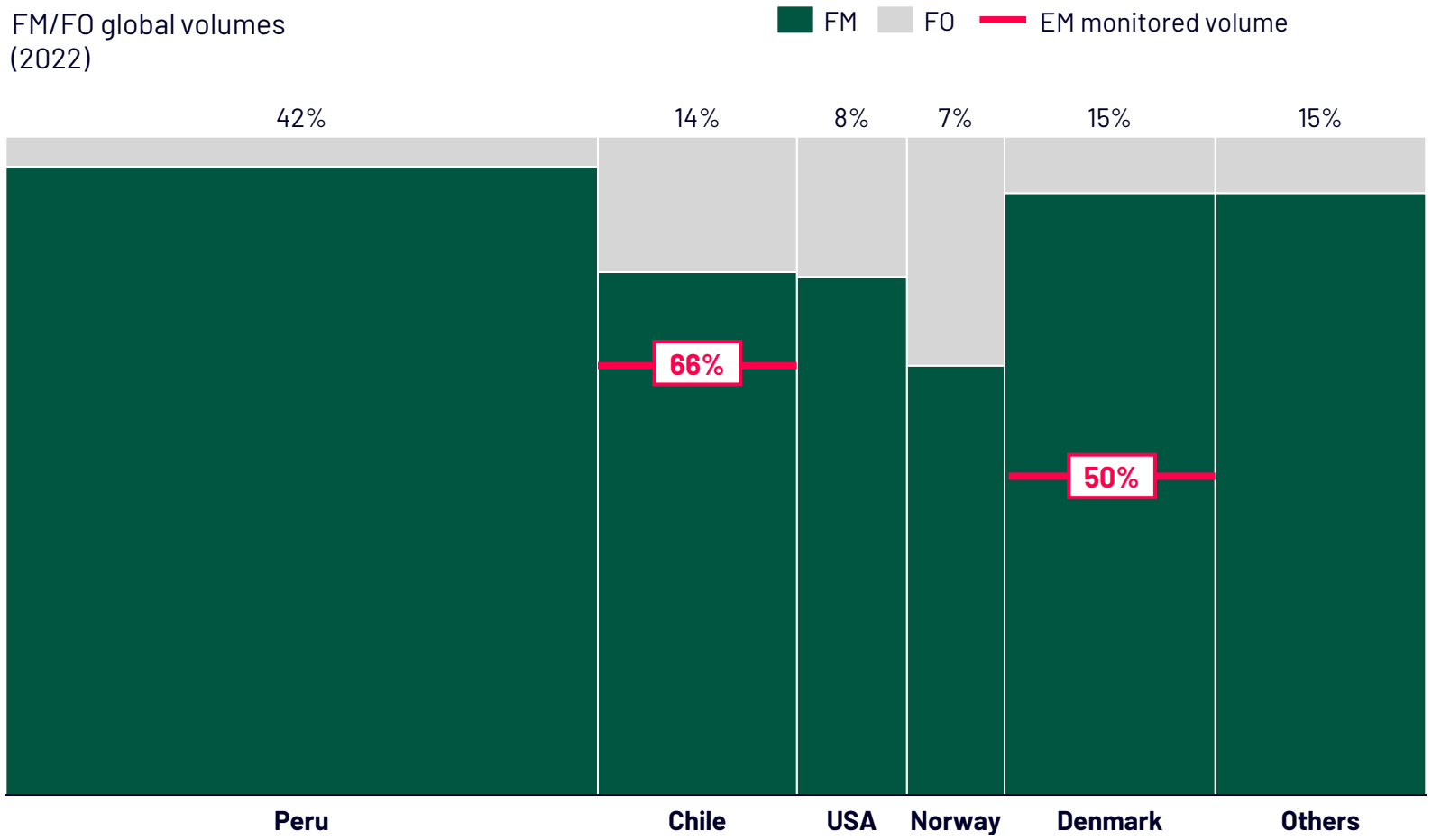


While compliance could technically be achieved using volumes from Chile and Denmark, it is unlikely due to competition from other markets (e.g., China) and industries (e.g., nutraceuticals) for these raw materials

Source: Kontali; Expert interviews

Driving Peru and Norway's compliance is key, considering relevance for FM/FO supply

FM/FO global volumes (2022)



Summary of stakeholder engagement insights

1 EM perception

Privacy concerns and the risk of penalties linked with EM installation and continuous monitoring pose barriers to broader implementation. However, regulation has been a major driver of adoption.

