WATER FOOTPRINT SALMONES CAMANCHACA 2024

Date: March 2025

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1. Introduction

1.1 About the Company

Salmones Camanchaca S.A. is a subsidiary of Camanchaca S.A. with over 30 years of experience and is a publicly traded company listed on the Santiago Stock Exchange. Vertically integrated, it includes freshwater and seawater facilities, primary and value-added processing plants. Additionally, it has commercial offices in various markets around the world to provide real support to the supply chain for its customers.

Salmones Camanchaca strives for the sustainable development of salmon farming, is a founding member of the Global Salmon Initiative (GSI) and the Chilean Salmon Marketing Council; it was the first salmon producer to be awarded three stars under the Best Aquaculture Practices (BAP) certification, and has now achieved four stars.

1.2 Salmon

Its main products are derived from Atlantic salmon and Coho salmon. These products are available as fresh fish, whole fish, chilled and frozen, fillets, and portions. Salmon is one of the best sources of long-chain omega-3 fatty acids and a great source of vitamin D.

This study measures the water footprint impacts during the hatchery, seawater farming, and processing stages of Camanchaca's salmon production for 1 kg of edible salmon.

1.3 Salmon Life Cycle

The life cycle of salmon intended for human consumption consists of various stages, illustrated in Figure 1. This study focuses solely on the freshwater (hatcheries), seawater (grow-out sites), and processing (processing plants) stages, based on 1 kg of salmon. In terms of energy, the study considers the use of diesel within these stages, as well as electricity and LPG, along with the water inputs and outputs during the processes, and the feed provided to the salmon for growth.

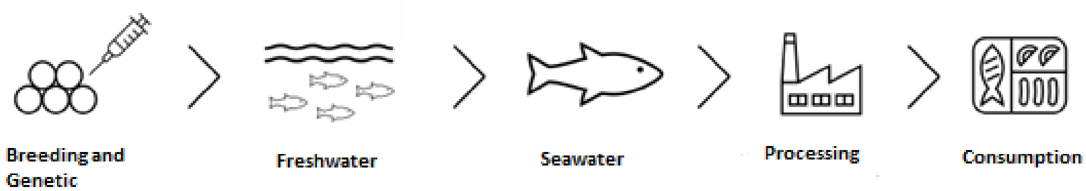


Figure 1: Salmon Life Cycle

2. Water Footprint

The use of freshwater for human activities often leads to a decrease in the availability of this resource (in a given area) or to the pollution of water bodies that receive discharges. In the first case, we refer to consumptive uses, which are those where the extracted freshwater is not returned to the original basin and, therefore, becomes unavailable for other uses. Water is consumed through evaporation, evapotranspiration, incorporation into products, transfer between basins, or discharge into the sea.

On the other hand, water body pollution refers to uses that degrade water quality, such as the emission of pollutants into the environment that contaminate the receiving water bodies. Both types of water use must be considered when analyzing the sustainability of water resources.

Since the water footprint is based on the Life Cycle Assessment (LCA) approach, the study considers both direct and indirect water uses throughout the relevant value chain and correlates them to potential impacts. The water footprint analysis classifies raw materials, energy sources, and emissions related to water resources within the defined system. According to the standard, the analysis must include both qualitative and quantitative aspects, and the database used must be transparent.

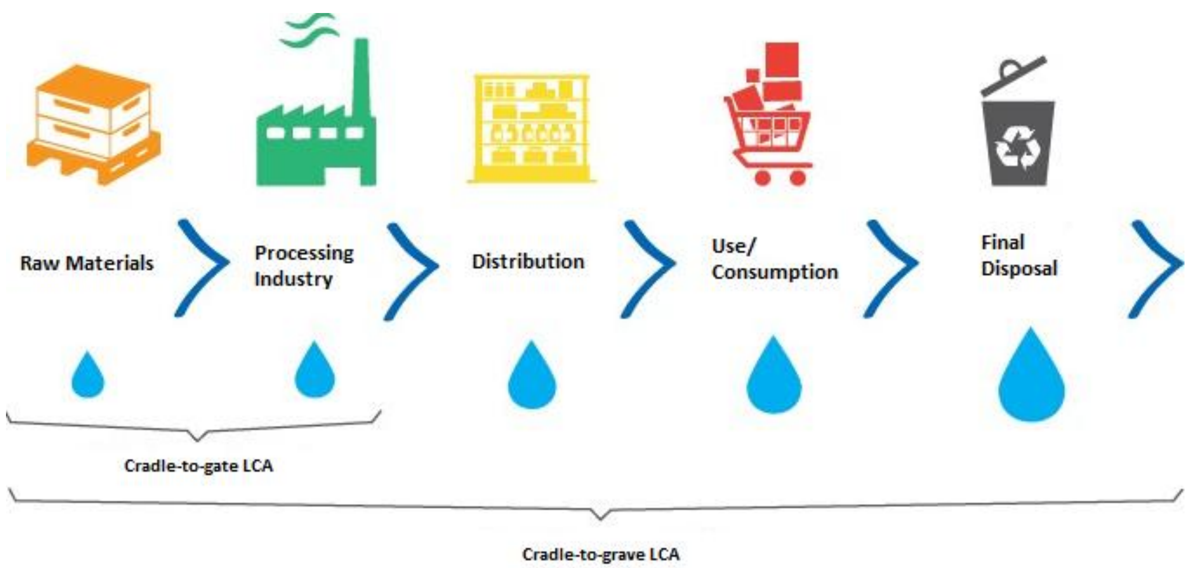


Figure 2: Diagram of the life cycle assessment approach in water footprint calculation.

