SUSTAINABILITY &
WINE

THESIS

SUSTAINABLE DISTRIBUTION OF ORGANIC WINE

Italian wineries

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Preface

The present thesis is part of the Bachelor's program in International Agribusiness. It represents an important part of the final assessment and is a condition of graduating. The research regards the distribution of Italian organic wine. The idea was to focus on sustainability. It provides Italian winemakers insights for distributing their organic wines in sustainable ways.

My motivation for this topic is related to my interest in the wine industry. This interest is growing over time thanks to my different experiences and studies in this field. Wine distribution is for me a part of the supply chain which is not a lot studied and spoken about. Indeed, when it comes to speaking out about sustainability, the first topics highlighted are wine production in the vineyard and the cellar. Comes after the outbound logistics. I have always been fascinated by trying to improve the industry and I see myself doing the same ahead for the distribution of organic wine. Nowadays, sustainability is a term that we hear more and more, especially in the food and beverage industries. I took into consideration that it's highly possible to not find sustainable solutions that work in this globalized industry. However, there is always something that could be economically, environmentally, and socially improved.
I would also like deep dive into the topic because I would like to have my own winery, it could therefore help me in my personal growth and understanding of the challenges inclined to it.

Moreover, it is important to emphasize that this thesis was not possible without the guidance and knowledge of my supervisor Elsbeth Kauffmann. I give my special thanks to her for all the help and support she gave me since September. Another special thank you to Seila Bruschi, hospitality and sales manager, for her support. With her help and advice, I was able to get in touch with interesting Italian wine professionals. It's therefore the occasion to also thank all of them, for the precious time they gave to me for the interviews. Thank you to Karl-Frederique Reuter for having accepted to answer my questions.
With their assistance, I could write a thesis with strong support showing sustainable solutions for organic wineries.

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16th of January, 2023

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Summary

This study entitled "sustainable distribution of organic wine" covers the distribution, packaging stages included, of Italian organic wines. Sustainability is the key word of this research. In what ways Italian wineries can improve sustainable distributions of their organic wines? Solutions and suggestions are given to Italian organic wineries. They can be applied to wineries from other countries such as France, Germany, or the United States of America. The idea is to give them a clear understanding of the possibility to complete a sustainable credible line of action for their whole supply chain, from the vineyard to the final consumers. Organic wineries have sustainable approaches in the vineyard and in the cellar because the winemaker follows the specifications provided by the European commission. But the way he chooses to sell his wine is not regulated, it is, therefore, more difficult to have the same ethic when there is a possibility to distribute his wine more than 2000 kilometers away.

Different materials and methods are used in this research. They are all described in detail. A total of 6 wine professionals have been interviewed. The idea was to understand the market and to have realistic opinions on how to improve distribution in sustainable ways according to the material and financial resources of small/medium wineries. Moreover, wine consumers from all over the world have responded to a questionnaire on alternative wine packaging. Scientific research was also done to cross-reference ideas.

Making wine distribution sustainable is not that simple, but some solutions can allow wineries to reduce their greenhouse gas emissions (environmental concern), save money (economic concern), have control over the different actors in the outbound logistics, and have real contact with the final customers (societal concern). Even one solution implemented can improve the sustainability of the distribution. The results of the research led to solutions such as favoring the local market, looking for wine retailers or restaurants that don't work with agents, implementing economic interest grouping (EIG), changing the packaging to a more sustainable one, and considering bulk.

In some ways, making the distribution of organic wine sustainable is possible, even though combining the 3 pillars for each solution is difficult. No single sustainable supply chain configuration is ideal for all wineries. Some improvements are more difficult to implement depending on the financial means, strategy, and marketing positioning of the winery. That's why it's recommended to update its marketing positioning, to have perfect communication with customers before certain improvements to facilitate understanding, and also to divide into equal parts the distribution channel and to optimize orders.

Key Words: Sustainability, Organic wine, Distribution, Short supply chain, Direct supply chain, Alternative sustainable packaging.

Table of contents

1- Introduction

To begin with, before wine became one of the most famous alcoholic beverages, wine production goes back 8000 years ago in Armenia, Georgia, and Iran. At that time, wines were probably created with wild grapes before they were domesticated by humans. Wine grapes have followed civilizations as they have expanded to the Mediterranean area. They, therefore, spread the wine through different countries; Greece, Croatia, Slovenia, Italy, France, Spain, etc. As grapes came into new areas, they slowly mutated to survive new climates and new soils. That's why today there are more than a thousand wine grape varieties, which give different types of wine. (Wine folly, 2022).
With time, wine became a cultural drink in many countries in the world. Important people such as kings, popes, and politicians, used to drink wine during their events. Today, wine is drunk on a daily basis by millions of citizens; for aperitifs, lunch, family and professional dinners, for gifts. Italy has the second highest wine-consuming population among European countries, after France. Indeed, according to a study made by Jan Conway in June 2022 about wine consumption in Europe in 2021, the Italian population consumed a total of 24.2 million hectoliters of wine (Statista, 2022). In Italy, large-scale retail is the purchase channel most used. Indeed, 57% of Italian consumers purchase their wine in supermarkets, 36% directly from wine producers, and 11% prefer online marketplaces (Statista, 2022).
For some years now, people start being more and more environmentally aware. Indeed, consumers now realized the impact of their consumption habits on the environment. Facing global warming, on TV, and on social media, ecology takes an important part in the daily life of citizens. More and more of them try as much as possible to avoid products/foods from intensive production. It is part of an ecological transition. Wine production has been blamed by consumers for being an intensive crop. In fact, according to Daniel Moscovici, Jeff Gow, Adeline Alonso, Rana Rezwanul, Lionel Valenzuela, and Radu Mihailescu, "as globalization allows more wine to move around the world, the world wine trade has accelerated, and competition has increased". With important competition, the wine industry is facing environmental, economic, and social challenges because the vine and wine are "seen as intensive crops and associated with environmental damages" (Moscovici et al, 2022). It explains how the trend of organic wine has emerged these last few years.

1.1- The trend toward certified organic wines

Over the last few years, the sales and production of organic wine have shown a considerable positive trend in the world. Indeed, nowadays people prefer to drink wine from a winery that has adopted eco-friendly practices in the vineyard and clean practices in the cellar. Sustaining the environment and supporting natural habitats and wildlife are important. There is also the belief in a safer drink for health and better quality. In Italy, the demand for organic wine has significantly grown, especially in 2019, when the sales in large-scale retail grew by almost 90%. To meet this increasing demand, winemakers have adopted an environmental approach by converting their vineyards into organic farming, which takes 3 years. In 2019, the Italian Ministry of Agriculture registered 107,143 hectares of wine-growing surface, which represents +102% compared with 2010 (Varia et al., 2021). This progression is the same worldwide, especially in European countries. The last report survey made by the International Organization of Vine and Wine on the development and repartition of the certified organic vineyard was made in 2019. According to this organization "Spain, France and Italy together account for the 75% of organic vineyards in the world total distribution" (OIV, 2021). It proves that European countries lead the organic conversion. Regarding the weight of organic vineyards as a share of the country's total area under vines, the ranking is dominated by Italy which devotes 15% of its vineyards to organic viticulture, followed by France with 14% (OIV, 2021).

Having an ethical vision results in respecting specific standards in the vineyard and in the cellar, provided by the organic certification. For European countries, the rules are provided by the European Commission.

Non-European countries have included standards that winemakers have to respect in the cellar before the European countries. It was only in 2012 that the European Commission completed its standard by certifying the wine as organic if it is subject to sustainable oenological treatments in the cellar. Before, the regulations were incomplete and too generic because they only looked at the raw material; if the grapes are from an organically growing technique or not. They didn't focus on the whole winemaking process. Therefore, it was only possible to use the wording "wine made from organic grapes" on the label (Wine Economics and Policy, 2014).
In 2012, a logo was created for "organic wine". All the European wines that meet the requirements can print the organic logo of 13.5 mm by 9 mm minimum on the label.
The table below shows the conditions to use properly the logo according to the production of the wine. (IFOAM, 2018)

Table 1:

The use of the organic logo on wine bottles

	Produced before 1st August 2012	Produced after 1st August 2012
Production methods meet requirements of new legislation	**"Organic wine"** For wines produced before 1st August 2012, producers must provide documentary evidence of compliance with new rules.	
Production methods do not meet requirements of new legislation	**"Wine made from organic grapes" [no logo permitted]** Wine produced before 1st August 2012 that have not been produced according to the new rules or for which there is not sufficient evidence to prove it.	**Conventional wines** No reference to organic possible

Note: *Adapted from IFOAM Eu group wine dossier, by IFOAM EU group, p.28*

1.2- The specifications for organic wine certifications

The last regulation made by the European Commission on organic production was in 2018. In accordance with the regulations of 2012, "Organic production is an overall system of farm management and production that combines best environmental and climate action practices, a high level of biodiversity, the preservation of natural resources and the application of high animal welfare standards and high production standards in line with the demand of a growing number of consumers for products produced using natural substances and processes" (EUR-lex, 2018).
Winemakers have to respect specifications by producing organic grapes according to the crop production rules and by using organic "ingredients" during the wine-making process. The form of organic standards is obviously more restrictive than the legal requirements for conventional wine at all steps of winemaking from grape picking to wine bottling. The basis of the organic certification aims to strengthen the following aspects of viticulture and enology (IFOAM, 2018):

- Attention to the biodiversity in the grapes
- Attention to soil fertility and soil life

- Importance of alternative approaches in case of diseases
- Importance of sustainable wine processing and storage
- Attention to the quality and source of wine ingredients, including limitations on enrichment and requirements for organic ingredients only
- Attention to the quality of yeasts (wild yeasts and spontaneous fermentation)
- Limitations on additives and reduction or suppression of sulfites
- Limitations on processing techniques
- Requirements or limitations on tools and equipment

Table 2:

A non-exhaustive list of substances in the production of organic wines

Substance	Application
Sorbic acid and sorbates	Microbiological stabilisation
Lysozyme	Microbiological stabilisation
Chitosan	Microbiological stabilisation
L-malic acid, D, L-malic acid	Acidification
Ammonium bisulphite	Protection of harvesting
Ammonium sulphate	Management of alcoholic fermentation
Chitin-glucan	Thinning
Chitosan	Thinning
Calcium alginate	Thinning
Co-polymer PVI / PVP	Thinning
Carboxymethylcellulose (CMC)	Tartrate / colour stabilisation
Yeast mannoproteins	Tartrate / colour stabilisation
Polyvinylpolypyrrolidone	Correction of colour
Beta-glucanase enzymes	Glucan elimination
Chitin-glucan	Clarification elimination of heavy metals (iron, copper)
Chitosan	Clarification elimination of heavy metals (iron, copper)
Calcium phytate	Clarification elimination of heavy metals (iron, copper)
Potassium ferrocyanide	Clarification elimination of heavy metals (iron, copper)
Urease	Treatement, elimination of ochratoxin A and urea

Table 3:

Permitted ingredients

Product	Application
Concentrated must	Enrichment
Concentrated rectified must	Enrichment
Sucrose	Enrichment
Yeast cells	Fermentation management, yeast nutrition
Active dry yeast, fresh yeast suspension	Yeast addition
Edible gelatine	Thinning
Plant proteins from wheat or peas	Thinning
Isinglass	Thinning
Egg white albumin	Thinning
Tannins	Thinning
Acacia gum (gum arabic)	Tartaric and colour stabilisation
Tannins	Addition of tannins

Note: Adapted from IFOAM Eu group wine dossier, by IFOAM EU group, p.17

Table 2 and 3 show some examples of the specific ingredients forbidden by the certification and the permitted ones in the wine-making process.

In the specifications of organic wine certification of 2018, there are also some standards regarding:
- Collection
- Packaging
- Storage
- Transportation

Those standards are less compared to the restrictions in the vineyard and the wine cellar.
According to the official journal of the European Union, it's important to not mix organic and in-conversion wines with conventional ones during the whole process. Indeed, when it comes to the collection of the products and prepare the units "Operators may carry out the simultaneous collection of organic, in-conversion and non-organic products only where appropriate measures have been taken to prevent any possible mixture or exchange between organic, in-conversion and non-organic products and to ensure the identification of the organic and in-conversion products. The operator shall keep the information relating to collection days, hours, the circuit, and date and time of the reception of the products available to the control authority or control body." (EUR-lex, 2018)
When another operator receives an organic product, they have to check the closing of the packaging, container, or vehicle and the presence of the indications required such as the name and address of the operator, the owner of the product, the name of the product accompanied by a reference to organic production, the name or the code number of the control body to which the operator is subject. When the product comes from a third country, it is written that "organic or in-conversion products […] shall be transported in appropriate packaging or containers, closed in a manner that prevents the substitution of the content and bearing the identification of the exporter and any other marks and numbers that serve to identify the lot, and shall be accompanied by the certificate of control for import from third countries where appropriate" (EUR-lex, 2018).
In the storage, it's the same vision. Storage has to be organized well in order to identify easily the different lots and avoid any mixing. Organic wines have to be clearly identifiable from conventional ones. (EUR-lex, 2018).

To make this happen in the best possible way, the organic charter requires good traceability in the whole process. In short, from the vineyard to the bottle, the winemaker needs to have control of the supply chain in order to be traceable. For instance, the winemaker has to write down in a book the volume or quantity used for each authorized oenological input. This valuable information must be supported by documents (technical sheets) that prove his compliance with the European organic wine regulation. During inspection from his certification body, he has to be able to prove compliance with the organic charter to avoid losing the certification (Kaur, 2017).
Each European countries have different certification bodies that give the organic label and check compliance. In Italy, the most important ones are; AIAB (Associazione Italiana per l'Agricoltura Biologica: Italian organization for organic agriculture), and BIO AGRICERT (IT-BIO-007) (Karlsson, 2020).

Organic wineries are free in the way of selling their organic wines. Indeed, there is nothing in the specifications that prohibits them from using a certain packaging or from exporting their wine beyond a certain distance.

1.3- The different possible distribution channels used for selling organic wine

Once bottles of wine are filled, the wine can be sold. The winemakers have different options. Indeed, multiple different channels can be used for selling wine/organic wine. As said in the previous part, nothing in the organic charter made by the European Commission prohibits the use of certain distribution channels. Companies have the choice according to the convenience of the channel and their strategy adopted.

The distribution of organic wine could be either direct or indirect.
Direct sales could be:

- Sales into the wine estate directly

In Italy, wine estate opens their doors to welcome people. Tourists or locals can stop to taste and buy products at any time of the day. Also, depending on the size of the winery, some can implement a paying wine experience which consists in doing a visit of the cellar, telling the story and the philosophy of the winery, and tasting the wines with professional explanations. (Sun & Drakerman, 2020).

- Sales during wine exhibitions

Direct sales could also be during a wine exhibition. Each year wine sellers have the opportunity, if they want, to participate in local, regional, or national B-to-C wine exhibitions. These events enable customers to meet the company and taste the wines represented. They can directly buy from these exhibitions. (Beverage Trade Network, 2013)

The direct distribution channels are the shortest ones because it is direct-to-consumers.

Indirect sales could be:

- On-trade

On-trade means a place where people can drink. It corresponds to the HORECA sector: hotels, restaurants, cafés, and bars. In this distribution channel, customers can easily have information and ask for tips before drinking.

- Off-trade

Off-trade means a place where people can buy. There are:
- Supermarkets/hypermarkets
- Independent retail
- Specialized stores of beverages

- Online

It's possible to buy wines online on companies' websites. It's a new trend since the covid-19. Indeed, as the shops had to remain closed, more and more companies decided to make commercial websites where people can order the wine they want and then receive it at home. Companies are specialized shops, independent retail, wineries, etc.
(Ligneris, 2016).

Indirect distribution channels can be in the local country or abroad. Most of the time, when wines are exported, the company uses intermediaries to help them to sell. Indeed, an Italian winery chooses an importer, who stocks the wine and then sells them to different points of sale and takes care of the administrative tasks of the country. They can also work with an agent which has already a professional network in the export country, or in Italy.

Table 4:

Some specific examples of sales points in Italy

Wine exhibitions	Franchise specialized shop	Supermarkets/hypermarkets	Online shops
- Cosmowine - Vinitaly - Enolitech - Autochtona - Expo Food & Wine	- Cavavin - Vin DiVino - La Fontana del Vino	- Basko - Carrefour Market/Express - Conad - Coop - Despar - Famila - Bennet	- Wineshop. it - WinefromItaly - Idealwine - Decantolo

In all these places where customers can purchase wines, there is a wide product range; white, rosé, red wine, organic, conventional, local wine, or international. In Italy, consumers have therefore the choice, regarding their quality and taste preferences. Taste and quality depend on a lot of factors; the grape variety, the soil, the climate, the aging methods, and the wine-maker's work in the cellar. In a grocery store, it is difficult to judge the quality of the wine so consumers base their choice on extrinsic attributes such as the origin of the bottle, the organic certification, the grape varieties, the brand, the price, and the label design. According to Meike Janssen, Isabel Schäufele, and Katrin Zander, organic food consumers are the ones who would be the most open to organic wines. Moreover, nowadays, more and more people pay attention to the provenance of the product (local, neighbors' countries, or other third countries) and are willing to pay more for the guarantee of having a sustainable bottle. Nevertheless, it depends on the level of knowledge about wine culture (Janssen et al., 2020). In Italy, organic wines are well appreciated by customers, 49% of organic wines were sold off trade in 2020. For Italian customers, organic is seen as value and quality regarding the environment, health quality, and authenticity (Enoitalia, 2021).
The success of organic wine goes beyond Italy, as Italian wines remain one of the most famous wines in the world such as DOCG Chianti Classico. Italy is one of the world's highest wine exporters in dollar value. Indeed, in 2021 Italy exported wine worth US$8.4 billion. 20.7% of the total wine sold was exported. The country follows France which is the one that exports the most (Workman, 2022). The exportation of Italian still bottles was up 12% in the US in the first half of 2021, 18% in Germany, and 19% in Canada (Guolo, 2021). A study was made by Isabel Garcia on the organic wine market. The author comes up that around 2/3 of Italian organic wine sales are exported (Garcia, 2018).

