

# The needs of champagne companies to develop their Sustainability

*Producer of Champagne*



Title: The needs of champagne companies to develop their sustainability within their winemaking and bottling.

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# Preface

This is the result of my thesis for my International Agribusiness degree at the AERES University of Applied Science. It is an essential part of the degree and an important part of our graduation. The latter is focused on the needs of champagne companies to develop their sustainability within their winemaking and bottling.

Over the past year, my interest in the environment has only grown. As I would like to take over my family's business, I realized that it was sometimes difficult to meet all the environmental requirements to remain profitable. However, the concept of sustainability allows us to bring together environmental, economic and social issues. In this concept I found an answer and a strength for the future of business in general. My interest turned to the world of wine, in particular champagne. The completion of my studies and various experiences in this field only widened my attachment and developed my curiosity about this subject. As a future manager of a wine company in Champagne, I am able to put myself in the shoes of Champagne producers. It is a world whose strengths, weaknesses and needs I know. This research is specialized in the wine-making part because what will be required of producers in the years to come is mostly in viticulture and vinification. Even if a lot of research is done on viticulture, there is less literature on vinification.

This thesis is not done in a group, no tasks were divided. However, it would not have been possible without my supervisor Sabine KUIPER, who took a lot of time for me, helped me, and gave me precious and necessary advice. Her amount of hard work is truly commendable. And thanks to my family and friends also for supporting me during the hard times and helping me from Champagne.

During the realization of the thesis, some changes were made on the introduction. First of all, the main question is specialized on the Champagne region more than the Champagne committee and the research literature is specialized only for the second and third sub-questions. In addition, the wording of the questions in the survey from English to French has been rewritten, although the meaning remains the same.

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# Summary

Wine is a global product, created and consumed almost everywhere in the world. The wine sector tends to always increase in production, consumption or new types of wine. We can also see an increase of sustainable actions implemented by producers, regions or countries. As the example in the Champagne region with the champagne committee and the creation of the Viticulture Durable en Champagne certification which pushes the producers of the Champagne region to improve their sustainability. However, despite all the efforts of the producers and organizations, the Champagne region still has a lot of work to do. This article is specialized in vinification and bottling, being a part of the production often forgotten in terms of sustainability. A survey and a literature research were therefore carried out among Champagne producers to understand what barriers they may face when implementing a more sustainable wine production. The results of the questionnaire showed that the producers' motivation for sustainability was present, especially with the environment and their ethical motivation, internal to the companies. With a main focus on a circular economy and respect for employees, the producers face financial problems and a lack of innovation. They claim that the help of champagne organizations such as the Comité Champagne, the Syndicat Général du Vigneron, or the Union des Maisons de Champagne, could help them to overcome these barriers. In addition, the researchers have been also asked for help. Producers, therefore, need these external actors to be able to move their winemaking toward a more sustainable future. For this, organizations should seek to meet their financial needs by offering grants, or funding research with professionals to find new innovations, to cover this gap. If studies and actions are implemented, this could change the production of champagne to a new, more sustainable future. In addition of this research a study on viticulture and trade/marketing of champagne wines can be done to complement the needs of producers along the entire wine production chain.

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# 1. Introduction

With global warming, more and more consumers are questioning where their food comes from and how it is produced. This trend is growing a lot in the wine industry as well (*Copelli, 2020*). A research by Isabel Schäufole and Ulrich Hamm (2017) shows that a considerable number of consumers in different countries have a positive perception of different production methods and say they are willing to pay more for wines with the characteristics of sustainable production. This should push wine producers to develop a more sustainable method.

## 1.1 Industry of Wine

The creation of wine dates, back to a mysterious period. It is impossible to have an idea of the first bottle of wine created since, what was not consumed at the time, would have been evaporated (*Cervin, Prescott, 2007*). According to the dictionary Le Robert (*nd b*), wine is defined as "an alcoholic beverage made from the fermentation of grapes". Today almost all the countries in the world produce wine. Five countries share 50% of the world's vineyards (Spain, China, France, Italy, USA). In 2021, wine production was around 260 million hectoliters according to OIV research, for 235 million hectoliters consumed worldwide. This consumption is increasing in the new producing countries and tends to decrease in the old continent countries, France, Italy, and Spain (*OIV, nd b*). The OIV, which carries out research every year on the vine and wine industry, is an intergovernmental body of a technical and scientific nature that operates under the aegis of an agreement signed in 2001. Its mission today is to bring together the actors of the vine and wine world to collaborate within the sector (*AIDV, 2022*).