2 Implementation challenges

Feed companies have limited leverage to mandate compliance with EM monitoring.

3 Cost implications

Implementation costs are typically assumed entirely by fisheries without government support, making market value recognition of EM a potential lever for adoption.

Source: Kontali, TNC analysis; Expert intervews

Potential cost increase from EM is ~US$0.002/kg of MI, covering annualized CAPEX and OPEX, negligible against total salmon production costs

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EM cost impact based on stages

CAPEX
- Control units (GPS, LTE, WIFI)
- Cameras – dependent on vessel length
- Sensors
- Installation

OPEX
- Equipment maintenance
- Data storage
- Data transmission

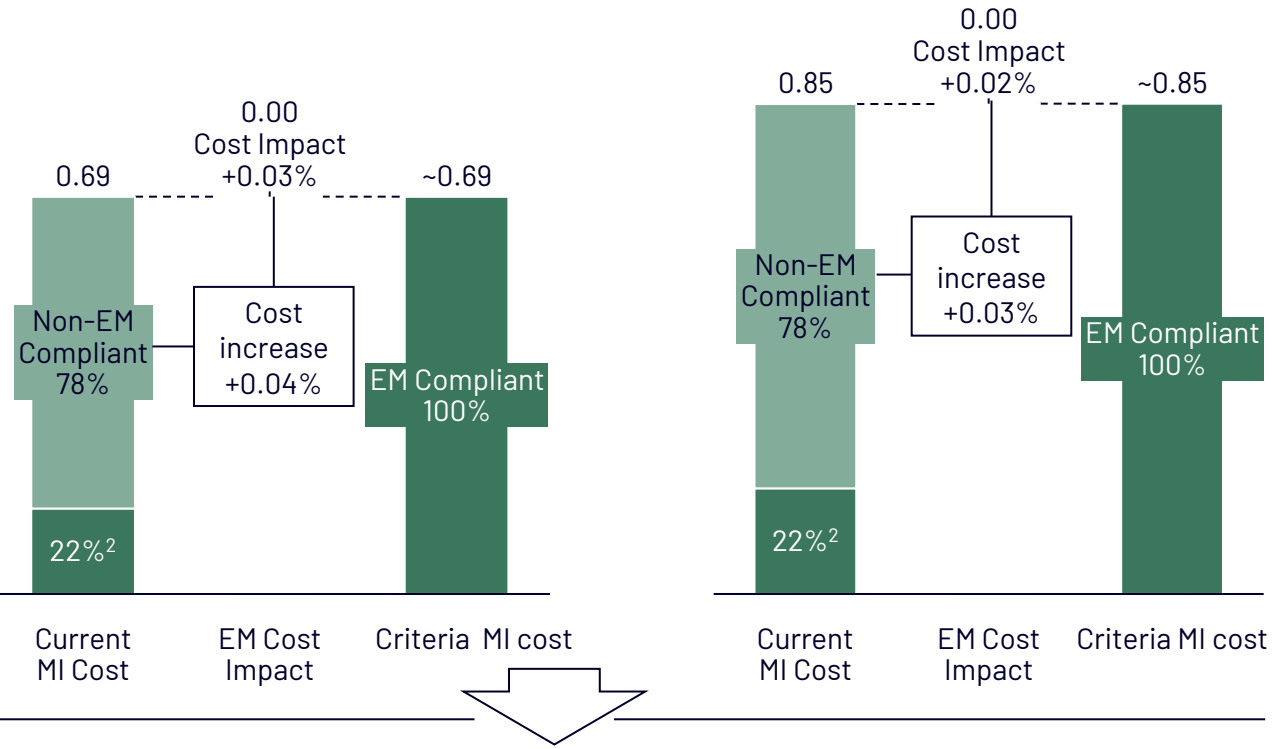
Data Management & Monitoring
- Centralized cloud services
- Wireless services
- Monitoring – video review and analysis

Opportunity Costs

EM cost of **US$0.002/kg** equivalent to **0.04% increase in cost in Chile** and **0.03% in Norway**

Average[1] increase in MI cost (US$) per kg of salmon

MI EM cost increase
(US$/kg of salmon, average[1] baseline)



EM cost increase through MI is ~0.03-0.04% depending on geography. This results in an overall feed cost increase of ~0.01%, which translates to an ~0.004% rise in total salmon production costs

