TENUTA FERTUNA
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WATER FOOTPRINT REPORT

Quantification and Reporting of the Water Footprint

COMPANY: Tenuta Fertuna s.r.l.
Data Reference Year: 2023
Report Ed. 1 rev. 0 del 21/10/2024

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Foreword

Water is an essential natural resource. The issue of water and its management has become increasingly significant within the global debate on sustainable development. This growing interest is due to the increasing demand for water, growing water scarcity in many regions, and/or the degradation of water quality.

The company Tenuta Fertuna S.r.l. has assessed the water footprint of its organization. The evaluation, conducted in accordance with the international standard ISO 14046:2016, aims to:

- Identify the potential environmental impacts related to water.
- Specify relevant geographical and temporal dimensions.
- Identify water use and changes in water quality in a modular manner, i.e., summing up the water footprints of the different life cycle stages.

ISO 14046:2016 outlines principles, requirements, and guidelines for the assessment of the Water Footprint of products, processes, and organizations, based on Life Cycle Assessment (LCA). Only emissions to air, water, and soil that impact water quality are included in the evaluation. The result of a water footprint assessment is a profile of impact indicator results.

Regulatory References

The standards referenced in this study are:

- UNI ISO 14046:2016 – "Environmental Management – Water Footprint – Principles, Requirements, and Guidelines" – for conducting and reporting the water footprint either as a standalone assessment or as part of a broader environmental assessment.
- UNI EN ISO 14040:2021 – "Environmental Management – Life Cycle Assessment – Principles and Framework" – describing the LCA structure;
- UNI EN ISO 14044:2021 – "Environmental Management – Life Cycle Assessment – Requirements and Guidelines" – the primary guide for the practical implementation of an LCA study.

This study report also complies with the guidelines provided by the Equalitas standard (Sustainability of the Wine Supply Chain: organizations, products, designations of origin (SOPD) SOPD_004_20210801) regarding the minimum elements to be considered for calculation.

Methodology

The water footprint assessment includes the four phases of life cycle assessment:

- Definition of the goal and scope;
- Water footprint inventory analysis;
- Water footprint impact assessment;
- Interpretation of results.

Intended use of the Report

This document is available to the company for data archiving and to quantify improvements in subsequent years. Use and dissemination of this report are at the company's discretion. The company may use the data contained herein, following the guidance of the Equalitas standard (http://www.equalitas.it), for communication and informational purposes toward its customers.

Purpose of the Study

The aim of this report is to present the results of the organization's water footprint quantification according to the principles of relevance, completeness, consistency, accuracy, and transparency, to:

- Identify areas of impact and enhance company awareness on water consumption and pollution.
- Highlight potential areas for improvement to design water-saving interventions.
- Enable verification of the impact source inventory in accordance with the standard.
- Provide useful information to demonstrate the company's environmental efforts and promote credible communication.
- Deliver results that are comparable over time, enabling the company to evaluate its performance.

Functional Unit

According to the Equalitas standard, an organizational water footprint study must be divided into the three main sections that typically represent a wine company: the vineyard (field), the winery (production), and bottling. The functional units suggested by the standard are shown in Table 1.

Table 1. Functional units

Area	Reference flow	Product index
Vineyard	Total quintals of grapes harvested and purchased that are suitable for processing	1 quintal of grapes suitable for processing in the year under review
Vineyard	Total liters of bulk wine/must produce and purchased that are suitable for sale/bottling	1 liter of bulk wine/must be suitable for sale/bottling
Bottling	Total liters bottled and ready for sale	0.75 liters of packaged wine ready for sale

The company purchases grapes and wine, which are processed and bottled by two outsourced partners. Therefore, the areas of interest for the study are the winery and bottling stages. Since this is an organizational study, the product index used for comparing results will be representative of the entire production and will be 1 liter of bottled wine.

Organization description

The company Tenuta Fertuna S.R.L. began its history in 1997. Originally, the estate covered an area of 145 hectares. In December 2019, the company was split into two entities: Tenuta Fertuna S.R.L., the commercial branch, and Fertuna Società Agricola Semplice, which manages the winery. The vineyards owned by the agricultural company were leased out in February 2019. Approximately 50 hectares are managed according to organic farming regulations, and all the grapes produced on these lands are sold to the winery itself. From this point forward in the document, "Fertuna" will refer to the agricultural company Fertuna Società Agricola Semplice, and "Tenuta Fertuna" will refer to the commercial company Tenuta Fertuna S.R.L. Fertuna's winery works exclusively with Tenuta Fertuna for wine production. The offices of Tenuta Fertuna are located at the same site as the Fertuna winery.
The company obtained certification in 2022 according to the SOPD EQUALITAS sustainability standard – SUSTAINABILITY OF THE WINE SUPPLY CHAIN: ORGANIZATIONS, PRODUCTS, DESIGNATIONS OF ORIGIN (SOPD). To maintain this certification, the company's activities are reviewed annually and, when necessary, improved across environmental, economic, and social aspects, in line with the principles of continuous improvement as outlined by the SOPD EQUALITAS sustainability standard. The company is involved in the production and aging of white, red, and rosé wines, including still and sparkling varieties. It bottles wine in glass bottles, packages wine in Bag-in-Box formats, and ages wines in barriques and tonneaux. The company does not sell bulk wine. In 2023, the Bag-in-Box production line was utilized. The company also operates a retail shop located in a villa/restaurant adjacent to the winery. All activities take place at a single site. The two companies, Tenuta and Fertuna, are located next to each other. Fertuna owns vineyards that are leased to the limited liability agricultural company Vignaluce-Enaoli. Tenuta purchases grapes primarily from Vignaluce-Enaoli and, to a lesser extent, from Fertuna. The grapes are processed by Fertuna on behalf of Tenuta. Fertuna performs winemaking exclusively for Tenuta. For 2023, the disgorging (riddling and removal of lees) of the sparkling wine was outsourced to the company Enoservizi, to which some bottles were sent for processing and dressing. The finished bottles were then returned to Tenuta. These bottles are included in the water footprint calculation, and thus the impact of transportation, as well as the electricity and water used by the outsourcing company, has been accounted for. The packaging materials are supplied directly by Tenuta Fertuna.