Europe is the world's largest wine producer and exporter. It alone represents more than half (approximately 60% depending on the year) of the volume of wine produced in the world. 70% of this wine products are exported across the world with the United States as the leading export market. European wines represent approximately 60% of world consumption. Italy, France, and Spain are the three main players in the European wine market. Together they produce 80% of European wines and represent 75% of the European wine-growing area (*Magnum, 2021*). As for France, in 2020 it was the first wine exporting country in value with an amount of 8.74 billion euros, but the second country in terms of wine production, just behind Italy. 46.6 million hectoliters for France against 49.1 million hectoliters for Italy (*Conway, 2022*). In France, 16 wine regions share the production of wine: Alsace, Cognac, Beaujolais, Bordeaux, Burgundy, Champagne, Corsica, Jura, Languedoc-Roussillon, Lorraine, Poitou-Charentes, Provence, Savoie and Bugey, South-West, Loire Valley, and the Rhône Valley.

## 1.2 Champagne

Among all the French wines, champagne is differentiated by its sparkle. Champagne is a wine, therefore a fermented grape juice, but a sparkling wine produced in the Champagne region (*Le Robert, nd a*).

The Champagne appellation is spread over 3 regions, with 34 200 hectares of vineyards. It counts 319 crus, 16 200 wine growers, 130 cooperatives, and 370 champagne houses. In Champagne, the notion of Cru is used to designate a wine-growing commune. In the past, there was a scale of cru, and from it, are created Premier Cru and Grands Cru. Even if nowadays this scale does not exist anymore. The domains continue to use it for the prestige conferred on the label (*Comité Champagne, nd b*). The Champagne appellation represents 0.5% of world vineyard acreage and 4% of France's total vineyard area (*Comité Champagne, 2021b*). The industry directly employs 30 000 people, of which 15 000 salaried staff, plus some 120 000

seasonal workers at harvest time. Champagne exports its wine to more than 190 countries, representing 10% of the volume of world consumption of sparkling wines. The Champagne is the first wine producing Appellation d'Origine Controlée (AOC) in the world in value. 320.2 million bottles shipped, of which 56.1% exported. It represents 5.7 billion euros in sales and a stock of over 1 billion bottles it still in ageing time (*Comité Champagne, 2021a*). Champagne is made from three main grape varieties: Pinot Noir, Meunier and Chardonnay (*Xicluna, 2022*).

The champagne is very regulated in its winemaking to follow and ensure its quality. The latter has a particular process that allows it to have aromas and bubbles specific to champagne, illustrated in Appendix A.

### **Harvest**

Harvest in Champagne takes place in September, the grapes are Hand-picked, it's not allowed to use the machine. 50 Kg perforated cases are used not to keep the juice oxidized and colored by the color of the baie's skin.

### **Pressing**

Champagne pressing has 3 main rules: no mechanical operation must be carried out between the harvest and the pressing; limited rate of extraction; and separation of first and second juice. The grapes are pressed slowly and gently in order to extract any color from the skin.

### **Must settling**

After, the juice descends in belons (smaller tank) and will stay so that the lees fall by gravity, to remove the natural impurities from the must.

### **Alcoholic & Malolactic Fermentation**

Then the juice is transferred into a bigger tank to do the two fermentations. The first one is alcoholic fermentation to create a wine, to produce alcohol. And the second, the malolactic fermentation to reduce the acidity.

### **Blending**

In Champagne it is very rare to only have one grape variety or grapes from one year in the bottle. Therefore, different wines from the different tanks are blended to create their perfect wine.

### **Bottling**

The wine is put into bottle of wine and a mixtion is add with it. The mixtion is a mix of sugar and yeast to create a second fermentation in the bottle.

### **Prise de mousse**

“La prise de mousse” translates directly into “intake of foam” is the step where the wine will become sparkling. Thanks to the mixtion add during the bottling of the wine, the yeast will redo an alcoholic fermentation, but this time the CO<sub>2</sub> that will escape will be trapped in the bottle and will create the effervescence

### **Ageing on Laths**

After “la prise de mousse” the wine must be aged. The legislation says that the wine must stay for at least 15 months for the non-vintage wine and at least 3 years for the vintage wine.