Note: FM – Fishmeal, FO- Fish Oil, MI – Marine Ingredients, EM – Electronic Monitoring; (1) Min Cost Based on Average 2019-2023, Max Cost based on Max cost/prices in same period, (2) Assuming global sourcing of FM/FO is available
Source: EM hardware and maintenance service providers, Sernapesca, NOAA, Lit. Research

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Feasibility assessment: Novel ingredients

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High → *Low*

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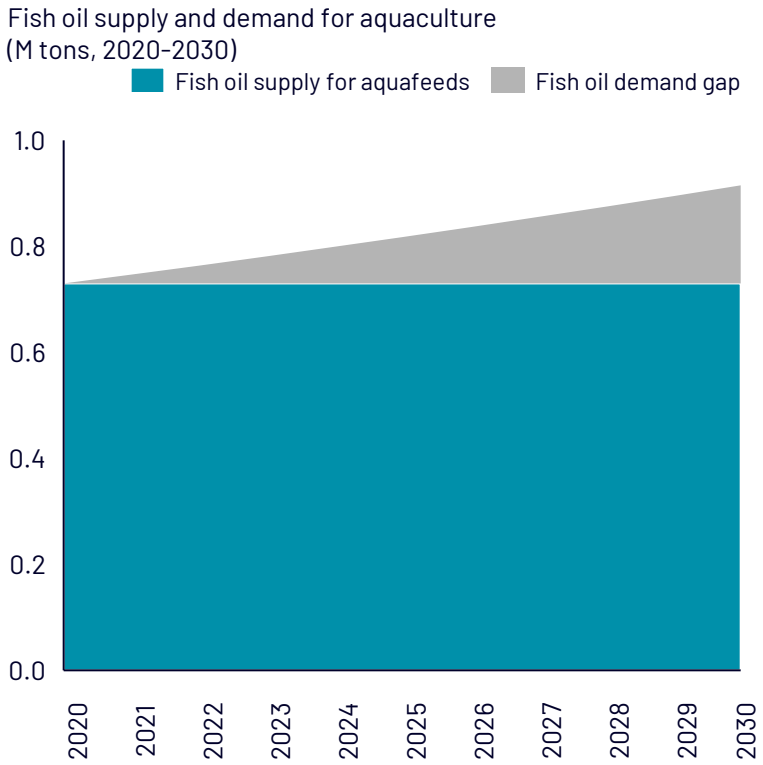
Novel Ingredients								
LCA				**Not applicable**				

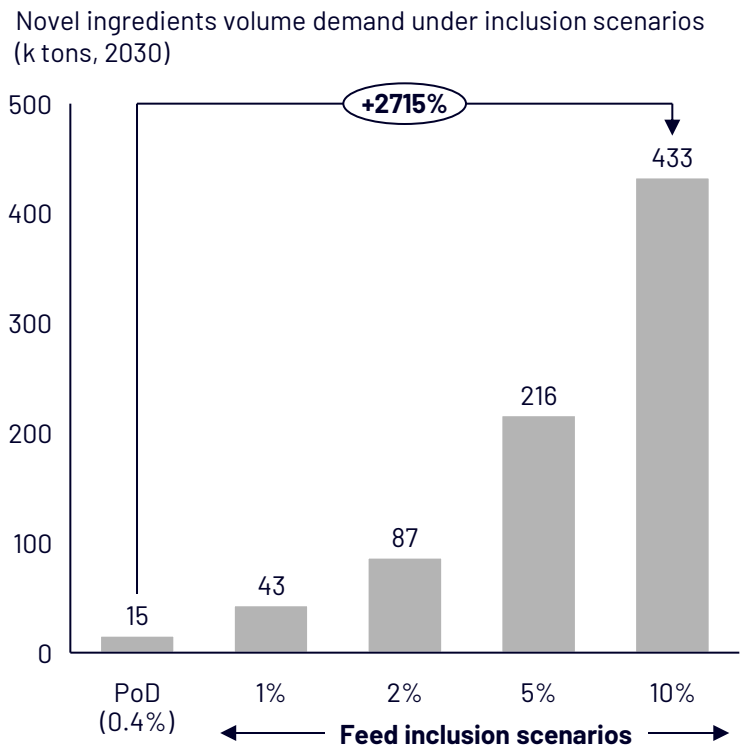
Note: DCF: Deforestation and Conversion Free. EM: Electronic Monitoring. LCA: Life Cycle Assessment. MI:Marine Ingredients. (1) Premium over regular MI prices, without peaks like in 2023, (2) Percentage depends on inclusion scenario (1% or 10%)