1.4- The different items used for selling wine

Winemakers also have different options to pack their organic wine as nothing in the organic charter is specified. In Italy, like other wine countries worldwide, different items are used to sell organic/conventional wine, depending on the cost and the marketing positioning of companies.

- Primary packaging

The most common first packaging that all consumers know is **glass bottles**. It remains the most widely used. It is easy to store and protects the quality of the wine by avoiding oxygen permutation. The container helps the aging process. A bottle of glass is aesthetic. Different types of sizes and shapes exist. Regarding the size, the most used are the standard bottle of 0.75L and the magnum of 1.5L. There are also "Piccolo" (18.7cl) used for the hospitality sector, "half" (37.5cl), "double magnum" (3L), "Jeroboam" (4.5L), "Imperiale" (6L), "Salmanazar" (9L), "Balthazar" (12L), "Nebuchadnezzar" (15L), and "Salomon" (18L). Regarding the shape of the glass bottles, there are Alsace/German bottles (taller and thinner than other types), Bordeaux bottles (cylindric shape, with straight sides and high shoulders), Burgundy bottles (a longer neck than the Bordeaux), Champagne bottle (heavier and thicker), Port bottle (the neck has a bulb to trap excess sediment during pouring), Provence bottle (resembles a bowling pin), and flat bottles (as its name indicates, they are flat). Italian wineries mostly use Bordeaux and Burgundy bottles (WSETglobal, 2022).

Over the years, new packaging has emerged such as the **Bag-in-box** or boxed wine. Inside the cardboard box is located a strong polylaminate plastic bag that is filled without air. This container can contain 3L, 5L, or, 10L. It is famous in the Australian market. The Italian HORECA sector demands more and more of this container. (Lekac, 2021).

There is also **canned wine**. Indeed, the wine is bottled in cans. One can permit to fill 1 or 2 glasses. It is less heavy than bottles and is resistant to shock. Today, few Italian producers use cans for their wine. (Lekac, 2021).

Paper bottles are made with paper. The winemaker Truett-Hurst launched it for the premium brand “PaperBoy”, and it was a first for the American market. As for cans, paper bottles are not a lot used by Italian companies (Lekac, 2021).

- Cork (part of the primary packaging)

Wine corks allow to close the bottle and avoid the wine to age in bad quality. With time, several corks are used by wineries. The most used in Italy and in the world is the “cork stopper”. There is also the “natural cork”, which is renewable, the “synthetic cork” made from plastic compounds, the “Champagne/Sparkling Wine Cork”, the “Grainy Cork” for near-immediate consumption, “Capped Cork” a natural cork and plastic destinated for beverages with high-alcohol percentages, “Screw Cap” very famous in New Zealand and offers little to no oxygen exposure, “Vino-Lok” made from glass, and “Zork” a combination closure and pull-off capsule. (Ridge, a.d).

- Secondary packaging

The second packaging of the wine is the container in which the bottle is transported. Most of the time, bottles of wine are transported in rectangular cardboard boxes of 6 or 12. The bottles can be either standing or lying down. To separate the layers and to protect the bottles are arranged cardboard dividers. A second packaging is also possible for 2 or 3 bottles; cardboard boxes with windows.
Wooden boxes can be used for 1 or several bottles.
As a gift, the bottle of wine can have different types of boxes made with different materials. (Daggar, 2022)

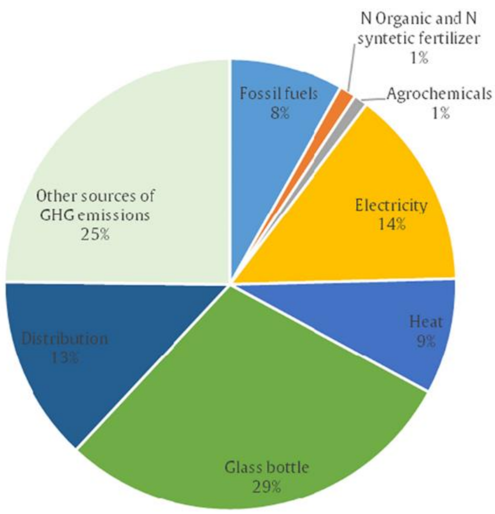
1.5- The impacts of wine distribution

First of all, several studies and research have been done regarding the environmental consequences of wine production in the vineyard and in the cellar; important greenhouse gas emissions due to the use of fertilizers, pesticides, water, and energy (Christ & Burritt, 2013), (Maicas & Mateo, 2020). Less has been made regarding the impact of wine distribution. The environmental, economic, and social impacts are the same for the distribution of conventional or organic wine. However, the total amount of GHFs emissions in the whole supply chain is lower for organic wine thanks to the manufacturing part being more sustainable. It’s interesting to find out how to increase the gap between the total amount of emission occurring from a conventional and an organic bottle, thanks to improving their distribution. Indeed, distribution can generate a lot of greenhouse gas emissions and can be expensive. The further away the final destination is, the higher the CO_2 emissions are. Emissions from air shipments are the worst, followed by trucking, container ships have the least impact. According to D’Ammaro, D., Capri, E., Valentino, F., Grillo, S., Fiorini, E., and Lamastra, L, the distribution of one 0.75l bottle of red wine from the winery to the retail (500km) is 0.223 kg CO_2 eq, and for a bottle of

white: 0.187 kg CO2 eq. The average carbon footprints that include the viticulture, wine-making, and packaging stages are 1.02, 1.25, and 1.62 CO2 per bottle of wine for organic red wine, conventional red wine, and conventional white wine, respectively. The packaging stage, due to the glass production process and electricity consumption for the bottling process, is one of the largest contributors to CO2. Indeed, this stage results in around 0.179 to 1.138 kg CO2 eq. bottle of wine (D'Ammaro et al, 2021).
Economically, the heavier a bottle is, the more expensive the transportation is. Fewer bottles are transported, which results in more transportation. Moreover, according to the economic and Ukrainian crises, the price of glass bottles has increased by 26% this year. The cost of packing cartons has also increased considerably which represents an important cost for the winemaker in total. (Gaven, 2022)
Getting back to the environment, as another example, Antonietta Baiano has compared the kg of CO2 emission for a 0.75l wine from France to Finland and from Australia to Finland with different packaging. The author found an average value of 1.23 kg CO2 for 0.75 L wine, ranging from 0.59kg CO2 for French wine packed in a bag-in-box to 1.92 kg CO2 for Australian wine in glass bottles. It is highlighted that within the wine supply chain, the packaging and the distance from the winery to the final selling destination have an important impact on the carbon footprint (Beverage, 2021).
Here is a diagram representing the percentage repartition of the contributors to GHGs emissions. GHGs relate to carbon dioxide (CO2), but also methane (CH4), nitrous oxide (N2O), ozone (O3), and halocarbons (CFC, HCFC, HFC).

Figure 1:

Percentage distribution of the contributors of GHGs emissions



In accordance with the emission calculation made above for the distribution of one 0.75l bottle, and for the viticulture, wine-making, and packaging stages, the same authors made an average repartition. Figure 1 shows that the main contributor to GHGs emissions is glass bottles (29%). Then, the electricity used in the cellar stage represents 14%, the heat used in the cellar phase is 9%, and fossil fuels used in the vineyard are 8%. Emissions related to the use of organic and synthetic fertilizers and agrochemicals in vineyards accounted for 1% of each one. Other sources of GHGs accounted overall for 25%. (D'Ammaro et al, 2021).

Note: *Adapted from the "Science of The Total Environment", Volume 779*

In short, an organic winery's distribution, packaging stage included, have a high environmental and economic impact, depending on where and how its wines are sold.

1.6- Sustainability in wine distribution

It is difficult to know where and how the Italian organic wines are sold and, what type of items the company uses to pack their wine. With all the possible countries and cities, all the possible distribution channels, it is not always specified the ones the wine-makers favor; short, long, direct, indirect, off-trade, or on-trade. It depends on his strategy: marketing positioning, economics, and ethics. Thousands of winemakers, thousands of ways of distributing wine because the organic charter doesn't regulate the distribution. According to the strategy and marketing position chosen by the company, it could be difficult to always have the word "sustainability" in mind during the whole process of the supply chain, from production to final delivery. The meaning of "sustainability" is large. Indeed, the winemaker has to take care of the environment while producing and distributing quality wine and being socially responsible. The objective is to make a profit and at the same time meet the needs of the present without compromising the ones of future generations. As seen above, with the organic certification, Italian wine-makers adopt sustainable behaviors, more specifically eco-friendly ones, in the vineyard and in the cellar; water management, fewer chemical substances, fewer quantities of So2, respectful methods for the soil, etc. They are free in the way they distribute the wine and even though several efforts are made during the production, the total GHGs emissions of 1 wine bottle are still important if nothing is adapted in the distribution. Improvements could be done in the distribution in order to extend the same ethic till the final customer.

This research aims to answer the following main question:

In what ways Italian wineries can improve sustainable distributions of their organic wines?

The sub-questions to help answer this research are:

- How is actual Italian organic wine distribution organized?
- How to shorten the distribution of organic wine?
- What are the most suitable items for sustainable distribution?

The objective of this research is to understand the current market and to give some sustainable solutions to Italian organic wineries regarding the distribution of their wines, including the packaging process. The idea is to give them the points of view of wine professionals and Italian & international customers. Scientific research was also done to cross-reference ideas. According to their strategies and marketing positioning, they could or not, implement solutions to complete a sustainable credible line of action for their whole supply chain.

2- Methodology

In this chapter, the materials and methods used for this research is given and described.

2.1- Materials and methods

The objective of this study is to identify sustainable solutions to improve the distribution of Italian organic wines. The idea is to give wineries answers on how to have the same ethics throughout the whole supply chain, from sustainable grape growth in the vineyard to sales.
To conduct the research, answers were collected from two target groups. Indeed, to be part of the first participants' group, the main criterion is that they are working in Italy and are related to the wine industry. They could be young wine professionals or experimented ones. The second participant group is larger because it includes wine lovers from all over the world. It was expected that they are wine consumers.
This research was designed to be conducted as two in-depth interviews and one survey. Both in-depth interviews are built-in questions that permit the collection of qualitative information. The first interview was composed of different sections. Each of them contained multiple questions that aim at discovering the solution to the individual sub-questions. The second one is destinated to go further in the answer to the second sub-question. The survey is a built-in questionnaire to collect quantifiable data. This questionnaire focused only on one subject related to the last sub-questions; packaging and sustainability.

In addition to these methods, literature studies have been done to cross-reference ideas for the second and third sub-questions. The objective was to confront the opinions of wine professionals and authors of articles. It is useful to understand if the solutions provided by researchers are feasible and affordable for wineries. Literature is from scientific articles and official sources.

2.1.1 – The in-depth interviews

- The first in-depth interview:

First of all, as said above the interview is made to be qualitative. The questions are destinated to Italian organic wineries regarding their production of organic wines, their actual organization, their distribution, logistics, their opinion about short distribution channels, and sustainable alternative packaging. A qualitative interview is more interesting to learn about opinions, points of view, and impressions than numerical data. In other words, deeper answers help to gain insight into the way winemaker or managers think, what their motivations are, and their attitude toward the distribution of organic wine. The objective was to collect around 5 qualitative interviews with information that permit answering the three sub-questions. These in-depth interviews were done in English. The wineries chosen were selected depending on different criteria; being an Italian winery, and being certified organic for at least 3 years. After 3 years, the company starts having its strategy for selling organic wine, so it's easier to get relevant information about the whole supply chain. The wineries were found on Italian websites that promote organic food and beverages. The wines, vision, and philosophy of the winemakers are expressed. Moreover, Seila, the sales and hospitality manager of an organic Chianti winery, shared her contact in order to get in touch with a maximum of interesting professionals. Multiple wineries were therefore contacted by mail in order to get as many positive responses as possible. The English interview was written in Word. It was not web-based and developed on Google Forms even though this pleasant experience provides also qualitative information from participants. The idea was to directly talk to them, either by meeting them or via e-mail. As the harvest

was done and the tourist season was almost ending, professionals were more available to give their time to answer the questions. Having a conversation with the professional allows more qualitative and deeper exchange. They can answer the questions properly and add relevant information. Unlike in Google Forms, if they have a doubt about a question, they can ask for a reformulation. It reduces the risk of skipping the question which makes the result less relevant to the research. However, the inconvenience is that the participant can feel pressure by directly talking to the student. That's why before meeting professionals, the questions on Word were sent by mail 3-4 days before that they can get to know the questions and start thinking about them.
In total, 5 interviews have been conducted.

Table 5:

The methods used to conduct the in-depth interview

Methods	Face-to-Face	Mail
Numbers	3	2

Face-to-Face interviews were done when the distance and the decided timing allowed it. Otherwise, a phone call has been done. The objective was not to force the participants, they were free to choose. Indeed, when they didn't want these two options, they could decide to answer the questions in Word and send back their responses. During Face-to-Face, a record was done in order to not miss important information. The record could be replayed several times.

- <u>The second in-depth interview:</u>

This second interview was goal-oriented to go into the second sub-question in depth; how to shorten the organic wine distribution. Since organic Italian wines are more and more demanded in the country and abroad, the distribution channel is indirect and long, where different intermediaries are involved; agent, wholesaler, importer/distributor, and retailer. The objective of this interview is to collect qualitative information about the possibility to shorten the distribution in order to make one as sustainable as possible. To do so, open questions have been asked to a French wine professional; Karl-Frederic Reuter. After graduating as an engineer-oenologist, Karl-Frederic Reuter worked for a decade in wine export. He was in charge of 40 countries in Europe and South America. He, therefore, has both technical and export expertise. Since 2019, he has been contributing this expertise to the French leading support network dedicated to the wine industry; "AOC Conseils" (supporting, guiding, building). He supports and advises wineries in the Loire Valley in their development; business, marketing, strategy, human resources, and CSR. Moreover, K-F. Reuter is a weekly lecturer on wine export management at the University of Agriculture in Angers. With his several experiences, his opinion about sustainable distribution was interesting for the research.
The interview was done in a Zoom meeting to make the discussion more interactive. It was done in French. The first exchange with him was by mail where details of the topic were sent also 3-4 days before the meeting. The interview was structured because the questions were already prepared. However, according to his answers, questions have been added for more explanations and details as the interview progressed.

2.1.2- The survey

In addition to the two qualitative in-depth interviews, a quantitative survey has been made for the research. It was created to give additional answers to the 3rd sub-question; what is the most suitable item for sustainable distribution?
The survey was web-based and made on Google Forms. Google form is an efficient free online service easy to use that makes numerical and figurative analyses with the responses collected. Online surveys

can provide a pleasant experience for the participants because they can do it when they get time, and without pressure. Nevertheless, the inconvenience is that if they don't understand the question, they cannot ask for a reformulation, and the risk of skipping the question is important which makes the result less relevant to the research. This survey, in the form of a questionnaire, is intended for a larger target group than the interviews; wine consumers from all over the world. Questions were written in English, the international language, to collect as many responses as possible. As Italian organic wines are sold around the world, the opinion of international wine consumers was as important as the Italian ones. The questions were related to the perception of consumers about wine packaging and sustainability. How the packaging of the wine can be more eco-friendly and less costly for the wineries? As consumers, are they really concerned about sustainability? Are they ready to buy another type of packaging? The answers collected matter for the wineries because the final customers are the ones who pay for the wine so before making any investments it's important to know if it's worth it.
As the participants, which correspond to the population size (N), are from different countries in the world, it is not possible to determine the sample size needed for relevant research because a large demographic has been favored. The objective was to collect the most answers possible.
This questionnaire was distributed online, by sharing and promoting participation via important networks such as LinkedIn and Instagram. The questionnaire was also printed and given to visitors of Monte Chiaro Organic Chianti Winery. Most of them are from the United States and Europe. When they had the time for it, they complete the questions anonymously. Moreover, contacts in the Monte Chiaro database were used to send the link of the Google Form by mail. 70% of the contacts are American which is relevant for the research because the United States is the first buyer of Italian wine abroad.