Below is a summary of the 2023 production data:

Table 2. Production Data for the Year 2023

Company Production Information	Quantity in 2023
Hectoliters bottled	1947
Total grapes processed (kg)	129491
Bulk wine processed (hl)	1050,13
Number of bottles filled	242558
Bag-in-Box (5 kg format)	727 lt
0.75 l bottles sent for outsourcing (disgorging and dressing)	3952

Report Dissemination Method

The report is available within the company for consultation and verification by third parties. Its results, in aggregated and simplified form, may be used for both internal and external company communications

Report Contact Person

For information regarding the water footprint inventory of Tenuta Fertuna S.R.L., the company contact is Paolo Rivella, available at: paolo.rivella@fertuna.it
Further data processing and communication to the company were handled by Ph.D. Agr. Georgia Faccioni – georgia.faccioni@gmail.com.

Organizational Boundaries Description

Tenuta Fertuna S.R.L. has adopted the control approach in considering water consumption, quantifying all direct and indirect water use resulting from activities over which the organization has operational and financial control. The organizational boundaries defined for the analysis were set to include, in the inventory, the impacts associated with operations carried out at the sites listed in the following table:

Table 3. Organizational Sites Included in the Study

Azienda	Indirizzo
Tenuta Fertuna s.r.l.	S.P. Aurelia Vecchia, Grilli, GR
Outsourcer -Fertuna Societa' Agricola Semplice	S.P. Aurelia Vecchia, Grilli, GR
Outsourcer - Enoservizi	SP 62, 20, 53019, Siena SI

The results are presented in an aggregated format to enhance understanding of the company's overall performance.

Reporting Period

The data used for quantifying the water footprint refer to the period: 01/01/2023 – 31/12/2023

Exclusions

As the IWINE-Q&S calculator was used, no results were omitted from the overall total. Employee commuting (home-to-work travel) was not included in the calculations.

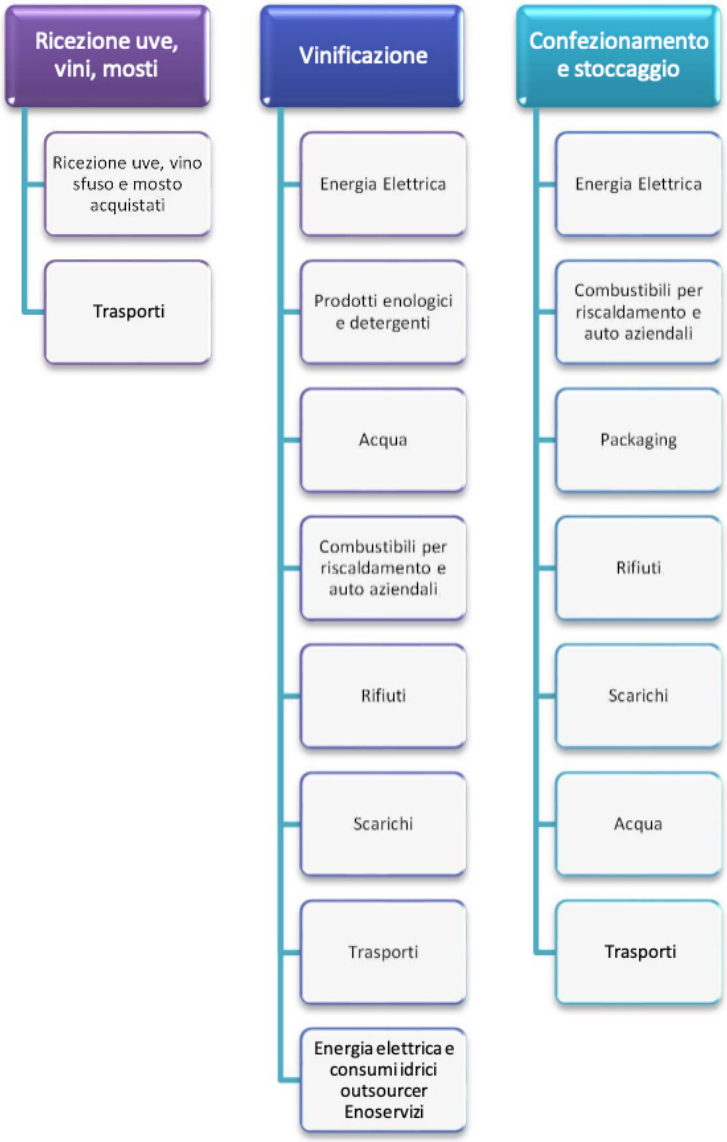
System Boundaries

The system boundary determines the unit processes included in the Life Cycle Assessment (LCA). The system boundary for this study considers two stages of the life cycle:

