May 2023

LCA of assessment of New Zealand-farmed King salmon

This is a summary of a wider LCA study - for the full report go to: salmon-lca.thinkstep-anz.com

To understand the sustainability of New Zealand-farmed King salmon, Fisheries New Zealand, Aquaculture New Zealand and the New Zealand Salmon Farmers Association asked sustainability firm thinkstep-anz to carry out a Life Cycle Assessment (LCA) study with a focus on carbon.

What is a Life Cycle Assessment (LCA)?

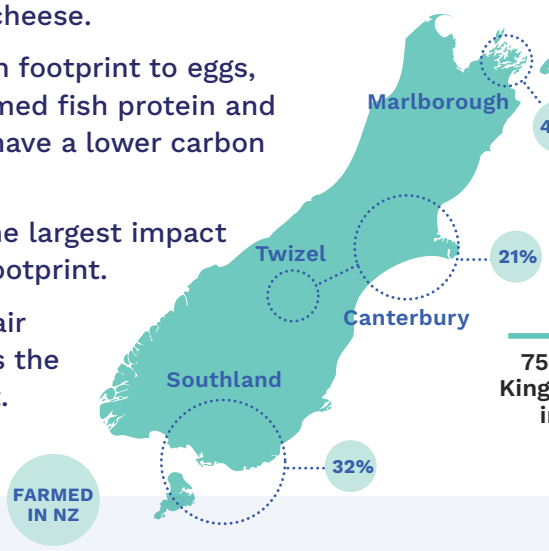
LCA is a science-based approach that measures the environmental impacts of a product over its entire life cycle. Data from an LCA can help businesses understand, manage and communicate their environmental impacts.

This study follows ISO 14044 and the Fish and Fish Products Product Category Rules (PCR).

Three international independent experts have critically reviewed the full LCA study.

Summary

- New Zealand-farmed salmon sold domestically has a lower carbon footprint than beef, lamb and cheese.
- It has a similar carbon footprint to eggs, poultry and other farmed fish protein and oysters. NZ mussels have a lower carbon footprint.
- Producing feed has the largest impact on salmon's carbon footprint.
- Exporting salmon by air significantly increases the total carbon footprint.



75% of the world's King salmon is farmed in New Zealand

NZ$312 million total revenue (estimated) for 2022

We compared the carbon footprint of NZ-farmed King salmon with other dietary proteins

Part 01: life cycle assessment

We first assessed the environmental impact of New Zealand-farmed King salmon over its life cycle.

Part 02: protein comparison

We then compared the impacts of producing farmed King salmon with other popular dietary proteins.

Part 03: ways to reduce impact

We identified what the New Zealand-farmed King salmon industry can do to reduce its environmental impacts.

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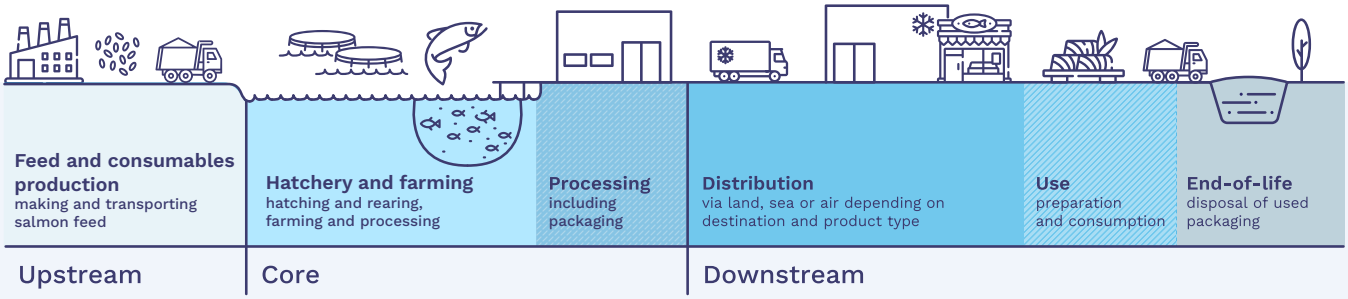
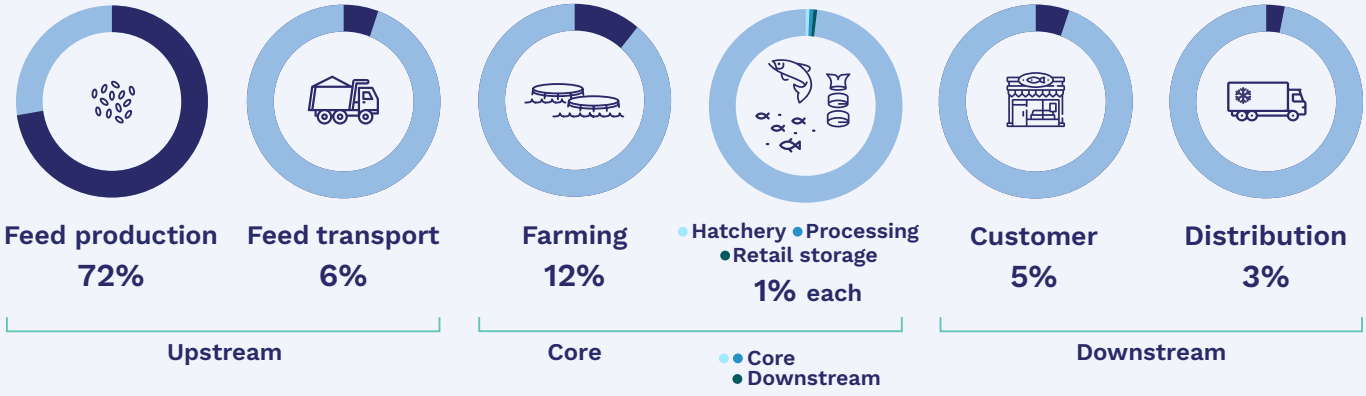
Our LCA study looked at three phases