The ISO 14046 standard specifies the principles, requirements, and guidelines related to the assessment of the water footprint of products, processes, and organizations based on Life Cycle Assessment (LCA), either as a standalone evaluation or as part of a more comprehensive environmental assessment. Based on this, the previously described stages must be considered, which involve the use of raw materials, grow-out centers, and processing.
Further details can be found in Annex 5.1.

3. Results

3.1 Water Footprint ISO 14.046

For this assessment, the software SimaPro 9.3.0.3 and the AWARE impact method were used. The results are presented for the declared unit: 1 kg of salmon.

Table 1: Potential environmental impacts per declared unit.

Category	Unit	Hatcheries	Grow-out	Primary Processing	Secondary Processing	Feed	Total
Water Use	m3	0.743	0.03	0.773	0.688	2.077[1]	4.311

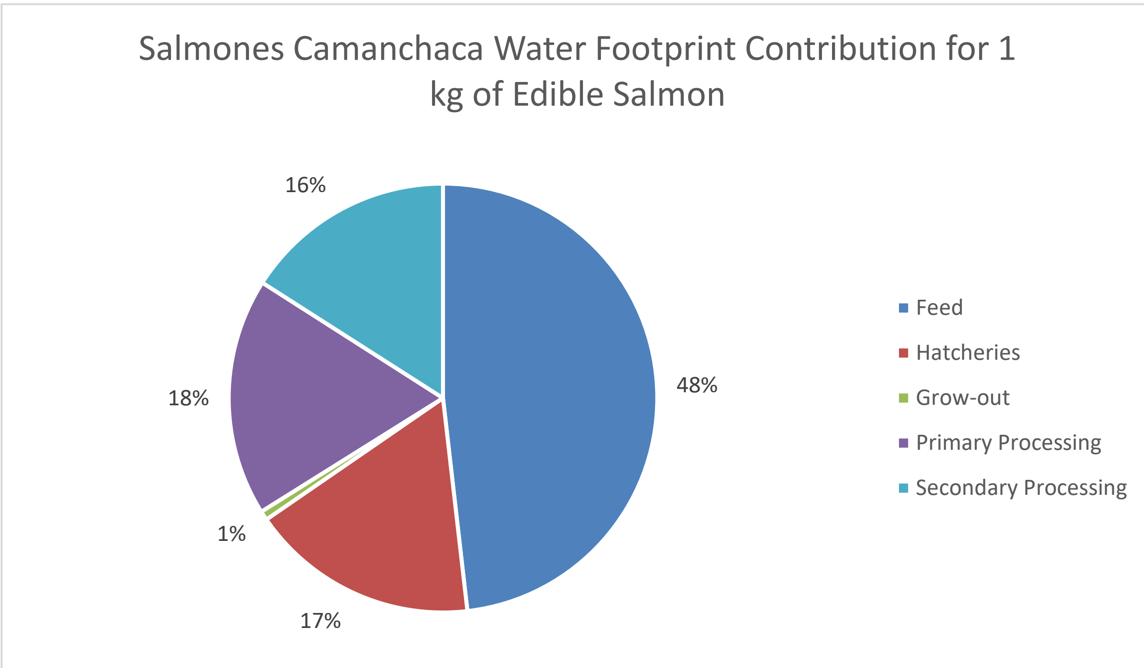


Figure 3: Water footprint contribution including feed.