- Winery Stage
- Bottling Stage

In accordance with the relevant ISO standard, the results are reported for the entire organization, meaning the sum of both stages listed above.
Below is the flow diagram for the water footprint assessment of the winery.

Figure 1. Production flow diagram



Water Footprint Inventory

The water footprint inventory analysis, in line with the applicable standards, was carried out by considering all input and output flows from the system under analysis.

Inventory Data Description

Primary data were collected directly from Tenuta Fertuna S.R.L. and Fertuna Società Agricola Semplice and refer to the period 01/01/2023 – 31/12/2023.
Data were entered into the IWINE-Q&S calculator by the company, based primarily on internal documentation (invoices, company logs, documents...), which are available in the files linked to the completed forms. For each data point entered, the corresponding reference document, the type of measurement or estimate used to obtain the value, and the associated level of uncertainty were recorded. As for secondary data, actual data were used whenever possible. When this was not feasible, calculations or estimates were made to obtain the most reliable possible values, using internationally recognized databases. The level of uncertainty for secondary data was also tracked. Each data entry is accompanied by one or more documents highlighting the decisions made.

Units of measurement, any estimates performed, and the associated uncertainty level for each input are also clearly specified.

Management of Inventory Data

The inventory data were collected at the facilities of Tenuta Fertuna S.r.l. and Fertuna Società Agricola Semplice — which also house administrative offices—using the help of on-site company staff. Most data were obtained by reviewing invoices and delivery notes (DDT); in a few cases, estimates were necessary.

Company Information

Description

Basic company data and production figures for the reference period. Water consumption in the winery.

Sources

Company registry information (visura camerale) and other administrative documents. Production data for the reference period were extracted from cellar records and purchase DDTs for grapes and bulk wine. No must was purchased in 2023.
Water used at both facilities comes from a well and a municipal aqueduct, measured via meters. Consumption figures exclude usage in the swimming pool and the villa with a restaurant adjacent to the cellar.
For the water consumed by the external bottler, an estimate was made based on an industry publication, using a conservative estimate of 3 L of water per liter of wine produced and applying the same water usage rate to sparkling wine disgorging and labeling (approximately 0.8 L water per liter of wine, accounting for 27% of total water use). For 2,964 L of sparkling wine, the outsourcer's consumption is estimated at 2,400.84 L. The outsourcer is assumed to use aqueduct-supplied water.

Data uncertainty

Primary data for all except the estimated water use of the outsourcer.

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Waste Disposal

Description
Data relating to waste disposal during the reference period.

Sources
Disposal data are from completed waste forms, documenting destination, weight, and material types (CER codes). Data are summarized in the cellar's waste register. Transport distances are estimated using Google Maps, based on destination location.

Data uncertainty
Primary data for quantities; approximate assignment of CER categories and estimated transport distances.

Stationary combustion of Fuels

Description
The production site is heated using heat pumps. The LPG tank on site is disused. No fuel was purchased or used in 2023.

Sources
-

Data uncertainty
Primary.

Electricity

Description
Electricity consumption recorded for the Tenuta offices and the Fertuna cellar, bottling, and warehouse. Consumption data come from Axpo Italia electricity bills, which include reactive energy charges. All reactive energy totals were included.
Impacts were allocated 50% to the cellar and 50% to bottling. The electricity mix follows bill specifications, adjusted based on Terna's 2023 national mix: 38.2% hydro, 28.4% wind, 14.1% biomass, 14% solar PV, 5.3% geothermal. Applying Axpo's reported 23.6% renewables gives 9% hydro, 6.7% wind, 3.3% biomass, 3.3% PV, and 1.2% geothermal. A rooftop PV system became operational in August 2023, but production data were unavailable due to metering software issues.
Since the software lacked a separate field for outsourcer electricity, its usage was included under bottling. Based on literature, electricity used for sparkling wine processing was estimated at 0.2 kWh per liter. For 2,964 L, this equates to 592.8 kWh.

Data uncertainty
Primary for Tenuta, estimated for the outsourcer.

Company Vehicles

Description
The company owns three diesel vehicles. Fuel expenses from fuel cards were converted to liters using a factor of 1.6 L/€. One vehicle is allocated to cellar logistics, while two are allocated to bottling.

Sources
Fuel purchase invoices

Data uncertainty
Primary for quantities; estimated for vehicle type and allocation.