- **Upstream processes:** making and transporting salmon feed
- **Core processes:** rearing, farming, harvesting, processing and packaging the salmon
- **Downstream processes:** transporting salmon to the consumer, cooking and disposing of it.

Full domestic life cycle – production to disposal

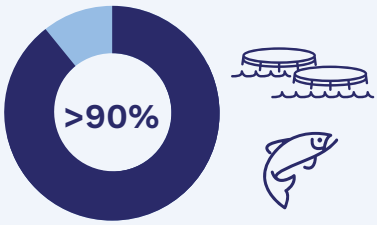


Carbon footprint of 1kg salmon meat by source:



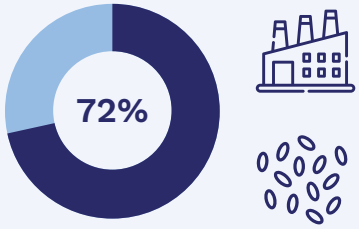
Where the impact comes from

To guide the industry to reduce its impact, we identified 'hotspots'. These are areas where improving practices will make the biggest difference.



Upstream and core

In the domestic market, more than 90% of the environmental impacts come from the first two phases of the life cycle: producing salmon feed, operating the hatchery, farming and processing.



Feed production

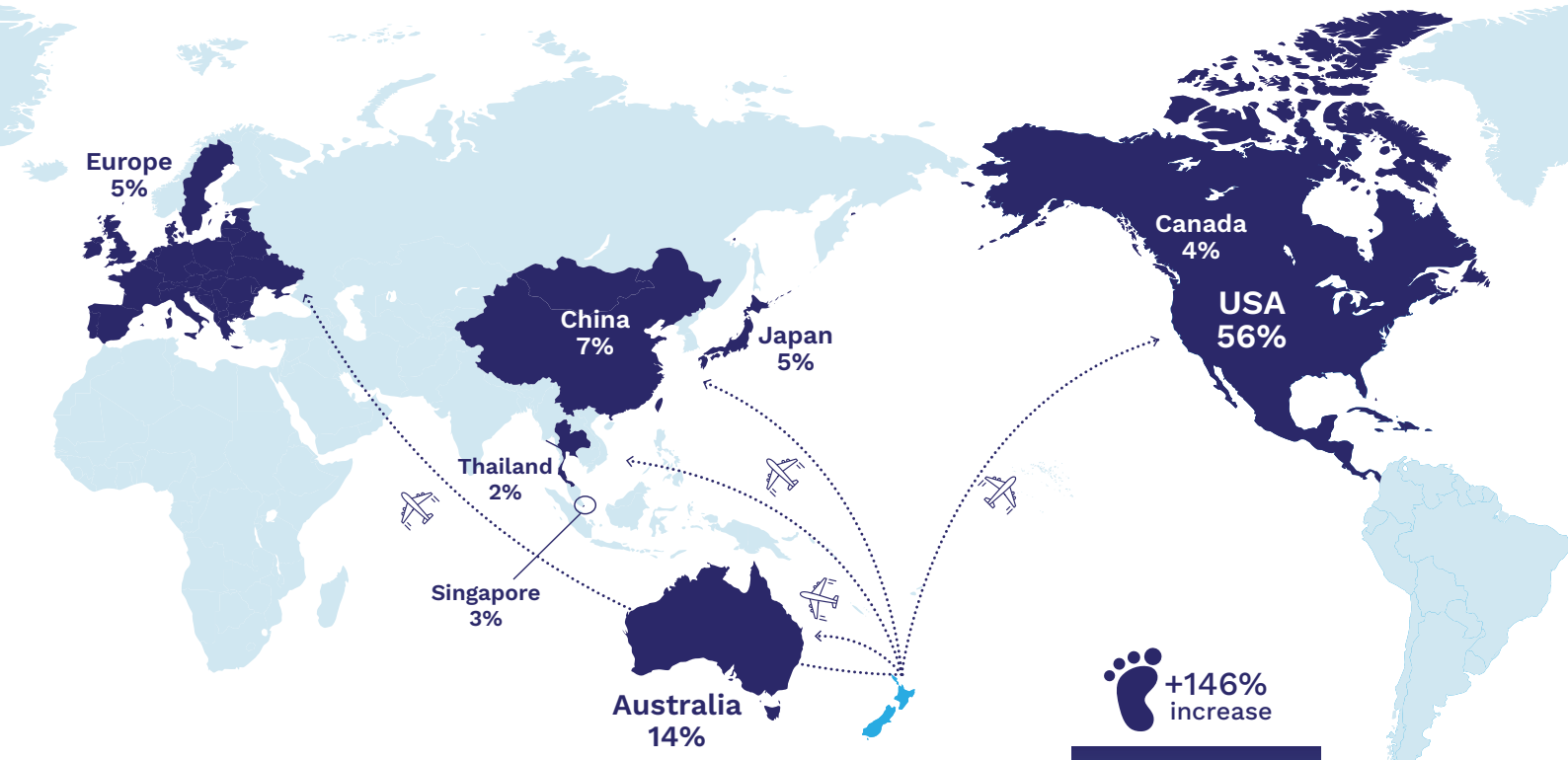
Producing the feed is the largest contributor (72%) to the carbon footprint of salmon domestically sold.

Transporting product to export markets adds to the carbon footprint

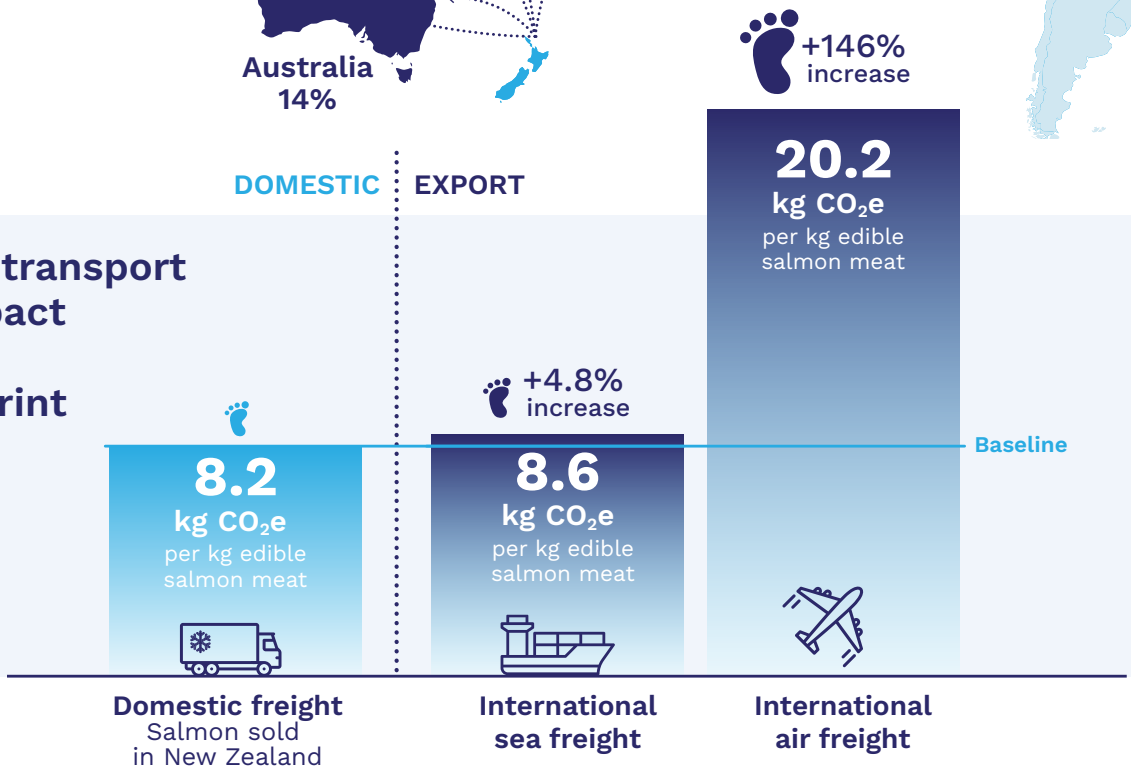
As salmon is a relatively high-value product with short shelf life it is often air-freighted fresh (gutted, head on).