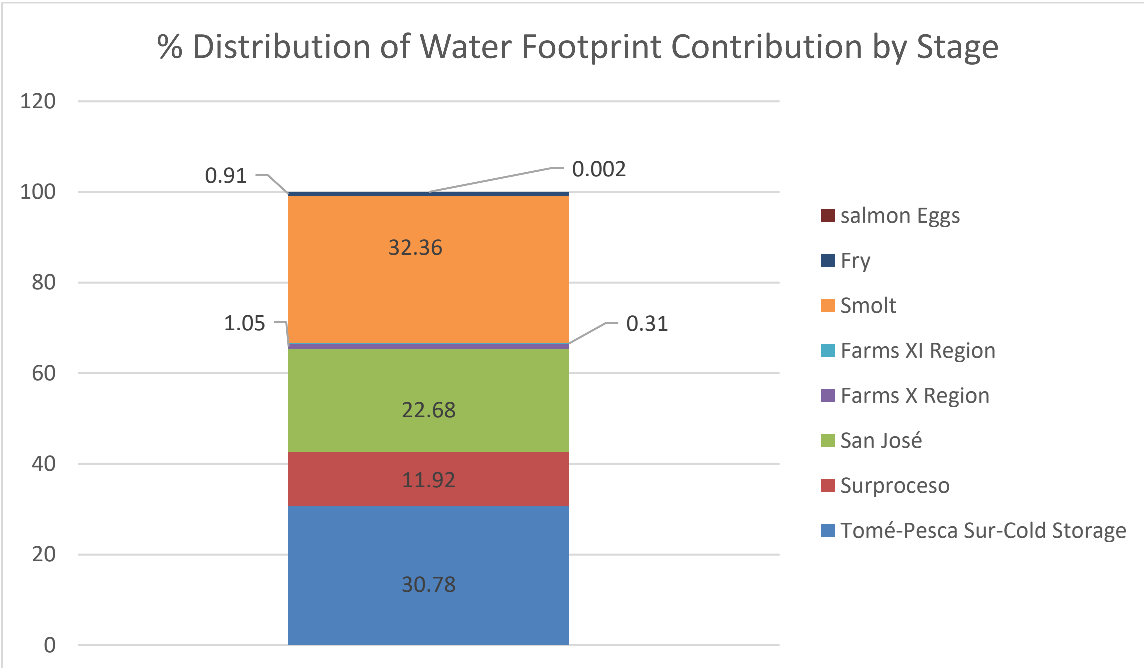


Figure 4: Percentage distribution of impact by stage excluding feed.

[1] Corresponds to information provided by the supplier as previously mentioned in Annex 5.1.5 of the assumptions in this report.

From Figure 5, it can be identified that the stage with the greatest impact on the water footprint comes from Smolt production, accounting for 32.36% of the impact excluding feed, followed by the Tomé secondary processing plant with 30.78% (primarily). This differentiation indicates that the stages of salmon production that contribute the most to the water footprint are those that use the largest amounts of freshwater. The following sections detail the contribution of each stage and facility.

3.1.1 Fresh Water

For the hatchery stage, a water footprint of 0.743 m³ was obtained, excluding fish feed. Additionally, it was identified that the hatchery with the greatest impact on the water footprint is Río Petrohué, where the main impact comes from the use of groundwater. This is because the used water is discharged into a river, resulting in a watershed transfer that affects the natural flow of the resource—a situation also observed at the Playa Maqui hatchery. Furthermore, the impact is related to the biomass production at this facility, which is higher compared to the other hatcheries.

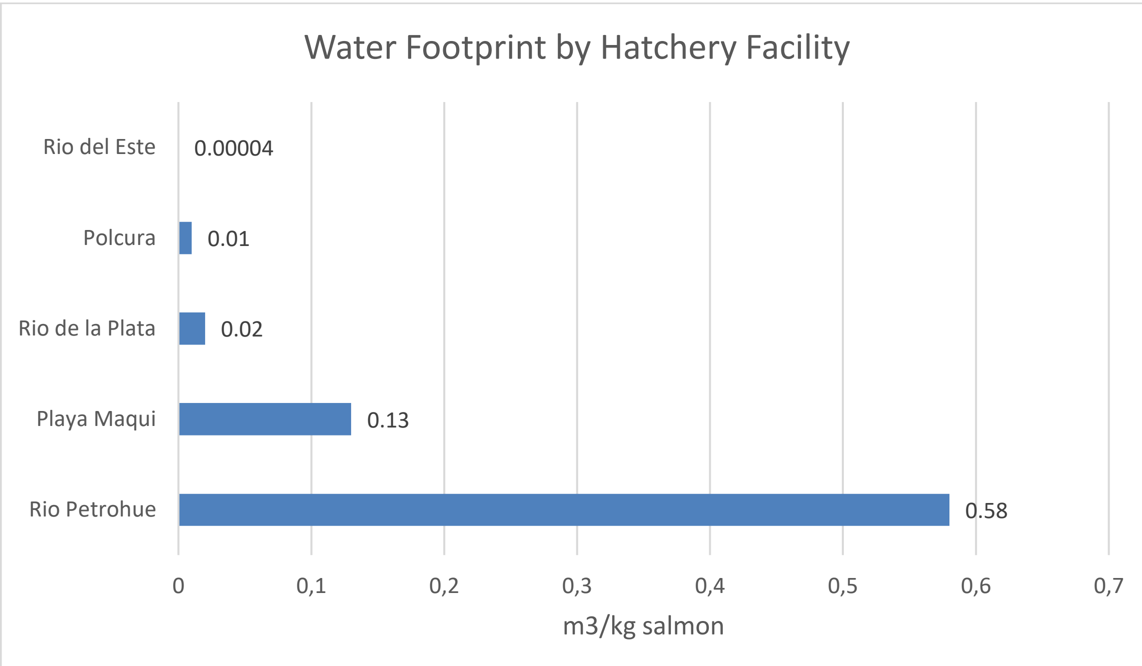


Figure 5: Water footprint and its contribution by hatchery facility

Following the same line regarding which type of salmon farming facility in the freshwater stage has the greatest impact (considering the differences between the production of Eggs, Fry, or Smolt), hatcheries where Smolt production takes place contribute 0.723 m³/kg of salmon, Fry production contributes 0.020 m³/kg, and finally, Egg production (Broodstock) contributes 0.00004 m³/kg. On the other hand, the impact associated with water use is also considered based on the geographic location of each hatchery, as assessed using the AWARE method, and is shown in the following table.