Table 6:

Summary of the methods used to share the link of the questionnaire survey

Methods				
LinkedIn	Instagram	Collecting contacts from the database of Monte Chiaro	Giving customers the printed questionnaire	Personal network

Thanks to frequent shares and personal connections, several numbers participants were collected: 108

2.2 – The in-depth interviews design

As mentioned above, two different in-depth interviews have been created; one destinated to Italian wineries and the other to international wine consumers.

- The first interview:

It was made up of 4 sections. In total, there are 47 open questions (as seen in Appendix 1). As said previously, to answer the 3 sub-questions, open questions are important to collect deeply qualitative information and opinion from the participants.
The interview was divided into these 4 following sections:

- *Section 1*: Introduction purpose. In fact, this part is related to basic questions in order to know more about the participant and the winery itself. Obviously, before this first section, some explanations about the main objectives of this interview and the topic of the research were provided. There are 10 questions in total. These 10 questions gave an overview of the winery, its production, the proportion of organic wine produced, the year when the wine has been certified, the reason for this sustainable choice, etc. The expected answers are short, opinions are not yet requested (as seen in Appendix 1, Section 1).
- *Section 2*: This section focused on understanding the actual organization of the wineries' organic wine distribution. It aims to answer the first sub-question and one of the knowledge gaps of the research. Indeed, as seen in the first chapter, it's difficult to identify where and how Italian organic wines are distributed. By asking questions in the interview, concrete explanations about their supply chain were directly given. The idea was to know more about their current distribution channels (used in Italy and abroad). This section is composed of 20 questions. Same as in the previous section, the expected answers are short (as seen in Appendix 1, Section 2).
- *Section 3*: The objective of this section is to highlight the perception of the participants on their distribution channels. According to them, are they sustainable? The aim of this section was also to ask them if it is possible to improve and shorten the distribution of organic wines in order to make it as sustainable as possible. The 6 questions help to answer the second sub-questions. The answers are expected to be developed (as seen in Appendix 1, Section 3).
- *Section 4*: In this last part of the interview, participants were destinated to give their opinion about the packaging of the wine. Questions concern packaging and sustainability. The objective was to identify the most suitable packaging for sustainable distribution. Everybody knows about the glass bottle, but it is not the only container to sell wines, and maybe not the most eco-friendly. With its 10 questions, this last part is useful to answer the last sub-question (as seen in Appendix 1, Section 4).

Table 7:

Summary of the sections and questions of the first interview answering the sub-questions

Sub-Questions	Sections & questions no.
• *How is actual Italian organic wine distribution organized?*	Section 1: Questions 1 to 11 Section 2: Questions 12 to 31
• *How to shorten the organic wine distribution?*	Section 3: Questions 32 to 37
• *What is the most suitable item for sustainable distribution?*	Section 4: Questions 38 to 47

- <u>The second in-depth interview:</u>

This interview was destinated for the French wine professional Karl-Frederic Reuter and was made up of 1 section of 10 open questions.

The interview starts with broad questions such as defining what is a “sustainable distribution”. Subsequently, questions focus on how to shorten the distribution of organic wine in Italy and in foreign markets (as seen in Appendix 2, questions 4 and 6). Detailed solutions are expected as answers. In addition to these 2 main questions, it is important to know if the solutions mentioned are affordable or not for all wineries.
If according to the professional, it is not possible to shorten the distribution of organic wine, an open question was asked regarding his opinion about other sustainable solutions that could be implemented by wineries, without necessarily shorting the distribution. It can give Italian wineries a broader overview of sustainable distribution.
At the end of the interview, questions are related to the cost of improving sustainability in the distribution in the percentage of the production cost, and to the possibility of an impact on the marketing positioning of the company (as seen in Appendix 2, questions 10 and 11).

2.3- The survey design

Regarding the questionnaire survey destinated for international wine consumers, the questions are mostly closed. The participants experienced one-choice answers, multiple choice, and few open questions (“Why this choice?”). It was made up of 2 sections in total:

- *Section 1*: This first section contains socio-demographic questions about the participants; age, gender, country of origin, the frequency they buy wine, their interest in organic wines and sustainability, etc. It was asked in the first question: “Are you a wine consumer? (As seen Appendix 3, section 1, questions 1) Participants who answered “yes” were granted to participate further in the survey, and the ones who answered “no” were automatically denied to go further in the survey. The questionnaire was therefore sent. The non-wine consumers were excluded from the sample population because to conduct a satisfactory investigation, it is more suitable for wineries to have the opinion of people that buy wine.
- *Section 2:* This part is the core of the survey because closed and some open questions have been asked regarding the packaging of the wine. Some questions are open because explanations and details are needed to conduct satisfactory investigations (as seen in Appendix 3, section 2, questions 16, 20, and 22). The idea is to know if customers care about the sustainability of the wine packaging or not. Different situations were proposed according to the packaging, the participants had to choose among them. It helps to know what the customers think about the different types of packaging and if they are willing to buy it.

  All the answers were destinated to answer the sub-question 3.

2.4 – Data analyses

The analyses of the qualitative and quantitative data are different. Thanks to the Italian wineries’ answers to questions of sections 1 and 2, a general supply chain mapping has been realized.
Regarding section 3, the answers of the Italian wineries have been sorted in a table.
The qualitative data expressed in the second in-depth interview by Karl-Frederic Reuter have been entered into a table as well.
Regarding section 4, the answers of Italian wineries have been analyzed visually thanks to charts and histograms. To do so, data to relevant questions have been collected from participants in Excel. The histograms are precise in terms of value.

2.5- Considerations

First, participants for the first in-depth interview are professionals working in Italian wineries mostly from the Chianti wine region as the researcher has more connections in this part of the country.
Moreover, for the questionnaire, it is expected that the majority of participants coming from social media will be young adults because this group is active online and is more likely to come across the survey. Young adults are also a suitable research population since they may be the future main buyers in the wine market. It is known that millennials have more and more environmental consciousness about the product they buy. Most of the questions where the participants had to make a choice among alternative sustainable packaging regards mostly IGT (typical geographical indication) wine because, in Italian appellation of origin (such as DOCG Chianti Classico), winemakers have to follow specific regulations. The points of sale are off-trade channels and not on-trade.
Last but not the least, distribution and packaging are part of the outbound logistics, but this research does not focus on logistics and inventory which are also part of the outbound logistics of the wine supply chain.

3- Results

In this chapter, results from interviews and the questionnaire survey will be described. This part is divided into three, corresponding to the sub-questions.

3.1- The current distribution of the Italian organic wineries

5 wineries were interviewed between the 11th and the 23rd of November of 2022. As presented in Chapter 2, an in-depth interview with open questions divided into 4 sections has been created. The answers to the first and the second ones are useful to understand the distribution of organic wine in Italian wineries.
First of all, a short presentation has been made of the 5 wineries interviewed. The answers collected from section 1 have been presented in a table (as seen in Appendix 4)

The main reason for this sustainable transition (making conventional wine to organic wine) is approximately the same for the 5 wineries. According to them, it was an obvious choice. Carpineta estate was already using sustainable practices in the vineyard so asking for the certification was obvious to the owner. They were one of the first in the Chianti wine region. Cantalici and Il Palagione estates are sensitive to the land and they didn't want their family & friends to drink chemical wines. For Monte Chiaro, being organic is means of quality and increases the perceived value of the brand. The motivation was also to clean the soil from the chemicals used by their sharecropper's management, to produce more quantity. For Villa Calsinaia, being certified organic was an obvious choice because according to the owner Sebastian Caponi "important changes start where we live" (personal communication, November 23, 2022).

3.1.1- Distribution of organic wines in Italy

Even though the 5 Italian wineries sell their wine abroad, most of them, Cantalici, Monte Chiaro, and Il Palagio, sell mostly in Italy with 80%, 75%, and 70% respectively. Carpineta Fontalpino (10%) and Villa Calcinaia (33%), are more present in foreign markets. All of them organize wine tours and tastings in their winery. This B-to-C channel represents between 20% and 80% of their national sales. They sell their wines to hotels, restaurants, café (HORECA), specialized shops, organic shops, and through their website shop. None of them, distribute their wine in supermarkets. Nationally, the distribution is always done by truck. Moreover, regarding the way of distributing the wine, there are between 1 and 3 intermediaries between the company and the final customers; the national distributor, agents, restaurants, shops, etc. Only Cantalici doesn't use an agent or distributor. For most of them, professional customers are located in different regions of the country, between 1 (mostly Tuscany) and 15. The frequency of orders placed varies according to their presence in Italy and the number of customers; between twice a week and 4 times a year.

- *Carpineta Fontalpino*: Among the 10% of wine sold in Italy, 60% are destinated to direct-to-sales consumers (from the winery), and 40% are destinated to Italian professionals: HORECA, specialized and organic shops. Those professional customers are located in all Italian regions (15). The winery works with a national distributor who stocks and sends wines to agents, depending on the region. The distributor places an order between 4 and 5 times a year.
- *Cantalici*: Among the 80% of wine sold in Italy, 80% are destinated to direct-to-sales consumers (from the winery), and 20% are destinated to Italian professionals: HORECA, specialized and organic shops. Those professional customers are located especially in the Tuscany region. The winery does not work with intermediaries between them and the retailers. Indeed, they directly ship to them. According to Michela, there are advantages and

inconveniences of working directly with the final retailers; “the advantage is that the winery doesn’t pay commissions, and has a social relationship with retailers which creates a confident climate in the business.” (Personal communication, November 11, 2022).

- *Il Palagio*: Among the 70% of wine sold in Italy, 20% are destinated to direct-to-sales consumers (from the winery), and 80% are destinated to Italian professionals: HORECA, specialized and organic shops. Those professional customers are located in 5 regions, especially Tuscany. The winery works with an Italian society distributor and an agent. Moreover, in addition to stocking their wine at the estate, they also have stock in North Italy in the Piedmont region. From the agent, an order is placed every 7/15 days (Tuscany), and for the other regions every 30/60 days.
- *Monte Chiaro*: Among the 75% of wine sold in Italy, 70% are destinated to direct-to-sales consumers (from the winery), and 30% are destinated to Italian professionals: HORECA, specialized shops. Those professional customers are located only in Tuscany. The winey works with 2 agents in the region. From the agent, an order is placed twice a week. Moreover, their shipping partner stock in their storage some quantities of wine.
- *Villa Calsinaia*: Among the 33% of wine sold in Italy, 25% are destinated to direct-to-sales consumers (from the winery), and 75% are destinated to Italian professionals: HORECA, specialized and organic shops. According to the owner Sebastian Caponi, the objective is to increase the number of direct-to-sale consumers (personal communication, November 23, 2022). The professional customers are located in all 4 regions. The winery works with an agent and for some regions such as Rome, with a distributor. Approximately, an order is placed twice a week, mainly from Florence.

3.1.2- Distribution of organic wines abroad

The proportion of wine sold abroad represents between 20 and 90%. For the 5 wineries, one of their main markets is the USA. Most of them distribute their wine by ship and truck, sometimes by plane for Monte Chiaro and Villa Calsinaia. They use between 1 and 4 intermediaries to sell their wine, depending on the market. Their customers are both professional and customers. The professional customers are the same as in Italy.

- *Carpineta Fontalpino:* 90% of the organic wine is exported, mostly to North America (USA and Canada) and to Europe with Switzerland and Denmark. Alice Marsalli has confirmed that the company would be ready and open to conquering new markets. Trucks and boats are used for transporting organic wines. Their international customers are Businesses (HORECA & wine shops) and private (through e-commerce). They use usually at least 3 intermediaries to distribute to the retailers: importer/distributor/agent. Approximately 1 order/month is placed.
- *Cantalici:* 20% of the wine is exported, mainly in the USA and China markets. To distribute the wines, they use trucks and boats. Michella has expressed that they would like to conquer new markets. Moreover, their objective would be to find importers, especially in Germany because for the moment they directly send to private customers and professionals without intermediaries. According to her, “it would be easier and more efficient to work with an importer, but the problem is that if they accept to work with us, they have to quite another winery so they are usually not open for new ones. It seems too late” (personal communication, November 15, 2022). The international importer in the US places an order ¾ times a year.
- *Il Palagio*: 30% of the wine is exported, mostly to the USA, Japan, and Germany. Gorgio would be open to conquering new markets; “why not”. Trucks and boats are used to transport organic wines. Their international customers are Businesses (HORECA & wine shops) and private (through e-commerce). They use usually at least 3 intermediaries to distribute to the retailers: importer/distributor/agent. He has added that they “normally are importers or

distributors" (e-mail communication, November 20, 2022). Approximately 1 order every 30/90 is placed.

- *Monte Chiaro*: 25% of the wine is exported, mostly to the USA, Sweden, and Japan. The answer of Seila Bruschi regarding the desire of conquering new markets was "of course". Their international customers are Businesses (HORECA & wine shops) and private (through e-commerce). The shipping companies for B-to-C deliveries use trucks and planes, and importers use ships. They use usually at least 3 intermediaries to distribute to the retailers: "licensed importer"/distributor/agent, depending on the market. In San Francisco, the company has a warehouse to stock its wines. Once a month an order is placed.
- *Villa Calsinaia*: 67% of the wine is exported, mostly to North America (USA and Canada) and to Europe with France. Sebastian Caponi would like to conquer new markets "but not too many because I want to improve the place where my wine is, for example in more quality restaurants" (personal communication, November 23, 2022). Trucks and boats are used for transporting organic wines. Their international customers are Businesses (HORECA & wine shops) and private (through e-commerce). They use usually at least 3 intermediaries to distribute to the retailers: importer/distributor/agent. Once a month an order is placed.

3.1.3- Items used for bottling and packing organic wines

Table 8:

The different items used by wineries for their organic wines

	Wine container	Weight	Type of corks	Type of label	Type of boxes
Carpineta Fontalpino	Mostly glass bottles. Bag-In-Box (for locals)	430g	Natural cork	Paper label	Cardboard boxes
Cantalici	Glass bottles	400g	Natural cork & rebuild cork	Paper label	Cardboard boxes
Monte Chiaro	Glass bottles	500g	Natural cork	Paper label	Cardboard boxes
Il Palagio	Glass bottles	500/530 g	Technical Cork (Nomacork) & screwcap	Paper label	Cardboard boxes
Villa calsinaia	Glass bottles	380g (85%) 600/750g for high-quality wines	Natural cork (85%) & rebuild cork	Paper label	Cardboard boxes & wood boxes

This table shows the types of items (first and second packaging) used by the 5 Italian wineries for their organic wines.

3.1.4- The entire supply chain of Italian organic wineries on a map

A map has been made to image the supply chain of the wineries. Details are highlighted on the distribution thanks to the result of section 2 of the 5 in-depth interviews (See the map in Appendix 5).

3.2- Shorten the distribution of organic wines

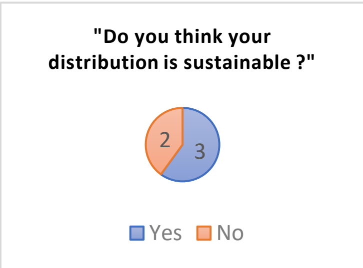
As presented in Chapter 2, section 3 of the in-depth interview with Italian wineries and the entire second in-depth interview with Karl-Frédéric Reuter help to answer the second sub-question. The results from these two aims to know how to shorten the distribution of organic wine.

3.2.1- Result of section 3 of the in-depth interview with the 5 Italian wineries

To begin with, the first question asked to professionals concerned their opinion on their distribution. The results help to understand if participants see the distribution of their organic wines as sustainable or not (figure 2). Moreover, as seen in the previous section, the majority of participants confirmed that most of their wines are sold directly to consumers in Italy and to businesses in foreign markets. One of the questions aimed to know their opinions on these two channels; which one is the most sustainable (figure 3).

Figure 2:

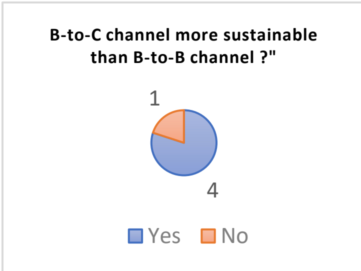
Repartition of answers
regarding their distribution



Note: 3 out of 5 professionals think their distribution is not sustainable. For them, it could be better. For Alice Marsalli and Sebastian Caponi, their distribution is not environmentally sustainable because they distribute their wines all over the world. Seila affirmed that compared to the distribution of other wineries, Monte Chiaro is close to being considered sustainable.

Figure 3:

Repartition of answers
regarding the B-to-C and B-to-B channels



Note: 4 out of 5 professionals think that the B-to-C channel is more sustainable than the B-to-B channel. According to Gorgio, even though the B-to-C channel is more sustainable, “it is not available” (email communication, November 20, 2022). He didn’t give more information. Seila, the unique person to not agree said that it is more difficult to implement groupage for customers than for professionals.

Thanks to the open questions, it was possible to identify solutions that wineries can implement to shorten their distribution. Here is a table that summarizes the opinion of participants.

Table 9:
Solutions to implement for sustainable distribution, according to wineries.