Achieving a higher inclusion of novel ingredients in the feed mix will be challenging considering current players' capacity

Even assuming FO supply remains constant, there will be a gap in supply that can be covered by novel ingredients



Additional novel ingredients volume required for salmon feed will vary depending on inclusion scenarios



Summary of insights from NI stakeholder discussions

- The aquaculture industry is not the primary buyer of novel ingredients; **pet food and human consumption offer greater price premiums**
- Therefore, **achieving price competitiveness with FM/FO requires greater scale**; no company currently operates with the capacity to make a significant impact
- Scaling is straightforward but demands **significant Capex**, requiring investors willing to fund expansion
- **Long-term market stability and market commitments** will be crucial for securing future financing

Increasing the inclusion of novel ingredients in salmon feed requires resolving scalability challenges for producers

Source: TNC novel ingredients analysis; Expert interviews

Algal oil inclusion could potentially increase salmon production costs in ~0.3-0.5%, depending on the level of inclusion (1-10%)

PRELIMINARY

NI cost impact considers 3 key assumptions

1 Focus on FO substitution, considering FFDRo>1

- Algal oil is the leading FO replacement today, offering EPA and DHA levels comparable to fish oil

2 Algal oil prices, while stable, are 10-50% higher than FO on average

- Algal oil offers more stable prices with lower fluctuations from natural events but is typically 10-50% more expensive than fish oil in a normal year
- In years with FO scarcity, algal oil can be 10-20% cheaper

3 Algal oil inclusion in feed composition can go between 1-10%

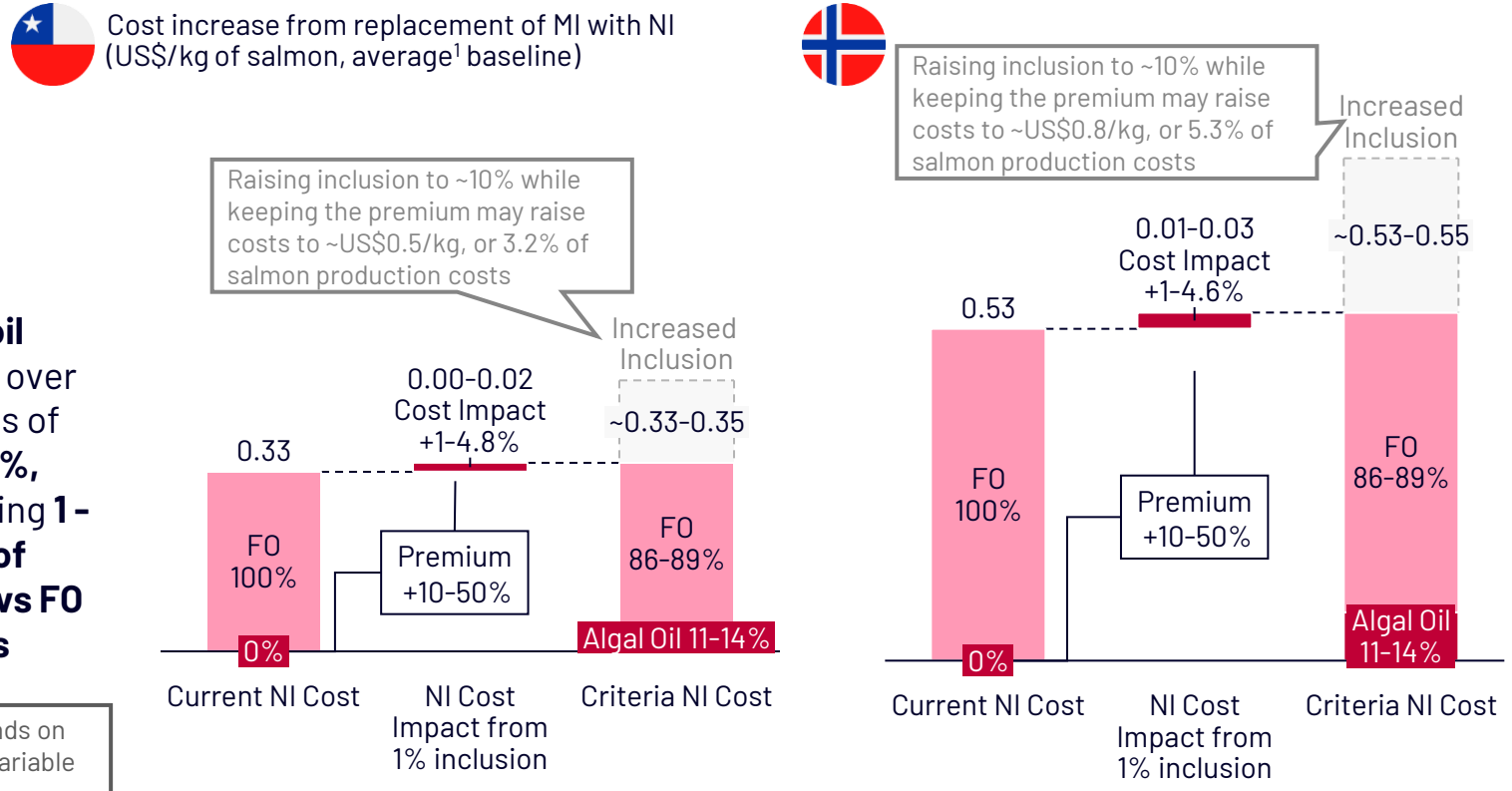
- Current limited volume available can limit inclusion (e.g., to 1%)
- Industry participants consider a ~10% inclusion target for novel ingredients in the medium to long term[2]