### **Riddling**

The second fermentation that took place in the bottle created a deposit. The purpose of riddling is to drop the deposit into the bottleneck to be more easily removed during disgorgement.

### **Disgorging and Topping Up**

Finally, the bottles are disgorged, which means that the deposit will be extract. During this step, the winemaker opens the bottle and with the pressure in the bottle when the bottle is opened, the deposit will be ejected. Then a liqueur and wine will be added to the bottle to be topped up.

### **Labeling**

After the disgorging, the wine must be kept for 12 months minimum to allow a good mix between the wine and the liqueur. And then the bottles are corked, muzzled and labeled to be sold.

In this region, there are also different types of producers, who have different needs and desires. They are qualified on the label of a bottle, it is the professional registration. This allows the consumer to know how the champagne was produced. There is:

**Négociant Manipulant (*Negotiator Manipulator*)**

A Négociant Manipulant is a winegrower or a company that elaborates in its own cellars the champagne, makes the vinification, the blending and markets it. The grapes come from the estate's own vineyards or may be purchased from other winegrowers, in whole or in part. There are about 250 Négociant Manipulant in Champagne, it is in this category that we find the big Houses of Champagne (Moët & Chandon, Veuve Clicquot, Bollinger...) which control 50% of the market.

**Récoltant Manipulant (*Harvester Handler*)**

The Récoltant Manipulant are the winegrowers who cultivate, harvest, vinify and market their champagne themselves from A to Z. There are more than 2000 Récoltant Manipulant in Champagne.

**Récoltant Coopérateur (*Harvester Cooperator*)**

For the Récoltant Coopérateur, the wine grower takes care of the marketing of his champagne himself, but not necessarily of its elaboration. He brings his grapes to a cooperative which ensures the winemaking with that of the other wine growers. He recovers bottles before or after disgorging to market them under his name.

**Coopérative de Manipulation (*Handling Cooperative*)**

The Coopérative de Manipulation highlights the existence of a cooperative of champagne producers and produces champagnes with the grapes of its members. 100 Cooperatives of Handling are counted in Champagne.

**Marque Acheteur (*Buyer Brand*)**

The Marque Acheteur informs the purchaser of the bottle of the simple affixing of the label and the mark of a distribution chain, a retailer, a restaurant owner or even a wine merchant, on bottles bought from several producers. It is possible to find on the label the mention "elaborated by NM-XXXX". NM, for Négociant Manipulant and the name, which makes it possible to know, by seeking a little, the true origin of its champagne. There is approximately 3000 MA.

**Négociant Distributeur (*Dealer Distributor*)**

The Negociant Distributeur buys wines in finished bottles on which he affixes, in his premises, a label. Then markets them (*Bouchet J, 2020*).

To allow a good organization and understanding between all these different producers, there are several organizations in Champagne. First of all, there is the champagne committee. The « Comité interprofessionnel du vin de Champagne », is a semi-autonomous public body established in 1941. The Champagne committee safeguards the collective interests of Champagne Growers and Houses to contribute to the competitiveness and balance within the Champagne business. Value creation is dependent on stringent quality standards and the need to protect and promote the age-old heritage vested in the Champagne AOC. Half of the people who work with the Champagne Committee are technicians and engineers specialized in viticulture, oenology and sustainable development (*Comité Champagne, nd a*). As said before, in this region there are 370 champagne houses and 16200 wine growers. However, these producers do not have the same desires and needs, hence the creation of two organizations to work with the champagne committee. Created in 1904, the "Syndicat Général des Vignerons" (SGV) translated as General Syndicate of Winegrowers represents the

winegrowers and cooperatives of Champagne. Its missions are managing the economic organization of the vineyard, assist the wine growers, promote the Champagne wines elaborated in the vineyard through the banner "Les Champagnes de Vignerons". Then there is the "Union des Maisons de Champagne" (UMC) which gathers the houses elaborating Great Brands (sometimes in low volume) from grapes bought from wine growers and coming from selected vintages to compose the assembly of their brand (*Comité Champagne, nd – c*).