In 2022 most exported salmon from NZ was transported to North America.

NZ $147 million total export revenue for w2022



The mode of transport has a big impact on salmon's carbon footprint

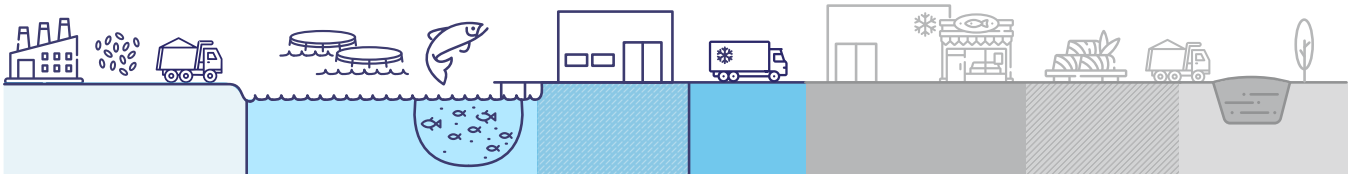


How New Zealand-farmed King salmon compares to other proteins

King salmon is an excellent source of Omega-3s and is packed full of nutrients essential for good health.

PROTEIN	B12	PHOSPHORUS	SELENIUM
18.2 per 100 g	83% RDI	29% RDI	35% RDI

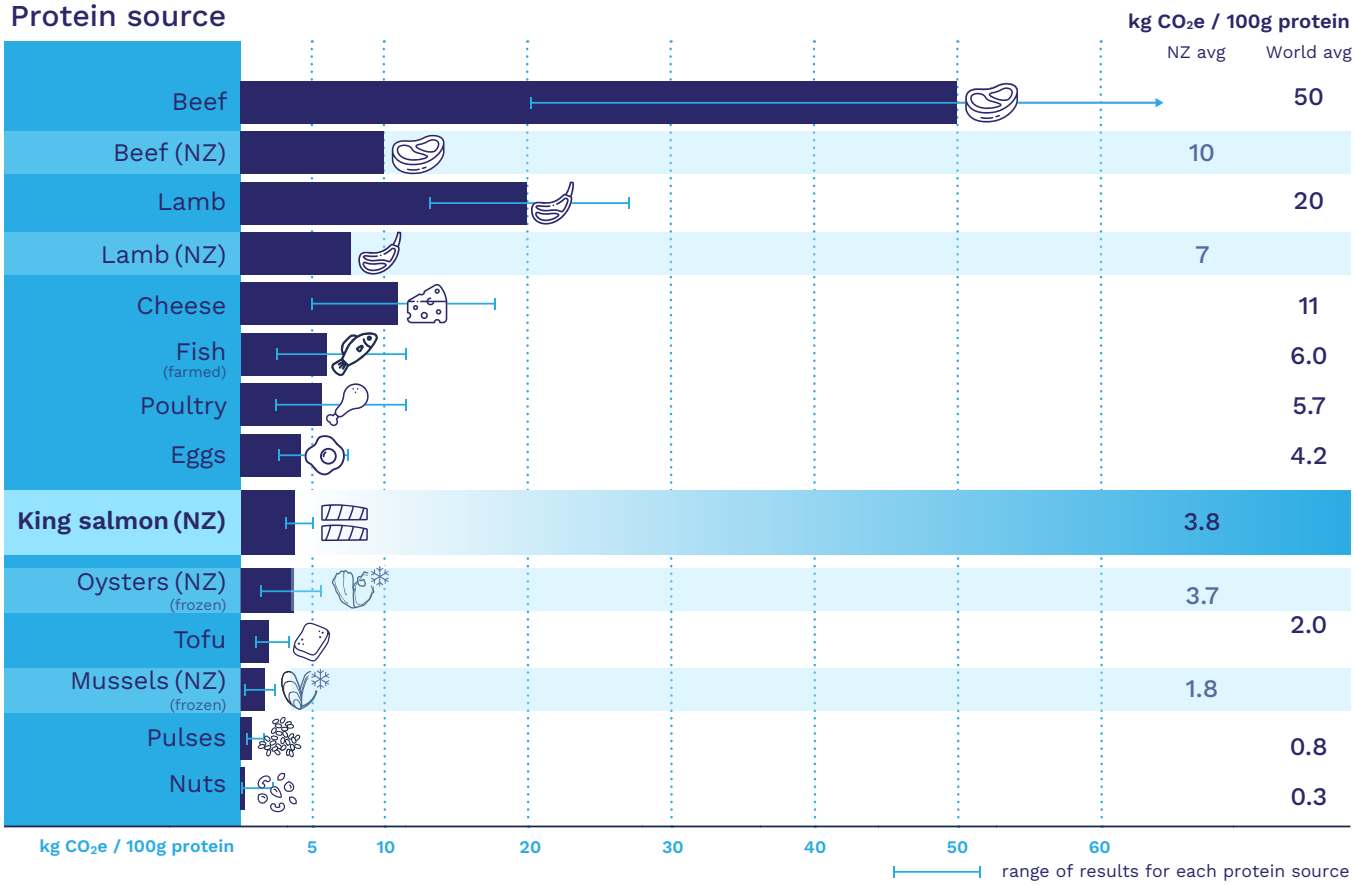
This part of the study compares the carbon footprint of different dietary proteins from production to retail only. It is measured in kg CO_2 per 100g protein, not the 1kg of edible meat we analysed in our LCA above.