	Sustainable solutions to shorten the distribution (Q° 34)	**Other solutions given to implement**	**Is it affordable for all wineries? (Q° 35)**	**Some interrogations noticed during the interview**
Carpineta Fontalpino	- Looking for professionals that don’t work with agents (thanks to professional exhibitions such as Vinitaly) The advantages expressed are: **ECO**: don’t pay any commissions	- Groupage with wineries that have the same destinations The advantages expressed are: **ECO**: cost-efficient **ENV**: fewer fuel emissions	The winery that does the groupage needs certification and enough place in the warehouse to stock orders, but affordable. To not work with agents is affordable. Changing the incoterms from	Alice Marsalli doesn’t know what is more environmentally sustainable between sending boxes to consumers’ homes or consumers taking their cars to come to the winery to buy boxes.

	SOCIAL: having real contact with professionals The disadvantages: **ENV**: "I think our orders are less optimized." (Personal communication, November 11, 2022).	- Changing the incoterms to have more control over the distribution	EXW to FCA is more costly because the winery has to take care of the transportation so more costly. It is not affordable for all wineries.	
Cantalici	- Looking for professionals that don't work with agents. The advantages expressed are: **ECO**: don't need to pay any commissions **SOCIAL**: being able to have control of the actors of the supply chain. The disadvantage is: **ECO**: "without agents, it's difficult to grow up because they already have contacts that could enable a company to evolve quicker." (Personal communication, November 15, 2022)	- Waiting to have enough orders before the carrier comes to take the orders. The advantage: **ENV**: fewer fuel emissions The disadvantages: **SOC**: issue to not meet clients' expectations	All these solutions are affordable for small and big wineries	Michella has interrogation on the export development abroad without an agent. "In Germany, we work without an agent but we are looking for one to help us to increase our sales". (Personal communication, November 15, 2022).
Monte Chiaro	In Italy: Looking for professionals that don't work with agents. In foreign markets: Each market imposes importers, retailers + logistics. "USA imposes 3 steps it is not possible to minimize the intermediaries and to internalize all the transports for sales". (Email communication, November 21, 2022).	- Choosing a sustainable third-party logistic. "By minimizing costs and rationalizing transports it's possible to be sustainable. It's strategic to select an outbound logistic system, which meets your philosophy and is economically sustainable for you." (Mail communication, November 21, 2022).	It is not always affordable for all wineries because third-party logistic that uses sustainable practices are usually big companies. For Seila," biggest the winery is, the more the distribution is efficient." (Mail communication, November 21, 2022).	No interrogations were noticed.
Il Palagio	"I don't think it's possible" (Email communication, November 20, 2022).	"I don't know and I don't think it will be possible" (Email communication, November 20, 2022).	"I don't think so" (Email communication, November 20, 2022).	No interrogations were noticed.
Villa Calsinaia	- "With 100% direct-to-consumer sales" - Going directly to the country to do a commercial tour (prospecting) - avoiding exporting to countries that require going through a number of intermediaries.	- B-to-C; schedule a day maximum per month, or a day every 2 two months (depending on the number of orders) for the carrier to pick up the orders. "If the customer accepts the date of shipping, then he has a discount if he	It is affordable. The process to only do 100% direct-to-consumer sales has to be conducted "step-by-step" (Personal communication, November 23, 2022)	Sebastian Caponi, doesn't know what is more environmentally sustainable between sending boxes to consumers' homes or consumers taking their cars to come to the winery to buy boxes "studies have

	wants to ship earlier, he pays more." (Personal communication, November 23, 2022)		to be made to know it". (Personal communication, November 23, 2022).

As seen in the previous part, the 5 wineries use e-commerce to send to customers (through their website). The last question asked in this section relates to it; "How you could optimize the distribution of B to C coming from e-commerce?" (As seen in Appendix 1, Section 3, Question 38). The 5 professionals gave 5 different answers:

- Only people in Italy can order wines on the website. "It will avoid long-distance transportation to deliver the wine". However, "to compensate for the orders from abroad, we have to find more customers in Italy". (Alice Marsalli, personal communication, November 11, 2022).
- Waiting to have more sufficient orders before contacting the transport carrier. (Michella, personal communication, November 15, 2022).
- Stocking wine in the warehouse of the transport partner to reduce the fuel emission (Seila, email communication, November 21, 2022)
- "We rarely sell wine from our website" (Gorgio, email communication 20, 2022).
- The idea of the discount if customers accept the date of shipping can also be applied for orders coming from e-commerce (Sebastian Caponi, personal communication, November 23, 2022).

3.2.2- Result of the in-depth interview with Karl-Frédéric Reuter

According to Karl-Frederic Reuter, sustainable distribution is an "efficient environmentally-friendly distribution" (phone communication, December 2nd, 2022). The distribution has to respect the 3 pillars, which are economic quality, social equity, and the environment. He agrees with the famous sentence of the Norwegian Prime Minister Mrs. Gro Harlem Brundtland; "it's a development that meets the needs of the present without compromising the ability of future generations to meet their own need". The professional added that it's "difficult for everybody to implement sustainable distribution" (phone communication, December 2nd, 2022), especially if winemakers already sell their wines abroad.

For him, short distribution channels are sustainable. Indeed, he immediately referred short distribution to local distribution. Selling wine to local people is sustainable in terms of carbon footprints because wines go directly to the final customers (professional or private) who live in the region. It's economically advantageous for small/medium wineries because they don't have to pay the intermediaries (agents, etc.). And socially, selling to locals heighten human relations because the seller and the buyer are both in communication, which fosters a trusting relationship. However, short distributions could be economically risky for the company because loyalty builds up over time. Mr. Reuter considers that if one consumer represents 15% of the total sales of the company, then it's dangerous in case of an unanticipated problem with him.
Furthermore, Karl-Frédéric Reuter gave his opinion on implementing short distribution.

Table 10:

How to shorten the distribution of organic wine according to Mr. Reuter

Sustainable ways to shorten the distribution of organic wine	
In Italy (Q° 4)	Abroad (Q° 6)
- If it is not the case, hire an employee that can directly prospect professional customers. However, "it is important to take into account that travels of sales representatives are generally not sustainable", because they usually travel	- Focusing more on the European market to shorten the distance of distribution - **"**Implementing Economic Interest Grouping (EIG) with one or two wineries that also export in the same specific

in a plane, which is costly and non-eco-friendly. "It is important to optimize those travel" (phone communication, December 2nd, 2022). - Working as much as possible with customers from the region, without being dependent on their customers. - "For me, optimization is the key". The professional said that it makes sense to work with a regional distribution because the orders are optimized. "The possibility of stocking wine in the region is a perfect way to shorten the transport of wine." (Phone communication, December 2nd, 2022)	country" (phone communication, December 2nd, 2022). It's a way to shorten the distribution thanks to a shared warehouse and to be almost fully responsible for the wine, even in the foreign market. "There is more traceability" (phone communication, December 2nd, 2022).
Is it affordable for all wineries? (Q°5)	Is it affordable for all wineries? (Q°7)
- "Hiring a new employee is expensive" (phone communication, December 2nd, 2022), - "A wholesaler sells wine 15% cheaper because he takes a margin" (phone communication, December 2nd, 2022). However, according to him, it is affordable in the long term because the winery can increase its prices by 5% each year.	- EIG may not be affordable by all small wineries because he explained that companies have to declare profits generated on income tax or corporate tax.

The last question relates to the other solutions to implement to make a distribution sustainable (without necessarily shortening the distribution channels). Ms. Reuter has answered:

- Using as much as possible the cleanest transports; train and ship. "For me, transporting wine in a sailing boat is utopian, it's just marketing." (Phone communication, December 2nd, 2022).
- Implementing groupage with other neighbor wineries in order to reduce the carbon footprint.
- For the wineries that plan to export and the ones that already do, the ideal would be to sell 1/3 of the total bottles to direct-to-customers sales, 1/3 to professionals in Italy, and the other 1/3 abroad. Ms. Reuter usually recommends this proportion to his customers.
- "The choice of packaging has an impact on greenhouse gas emissions" (phone communication, December 2nd, 2022), the best options for him are lighter, returnable bottles, biodegradable labels and ink, eco-design of label rolls, and wax instead of aluminum capsules.

3.2.3- Results from the literature review

Some research has been conducted regarding wine distribution and sustainability.
- The first one found is an article entitled "The energy and carbon intensity of wine distribution: A study of logistical options for delivering wine to consumers" written by Susan Cholette and Kumar Venkatb. This scientific article extracted from the Journal of Cleaner Production reminds the reader that the logistic of food and beverage is "often energy-intensive, especially for the wine industry" and that organic products are not always more sustainable than conventional ones; "organically grown food is not necessarily more carbon efficient than its conventional counterpart, as economies of scale may make the latter less intensive to transport and dominate the net carbon impact"(Cholette & Venkat, 2009). These two authors propose a solution: the use of a software called CargoScope that "allows users to build a supply chain network and define the storage, transit and processing parameters for every echelon", especially in the United States which requires different echelon between the seller and the buyer. Wine companies can use this web-based tool to create and revise their model of distribution thanks to the calculation of the energy and the amount of carbon footprint emitted. The data are generated by U.S governmental and international agencies. To structure their models, users have to choose their nodes, depending on the number of echelons in their supply chain. "Each node represents either a storage or processing echelon, and the inter-echelon connections represent transportation links, where the user specifies the distance, selects from a predefined list of

transport modes, and sets three key parameters: temperature control, utilization rate, and backhaul rate” (Cholette & Venkat, 2009). If a winey works with a 3PL logistic, the user has to select for instance New Vine Logistic (NVL) and FedEx (FDX), (as seen in Appendix 6). In this article, scenarios have been done depending on 5 ways of distributing wine and on the distance (short and long).

Table 11:

Energy and carbon emitted depending on the distribution mode and the distance

		SHORT DISTANCE (Sonoma – San Fransisco)		**LONG DISTANCE** (Sonoma – Manhattan)	
		Energy (MJ=Megajoule)	**Carbon** (Kg of CO2 per half case)	**Energy** (MJ=Megajoule)	**Carbon** (Kg of CO2 per half case)
DISTRIBUTION MODE	3-tiers	31.19	2.18	48.61	3.62
	3 tiers via retailer warehouse	32.28	2.25		
	3PL	5.83	0.42	Truck: 49.39 Plane: 369.88 Train: 29.72	Truck: 3.64 Plane: 26.17 Train: 2.19
	Winery self-distribution	27.2	1.89		
	Consumers drive to the winery		1.43 (if trip) 14.5 (if only for it)		

Note: This table was hand-made thanks to the results expressed in the Journal of Cleaner Production (Cholette & Venkat, 2009). These results take into account several factors such as the type of truck, diesel or hybrid, the number and weight of the cases, if a controlled temperature is needed, and the number of days in storage with and without the controlled temperature.
The ranking of the scenario is in the appendix with details of the transport link which contributes the most to emissions (Appendix 7).

- According to Mario D’AMICO, Giuseppe DI VITA, and Salvatore BRACCO, “Direct sale represents one of the most important forms of the short food supply chain […] it allows the reduction of distance between producer and consumer” (D’AMICO et al., 2014). Since the early 2000s, EU policies started to support short supply chains and local farming. The authors studied an “experiencing booming expansion” of direct sales in Italy. This phenomenon has a positive impact on farmers/wineries. Indeed, “the shortening of the chain represents a compelling opportunity in economic terms, in the light of the current economic crisis, which has weakened household purchasing power, reducing, on the other hand, the profitability of farmers, in particular, for small-size farms.” (D’AMICO et al., 2014). Moreover, from a social point of view, it allows a more direct relationship between producers and consumers. It becomes more and more their authenticity and freshness expectations. From an environmental point of view, a short supply chain reduces the final distance between the producer and the final consumers (D’AMICO et al., 2014). The three lecturers highlighted the different forms of direct sale within the short food supply chain: farm shops, farmers markets, roadside sales, pick-your-own, fair-trade groups, home deliveries, etc. (As seen in the table in Appendix 8).

- According to Barbara Francioni, Tiia Vissak, and Fabio Musso wine companies that start to internationalize late are called “latters” or ‘late starters”. In their article entitled; “Small Italian wine producers’ internationalization: The role of network relationships in the emergence of late starters”, is highlighted the relevance of having personal network relationships to stimulate and support international market development. The authors express the idea of wine tourism to develop this important network. Indeed, international customers that enjoy the experience in the winery can order wine to their homes can talk about the wine/company to friends, and can seek to buy wine again in the future. The network created thanks to this short distribution channel contributes to firm growth. The 3 authors have interviewed 4 Italian wineries that are late starters. They are all attracting tourists to their wineries. The first one is active in attracting tourists thanks to wine tours, tastings, dinners, and sports events, and internationalization has never been a priority. Their wine is in Denmark due to "a strong personal relationship" (Francioni et al., 2017). The company also get in touch with a Swiss restaurant owner who visited the firm during a holiday. The second Italian winery decided to start sales to final customers instead of using intermediaries. In the 70s they had their first experience abroad after having met German, British, Belgian, Dutch, and Swiss importers at a local trade fair. Another Austrian importer started buying after visiting several wineries in the Marche region. In addition, two Italian expatriates whom the owner knew also started promoting his wine. The third wine Italian winery starts its export after the visit of a German customer that started to import wines. As the second winery, the owner usually participates in trade fairs to meet and get in touch with importers. Thanks to this, they met their US importer (currently the firm's largest foreign market). Thanks to their presence in the US, they could enter the Canadian market. Moreover, after attending a local trade fair, the owner met an Italian importer with business activities in Switzerland and Austria. The last Italian winery mainly sells wine to local retailers. "He entered Germany first as an Italian working at a German retail chain who visited the firm during vacation and gave the owner some contacts" Later on, a Belgian importer visited the firm and bought wine for his store. (Francioni et al., 2017).

3.3- Suitable Items for sustainable distribution

As presented in Chapter 2, section 4 of the in-depth interview with Italian wineries and the questionnaire made on Google Form help to answer the second sub-question. The results from these two aims to know the most suitable items for distributing organic wine in a sustainable way.

3.3.1- Results of section 3 of the in-depth interviews with the 5 Italian wineries

First of all, the opinions of the 5 professionals are pretty similar about the packaging.
All of them distribute their wine in glass bottles and none of them had already received a remark regarding the container they use. However, they all think that the new generation is more aware. Alice Marsalli from Carpineta Fontalpino has affirmed "In general, for food products, young consumers pay more and more attention to the packaging of products, especially with plastics" (personal communication, November 11, 2022). Seila Bruschi had precise that it is the northern European market that is the most aware of the packaging.

The following question asked was about potential alternatives to glass bottles; according to them what would be the best alternative(s) containers? All their answers were "Nothing else". The reason given was that for the moment only glass material is suitable for valuable wine, to preserve from oxidation. Michella from Cantalici added, "the best glass alternative could be canned, which is less expensive and more eco-friendly, but it's not the best alternative for the quality of the wine." (Personal communication, November 15, 2022).

After that, a question related to bulk wine has been asked; what would be the advantages and the inconveniences of selling bulk wine (ex: bag-in-box)? For them, the advantage is that the material is less expensive than a bottle. Sebastian Caponi from Villa Calsinaia said that in the DOCG appellation of origin regulations, wineries cannot sell their wines in bag-in-box. Only the wine table and IGT wine can be packed in a 3 or 5L container. Michella from Cantalici has expressed her opinion, "it would be interesting to pack our IGT wine in a bag-in-box destinated for locals" (personal communication, November 15, 2022). She thinks, they will not lose clients because for them it is even less expensive and they are local. It is what Alice from Carpineta Fontalpino does; selling wine in a bag-in-box destinated for locals. However, she added that "bag-In-Box should be more studied because there is plastic inside the container, which is not eco-friendly" (personal communication, November 11, 2022). Seila from Monte Chiaro affirmed that "Bulk wines are good for restaurants but do not communicate value so don't increase the brand awareness" (personal communication via e-mail, November 21, 2022). For the professional interviewed, if they change the packaging from wine packed in bottles to bulk, they will lose customers, so none of them plan to pack in this container or another container.

Concerning the last question on the possible change in Italian cultural habits of buying a bottle of wine, all the professionals disagree on a potential change. Alice said, "It will be harder for Italians with strong wine traditions to understand well this transition." (Personal communication, November 11, 2022). For her, Michella, and Sebastian, Northern European markets are more willing to change their consumption habits toward eco-friendlier packaging.

3.3.2- Results of the questionnaire

A questionnaire of closed and open questions destinated to international customers has been made to try to determine the most suitable item for sustainable distribution. As seen in chapter 1, glass bottle is responsible for 29% of the wine's carbon footprint in the supply chain. The idea is to identify the alternative packaging(s) that customers would be willing to buy, or not. The questionnaire of 30 questions allows us to understand better consumers' minds.

108 people entered the questionnaire, 104 are wine consumers and 4 people are not, so they were rejected from the questionnaire. An analysis will be therefore done on the 104 participants.
58.7% of them are male and 41.3% are female. Moreover, they are from 16 different countries (Figure 2) and most of them are aged between 40 and 65 years old. Most of the participants drink wine two to three times a week (Figure 3).