Table 2: Water use impact in Camanchaca hatcheries 2024 according to the AWARE method.

Facility Name	Region	Water Inflow [m³]	Biomass [kg]	AWARE Factor (Non-agriculture)	AWARE Method Impact per Biomass (m³/kg)
Río Petrohué	Region X	3,135,650	1,631,081	0.5	0.96
Río de la Plata	Region X	5,790,064	46,249	0.5	62.60
Río del Este	Region X	4,863,420	627	0.5	3,878.8
Polcura	Region VIII	16,542,121	32,201	33.9	17,414.9
Playa Maqui	Region X	7,841	370,876	0.5	0.01

Table 9 presents the variation in the assessment of water stress according to the geographic location of different river basins, based on the AWARE2 method, and illustrates how the water footprint impact is evaluated using the Life Cycle Assessment (LCA) methodology in accordance with ISO 14046 for hatchery operations. A clear discrepancy is observed, primarily due to the methodological differences in data processing for impact quantification.

On one hand, the use of SimaPro software—which provides a national water scarcity factor for Chile (81.31, as stated in the assumptions)—results in a higher water footprint, as the software applies a more globally-oriented impact assessment approach. On the other hand, when impacts are calculated using location-specific AWARE data and the corresponding basin-level factors, the quantification of water-related impacts varies significantly.

Furthermore, the results shown in Table 9, which relate water use to both the assessment method and the geographic location of Camanchaca's active hatcheries in 2024, indicate that the "Polcura" facility exhibits the highest water use impact.

This can be explained by the fact that the Polcura hatchery is located in the Biobío Region, where higher water scarcity has been identified compared to the Los Lagos Region (see Illustration 1). This impact is not the result of all the water used in the hatchery's processes being transferred to the final product or discharged into a different watershed, but rather stems from the concept of resource use itself. When water is extracted from a basin (in this case, a river) and used for production processes over a given period—yet discharged at a later time—an environmental impact occurs due to the temporary unavailability of the resource in its natural flow.

Moreover, when considering the biomass output per facility, the impact is also associated with the fact that Polcura has relatively low production (in kg), yet a high volume of water usage (in m³). When calculating the indicator (m³ of water used per-kg of biomass), this results in a greater impact than if production levels were higher.
For this reason, Polcura differs from the facilities located in the Los Lagos Region, which presents lower water use impacts—primarily because they have higher biomass production and lower water consumption, as is the case with Río Petrohué and Playa Maqui.

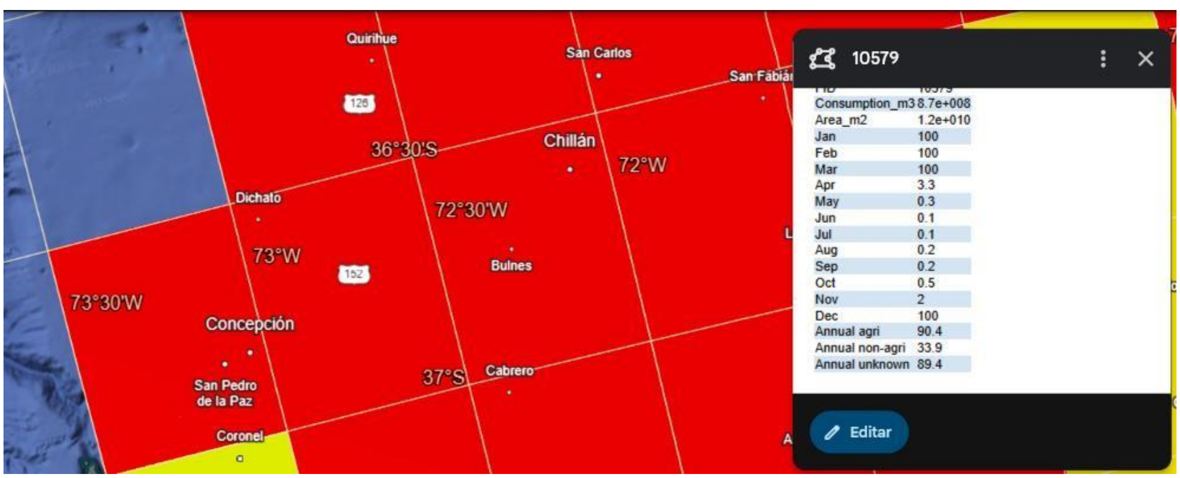


Illustration 1: AWARE map excerpt showing water stress at the location of the Polcura hatchery.