Third Party Vehicles (Transport of Grapes and Bulk Wine)

Description
Transport of purchased grapes and wine. No must was purchased in 2023. Transfers from Fertuna to Tenuta, both on the same site, are excluded as zero km. Bottles sent to the outsourcer used the outsourcer's van. In 2023, one dispatch of 3,952 bottles (2,964 L) occurred.
Wine weight: 2,964 L × 0.99 kg/L = 2,934.36 kg; bottles: 3,952 × 0.88 kg = 3,477.76 kg; total = 6,412.12 kg.
Employee commutes were included: round-trip distances multiplied by four and the number of workdays (250). One employee, hired in late March, had days of presence calculated. An employee living near the site was assigned a symbolic 1 km distance.

Sources
Google Maps.

Data uncertainty
Primary for arrival quantities; estimated for distances, bottle weights, and employee journeys.

Packaging

Description
Quantities of packaging materials purchased during the reference period. All bottles were conservatively classified as dark glass. Bag-in-box sacks estimated at 200 g each, boxes at 400 g for 93 units. Labels estimated at 3 g each for the total bottles in 2023. Transport assigned to the main supplier, Etichettificio Alkam (Ornago, MB).

Sources
DDTs; distances estimated via Google Maps.

Data uncertainty
Primary and estimated quantities; estimated for transport.

Oenological Products

Description
No detergents or soda were purchased in 2023; steam is preferred. Stabilizers included ~80% gum arabic and ~20% mannoproteins. For suppliers Vitis and Zucchelli, purchases were directly from the shop, so transport impact is included in company vehicle data.

Sources
Purchase DDTs; distances via Google Maps.

Data uncertainty
Primary and estimated quantities; transport estimated.

Additional Water Footprint Data

Description
Wastewater analyses conducted by Caim Group (Test Report No. 2304477.01 dated 11/09/2023, Sample No. 2304477.01). Phosphorus results were not reported. Since there is no flow meter post-treatment—discharge goes to phytodepuration—the discharge volume was assumed equal to intake.

Sources
Consumption meters and water analysis.

Data uncertainty
Real consumption data and primary analysis data.

Data type
To assess the uncertainty level of the data, the following uncertainty coefficients are assigned to each data type:

- Measured data → value 1

These data have written documentation (e.g. invoices, bills, records, meters), making them objective and verifiable, with little or no error margin.

- Approximated data → value 2

If measured data was unavailable, an approximation was made and documented. Although not exact, this data closely reflects the true value.

- Estimated data → value 3

These are based on calculations using the best available information. When company data was lacking, estimates were made using data from manufacturers, official databases, models, or literature.

Allocations
The following allocations were applied:

- External bottler's water use: allocated to the company's bottling data.
- Electricity: impacts allocated 50% to the winery and 50% to bottling. The external bottler's electricity impact was added to total bottling.
- Company vehicles: one vehicle used for logistics was allocated to the winery, while the other two were allocated to bottling.

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Selected Impact Categories

The Water Availability Footprint includes one or more impact categories. For this study, the selected impact categories are:

Table 4. Impact category

Impact Category	Assessment Method	Unit
Water Scarcity	AWARE	m3eq
Acquatic Acidification	Impact 2002+	kg SO2eq
Aquatic Ecotoxicity	ILCD 2.0 2018 midpoint, human health, carcinogenic/non-carcinogenic effects + UseTox 2.19	CTUe
Human Toxicity	ILCD 2.0 2018 midpoint, human health, carcinogenic/non-carcinogenic effects + UseTox 2.19	CTUh
Acquatic Eutrophication	ReCiPe Midpoint (I) V1.13, freshwater eutrophication	kgPeq

Historical baseline year

This is the company's first Water Footprint study, making 2023 the historical baseline year.

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Quantifying the impact of the water footprint

Water Footprint Impact Assessment Methodology

The Water Footprint assessment phase links inventory data to specific water-related impacts using characterization factors. These five impact categories represent potential damage to the water resource from product production, use, or import:

1. Aquatic Acidification – increase in water acidity (kg SO_2 eq)
2. Aquatic Ecotoxicity – ecosystem-level toxicity (CTUe)
3. Human Toxicity – human health toxicity (CTUh)
4. Aquatic Eutrophication – nutrient enrichment of freshwater (kg Peq)
5. Water Scarcity – freshwater usage relative to availability (m^3eq)

These categories and methods align with the study's objectives and scope. The IWINE Q&S calculator was adopted to minimize uncertainty and produce accurate, reproducible results.

Characterization factor used

The characterization factors used were derived from the integrated database within the IWINE-Q&S calculator and come from recognized and reliable bibliographic sources and databases.
The characterization coefficients were obtained from Ecoinvent 3.8 (Sonderegger & Bourgaul, 2021: "Documentation of impact assessment methods implemented in the ecoinvent database v3.8 (2021.09.21)").
For the calculation of pesticide-related impacts, the coefficients were sourced from the Joint Research Centre (JRC, 2020) study:

- "Environmental Footprint: Update of Life Cycle Impact Assessment Methods – Ecotoxicity freshwater, human toxicity cancer, and non-cancer."

Some characterization factors, particularly those related to the impact of fertilizers on Aquatic Eutrophication and Aquatic Acidification, were derived from the equations of the PEFCR 2018 method.