Figure 4: *Country of origin of the participants*

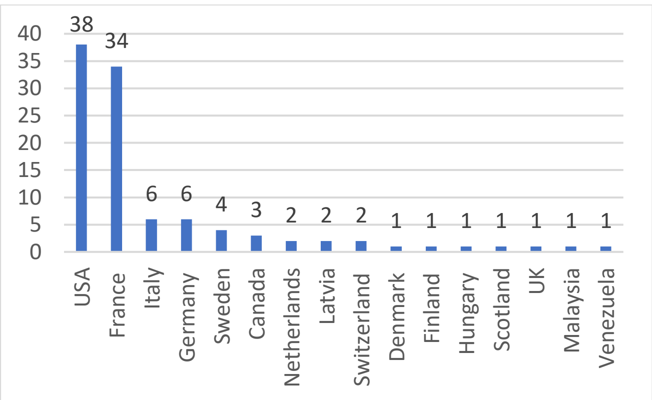
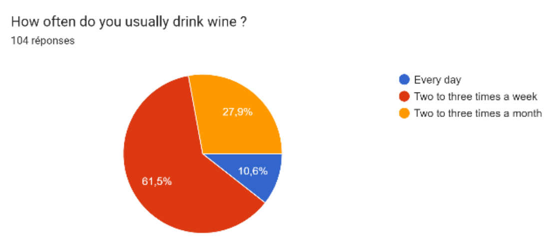


Figure 5: *Frequency of wine consumption*



In terms of wine, 92 out of 104 participants drink organic wines, however, only 25% drink more organic wine than conventional ones. For the other 75%, their organic wine consumption represents less than conventional wine.
In terms of packaging, the vast majority (101 participants) mostly chose wine packed in a glass bottles. 4 participants, from France, Latvia, and the US, also selected Bag-In-Box, and 2 others from the USA selected the container "cans". 1 American person also ticked "paper bottle".

The main factor of this choice is answered in question 9; "I only find glass bottles in the wine stores I frequent" (57 answers) and "I think the other packaging is not suitable for the quality of wine" (54 answers). The majority of the consumers, 82 out of 104 participants (78,8%), care about the packaging of the wine. 10 people affirmed that for them, the heavier the bottle is, the better the quality is. The other 94 don't believe in it. Moreover, they don't really pay attention to the weight of the bottle because 22 (21.2%) pay attention to it. 34 people don't pay attention to the cork, the others do it but for different reasons. 60 declared it is related to the conservation of the wine and 15 to the environment. If the mention "sustainable cork" is written on the back label, it could be a motivation to purchase of 27 participants (26%). 42 (40.4%) declared that it would be not a motivation while 35 (33.7%) said "probably".

Their opinions on wine alternative packaging in four figures:

Figure 6: *Is Bag-in-Box sustainable?*

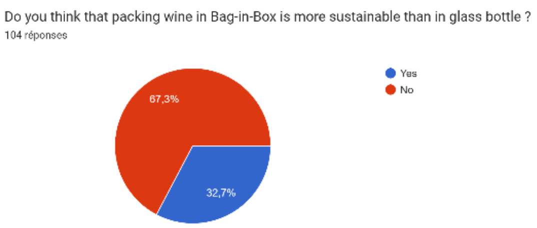


Figure 7: *Are Cans sustainable?*

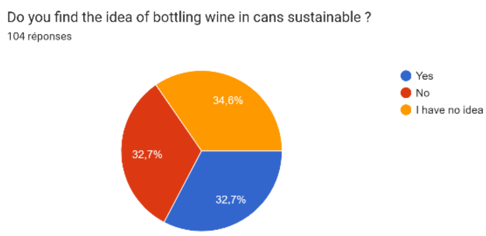
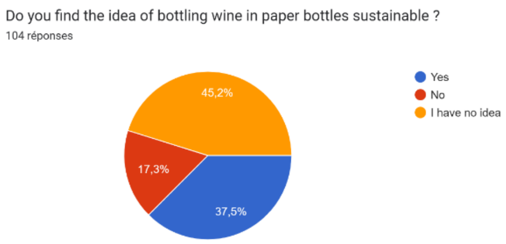


Figure 8: *Are paper bottles sustainable?*



Bag-In-Box: Between an entry-level organic wine in a glass bottle and in a Bag-In-Box from the same region and same grape variety(ies), 91.3% of the participants prefer to buy wine in a glass bottle instead of in Bag-in-box. The reasons collected are longtime habits, glass bottle is easier to store and to finish because "one time=one wine". Some people shared that they already had bad experiences with bag-in-box before and it has a bad reputation because the wine inside is seen as cheap and bad quality. In the plastic of the bag-in-box, the wine cannot age in good condition as in a glass. The people who answered bag-in-box are from the Netherlands, Latvia, Malaysia, Italy, and the US. The next question aims to know for what type of wine they will be more willing to buy a bag-in-box. The Rosé comes first (48.1%), then "none of them" comes second (26%), before the red (25%) and the white (24%).

Cans: 51% of the participants would be not willing to buy organic wine in cans, 18.3% stated "yes" and 30.8% "maybe". The reasons for not being interesting are the old habit of drinking wine in a glass bottle, the shape not appealing and the aluminum could affect the taste. The consumption is individual and is similar to beer. The ones who would be willing to buy cans are mostly from France and the US. They wrote that cans are useful for drinking outside and in small quantities. A person added that he would only buy white wine in cans because he enjoys drinking them young. Another one thinks that this container needs better marketing.

Paper bottles: 54.8% of the people may be willing to buy wine packed in paper bottles, 29.8% are not interested in it, and 15.4% could be ready to buy paper bottles. According to the majority of the participants, paper bottles are not suitable for valuable wine. They are afraid of the quality and prefer to drink in the packaging they trust the most; in glasses. Even though it is better for the environment, they need proof that the paper doesn't change the quality of the wine. The ones who would be willing to buy are Americans, French, Swedish and German, and are mostly between 40 and 65 years old. Their reason is curiosity and the weight which is lighter than glass. They affirmed that they need to see and try to understand.

Recycled PET flat bottle: 56.7% of the participants have never heard about this container before. 22.1% would be not willing to buy this bottle and 21.2% would be interested in buying it. The ones interested are mostly American, French, Swedish, and Latvian.

The next questions aimed to know if the participants will continue to buy the wine after the winery, they know changed its packaging. The result in three figures:

Figure 9: *From glass bottles to PET flat bottles*

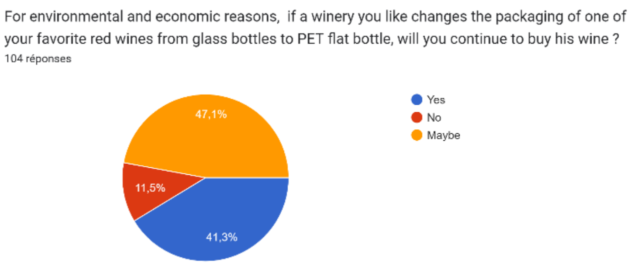


Figure 10: *From glass bottles to cans or paper bottles*

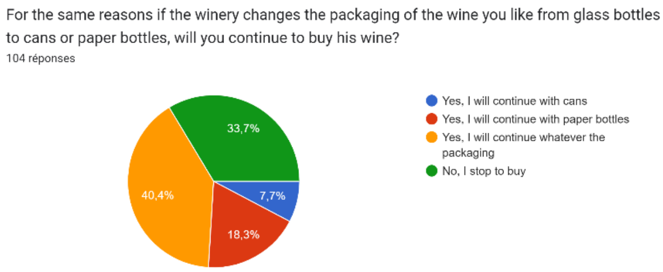
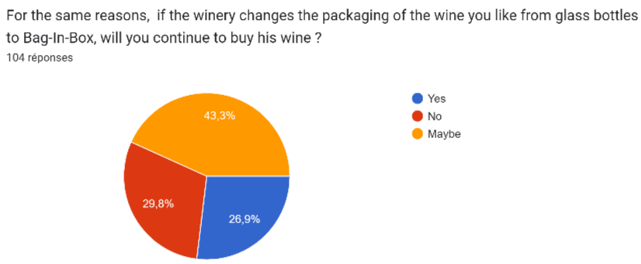


Figure 11: *From glass bottle to Bag-In-Box*



Notes: As seen in the three figures, participants would be more willing to continue to buy the wine in PET flat bottles. In each proposition, almost half of the total consumers stated "Maybe" to continue to buy. In a winery changes its packaging from glass bottles to Bag-In-Box, the owner will lose the most of the clients because almost 30% of the participants stated that they will not continue to buy.

If there is an opportunity in an organic shop, 38.5% of the participants would be willing to come with their own glass bottle and fill it with organic wine in bulk. 21.2% of them stated "No "and the majority, 40.4%, would be willing only if they know the winery.

Almost half of the participants may be ready to re-evaluate the purchase of wine in alternative packaging. 36.5% will be ready to do it, whereas 14.4% of them stated "No".
The reason for this "no" is the strong tradition, habits, and the good conservation of the wine in a glass. Apart from that, according to the participants, the environment and sustainability are important to consider nowadays. They are ready to try and if they like, they will continue to buy. There is also an economic factor in this re-evaluation. Some people mentioned that alternative packaging will be more suitable for white wines which don't need a lot of conservation. The format of the alternative packaging needs to be democratized and has to guarantee the maintenance of quality. As indicated in one of the answers, they need to understand the complete life cycle of the different options. A person also talked about the returnable bottle.

3.3.3- Results from the literature review

Some research has been conducted regarding wine distribution and sustainability.
- The first one is an article entitled “Comparative life cycle assessment of alternative systems for wine packaging in Italy”. The study proposes an LCA comparison of a traditional glass bottle, an aseptic carton, a bag-in-box, a refillable/returnable glass bottle, and a PET bottle. The comparison of individual wine packages was performed only considering 3 L of wine because the minimum packed-in bag-in-box is 3 L. The objective is to identify the cleanest packaging alternative from an environmental point of view. Alternative scenarios were also defined in function of the variation of three important aspects that affect the most the environmental performances: the weight the of container, wine distribution distances, and the end of life of packaging systems.
The weight has been calculated according to the composition of all the layers of containers and closures as well as the secondary and tertiary packaging. Inventory data were provided by Tetra Pak company. Bag-in-Box is the lighter one;

- <u>Aseptic carton</u> (ac) system packaging = 216.4g
- <u>Bag-in-box</u> (bib) system packaging = 175.9g
- <u>Single-use glass bottle</u> (glass b) system packaging = 2495.3g
- <u>Refillable glass bottle</u> (glass b ref) system packaging = 442.0g
- <u>PET bottle</u> (pet b) system packaging = 422.0g

Wine pallet packaged in the different packaging systems was also calculated (as seen in Appendix 9) as well as the distribution on road. As Carmen Ferrara and Giovanni De Feo mention “The estimation of vehicle emissions was carried out considering the average emission values deriving from the use of lorries. The estimation of distance in km for the distribution was 500 km. With the same amount of product to be transported, the distribution efficiency depends on two factors: the overall weight (product weight + packaging weight) and the palletizing efficiency (that depends on the shape and features of packaging)” (Ferrara & De Feo, 2020). The simulation of the palletizing efficiency was done with logistics the software tool, Cape pack 18. Regarding the end-of-life of packaging systems, the composition (in %) of incineration, landfilling, and recycling processes of the different packaging scenarios in Italy have been modeled thanks to the data provided by The National Packaging Consortium (as seen in Appendix 10).

Four graphs have been done to compare the life cycle impacts of all packaging systems. Environmental impacts (Global Warming Potential/Human health/Ecosystem and Resources) of the different packaging were highlighted according to the distance of distribution in km (as seen in Appendix 11). As a result, the bag-in-box is the preferable alternative, then there is the aseptic carton, due to its light packaging weight and great palletizing efficiency. The environmental impacts of bag-in-box were from 60% to 90% lower than a glass bottle. The refillable glass bottles also allow an impact reduction compared to the use of glass bottles. It is noticed that with a short distance (100km in graphs) the environmental performance of the refillable glass bottles becomes comparable to aseptic cartons. At a greater distance, the environmental burdens of transport would make them not convenient.
Carmen Ferrara and Giovanni De Feo mentioned some advantages of using Bag-In-Box. Indeed, usually, wine-packed in this alternative packaging has an expiration date of one year. After having opened the BIB, there is better conservation of wine quality level due to the closure system that allows the entry of oxygen into the package. The value added of it is the possibility to extend the shelf life of wine during consumption time (Ferrara & De Feo, 2020).

- After the study of the environmental impact, it is interesting to see the economic impact of alternative packaging with an article entitled “An economic and environmental analysis of wine packaging systems in Italy: A life cycle (LC) approach”. This study is in line with the previous one concerning the high environmental impact of glass bottles and the low impact of Bag-In-Box.
A graph has been done for visualizing the result of the life cycle cost (LCC) of the packaging (as seen in Appendix 12). It reports both the historical cost results (HLCC) and forecasting the cost results (FLCC).

As a result, cardboard-based packaging (aseptic carton and bag-in-box) and 3 l PET bottles were the most economically sustainable solutions. Glass packaging has the highest LC costs. Moreover, it is noted that the package size affected the results. Packaging with smaller-size containers is the worst economic alternative. Indeed, with the same functional unit, smaller containers implied a greater amount of material to produce and, more resources and energy to consume. Larger size containers allow to save resources and costs. Moreover, other graphs have been done to highlight the result of economic and environmental impact with LCA (ordinate axis) and LCC (abscissa axis) (as seen in Appendix 13). As a result, "Except for the impact category of land use, Aseptic cartons, Bag-In-Box, and PET bottles of 3 l are the most sustainable alternatives from both an economic and environmental point of view" because the results were the lowest amount of raw materials and energy quantity in the production of these packaging. Even though glass is recyclable, it has the worst economic and environmental performances due to the high consumption of resources and energy that occurs in the production phase (Ferrara et al., 2022).

- The last article is an article written by a French company, Oé, that uses returnable/refillable bottles. Oé was the first wine company in France to reuse this system. It allows focus on the circular economy by recovering the bottles. The company works with several partners around the country (approximately in all the regions they sell their wines). To reuse glass, our partners clean the bottles with hot water, which saves 33% of water compared to a new bottle produced, reduces the electricity used by 76%, and produces 79% fewer greenhouse gases. In addition to enabling a circular economy, the company claims that this system promotes short circuits/distributions and the local economy. Moreover, the company uses different natual materiam for their wine such as the cork which is a natural cork from FSC forest (Forest Stewardship Council), ensuring that the trees are managed sustainable manner. In addtion to avoid the contact of the wine with oxygen, natural corks are one of the most recyclable and biodegradable cork. (Rey, 2021).

4- Discussion of the results

This chapter aims to highlight the importance, meaning, and relevance of the results. The idea is to interpret those results and to demonstrate if they relate to the sub-questions and literature review. This part contains a critical reflection on the finding and research methods used.

4.1- The current distribution of the Italian organic wineries

The first sub-question" how is actual Italian organic wine distribution organized?" was the knowledge gap of the research. As said in chapter 1, there are no studies or researches on the organization of organic wine distribution. The first and second sections of the interview helped to give the readers specific ideas about the distribution of Italian organic wineries. As previously indicated, 5 wine professionals from the Chianti wine region (Tuscany) had accepted to answer the questions, either face-to-face or by e-mail.

All the participants made the choice to become an organic farm at least 7 years ago because they all are sensitive to the land and to what they drink. Surprisingly, no one has mentioned the market in their explanation of the sustainable transition. Indeed, I expected to hear about the adaptation to the market as consumers are more and more interested in organic products.
Regarding the distribution of their wine, they almost have the same organization;

- Selling organic wine in one or several regions in Italy and abroad to professionals (HORECA, specialized shop), and to customers through their e-shop on their website and thanks to wine tourism in their farm.

The proportion of sales in Italy and abroad is different according to their strategy. Some are more present abroad and others are more present locally. I have noticed that the ones who export more would like to export less to concentrate more on direct sales from the winery (Villa Calisinaia). On the contrary, the one who exports less would like to conquer more markets (Cantalici). The United States is the target export country because they are the first importer of Italian wine in the world. It was expected that the wineries who export, distribute their wine in this market.

- Selling through intermediaries in Italy and abroad. Most of them have at least one agent for the Italian market and at least 3 intermediaries for international markets such as the USA.

Again, the one who doesn't get or gets a few intermediaries would like to look for other ones (Cantalici). Moreover, I would have imagined that they select differently their intermediaries, and carriers, according to sustainability, and their philosophy, but nobody mentioned it.

- Selling wine in a glass bottle. It was not a surprise that they sell almost all their wine in glass bottles, from entry-level to premium wine. Only Cantalici packs some quantity of wine in 3-liter bag-in-boxes for local people. This wine packed in bulk is an IGT (Indication geographic typic). This appellation of origin is less strict than the DOCG which is the most prestigious Italian appellation of origin. In the DOCG regulation, wineries cannot pack their wine in bulk. In Italy, winemakers usually produced both, DOCG wine and IGT wine. As seen in the 5 interviews, even IGT wines are mostly packed in glass bottles.