3.1.2 SeaWater Farms

For the grow-out stage, a water footprint of 0.03 m³/kg was obtained, excluding salmon feed. Considering that this stage involves the highest feed consumption, the water footprint associated with the feed used for the salmon represents an indirect footprint for Salmones Camanchaca. The contribution of this stage to the total water footprint depends 99% on this indicator (2.054 m³/kg), primarily due to the raw materials used in feed production—such as soy, soybean oil, and soy lecithin[3]—and to a lesser extent, the inclusion of fish-derived ingredients.

These ingredients carry a water footprint associated with their production, referred to as upstream impacts, which are reflected in Camanchaca's indirect footprint. As a result, it becomes imperative that feed suppliers take concrete actions regarding the selection of their raw materials.

2 AWARE Method: A method that assesses water scarcity in a specific geographic area.

3 According to SimaPro database, the values are 0.08, 3.28, and 0.15 m³/kg of raw material, respectively.

3.1.3 Processing

In the processing plants, salmon is transformed into the final product. In 2024, two primary plants (San José and Sur Proceso) and two secondary plants (Tomé and Pesca Sur) were in operation, in addition to the consumption from the Manchester and Pacífico cold storage facilities, which are attributed to the secondary plants. The total water footprint for this stage was 1.46 m³/kg, of which 0.77 m³/kg came from the primary plants, and 0.68 m³/kg from the secondary plants and cold storage facilities.

Among the primary plants, the San José facility (a company-owned plant) accounted for the largest share of the water footprint, contributing 66%, while Sur Proceso (a contracted facility) contributed the remaining 44%. In the secondary processing stage, the greatest impact on the total water footprint for this stage—including both primary and secondary processing—was observed, with the Tomé plant accounting for 47% of the total footprint.

This higher impact is mainly due to a watershed change following water use: freshwater extracted from a river is discharged into the ocean after treatment, thus causing a significant hydrological impact. This is further influenced by the use of municipal water from the sewage network by the cold storage facilities.

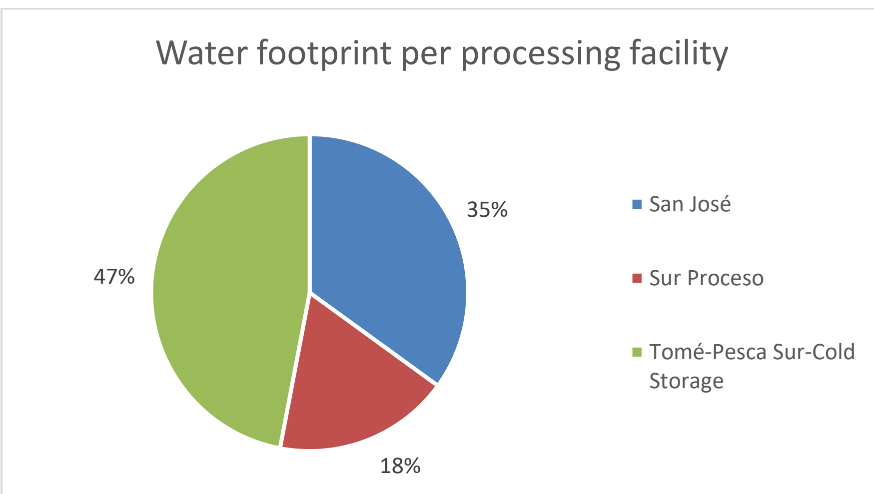
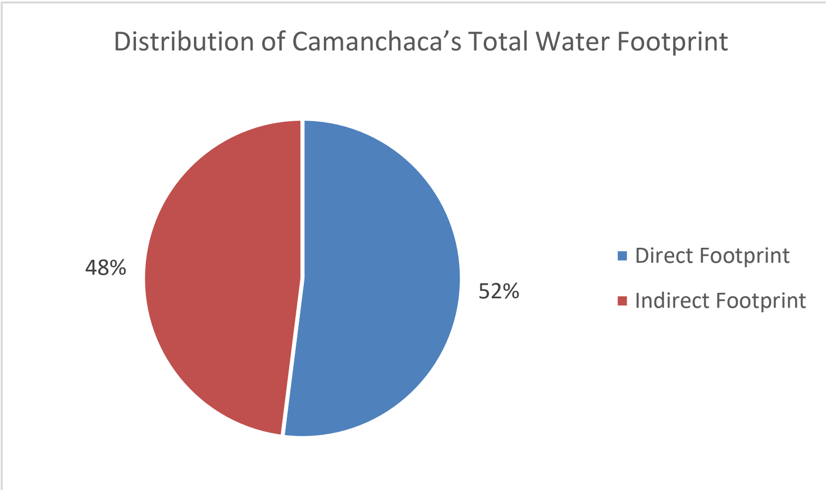


Figure 6: Water footprint by contribution from primary and secondary processing plants.