Agal oil premium over FO prices of **~10-50%,** representing **1 - 4.8% of increase vs FO costs**

Impact depends on premium vs variable fish oil prices

Average[1] increase in MI cost (US$) per kg of salmon

Cost increase from replacement of MI with NI (US$/kg of salmon, average[1] baseline)



Replacing fish oil with algal oil could increase overall feed cost in ~0.1-1.1% depending on geography, ~0.3-0.5% increase in salmon production costs

Note: FM – Fishmeal, FO- Fish Oil, MI – Marine Ingredients, NI – Novel Ingredients; (1) Min Cost Based on Average 2019-2023, Max Cost based on Max cost/prices in same period, (2) Nutreco Commitments; Source: Expert Interviews, Lit. Research

CONTENTS

Feasibility assessment: Life cycle assessments (LCAs)

The Nature Conservancy

High → *Low*

	Volume		Cost		Implementation at scale			Overall assessment
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Novel Ingredients	Current capacity is limited, coupled with competition from other industries	Fragmented industry A clear market signal will be essential for capacity expansion	• 10-50% premium over regular MI prices1 • Equivalent to 0.3-0.5% of production costs for 1% inclusion (if % inclusion high impact can be ~5%)	**High potential reduction** Advanced market commitments (AMCs) aid growth of sub-scaled production, reducing costs	Advanced market commitments can signal demand and support capacity expansion	Feed companies to report novel ingredient inclusion and continue tracking & reporting FFDR progress	**Unfavorable impact of regulation** Current regulatory frameworks are strict, hindering widespread adoption	Limited capacity today Advanced market commitments can support the required volume expansion
LCA				**Not applicable**				

Note: DCF: Deforestation and Conversion Free. EM: Electronic Monitoring. LCA: Life Cycle Assessment. MI:Marine Ingredients. (1) Premium over regular MI prices, without peaks like in 2023, (2) Percentage depends on inclusion scenario (1% or 10%)

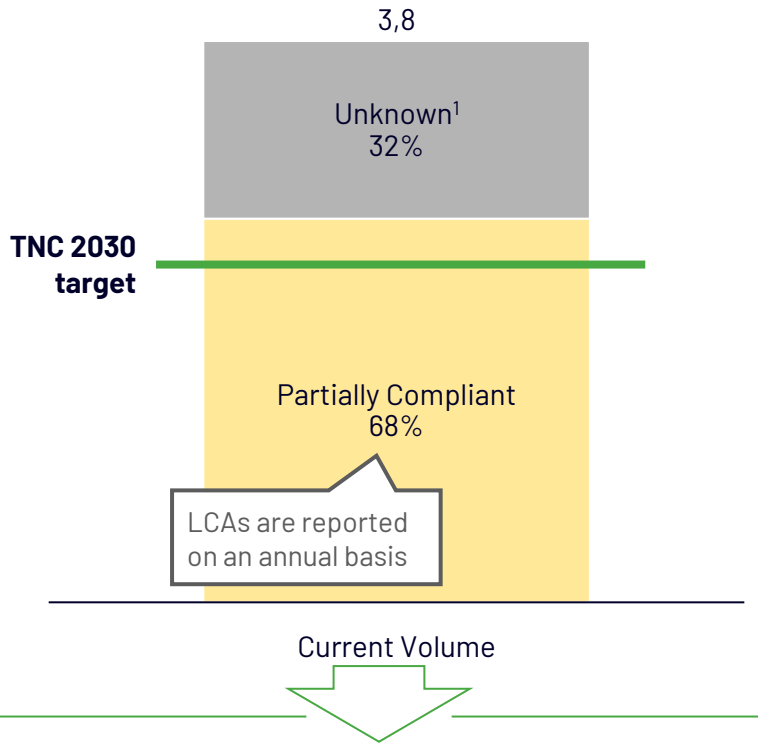
Life Cycle Assessment adoption by salmon feed suppliers is high and sufficient to comply with feed criteria