Calculation Assumptions

Below is a brief description of the assumptions and criteria underlying the calculation.
The calculator applies the following exclusions due to either the irrelevance of the data regarding the impacts to be considered, or the lack of a conversion factor in the available databases:

- The use and degradation of water quality related to marketing activities, transport of the finished product, product use phase, and the share attributable to the production of equipment and facilities are excluded.
- Product use and disposal are not included in the calculation.
- For third-party vehicles, only diesel fuel consumption is considered.

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Water footprint inventory results

The company calculated the results separately for each site, as required by the calculator used. Table 5 presents the combined results of both sites in absolute terms.

Table 5. Overall Organizational Results

Impact Category	Results	Unit
Aquatic Acidification	3196,83	kg SO2 eq
Aquatic Ecotoxicity	2657065,57	CTUe
Human Toxicity	7,00E-02	CTUh
Aquatic Eutrophication	140,15	kg P eq
Water Scarcity	193004,80	m3eq

Table 6 presents the same data expressed per functional unit, which—as outlined in the relevant section—refers to the winery phase and is represented by the liter of bottled wine. To relate the data to the functional unit, the values in Table 5 were divided by the total volume of bottled wine, which amounts to 194,700 liters.

Table 6. Impact Categories per Functional Unit

Impact Category	Results	Unit
Aquatic Acidification	1,64E-02	kg SO2 eq
Aquatic Ecotoxicity	1,36E+01	CTUe
Human Toxicity	3,60E-07	CTUh
Aquatic Eutrophication	7,20E-04	kg P eq
Water Scarcity	9,91E-01	m3eq

Table 7 presents the impact values broken down by individual process across the five impact categories considered.

Table 7. Results by Process

Unit processes	Aquatic Acidification (kg SO_2 eq)	Aquatic Ecotoxicity (CTUe)	Human Toxicity	Aquatic Eutrophication	Water Scarcity
Unit	kg SO2 eq	CTUe	CTUh	kg P eq	m^3eq
Mobile Combustion	103,93	282541,88	4,57E-04	5,11	3739,83
Water Consumption	0,00	0,00	0,00E+00	0,00	71280,64
Electricity Distribution	63,76	22298,75	9,08E-05	4,82	3377,42
Imported Electricity	1.062,60	371.645,81	1,51E-03	80,29	56.290,29
Production of Oenological Products	5,89	9811,32	1,55E-05	0,32	1299,79
Fuel Production	4,68	35384,11	9,33E-06	0,07	47,00
Packaging Material Production	1.843,11	1.655.058,43	3,22E-03	46,30	54.416,77
Incoming Transports	38,02	75913,98	1,08E-04	0,87	666,59
Packaging Material Transport	71,79	198354,97	2,81E-04	2,28	1845,08
Waste Transport	2,31	3750,85	7,19E-06	0,08	26,16
Purchased Grape Production	0,37	1213,33	3,39E-02	0,01	5,93
Purchased Bulk Wine Production	0,38	1092,14	2,97E-02	0,02	9,30
TOTAL	3196,83	2657065,57	6,94E-02	140,15	193004,80

The percentage contribution of each process to every impact category is shown in Table 9

Table 9. Percentage Contribution of Individual Processes to Each Impact Category

Unit processes	Aquatic Acidification	Aquatic Ecotoxicity	Human Toxicity	Aquatic Eutrophication	Water Scarcity
Unit	% di kg SO2 eq	% di CTUe	% di CTUh	% di kg P eq	% di m^3eq
Mobile Combustion	3,25	10,63	0,66	3,65	1,94
Water Consumption	0,00	0,00	0,00	0,00	36,93
Electricity Distribution	1,99	0,84	0,13	3,44	1,75
Imported Electricity	33,24	13,99	2,18	57,29	29,17
Production of Oenological Products	0,18	0,37	0,02	0,23	0,67
Fuel Production	0,15	1,33	0,01	0,05	0,02
Packaging Material Production	57,65	62,29	4,64	33,03	28,19
Incoming Transports	1,19	2,86	0,16	0,62	0,35
Packaging Material Transport	2,25	7,47	0,40	1,63	0,96
Waste Transport	0,07	0,14	0,01	0,05	0,01
Purchased Grape Production	0,01	0,05	48,92	0,01	0,00
Purchased Bulk Wine Production	0,01	0,04	42,86	0,01	0,00
TOTAL	100,00	100,00	100,00	100,00	100,00

KEY						
0% a 1%	1,1% a 3%	3,1% a 5%	5,1 % a 10%	10,1% a 20 %	20,1% a 35 %	oltre il 35,1%

Figure 2. Percentage Contribution of Individual Processes to the Aquatic Acidification Category