3.2 Operational and Inderect Water Footprint

Camanchaca's direct water footprint for the year 2024 is 2.23 m³/kg of salmon, while the water footprint associated with salmon feed accounts for 2.07 m³/kg. Approximately 52% of the total water footprint can be managed through actions taken directly by Camanchaca, whereas the remaining 48% cannot. Therefore, it becomes essential to engage in concrete discussions with Camanchaca's feed suppliers and request that their salmon diets incorporate raw materials with a lower water footprint.

Figure 7: Direct and Indirect Water Footprint of Camanchaca in 2024



A clear example was observed in the 2024 assessment, when feed suppliers provided their diet formulation certificates for Camanchaca, including water footprint indicators. One of the most significant suppliers reported a 38% increase in their water footprint compared to 2023. Furthermore, it was noted that some other suppliers do not measure the water footprint of the feed itself, but instead report water consumption indicators from their facilities, which affects the quality of the information provided for Camanchaca's overall water footprint assessment.

3.3 Other detected Impacts

In addition to the water footprint, the use of SimaPro software allows the identification of other environmental impacts affecting ecosystems as a result of Camanchaca's operations. The following table presents impacts such as eutrophication, ecotoxicity, and others across the various stages considered in this assessment.

Table 3: Other impacts identified in the water footprint assessment based on LCA.

Damage Category	Unit of Measure	Hatcheries	Grow-out Sites	Primary Plants	Secondary Plant
Acidification	mol H^+ eq	0.54033	0.00324	0.00008	0.00043
Climate Change (Carbon Footprint)	kg CO_2 eq	64.16416	0.27100	0.01158	0.03472
Ecotoxicity (Freshwater)	CTUe	185.43473	0.24946	0.02299	0.05625
Eutrophication, Marine	kg N eq	0.10063	0.00017	0.00001	0.00003
Eutrophication, Freshwater	kg P eq	0.03677	0.00000	0.00000	0.00000
Eutrophication, Terrestrial	mol N eq	1.04649	0.00184	0.00010	0.00028
Ionizing Radiation	kBq U-235 eq	0.14816	0.00074	0.00005	0.00019
Land Use	Pt	64.52396	0.17845	0.00824	0.02608
Photochemical Ozone Formation	kg NMVOC eq	0.30562	0.00100	0.00003	0.00013
Resource Use, Fossil	MJ	784.56084	3.50050	0.11185	0.41060
Resource Use, Minerals and Metals	kg Sb eq	0.00006	0.00000	0.00000	0.00000

4. Conclusion and Recommendations

ISO 14046 establishes that water use is measured when it is consumed, evaporated, evapotranspired, incorporated into products, transferred between basins, or discharged into the sea (ISO 14046, 2014), giving rise to the water footprint. The assessment being carried out by Camanchaca regarding its processes will serve as a foundation for developing short-, medium-, and long-term strategies related to water and climate resources.

According to the assessment conducted under ISO 14046, the water footprint of 1 kg of salmon produced by Camanchaca is 4.31 m^3.

From the gaps identified in the quantification of both the water and blue water footprints, the following key points were observed:

- Monitor the use and consumption of groundwater to enable efficient resource management, particularly given the higher environmental impact associated with water stress.
- Continue the implementation of flow meters for both water extraction and discharge.
- Request water footprint assessments from feed suppliers, including analysis of raw materials and/or;
- Incorporate detailed analysis of raw materials, including country of origin and production technologies, to reduce uncertainty in data collection and support the company's water management efforts.
- Continue promoting the use of renewable energy, particularly electricity for hatchery operations, in order to help reduce environmental impacts.
- Identify sources of non-conventional renewable energy used by electricity providers to refine impact results accordingly—e.g., small hydropower, photovoltaic solar, wind, or others.
- Improve the quality of data identifying Camanchaca’s indirect water footprint, particularly in relation to feed.
- Engage in dialogue with feed suppliers to consider alternative raw materials with a lower water footprint.

It is important to highlight that in 2024, Camanchaca provided more detailed information for the assessment, and that water consumption records became more accurate due to the installation of an additional flow meter at a company-owned facility compared to 2023—for both water extraction and discharge. This reflects the company’s ongoing efforts to obtain more accurate environmental impact indicators year after year.

Finally, Camanchaca should continue working on information gathering to support better decision-making, taking into account the risks associated with water resources, the importance of engaging the company’s supply chain, identifying and tracking the main sources of water footprint demand throughout the feed cycle, and communicating to stakeholders the measures being implemented to improve its environmental performance.

5. Annexes

5.1 Definition of the Study´s Goal and Scope

5.1.1 Goal

To measure the company's water footprint, specifically for processes related to salmon production, including hatcheries, grow-out sites, and processing plants.

5.1.2 Data Collection and Quality

In accordance with ISO 14046, data quality requirements must address temporal, geographic, and technological coverage, and must include information on data completeness, representativeness, consistency, and reproducibility.