Feed criteria defines LCA frequency for feed and novel ingredients

- **LCA measurements** for feed and novel ingredients, including carbon footprint, and conducted via globally-recognized methodology*
  - Feed footprints should be aggregated and reported quarterly
  - LCAs for novel ingredients should be requested from suppliers at least once a year
- **Carbon footprint** for feed must not exceed an absolute upper limit per kilogram**

Currently ~68% of volume in the industry incorporates LCAs in their reporting

Volume of salmon feed with LCA
(M tons, 2024E)



Moving forward, there are no significant challenges to increase reporting frequency

*"We usually generate a report annually, but still, **we already give some of our customers partial reports during the year**, so **doing this [reporting LCAs quarterly] would imply no cost at all**."*
Sustainability Leader, Feed Producer 1

*"I think **quarterly is good** (..) it fits better into the farming calendar of our customers as well and the lifecycle of the salmon, and **it seems like a reasonable middle ground between granularity and practicality**."*
Sustainability Leader, Feed Producer 2

*"We are **already conducting LCAs biannually**, as are most leading companies in the industry (...) **increasing the frequency would not significantly impact costs.**"*
Business Development Leader, Novel Ingredients Producer

Transitioning to quarterly LCAs should require minimal to no additional effort or cost for the world's largest feed producers, and transitioning those players' reporting would be enough to achieve compliance fulfillment

* Note: For example, PEFCR. **Note: For example, the forthcoming BAP Vanguard standard will establish an absolute emissions limit for salmon feed. (1) No information found on LCA publications; We are calculating volume compliance considering each player's market share using their installed capacity Source: Company reports; Intrafish; Salmon Business

CONTENTS

Feasibility assessment: Overall summary

The Nature Conservancy

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LCA	Salmon feed suppliers widely adopt LCAs; transitioning to quarterly updates requires minimal effort or cost	LCA is widely adopted by feed producers, with novel ingredient companies also viewing it as a requirement	• Negligible costs • No impact in salmon production costs	**Not applicable** – Negligible cost	Low effort required to increase reporting frequency and promoting use in feed mix decisions	Feed and novel ingredient companies should continue reporting footprint results	**Neutral impact of regulation** LCAs not required by regulators	Enough LCA compliant volume and willingness to increase frequency (with negligible cost)

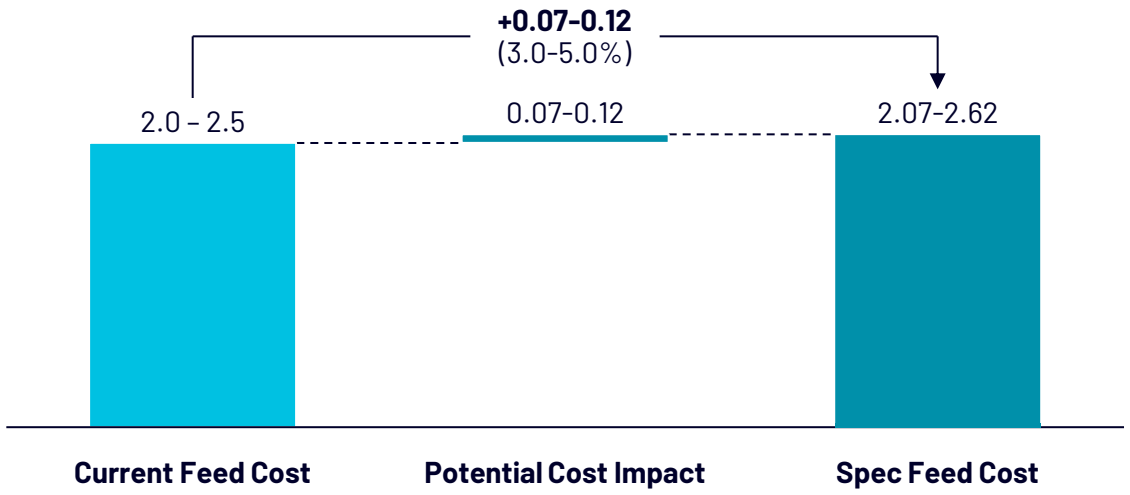
Note: DCF: Deforestation and Conversion Free. EM: Electronic Monitoring. LCA: Life Cycle Assessment. MI:Marine Ingredients. (1) Premium over regular MI prices, without peaks like in 2023, (2) Percentage depends on inclusion scenario (1% or 10%)