Interviews show that in Italy, there is a strong tradition of drinking wine in a glass bottle. It's in the cultural habit. As Alice Marsalli from Carpineta and Sebastian Caponi from Villa Calsinaia said, North of Europe could change their habit and drink wine from another packaging, but in South of Europe, it is not the case yet. However, we can see that the weight of the bottle tends to be lighter. Indeed, the empty bottles of the 5-wine professional weigh between 380 and 750g. A weight inferior at 410g is today considered light. Cantalici (400g) and Villa Calsinaia (380g) use light bottles. Villa Calsinaia uses a 380g glass bottle only for its entry-level wine. The premium wine is packed in a 750g glass bottle. This winery was the only one to differentiate the weight of the bottle from the quality of the wine. Maybe other wineries do the same. It shows another cultural habit that continues to persist in Italy, even though lighter glass bottles are more and more present in the market.

If it would have been possible, it would have been appreciated to have more interviews in order to have different organizations of organic wine distribution because these 5 results are not the generalies.

4.2- Shorten the distribution of organic wine

First of all, different opinions on what sustainable distribution is were noticed. Indeed, some wineries interviewed think their distribution is sustainable and others think the opposite because they sell boxes all around the world. However, they agreed that the short channel is more sustainable than the long channel and almost all of them think that the B-to-C channel is more sustainable than the B-to-B channel. The interviews of the 5 wineries were helpful because, on one hand, we can understand what they are currently thinking about sustainable distribution, and on the other hand, it allows us to have real solutions that could shorten the distribution according to their (financial) means. Talking face-to-face with the wine professionals and owners of wineries gives the guarantee to have honest answers and not utopian solutions. In addition to their interesting point of view, the opinion of the French professional Karl-Frédéric Reuter gave an overview of the feasible possibilities, and answered interrogations of the Italian wineries. For instance, Karl-Frédéric Reuter has referred short channels to the local market. He has mentioned different social, environmental, and economic advantages such as a stronger relationship between the seller and the buyer, and the distance of distribution less important. This argument is contradicted by the opinion of Gorgio from Il Palagio. The owner thinks that the economic part is very important and that reducing the distance of distribution is too dangerous because there is less probability to find a lot of customers. In his interview, Karl-Frédéric Reuter gave an answer on the sales repartition: "1/3 of the sales from the winery, 1/3 in Italy and the last 1/3 to foreign markets". It shows that the economic part is fundamental for the wineries, the possible change for a sustainable distribution will be done according to the economy first. It was expected that this fear of losing money is more important than the improvement of the environment. During the interview with Karl-Frédéric Reuter, the French professional brought to light a subject often forgotten which is the business travel of sales representatives to target export countries or to meet current importers. These travels are not economically and environmentally sustainable because workers usually travel by plane. It's right to highlight this unexpected result when it comes to talking about the sustainable distribution of wine. Thanks to all of the interviews it was also possible to collect sustainable solutions without necessarily shortening the distribution like the choice of packaging, the use of cleaner transports, and groupage.

Regarding the literature review, a lot of scientific articles about the environmental benefits of short distribution and the consequences of long distribution were found. Indeed, there are more studies done on the environmental consequences than the economic consequences. The first scientific article mentioned in the previous part was focusing on the American market. Even though it would have been more realistic that the article focuses on Italy, it is still interesting because the United States is the worldwide leading importer of Italian wines, and the environmental analysis (energy and carbon footprint) done can be applied anywhere in Italy. As said in the previous chapter, the longer the distance is, the more difficult is to shorten the distribution. However, the result showed that when there is a long distance of distribution, the most environmentally sustainable solution is to work with 3-tiers and third-party logistics with a train. It would have been more complete if, for the same condition (quantity, the weight of the wine, type of transport, storage time, and distance), the article would have made an economic analysis of the different possibilities to distribute wine.

4.3- Suitable Items for sustainable distribution

The interview of the five Italian professionals allowed us to have in mind what they think about their packaging and the alternative wine packaging that exist in the market. As a result, tradition and habits strongly persist in Italy. It was expected that it will be in that sense because wine is in the culture of South European countries. According to the interviewees, selling wine in another container than glass bottles is not worth it for the brand image. They have a bad image of bulk wine, only 1 person out of 5 uses bag-in-boxes for their IGT wine (unique appellation of origin that accepts this packaging). The other don't and according to their answer are not ready to. Sebastian Caponi, the owner of, Villa Calsinaia, uses different bottles depending on the quality of the wine because it is said that for consumers, a heavy bottle is qualitative.

The questionnaire was the opportunity to know what wine consumers really think about alternative packaging. Thanks to the questions, it was possible to differentiate what the professionals think consumers have in their minds, and what consumers really believe and feel about the packaging. For example, only 9.6% of the participants believe in "the heavier the bottle is, the better the quality is", which contradicts Sebastian's thought. The participants that answer this were mostly from France and were aged between 40 and 65 years old. Looking at the age, it was expected to get the most answers from participants aged 18-25 but most of them came from participants aged between 40 and 65 years old (44.2%). And surprisingly, positive results on alternative packaging were mostly from this age range and not from younger participants as the professionals thought. They are usually more aware of the environment and more willing to change their habits. It could have been interesting to have more answers from Italian consumers in order to know better the Italian market. However, the sample of answers from the United States is very useful because the US is the first importer of Italian wine in the world. It's interesting to have their opinions.

As we saw in the results, participants mostly answered "Maybe" if they could change their purchase of wine from a glass bottle to a bag-in-box or PET flat bottle or paper bottle. We can see that people could be open to trying some alternative packaging with a wine they already know from before. Nevertheless, as read from the last question, they need to know more about the life cycle assessment and the maintenance of the quality of the wine in it.

With the scientific articles different examples of alternative sustainable packaging. As expected, glass bottle is the less environmentally sustainable, not in recycling but in production. This material is also costly for wineries. After several calculations (production, distribution, recycling) and comparisons, Bag-In-box is the most sustainable packaging even with the plastic insider. Smaller containers implied a greater amount of material to produce and, more resources and energy to consume. Larger size containers allow to save resources and costs. However, consumers don't have the same opinion because in the questionnaire, 67.3% think that a bag-in-box is less sustainable than a glass bottle, and 8.7% stated that they will be willing to buy a bag-in-box instead of a glass bottle (for the same wine region and grape varieties). Consumers mainly focus on the recycling process and not especially on the production process. According to them, the plastic inside pollutes, they perceive low quality, and 3L could be too much. However, if they know the producer and the wine from before, they could buy the wine in a bag-in-box if the packaging changed (26.9% said" yes" and 43.3% said "Maybe"). These answers were expected but are now confirmed; it's easier to try another packaging when we have already tried the wine of the winery. The scientific articles confirmed with proof that aseptic cartons and PET bottles are also more environmentally sustainable. The refillable/returnable glass bottles also had positive economic and environmental results. As noticed, for a short distance, this packaging alternative has an as comparable impact as aseptic cartons. At a greater distance, the environmental burdens of transport would make a returnable bottle not convenient. With the article written by the French brand "Oé", we could get more figures and proof that producing a new glass bottle is less sustainable than washing it and redistributing it.

5- Conclusion and recommendations

In this chapter, all the sub-questions and the main question will be answered in a convincing way. The choice of solutions will be well-reasoned in accordance with the relevance of the results. This part can be taken into account by European wineries and non-organic wineries that wish to improve their distribution in sustainable ways.

In recent years, Italy has had an increasing number of organic wineries, mainly due to the growing interest of consumers in organic products. Italy is in the Top 3 of the European countries that have the most organic vineyards. The specifications that Italian winemakers have to follow are provided by the European commission. Since 2012, specifications regard the vineyard (the work of the land) and the wine-making process (the work in the cellar). Nothing relates to the distribution apart from traceability. As indicated previously, the total amount of GHGs emissions in the wine supply chain is lower for organic wine than conventional wine thanks to the manufacturing part being more sustainable. The idea was to find out how to increase the gap between the total amount of emission occurring from a conventional and organic bottle thanks to improving the distribution and packaging stages. The keyword of the research was "sustainability", with the 3 pillars; economic, social, and environmental. The objective was to find solutions for Italian winemakers to distribute their wine in a sustainable way; in what ways Italian wineries can improve sustainable distributions of their organic wine?

5.1- Conclusion

"How is actual Italian organic wine distribution organized?". The current distribution of organic wine in Italy is the same as conventional wine. Organic wineries use both direct and indirect channels to sell their wine for both short and long distances. Most of them sell their wine directly in their winery to customers/tourists. They organize tours and tastings for tourists which means that Italian wineries invest money in wine tourism in order to attract tourists. These sales shares represent a large part of their turnover. These tourists from all over the world come on-site to buy bottles, which is economically and societally sustainable for the winery that has real contact with the final consumers and that sells its wine without moving. Organic wineries adapt the organization of their distribution according to their marketing positioning. They prefer selling their wine in Italian and international wine retailers, restaurants, and hotels where the quality is emphasized rather than in supermarkets, where all types of wine and price ranges are represented. Organic wineries work with one or several intermediaries. Intermediaries also have their ethics, philosophy, and values. According to the financial means of the wineries, they could decide to work with partners that conduct sustainable actions. Moreover, wineries use glass bottles for their organic wine, cardboard boxes, and mostly natural cork. They remain traditional because they have bad opinions about the other alternative packaging.

The second sub-question aimed to know how to shorten the distribution of organic wine. Shortening a distribution (distance and/or number of intermediaries) for sustainable reasons is complicated depending on the size and resources of the wineries. Each improvement has a cost and the result of these investments are noticeable in the long term. At their level, each Italian winery can implement some sustainable actions. Even one action improves the sustainability of a distribution.
Direct-to-consumer sales in the winery are advantageous in the case of Italy which welcomes many tourists each year. Thanks to their vacation in the region, people can discover the winery and buy from there, like locals. Economically, it's more sustainable for the winery to sell its wine on-site rather than in the retailer of the neighboring city because the customers pay the real purchase price. The wine shop buys cheaper the price of bottles which is less convenient for the company. Moreover, thanks to a real experience with the producer, locals, and tourists can do free communication (sharing on social

media and to relatives) which allows a positive impact on the brand image. Welcoming people into the winery open up also opportunities in the country or abroad by developing the network. It is environmentally and economically sustainable because the sales representative has less need to travel to get opportunities.

Selling wine to the local market is also important, especially when the winery doesn't have the material resources to attract tourists. It is environmentally sustainable because the distance of transportation is shorter and the seller has control over the distribtuion. The seller also has real human contact with his final professional customers which allows customer loyalty. It participates in local economic development.

Looking for wine retailers or restaurants that don't work with agents enables wineries to not pay commissions, to have control over their distribution, and to have contact with the customers, which promotes a climate of trust between the two parties.

In foreign markets, looking for professionals that don't work with intermediaries is more difficult depending on the export countries' regulations. The USA imposes at least 3 steps before the final customers. That's why it's interesting to diversify the selling zone to countries that have fewer regulations like European countries. Considering an Italian winery with little export volume, it is in his interest to export without distributors or agents because the EXW selling price will be higher without the intermediary. If the winery wishes to sell more volume in the country, working with an importer/distributor is more economically interesting because he will distribute more volume.

The longer the distribution distance is, the more difficult it is to make the distribution short.

Implementing Economic Interest Grouping (EIG) is also a solution for exportation. Working in collaboration with one or two wineries that also export in the same country is a way to shorten the distribution thanks to a shared warehouse. It is socially sustainable because the wineries share their knowledge. They are almost fully responsible for the wine, even in the foreign market. There is more contact and traceability in the distribution. Implementing EIG is an investment because it requires wineries to declare profits generated on income tax or corporate tax, but in the long term, it develops or improves activity and results for its members.

The third sub-question aimed to know what are the most suitable items for sustainable distribution. The most famous wine container is the traditional 0.75l glass bottle. However, it is not the most sustainable in terms of cost and environmental impact on production. Like Bag-In-Box, aseptic cartons and PET Bottle were studied as the most sustainable alternatives packaging (lighter, great palletization efficiency, less costly, and saves resources with a low amount of raw material and energy quantity in production), it has the sense to improve sustainable distribution in:

Changing the packaging of the IGT wine to more sustainable alternative packaging. In the Italian DOCG regulations, DOCG wine has to be sold in glass bottles. IGT wine can be packed in different packaging because the IGT regulation doesn't prohibit anything. So, for economic and environmental reasons, it could be interesting to pack entry-level wine that doesn't need time to age, in a Bag-in-box or/and PET bottle for a small quantity.

This same entry-level wine in IGT can:

Being sold in bulk in organic shops, where consumers come with their containers to fill it. They pay the quantity. The winery saves money in transport and by not buying containers, the consumer saves money as well because the wine is cheaper in bulk. It makes sense to implement it in a city where there is a higher chance that consumers know the winery.

In order to improve wine packaging sustainability without substituting glass for wine packaging;

Using light and returnable bottles with a natural *cork from the forest labeled FSC*. Lightening the weight of bottles reduces the carbon footprint of production and transportation. The glass is also less expensive. A glass bottle reuse program is a convenient alternative only when considering the local market, such as restaurants, bars, and hotels. In the local market, the environmental performance of the refillable glass bottles becomes comparable to aseptic cartons, just after the bag-in-box. Reuse bottles can be used for restaurants and bars in the region. After being used, the bottle is washed by a regional partner and sent back to the winery, which saves water compared to a new bottle produced, reduces the electricity used, produces fewer greenhouse gases, and promotes short circuits/distributions and the local economy. Investing in natural cork from forests labeled FSC (Forest Stewardship Council) is environmentally sustainable with the proof that the trees are managed in sustainable manner.

To answer the main question, in some ways, making the distribution of organic wine sustainable is possible. It's however not always possible to combine the 3 pillars because the economic part weighs more in a decision. Moreover, no single sustainable supply chain configuration is ideal for all wineries. According to the marketing positioning of a winery, some solutions are more difficult to implement. Even though a winery carries out one action mentioned, it improves the sustainability of its distribution. The company still saved money and/or emitted fewer greenhouse gases and/or strengthen social ties with its customers.

5.2- Recommendations

As a result of the conclusions, recommendations is given in this part. These recommendations are divided into short and long-term recommendations.

Long-term recommendations

Making a shorter distribution when it is long is a process that has to be studied now in the long term and is implemented step by step.

<u>Dividing into almost equal parts the distribution channels</u>
With strong relationships created in the local market, it's easier to be dependent on certain customers that are close to the winery. The local market starts being dangerous when one customer represents more than 15% of the total sales of a company, that's why K.F. Reuter advises wineries to sell approximately 1/3 of the wine directly from the winery (direct-to-consumer sales), 1/3 to Italian professionals (HORECA, etc.), and the other 1/3 to international markets. It enables wineries to determine their export volume, in long term to re-evaluate their export countries and adjust the organization of their distribution according to the distance. It's a step-by-step process.

<u>Optimizing orders is the key to all types of sustainable distribution</u>
For wineries that cannot shorten their distribution because they are for instance present in the United States for several years, the optimization of Italian and international orders is recommended. Groupage is a sustainable action because sharing the container with other producers is cost-efficient and involve less transportations. Moreover, for the distribution in Italy, working with intermediaries that optimized orders and have sustainable charters is optimal. The possibility to have, thanks to the intermediary, a place to stock wine in the region where most of the wine is ordered allows optimization because there are fewer long transport distances. It is more sustainable than doing different self-distribution in the same region. It is therefore important to choose the right partner. More and more respect a sustainable charter. Although small wineries are unlikely to have significant leverage with their distributor partners, they could favor one that uses rail instead of trucks (for long-distance deliveries). To optimize orders coming from e-commerce, spacing out the pick-up dates to group as many orders as possible reduce the number of transportation and therefore the gas emissions. To meet the client's expectations, the winery can schedule a day maximum per month or a day every 2 two months (depending on the number of orders) for the carrier to pick up the orders. If the customer accepts the date of shipping, he has a discount but if he wants the wine earlier, he pays more. It's a process to study in long-terms.

Short-term recommendations

Updating the marketing positioning

Actions conducted by a company are in line with its marketing positioning. Some improvements (the packaging, wine experience within the company, etc.) are difficult to implement because they are not in line with the product, its target group, or the competitors. Updating the position of the wine is therefore recommended in order to facilitate improvement. It will create new perceptions in the customer’s minds. It has to be done regularly according to the evolution of the market. All wineries are able to do so. It’s a short-term activity because it’s one of the first steps before implementing improvement.

A perfect communication

If a winery is ready to change the packaging of its entry-level IGT wine, perfect communication and marketing are needed to facilitate the understanding of customers. Indeed, the choice of this sustainable transition should be explained to the consumer. Moreover, as seen in the questionnaire, consumers need to trust the container, which means that they expect details of the material used in the container, the life cycle assessment, the advantages for the environment compared to the glass (in the production and recycling stages), and the consequences on the quality of the wine. They have mentioned that they are willing to try, especially if they know the company and/or the wine from before. If they are satisfied, they can continue to buy for sustainable reasons. Communication is important to stimulate the curiosity of people and to change people’s perceptions. Communication can be done through social media and newsletters.

Further research

More research can also be done regularly to investigate new potential solutions. The market is constantly changing, so it’s important to take a step back and identify new opportunities to make the distribution more sustainable. The way to do more research is to read scientific articles or/and ask questions to other professionals.