Below are the data quality requirements:

i. Declared Unit

The declared unit for this study (Functional Unit) is 1 kg of salmon.

ii. Temporal Scope

Year 2024, corresponding to the production carried out by Salmones Camanchaca between January and December.

iii. Geographic Scope

Territory of Chile, specifically the regions of Biobío, Los Lagos, and Aysén. This includes both company-owned facilities and contract operations, with overall consumption data considered for the study.

iv. Reproductibility

While the data quality and methodological approach allow for this study to be reproducible, it is not recommended due to the confidentiality of the information.

v. Data Sources

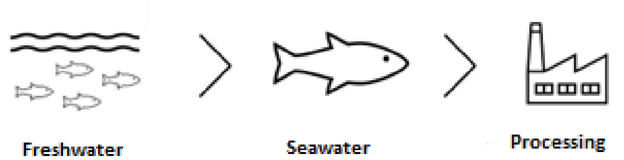
As mentioned above, the information used for this water footprint assessment was obtained directly from Salmones Camanchaca. To collect the data, the company and its suppliers were provided with a questionnaire in Excel format, in which they were asked to report information related to water use (fresh and seawater), electricity consumption, fuel use, feed quantity, and measurements of contaminant concentrations in effluent discharges.

For data modeling in SimaPro, the Ecoinvent and Agri-footprint databases were used in their most recent versions. The method applied for the water footprint assessment was AWARE.

5.1.3 Scope

This study, which focuses on salmon production, includes the use and consumption of water in the freshwater stage (hatcheries), marine grow-out sites, and processing (both primary and secondary). Additionally, it considers the water required for biomass transport throughout the different stages of production.

Figure 8: Scope of the water footprint study.



In the freshwater phase, in a controlled environment, incubation, fry rearing, and smoltification occur to reach a "Smolt" salmon with an average weight of 150 grams. Once the salmon has reached the corresponding weight, it is transported to a seawater facility responsible for growing the fish to a commercial size of 5 kg. This transport is carried out using special trucks that carry the fish and water inside until they reach wellboats to be taken to different seawater farms.

Finally, in the processing phase, the salmon is transformed into various products, either fresh or frozen, to then be distributed to customers and subsequently acquired by final consumers.

It should be noted that this methodology relates to water pollution because the SimaPro modeling software uses databases to analyze water components according to their location and corresponding natural concentrations based on parameters.

5.1.4 Exclusions

The following aspects were excluded from this assessment:

- Labor was not considered in any of the stages analyzed, as it does not represent a significant contribution to the product's environmental performance.
- Impacts associated with the manufacturing of machinery and equipment used throughout the salmon's life cycle were excluded.
- Administrative activities, business travel, paper use, and lighting were also not included.
- Regarding the impact of feed, it was not included in the SimaPro modeling due to the unavailability of detailed information on the list of raw materials and their origins.

5.1.5 Assumptions

The following assumptions were considered in this study:

- The quantification of inputs was carried out by stage (freshwater, marine grow-out, and processing).
- Regarding fish feed, the water footprint of the feed was provided by suppliers, with reported values of 1.7 m^3/kg and 1.3 m^3/kg of feed. For the purpose of calculating the water footprint impact associated with feed use, the quantity of feed purchased from each supplier was considered: 99% of the feed was associated with the 1.7 m^3/kg value, and 1% with the 1.3 m^3/kg value.
- Water consumption (i.e., water not returned to the source system) was considered, including groundwater extraction and water from municipal sewer networks.
- Marine grow-out sites were considered separately by region, with their respective consumptions grouped as a "single facility" per region.
- For cold storage facilities and Pesca Sur, energy use, water consumption, and processed raw material were allocated to the Tomé processing plant impact.
- For contract processing (maquila), energy use, water consumption, and processed raw material were used for impact modeling.
- The water stress factor for Chile is 81.31 (WULCA, 2023).
- For hatcheries, the water scarcity impact from the AWARE method was differentiated by the geographic location of each facility in Chile. The impact factors used were 0.1 for Río Petrohué, Río de la Plata, Río del Este, and Playa Maqui, and 17.2 for Polcura.

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5.1.6 Environmental Impact Categories

To obtain the results, the impact assessment methods and categories listed in Table 4 were used.

Table 4: Impact Assessment Methods and Evaluated Categories

Method	Impact Category Used	Description
AWARE	Water use	Represents the relative available water remaining per area in a region/basin after the demands of humans and aquatic ecosystems have been met.
EN 15804	Environmental declarations	This European standard establishes the core Product Category Rules (PCR) for Type III environmental declarations of any construction product or service.

5.2 Water Use Inventory

The information used for the freshwater, harvest, production, and transport stages corresponds to primary data provided by Camanchaca, while secondary data were obtained from the Ecoinvent 3.10 and Agri-footprint 5 databases.

5.3 Raw Materials

The main raw material considered in this study is presented below.

i. Fish Feed

During the freshwater and grow-out phases of salmon production, feed from various suppliers is used. For this assessment, the water footprint values (in m^3/kg of feed) were obtained directly from the reports provided by the suppliers.

ii. Water Factors for Water Footprint Calculation

Below are the water factors used by SimaPro to calculate the water footprint associated with the energy used in the different production processes.