Implementing the criteria could result in an upcharge of US$7-12 cents per kg of salmon, representing 1-2% of salmon production costs

PRELIMINARY

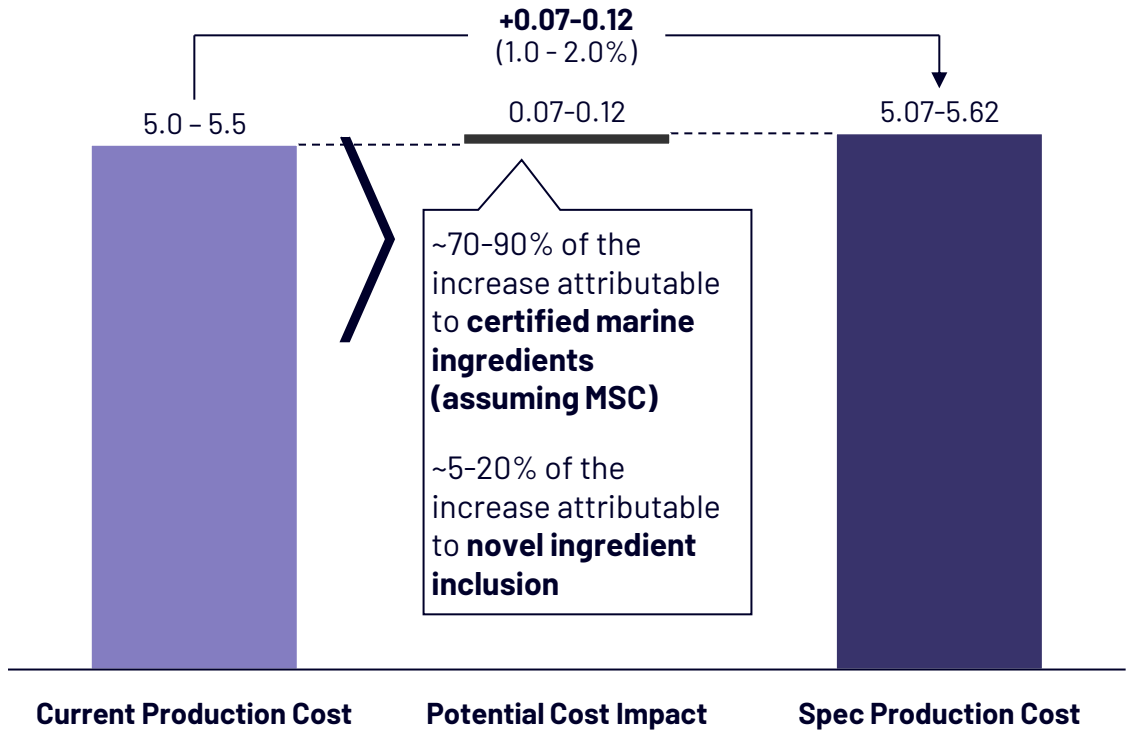
Sustainability efforts in salmon feed can imply a potential upcharge of US$7–12 cents...

Feed Cost per Kg of Salmon,
(US$/Kg of Salmon, Annual, Average[1] Baseline)