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Tables and figures list

Appendices

Appendix 1: First in-depth interview

Section 1:

1- What is your name and your role in the winery?
2- In which Italian wine region is your winery located?
3- How many employees work on a year-round basis?

   "<5 employees" or "Between 5 and 15 employees" or ">15 employees"
4- On how many hectares are you working?
5- How many bottles do you produce each year?
6- What is the proportion of organic wines produced?
7- If not 100%, do you plan to produce more organic wines?
8- What is the average price of your organic wines?
9- When did you certify your wines "Organic Wine"?
10- What was the main reason for this sustainable transition?
11- In addition to sustainable practices provided by the organic charter, do you currently implement other sustainable actions/practices in your supply chain? Could you give examples?

    Environmental:
    Economic:
    Society:

Section 2:

Regarding the distribution of your organic wines:

12- What is the proportion of your organic wine sold in Italy?
13- What is the estimated proportion of direct-to-consumers sales? (From the winery and B to C wine exhibitions)
14- Do you organize wine tours and wine tastings in your winery?
15- In which structure do you sell your organic wine in Italy?
16- In how many Italian regions do you sell your organic wines?
17- Do you work with an Italian agent as an intermediary between you and the structures?
18- Approximately, how often do Italian B to B clients that propose your organic wines place an order?
19- Do you have a storage facility somewhere else in Italy to stock your organic wines? Why?

20- What is the percentage of sales in foreign markets?

21- Which are the main foreign markets?

22- What are the most means of transport used?

a- What do you use for internal transport?

b- What uses the company which delivers your wine abroad?

23- Would you like to conquer more markets abroad for your organic wine?

24- What are your final B-to-B clients in foreign markets?

25- How many and what type of intermediaries do you work with?

26- How often do the international importers who propose your wines place an order?

27- What is/are the contents that you use for your organic wine?

28- If you use glass bottles, what is their medium weight?

29- What is the percentage of bottles glass waste due to outbound logistics? (broken, etc.)

30- What sort of cork do you use?

31- Do you recycle wine boxes or other packaging? If yes, what?

Section 3:

32- Do you think the distribution of your organic wine is sustainable? If yes why?

33- In your opinion, how is it possible to minimize the number of intermediaries for selling wine?

34- What would be the sustainable solutions to implement to shorten the distribution of wine?

35- In your opinion, all wineries can implement these sustainable solutions in their distribution? (Small, big)

36- In your opinion, is the B-to-C channel more sustainable that the B-to-B channel?

37- How you could optimize the distribution of B to C coming from e-commerce?

Section 4:

38- Have you ever had a remark regarding the glass packaging of your organic wine?

39- Do you think that consumers pay real attention to the sustainability of the packaging?

40- According to you, what are the best alternatives to glass bottles?

41- Is it suitable for valuable wines? Why?

42- Economically and environmentally, what are the advantages and the inconveniences of selling bulk wine?

43- If you don't do, are you planning to pack also in bulk? If not, why?

44- Do you think you will lose customers if you change the packaging?

45- What do you think about Flexitank?

46- Is it affordable for all wineries?

47- Do you think it would be difficult for consumers to change their cultural habits of buying a bottle of wine?

Appendix 2: Second in-depth interview

1) Selon vous, qu'est-ce qu'une distribution durable ?
(According to you, what is a "sustainable distribution"?)

2) Est-ce que privilégier des canaux de distribution courts est une façon d'être plus durable ?
(According to you, is short distribution sustainable?)

3) Pour les domaines viticoles, quels sont les avantages de ces distributions courtes ?
(For wineries, what are the advantages of short outbound logistics?)

4) Sur le territoire Italien, qu'est-ce qui pourrait être mis en place pour diminuer le nombre d'intermédiaires entre les domaines viticoles et les clients finaux ?
(On the Italian territory, what could be implemented to shorten the distribution of organic wine, from the winery to the final customers?)

5) Cela est-il financièrement abordable pour tous les domaines ?
(Is that affordable for all wineries?)

6) A l'export, par quel(s) moyen(s) pourrait-on diminuer le nombre d'intermédiaires, et donc d'avoir un canal de distribution court ?
(In foreign markets, how can we reduce the number of intermediaries during the distribution, and therefore have a short distribution channel?)

7) Cela est-il financièrement abordable pour tous les domaines ?
(Is that affordable for all wineries?)

8) Sans forcément raccourcir les canaux de distribution, y'aurait-il d'autres solutions durables à mettre en place pour exporter les vins ?
(Without necessarily shortening the distribution channels, are there other sustainable solutions to implement to export wines?)

9) Quel est l'impact par bouteille sur le coût de l'amélioration de la durabilité dans la logistique et les distributions ? (En pourcentage sur le coût de production).
(How much is the impact per bottle on the cost of improving sustainability in logistics and distributions? (In percentage of the production cost).

10) Pensez-vous que cette marge pourrait changer le positionnement marketing des domaines sur le marché ?
(Do you think this markup could change the marketing positioning of the wineries?)

Appendix 3: Questionnaire survey

Section 1:

1) Are you a wine consumer?
    - Yes
    - No

2) What is your gender?
    - Female
    - Male
    - Other

3) Where are you from?

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4) How old are you?
    - 18-25
    - 26-40
    - 40-65
    - >65

5) How often do you usually drink wine?
    - Every day
    - Two to three times a week
    - Two to three times a month

6) Do you drink organic wine?
    - Yes
    - No

7) Your organic consumption represents more or less than conventional wine?
    - More
    - Less

Section 2:

8) Which wine container do you buy the most?
   - Glass bottle
   - Bag-in-box
   - Paper bottle
   - PET bottle
   - Cans
   - Other: ____

9) What are the main key factors for choosing to buy wine packaged in glass bottles?
   - I think the other packaging is not suitable for wine
   - I only find wine in glass bottles in the wine stores I frequent
   - Other: ____

10) Do you care about the sustainability of the packaging?
   - Yes
   - No

11) Do you pay attention to the weight of the glass bottle you buy?
   - Yes
   - No

12) For you, the heaviest the bottle is, the better the quality is?
   - Yes
   - Not at all

13) Regarding the type of cork used, for what reason do you pay attention to it?
   - For good conservation of the wine
   - For the environment
   - I don't pay attention to the cork
   - Other: ____

14) If the mention "sustainable cork" is written on the back label, could it be a motivation to purchase?
   - Yes
   - No
   - Probably

15) Do you think that packing wine in Bag-in-Box is more sustainable than in glass bottle?
   - Yes
   - No

16) Between an entry-level organic wine in a glass bottle and in a bag-in-box from the same region and the same grape variety(ies), which one will you buy for your own consumption?
    - Glass bottle
    - Bag-in-box

17) Why this choice?

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18) For what type of wine will you be more willing to buy a bag-in-box?
    - Red
    - White
    - Rosé
    - None of them

19) Do you find the idea of bottling wine in cans sustainable?
    - Yes
    - No
    - I have no idea

20) Would you be willing to buy organic wine in cans?
    - Yes
    - No
    - Maybe

21) Why this choice?

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22) Would you be willing to buy organic wine in a paper bottle?
    - Yes
    - No
    - Maybe

23) Why this choice?

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24) Would you be willing to buy organic wine packed in a recycled PET flat wine bottle?
    - Yes
    - No
    - I don’t know, I’ve never heard about it

25) For environmental and economic reasons if a winery you like changes the packaging of one of your favorite red wines from glass bottles to PET flat bottles will you continue to buy his wine?
- Yes
- No
- Maybe

26) For the same reasons, if the winery changes the packaging of the wine you like from glass bottles to Bag-In-Box, will you continue to buy his wine?
- Yes
- No
- Maybe

27) For the same reasons if the winery changes the packaging of the wine you like from glass bottles to cans or paper bottles, will you continue to buy his wine?
- Yes, I will continue with cans
- Yes, I will continue with paper bottles
- Yes, I will continue whatever the packaging
- No, I stop to buy

28) If there is an opportunity in an organic shop, would you be willing to come with your own glass bottle and fill it with organic wine in bulk?
- Yes
- No
- Only if I know the winery

29) Are you willing to re-evaluate the purchase of your wine in alternative packaging?
- Yes
- No
- Probably

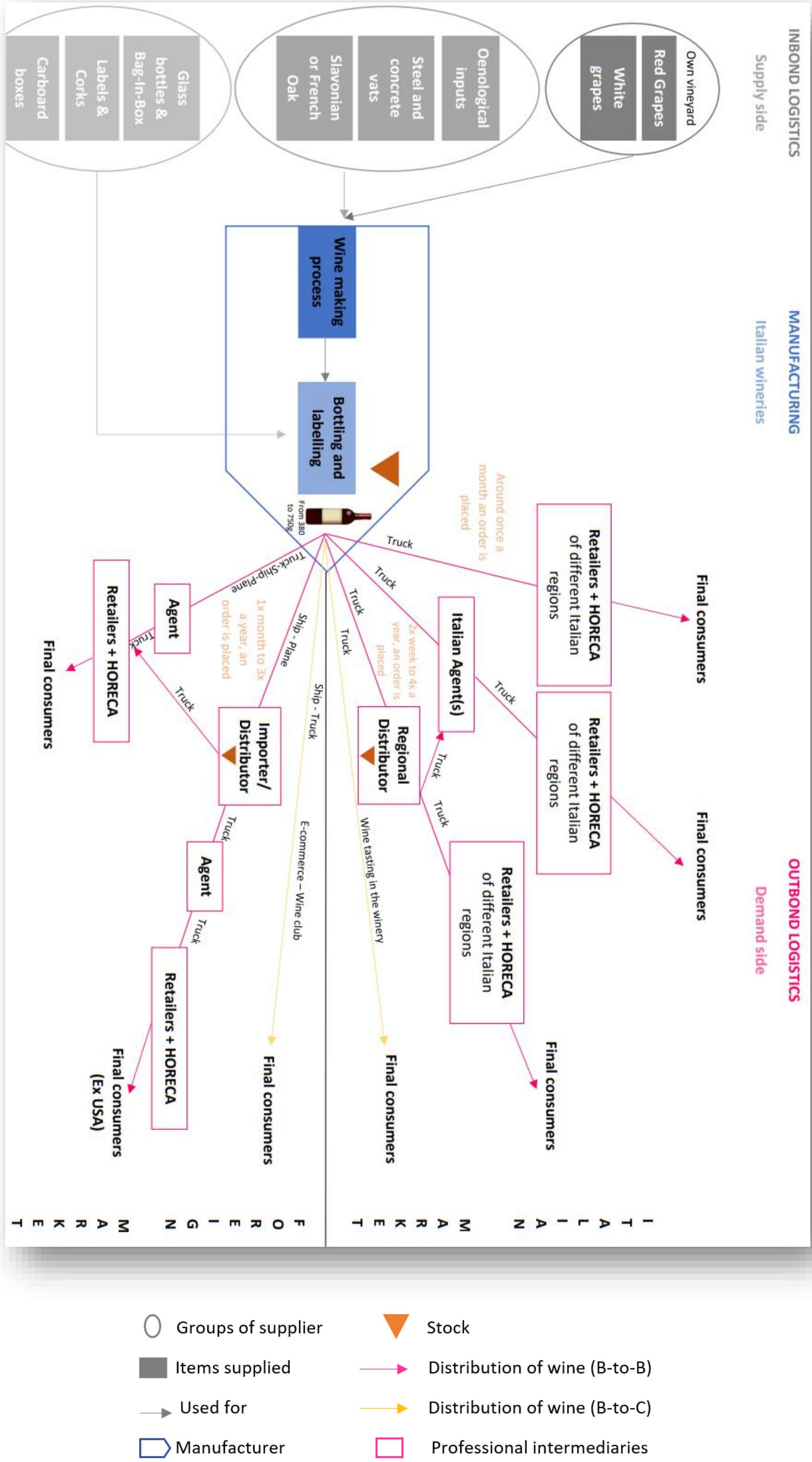
30) Why?

____

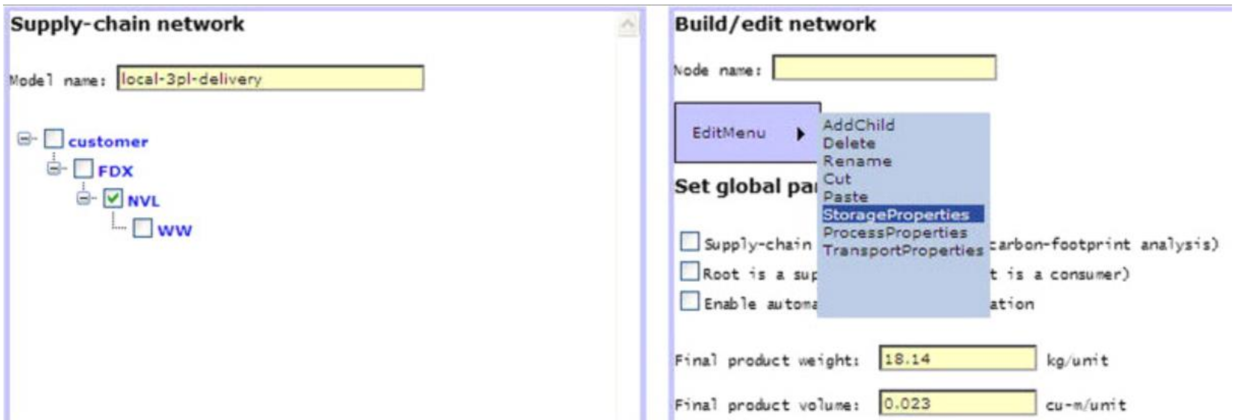
Appendix 4: Short presentation of the Italian wineries interviewed

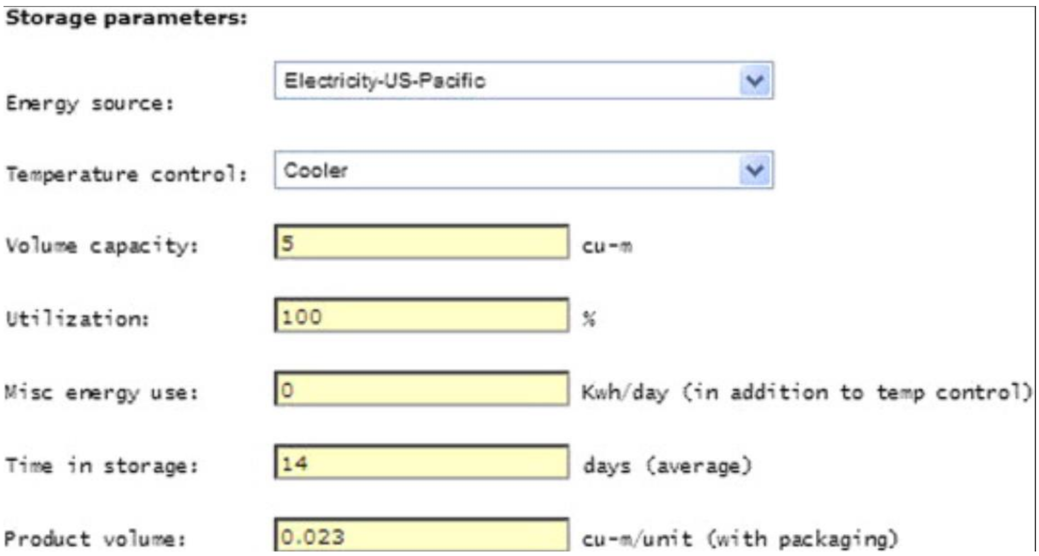
	Carpineta Fontalpino	*Cantalici*	*Monte Chiaro*	*Il Palagio*	*Villa Calcinaia*
The person Interviewed	Alice Marsalli	Michela	Seila Bruschi	Gorgio	Sebastian Caponi
Wine region	Tuscany: Chianti Colli Senesi & Classico	Tuscany: Chianti Classico	Tuscany: Chianti Colli Senesi	Tuscany: Chianti	Tuscany: Chianti Classico
Number of employees	7	27	15	10	8
Number of Hectares	29	70	12	11	31.5
Production of Bottles/year	100.000/120.0000	Around 70.000	40.000/45.000	75.000/80.000	100.000/110.000
The proportion of organic wine	80% of the total production	100%	100%	100%	100%
Average price	20€	22€	20€	15€	19€
Date of certification	2008	2015	2010	2011	2014

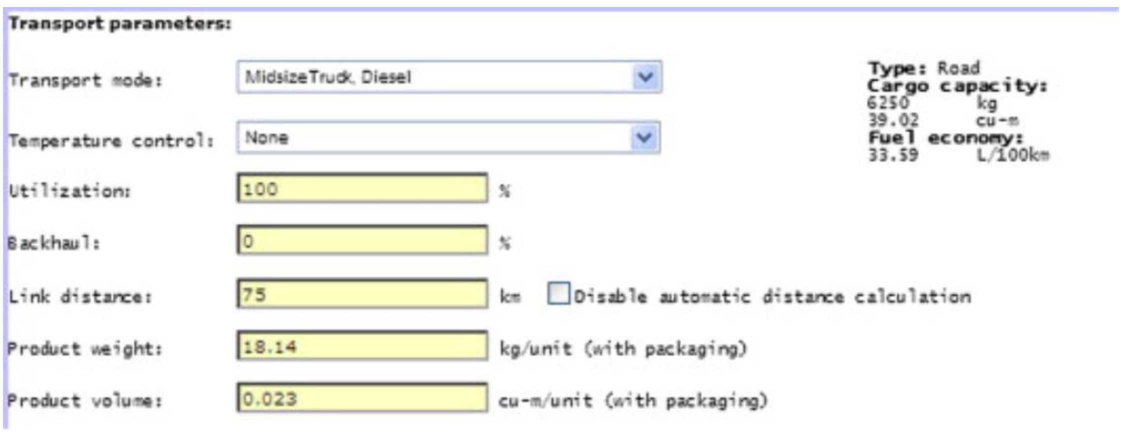
Appendix 5: Supply chain mapping of the Italian organic wineries



Appendix 6: Parameters to fill in in CargoScope







Appendix 7: Ranked summary comparison of all the scenarios expressed.