Table 5: Water Footprint Factors for Energy Consumption Calculations

Energy Source	Water Factor	Unit of Measure
Renewable Electricity	0.00168	m^3/kWh
Diesel	0.00088599	m^3/MJ
Propane	0.0013478	m^3/MJ
LPG (Liquefied Petroleum Gas)	0.0013478	m^3/MJ
Natural Gas	0.00162936	m^3/MJ

5.4 Freshwater Phase

The salmon production cycle begins in a controlled freshwater environment, where the fish reach an approximate weight of 100 to 120 grams before being transferred to the seawater phase. Six freshwater facilities were considered for this stage, located between the Biobío and Los Lagos Regions. This phase included electricity consumption, feed usage, and fuel consumption for internal transport and machinery operations.

Table 6: Inputs for the Freshwater Phase.

Feed (kg)	Electricity (kWh)	Diesel (MJ)	Water (m^3)
1.05	6.097	4.86	14.58

5.5 Grow-out Phase

Once the salmon have reached the required weight, they are transported to a seawater grow-out facility, where they are raised until reaching an average size of 5.6 kg. For this study, 23 grow-out facilities located in the Los Lagos and Aysén Regions were included. This phase considered electricity consumption, feed usage, and fuel consumption for internal transport and machinery operations.

Table 7: Inputs for the Grow-out (Seawater) Phase

Feed (kg)	Diesel (MJ)	Water (m^3)	Electricity (kWh)
1.19	2.71	0.005	–

5.6 Processing Plant

Once the salmon reach commercial weight—approximately 5.6 kg—they are transported to the processing plant to be transformed into the final product. Camanchaca operates two primary processing plants and two secondary processing plants, located in the Biobío Region (Tomé Plant and Pesca Sur) and in the Los Lagos Region (San José Plant and Sur Proceso). For each plant, electricity and fuel consumption, as well as organic waste generation, are considered. Additionally, water and energy consumption from the Manchester and Pacífico cold storage facilities are included.

Table 8: Inputs for the Processing Stage

Electricity (kWh)	Renewable Electricity (kWh)	Diesel (MJ)	Water (m^3)
0.133	0.603	0.59	0.02

5.7 Water Consumption by facility 2024

The demand for freshwater is increasing due to a variety of factors, including variable availability, population growth, urbanization, rising income levels, and changes in diet—with agricultural production being the largest consumer of water. It is important for food producers to be aware of their water use and take action to improve water-use efficiency within their production processes (ASC Food Standard, 2023).

According to Indicator 1.18.1, the source of freshwater (i.e., surface water or groundwater) must be reported, and water use data must also be recorded by source.

Table 9: Water Withdrawn by Active Facilities in 2024

Facility	Water Source Type	Water Volume (m^3/year)	Flow meter
			Inflow
Rio Petrohué Hatchery	Groundwater	3,135,650	Yes
Rio de la Plata Hatchery	River	5,790,064	No
Rio del Este Hatchery	Groundwater	265,933	Yes
	River	4,597,487	No
Polcura Hatchery	River	16,542,121	No
Playa Maqui	River	7,841	No
Grow-out farms X Region[4]	Sea	7,073	Yes

[4] **Grow-out Farms, Region X:** Water consumption from seawater grow-out farms located in the Los Lagos Region.

Grow-out farms XI Region[5]	Sea	19,421	Yes
Tomé Plant	River	336,027	Yes
San José Plant	Groundwater	66,475	Yes
	Sea	89,264	Yes
Sur Procesos Plant	Groundwater	35,017	Yes
	Sea	26,265	Yes
Cold Storage Pacifico	Sewage Network	1,403	Yes
Cold Storage Manchester	Sewage Network	21,344	Yes
Pesca Sur Plant	River	2,197	Yes

According to ASC Indicator 1.20.1, all effluents must be identified (including those from production, site runoff, offices, and any on-site accommodations), along with the discharge destination (e.g., surface water, groundwater, seawater, municipal treatment plants), clearly distinguishing between "freshwater" and "other water" discharges, and specifying the level of treatment performed on-site.

Table 10: Discharged Water by Active Facilities in 2024

Facility	Water Discharge Destination	Water Volume (m^3/year)	Flow Meter Effluent
Río Petrohué Hatchery	River	2,670,529	Yes
Río de la Plata Hatchery	River	5,790,064	Yes
Río del Este Hatchery	River	4,863,420	Yes
Polcura Hatchery	River	16,542,121	Yes
Playa Maqui Hatchery	River	7,841	No
Grow-out Sites – Region X	Sea	6,484	Yes
Grow-out Sites – Region XI	Sea	21,160	Yes
Tomé Plant	River	432,583	Yes
San José Plant	Sea	108,641	Yes
Sur Procesos Plant	Sea	46,115	Yes
Pacífico Cold Storage	Sewage Network	–	Yes
Manchester Cold Storage	Sewage Network	17,075	Yes
Pesca Sur Plant	River	–	Yes

[5] **Grow-out Sites – Region XI:** Water consumption from seawater grow-out farms located in the Aysén Region.

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