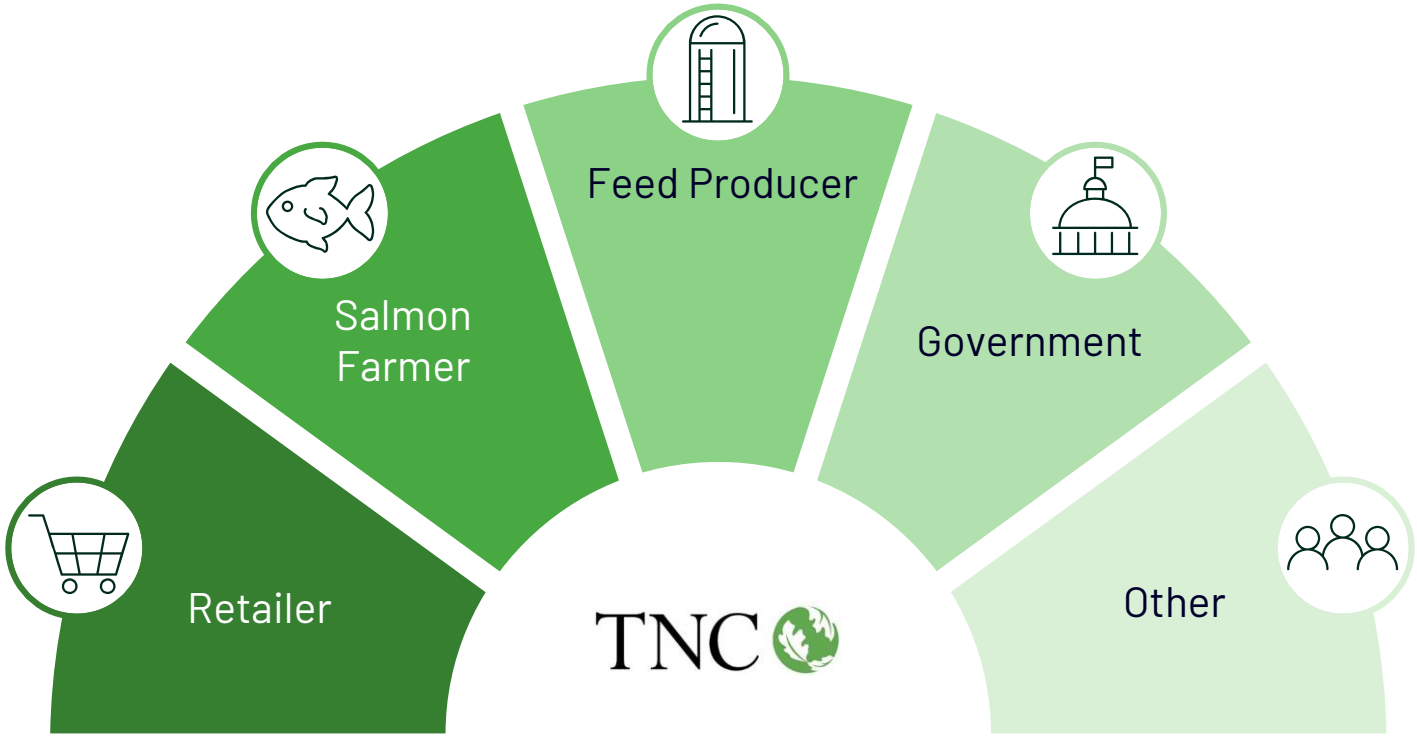
...equivalent to 1-2% increase in salmon production costs

Production Cost per Kg of Salmon,
(US$/Kg of Salmon, Annual, Average[1] Baseline)



Note: (1) Average: between average Chile and Norway feed and salmon production costs; Source: Lit. Research, Expert Interviews, Internal Analysis

TNC is committed to supporting value chain alignment by facilitating collaboration to establish common commitments & drive action



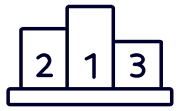
Key actions

1. Set sustainability expectations (criteria definition)
2. Facilitate alignment across the value chain
3. In support of modest sustainability premium, communicate major cost drivers to industry actors
4. Collaborate on 'playbook' or roadmaps to comply with commitments
5. Oversee continuous program progress

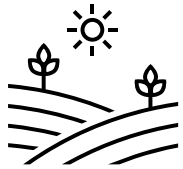
We aim to engage industry leaders in the initiative to establish a new standard of feed sustainability across the industry

The Nature Conservancy

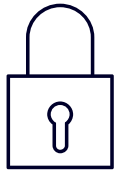
Why should you care?



Enhanced **reputation & positioning as sustainability leader**

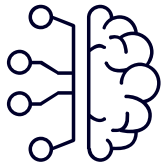


Lowering our impact on critical marine and terrestrial ecosystems



Lower **supply chain risk**

Increased **market access and/or recognition** and **differentiated product**



Improved **scientific and biological data**

Diversified cost risk through novel ingredients inclusion

Join us – scan to confirm your interest!


The Nature
Conservancy