We compared the carbon footprint of producing New Zealand-farmed King salmon with producing other protein types. New Zealand-farmed King salmon has a lower carbon footprint per 100g of protein than beef, lamb and cheese.

Its carbon footprint falls into a similar range to global egg, poultry and farmed fish protein. The carbon footprint is also similar to New Zealand-farmed Pacific oysters but higher than that of New Zealand-farmed Greenshell mussels.

Carbon footprint of different dietary proteins on the global market - production to retail only



* The carbon footprints of the oysters and mussels come from thinkstep-anz (2021). The carbon footprints of New Zealand beef and lamb are from Beef and Lamb NZ (2022), converted to per 100g protein. The other nutritional proteins come from global production data from Poore and Nemecek (2018). All products are shown using a system boundary that spans from farming to retail.

The results for salmon are for domestic distribution. The bars are used to show the tenth and ninetieth percentiles (the range within which 80% of producers will fall). These bars indicate the range of results for a particular protein source, due to different production methods, technologies, and locations.

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Opportunities to lower the impact from feed

Feed formulation

Work with suppliers to identify feed formulations that balance nutritional content, availability, environmental impacts and price.

Finding alternatives

Replace high-impact feeds like soy protein concentrate and rapeseed oil.

Improving yields

Reduce the amount of feed needed to produce one kilo of salmon by making the feed more nutritious and digestible, and improving salmon genetics.

Feed formulation

Further improve feeding systems and technology: camera and system monitoring can make feeding more efficent.

Opportunities to lower the export carbon footprint

Investigate options for sea freight

Improving freezing and chilling technology could lead to increased sea freight and lower the transport footprint for international markets. Super-cooling salmon can contribute to a lower carbon footprint because it reduces the amount of ice, transport and packaging materials needed. The product stays fresh for longer, allowing for longer transport times.

Support use of lower carbon fuels for airlines

Encouraging air freight companies to use lower carbon fuels could also have a significant impact on the carbon footprint of salmon.

The LCA study was funded by Fisheries New Zealand. This summary report was funded by Fisheries New Zealand and AQNZ.

We would also like to thank these organisations for providing data for the LCA or feedback:

- Biomar Australia
- Skretting Australia
- Salmon Smolt NZ
- New Zealand King Salmon
- Sanford
- Akaroa Salmon
- Mt Cook Alpine Salmon
- NZ Salmon Farmers Association

Aquaculture New Zealand

About Aquaculture NZ

Aquaculture New Zealand is the voice of Aotearoa New Zealand's aquaculture industry, representing the interests of the three main species grown in New Zealand: King salmon, Greenshell mussels, Pacific oysters.

www.aquaculture.org.nz

Fisheries New Zealand
Tini a Tangaroa

About Fisheries New Zealand

Fisheries New Zealand works to ensure fisheries resources are managed to provide the greatest overall benefit to Aotearoa New Zealand. Our focus is the sustainability of wild fish stocks, aquaculture, and the wider aquatic environment, now and for future generations.

www.fisheries.govt.nz

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About thinkstep-anz

thinkstep-anz is an independent sustainability firm. We have been helping businesses succeed sustainably for more than 16 years. Our services span sustainability strategy and technical solutions to make products, businesses and the built environment more sustainable.

www.thinkstep-anz.com

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