Scenario	Local or distant	Energy – MJ	Emissions– kg CO_2	Link with greatestemissions	Link's percent oftotal emissions
L4: local 3PL delivery	Local	5.83	0.42	NVL > FDX	48%
L1a: local 3-tier, standard scenario, with consumer using public transit or walking	Local	6.97	0.50	DW > RS	32%
L1b: local 3-tier, standard scenario, with consumer fully loading the car	Local	12.82	0.91	RS > CU	45%
L5c: consolidation run. consumer utilizes 100% of CargoScope of midsized pickup	Local	20.67	1.43	n/a	
L3b: winery self-distribution, via midsized truck	Local	27.2	1.89	RS > CU	89%
L1: local 3-tier, standard	Local	31.19	2.18	RS > CU	77%
D4: long distance 3PL fulfillment via rail	Distant	29.72	2.19	OAK > NWK	70%
L2: local 3-tier, with retailer warehouse	Local	32.28	2.25	RS > CU	74%
L3a: winery self-distribution, via light truck	Local	37.27	2.64	RS > CU	64%
D1: 3-tier distribution, Long Distance	Distant	48.61	3.62	DW-CA > DW-NJ	78%
D2: long distance 3PL fulfillment via truck	Distant	49.39	3.64	FDX-CA > ESS	77%
L5b: consumer drives a hybrid	Local	208.89	14.47	n/a	
D3: Long distance 3PL fulfillment via airfreight	Distant	369.88	26.17	FDX-CA > NWR	98%
L5a: consumer drives a regular car to the winery	Local	487.41	33.75	n/a	

Appendix 8: Different forms of direct sale within the short food supply chain

Typology	*Purchasing Place*	*Actors interaction*
Farm shops	Farm	One seller – one purchaser
Farmers markets	Local market	Many sellers – many purchaser
Roadside sales	Street market	One seller – many purchaser
Pick your own	Farm	One seller – one purchaser
Fair trade groups	Home	Group of purchasers
Box schemes	Home	Group of purchasers
Home deliveries	Home	Many sellers – many purchaser
E-commerce	Home	One seller – one purchaser

Appendix 9: Main inventory data of the distribution phase

Data for distribution	Aseptic Carton	Bag-in-box	Single use glass bottle	Refillable glass bottle	Multilayer PET bottle
h pallet (m)	1.494	1.450	1.769	1.769	1.654
Weight of pallet structure (kg)	25	25	25	25	25
Nº of containers	800	328	570	570	570
Weight of wine in 1 pallet (kg)	792.0	974.2	423.2	423.2	423.2
Weight of system packaging in 1 pallet (kg)	57.70	57.71	355.6	355.6	60.1
Total weight of 1 pallet (kg)	874.7	1056.9	803.8	803.8	508.3
Weight of FU[a] (kg)	3.280	3.222	5.641	5.641	3.567

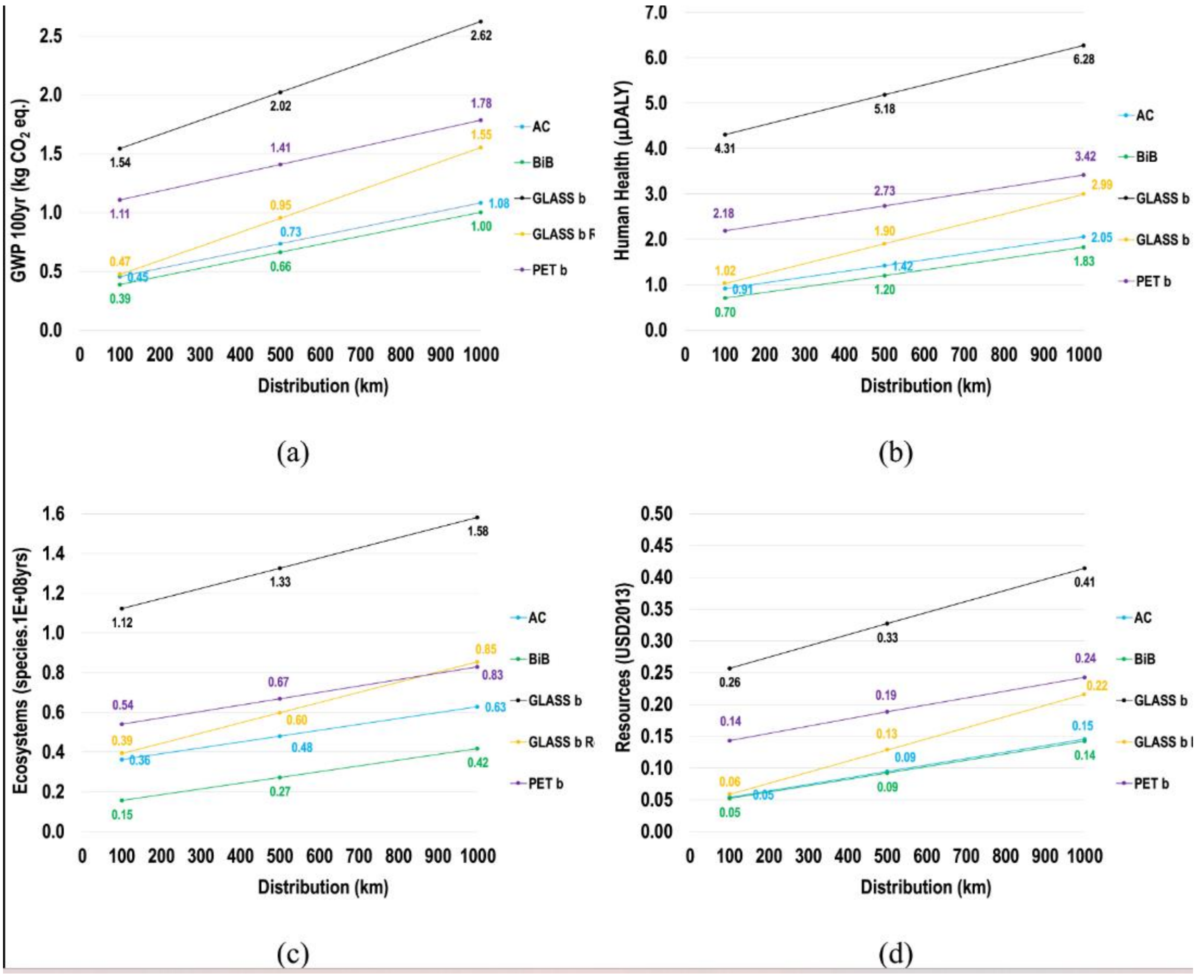
a

These values of functional unit weight were calculated for the evaluation of the environmental impacts of distribution phase, therefore also the weights of wine and pallet (normalized in function of 3 L of wine) were considered.

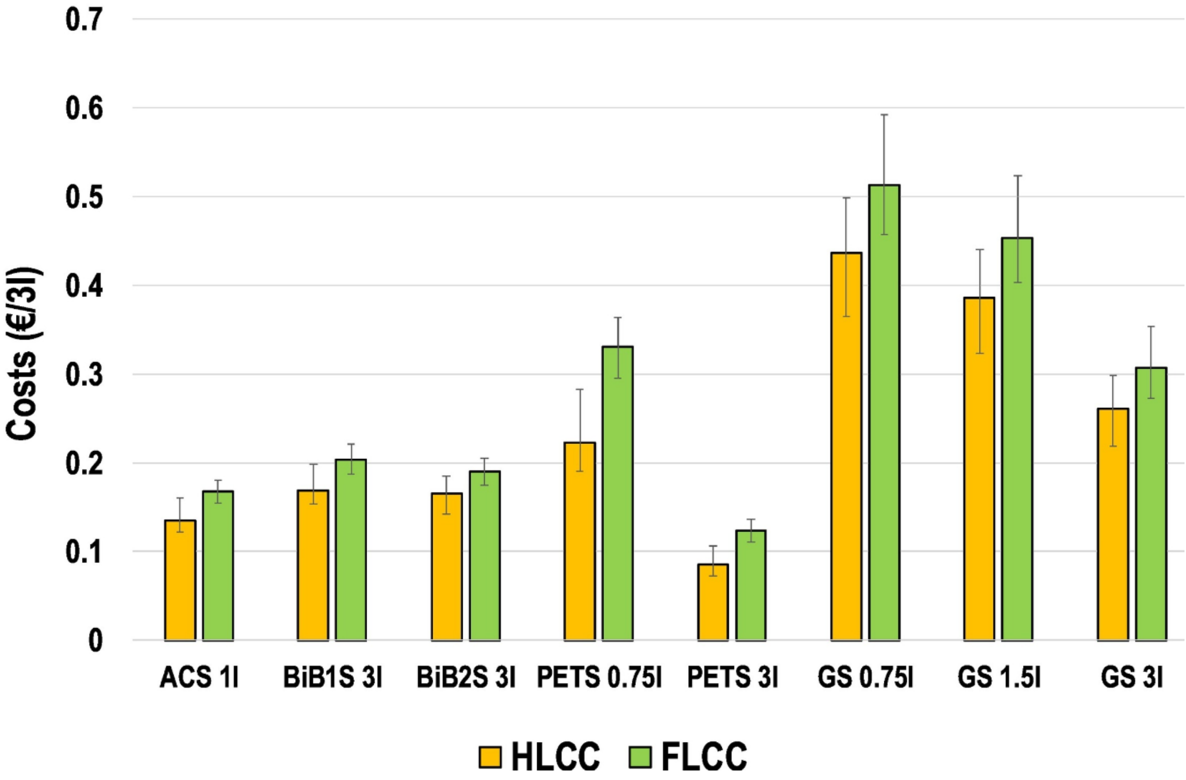
Appendix 10: Inventory data about the composition, in percentage terms, of incineration, landfilling and recycling processes of packaging disposal scenarios in Italy for the year 2017

Wine packaging system	Recycling	Incineration	Landfilling	Source of Data
Aseptic Carton				
Polylaminate (Cardboard-LDPE-Al)	27.2%	31.5%	41.3%	Tetra Pak – 2017[a]
Closure (HDPE - PP)	27.2%	31.5%	41.3%	Tetra Pak – 2017[a]
Bag-in-Box				
Bag (LDPE - PETMet)	27.2%	31.5%	41.3%	Assumed the same of AC (Tetra Pak - 2017)
Box (Cardboard)	79.8%	12.3%	7.9%	Comieco (National paper and cardboard Packaging Consortium) - 2017
Handle (HDPE)	43.5%	40.0%	16.5%	Corepla (National plastic Packaging Consortium) - 2017
Tap (HDPE - LDPE - PP)	27.2%	31.5%	41.3%	Assumed the same of AC (Tetra Pak - 2107)[a]
Glass b and Glass b Ref				
Bottle (Glass)	72.8%	–	27.2%	CoReVe (National glass Packaging Consortium) - 2017
Capsule (Al)	63.4%	5.2%	31.4%	CiAl (National aluminium Packaging Consortium) - 2017
Cork stopper	62.0%	–	38.0%	ISPRA (Italian Institute for Environmental Protection and Research) - 2017
Multilayer PET b				
Bottle (PET)	43.5%	40.0%	16.5%	Corepla (National plastic Packaging Consortium) - 2017
Screw cap and capsule (Al)	63.4%	5.2%	31.4%	CiAl (National aluminium Packaging Consortium) - 2017
Secondary-tertiary Packaging				
Cardboard box	79.8%	12.3%	7.9%	Comieco (National paper and cardboard Packaging Consortium) - 2017
Cardboard sheet	79.8%	12.3%	7.9%	Comieco (National paper and cardboard Packaging Consortium) - 2017
Cardboard corners	79.8%	12.3%	7.9%	Comieco (National paper and cardboard Packaging Consortium) - 2017
PE stretch film	43.5%	40.0%	16.5%	Corepla (National plastic Packaging

Appendix 11: Life cycle impacts of the base case of the five wine packaging systems in function of distribution distance variation, calculated with the categories of GWP (a); human health (b); ecosystems (c); resources (d).



Appendix 12: Life cycle costs of considered packaging systems in terms of historical costs (HLCC) and forecasting costs (FLCC).



ACS = Aseptic carton

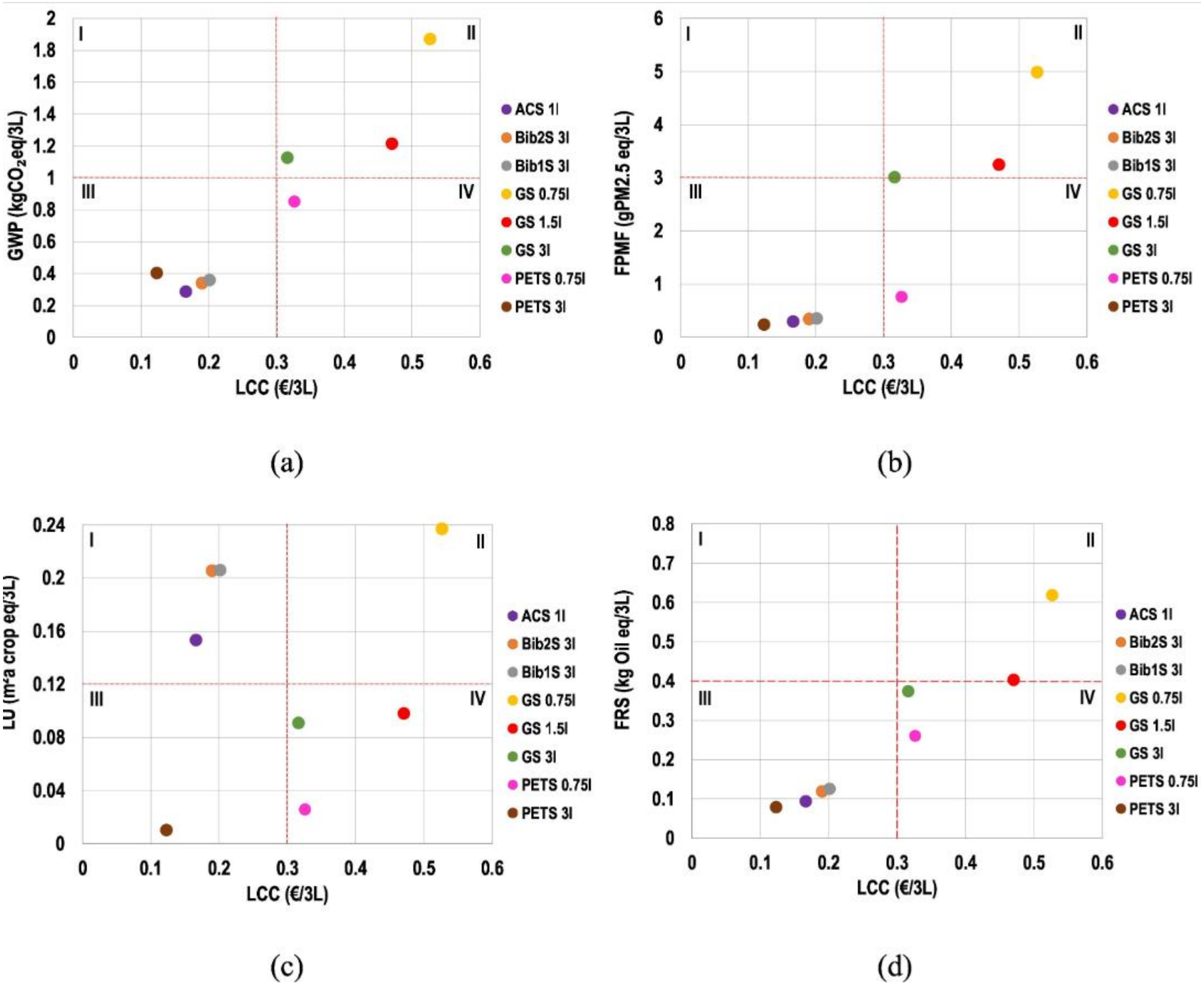
BIB1S = Bag-In-Box PET-MET

BIB2S = Bag-In-Box EVOH

PETS = PET bottle

GS = Glass bottle

Appendix 13: LC impacts vs LC costs of all wine packaging systems considered.



« The environmental impacts are reported for the most relevant midpoint categories: Global warming potential (a); Fine particulate matter formation (b); Land use (c); Fossil resources scarcity (d).” (Ferrara et al., 2022)