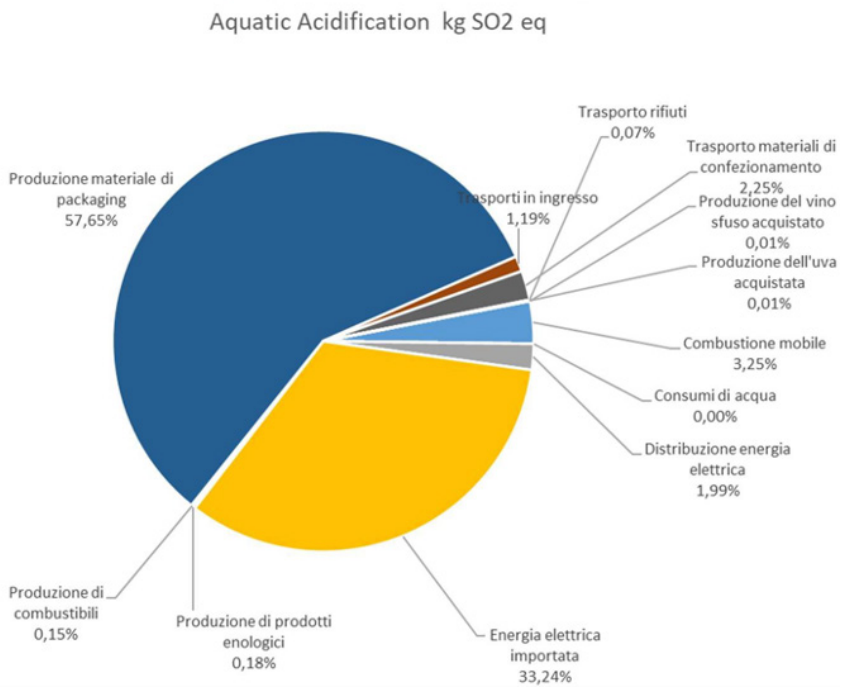

Figure 3. Percentage Contribution of Individual Processes to the Aquatic Ecotoxicity Category

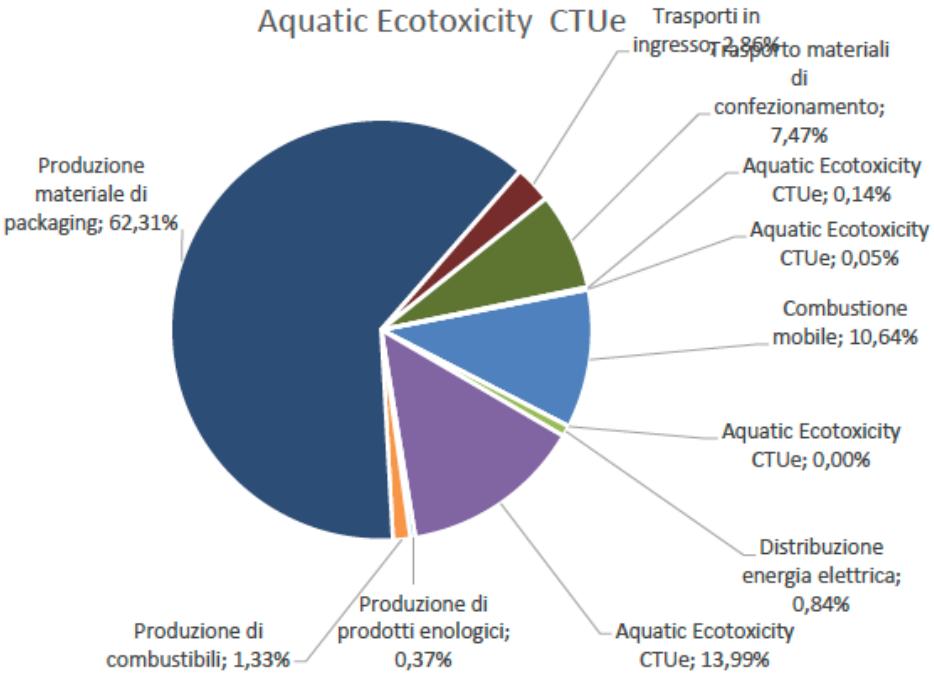

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Figure 4. Percentage Contribution of Individual Processes to the Human Toxicity Category

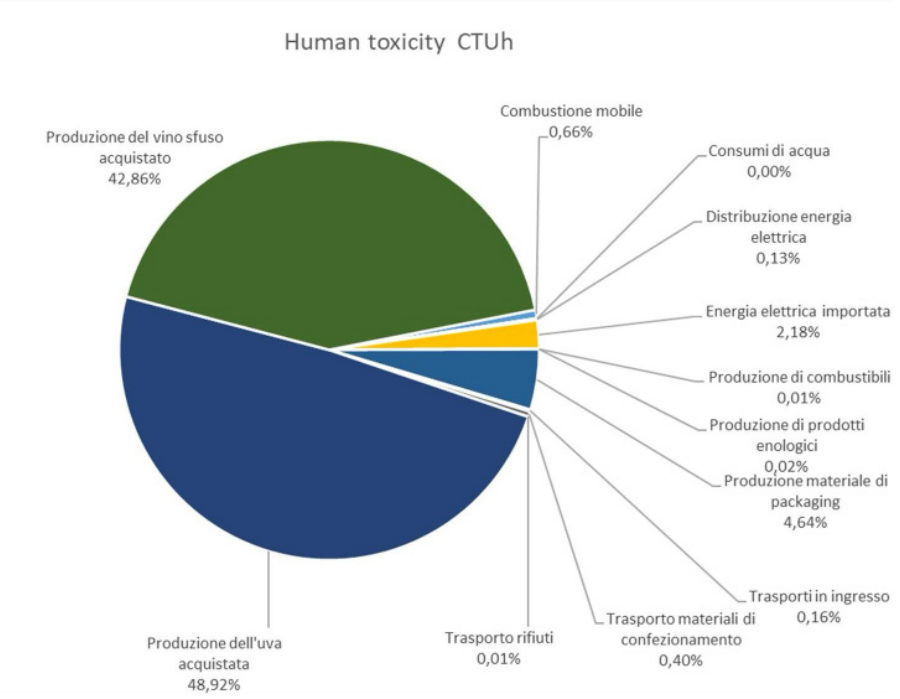

Figure 5. Percentage Contribution of Individual Processes to the Aquatic Acidification Category

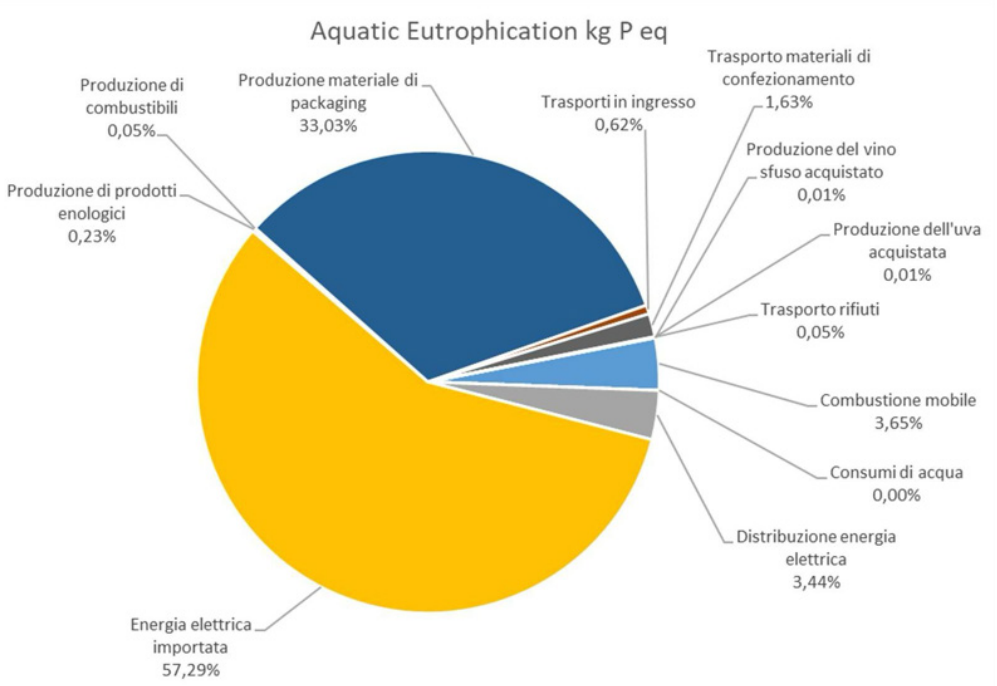

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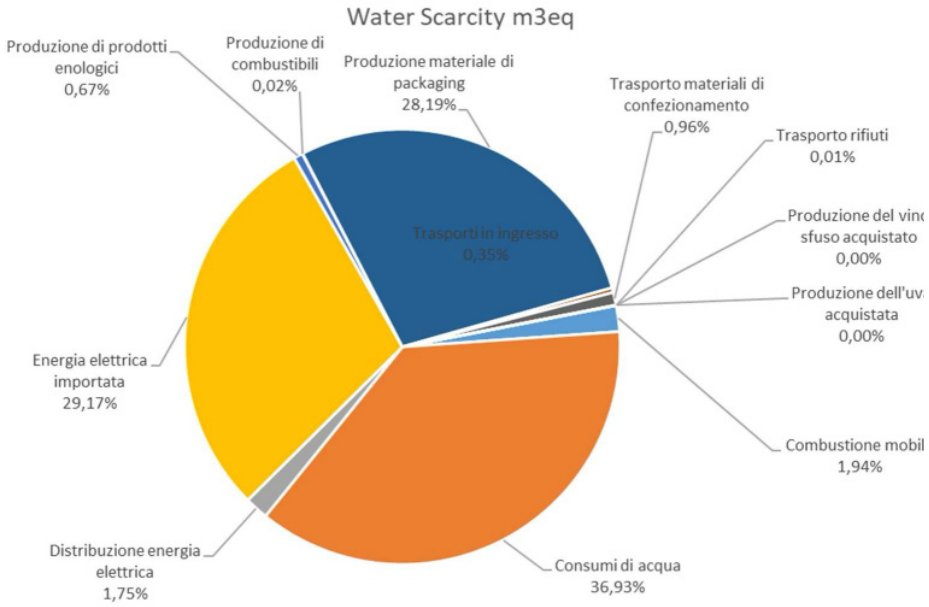
Figure 6. Percentage Contribution of Individual Processes to the Water Scarcity Category



Interpretation of the Results

At this stage, based on the results obtained from the impact assessment, it is possible to identify the critical points of the production process—that is, the elements that contribute most to the calculated water footprint and on which actions can be taken to reduce it.

The overall values reported in the summary tables (Tables 5 and 6) show an impact trend on the water resource that is consistent with the sector of origin.
The category "Water Scarcity" is most impacted, in terms of % m^3 eq water consumption, by the direct water use for production and cleaning activities (37%), followed by electricity production, with 29% of virtual water use. Next is packaging production, contributing about 28%. Finally, a small impact comes from electricity distribution, accounting for 1.75%. All other processes are essentially negligible.

Regarding the category related to Aquatic Acidification, the indicator is mostly impacted by packaging material production (57%). Another significant contribution comes from imported electricity, at 33%. Mobile combustion has a low impact of 3.8%. Other smaller contributors are transportation related: packaging transport (2.2%) and incoming raw material transport.

Aquatic Ecotoxicity is primarily impacted in absolute terms by packaging material production (62%), followed by purchased electricity (14%), thirdly by mobile combustion from company vehicles used for material collection (10.63%), and to a lesser extent by packaging material transport (7.5%). Incoming transport accounts for 2.9%, while other processes have much lower incidence.

The Human Toxicity category is dominated by impacts from purchased grapes (49%) and purchased bulk wine (43%). The impact from packaging material production is 4.6%. Other contributions, except for imported electricity at 2%, are negligible.

Finally, Aquatic Eutrophication is mostly impacted by imported electricity production (57%) and packaging material (33%). Electricity distribution impacts 3.5%, while mobile combustion for company vehicles accounts for 3.65%.

The company has long been undertaking improvement actions involving energy, water, and packaging material savings.

Since August 2023, the winery's photovoltaic system has been fully operational. Therefore, a reduction in the energy impact can be expected in the following vintages, a trend confirmed by annual monitoring reported in Table 10. Additionally, including reactive energy impact has significantly increased the electricity category. An energy analysis of the company's electrical system could help identify possible non-functional energy consumption.

Table 10 – Electricity Summary

Year	Consumption kWh (active energy only)	kWh/liter bottled wine
2021	221985	1.74
2022	230631	1,65
2023	229296	1,18

Regarding bottle weight, the average bottle weight stabilizes below 550 g. The heaviest bottles are special formats (magnums) and sparkling wine bottles. 2022 was a particular year marked by a shortage of glass bottles on the market. For production needs, the company purchased available bottles as needed. In 2023, the company made large purchases to build stock, significantly reducing purchases in 2024.

Table 21 – Bottle Summary

Glass bottles	2021	2021	2021	2021
Average weight (kg)	0.499	0.55	0.517	0.533

Water consumption relative to bottled wine in 2022 was quite high. For 2023, the reported consumption is net of the winery and has decreased compared to the previous year. The high water use is related to the preferential use of steam for cleaning, which reduces the use of detergents and chemicals.

Table 32 – Water Consumption Summary

	2022	**2023**
Tap water (m^3)	1459	1364
Well water (m^3)	41	26
Total (m^3)	1500	1390
Bottled wine (L)	141547	194700
Liters of water per liter of bottled wine	10,6	7,1

Based on the analysis, these are the three main impact categories on which to focus efforts to reduce the company's water footprint.

Uncertainty Assessment

To calculate uncertainties, a qualitative method was applied, assigning a numerical value (from 1 to 3) to each company data point or emission factor reflecting the source quality.

Regarding primary data collection (directly from the company), the operational data protocol specifies uncertainty levels depending on the case:

- Measured data: backed by written documentation (e.g., invoices, company records, tables prepared by company staff), objective and verifiable with minimal or no error margin;
- Approximated data: used when measured data is unavailable, with documented approximation procedures; although not objective, these data closely approximate the intended value or quantity.
- Estimated data: results from calculations based on available information; if unavailable at company level, data were sourced from producers, official databases, models, or bibliographic materials.

Each level is associated with a "data uncertainty coefficient":
- Measured data = 1
- Approximated data = 2
- Estimated data = 3

Uncertainty levels for transformation coefficients in IWINE-Q&S were defined as:
- 1 = emission factor from the product source company, i.e., updated bibliographic data

- 2 = emission factor from international databases, officially recognized but not site-specific
- 3 = factor derived from reliable analogous sources and inferred by analogy with similar products

Uncertainty is low for individual sites and therefore also for the overall organizational calculation.
Below are the uncertainty values.

Table 11 – Uncertainty

Category	Avg. Data Uncertainty	Avg. Emission Factor Uncertainty
Mobile combustion	2,45	1,00
Direct water consumption	1,50	1,00
Electricity Distribution	3,00	3,00
Imported Electricity	1,00	1,00
Phosphorus in water	1,00	1,00
Production of Oenological Products	1,20	1,00
Fuel Production	1,00	1,00
Packaging Material Production	2,50	1,00
Incoming Transports	1,17	1,00
Packaging Material Transport	1,29	1,00
Waste Transport	2,00	1,00
Purchased Grape Production	1,00	1,00
Purchased Bulk Wine Production	1,00	1,00
Avg.	1,55	1,15