### 1.3 Sustainability

Sustainable wine is mostly associated with organic wine. However, sustainability involves a much wider range of practices aimed at reducing the environmental impact of wine production and improving working conditions. Sustainable practices can include converting to organic production, reducing energy and water use, recycling, and others. The market for sustainable wine is still considered to be a niche, but a niche with growth potential. Entering this market also involves challenges, such as convincing consumers of the quality of organic wine or communicating the value of sustainable approach (*Ministry of Foreign Affairs, 2016*).

The word "sustainability" has so many definitions that it holds a shadow of ambiguity. Sustainability can be seen as a concept based on various principles: economic principles (maximizing welfare and improving efficiency), ecological principles (living within carrying capacities and conservation of resources) and equity principles that concern intragenerational and intergenerational equity (the disparity of wealth among different regions of the world or among generations) (*Santini, 2013*). By sustainability the researcher of this report is talking about the respect for the environment that is based on a respectful attitude toward the future of man on planet earth, therefore, reducing greenhouse gases, reducing pollution, waste ... while allowing economic balance to the company and equity within the company.

We can emphasize that there are more and more wineries that are moving towards sustainability. Each one has its reasons and motivations, the most known and answered being:

#### **Customer requirement**

As consumers become more aware of the vulnerability of our global environment, the demand for sound agricultural production practices is increasing. In the future, the perception of the producer as a conscientious environmental steward will be an important influence on the consumer's purchasing decision. Consumers' pressure has created a market for wines inspired by environmental issues, such as organic or biodynamic wines

#### **Climate Change**

The real and visible changes in the climate temperament are causing producers to react.

#### **Government regulations**

Governments are taking more and more responsibility for enforcing sustainability metrics, and this is having an effect on the wine industry

#### **Business sense**

A healthy planet and healthy employees are factors that must be considered in order to meet the sustainable economic needs of a winery.

#### **Investor pressure**

Investors tend to invest more in sustainable industries, to make their money profitable. (*Buttler, 2022*).

In a research by Cristina Santini, Alessio Cavicchi and Leonardo Casini (2013), they explain the difference between internal drivers and external drivers of motivation. Internal drivers are all those drivers that take place within the firm: they are ethical motives inspiring top

management and entrepreneurs as well as strategic intentions based on the recognition of an advantage that might arise from sustainability. External drivers, instead, take place in the firm's external environment. External drivers happen outside of the firm and include pressures arising from institutions, customers, communities, associations, environmental groups, activists, regulators and competitors.

Moreover, in the wine sector, environmental preservation is a kind of "natural instinct" for wine growers, concerned with maintaining appropriate environmental conditions and preserving natural resources in order to maintain the productivity of the land, not only for the current enterprise but also for future generations of wine growers who will manage the farm (*Corbo, 2014*).

The wine industry is committed to sustainability: the stakeholder's interest in the topic is constantly growing and a wide number of sustainability programs have been launched in recent years, by both private businesses and consortiums. The launch of these initiatives has signaled the commitment of farmers and wine producers to the implementation of sustainability principles in viticulture and wine production, which is a positive signal. Unfortunately, the varied design of the sustainability initiatives and the differences in the objectives, methodologies, and proposed tools risks to create confusion, and undermine the positive aspects of these initiatives (*SabbadoFlores, 2018*).

In the wine world, the notion of sustainable viti/viniculture is supported by official documents from the International Organization of Vine and Wine, which include definitions, guidelines and general principles (*OIV, nd*).

At the same time, wine regions have been creating their own frameworks, presented as national (or regional) programs or frameworks in order to adapt sustainability in their contexts and deal with local issues (*SabbadoFlores, 2018*). For example, the "California Sustainable Winegrowing Alliance" in California, the "Wine Sustainable Policy" in New Zealand, the "Integrated Production of Wine Scheme" in South Africa, and the "Sustainable Viticulture in Champagne" in Champagne (*Corbo, 2014*).

The Sustainable Viticulture in Champagne certification (VDC) is a demanding process that implies a number of commitments required by the environmental certification. In table 1 the commitments are mentioned with some examples. This meets the specific ambition of the Champagne region. Auditing and certification awards are the responsibility of an independent certifying body.

*Table 1: Explanatory table of the main points of the Sustainable Viticulture in Champagne certification (Comité Champagne, 2022)*

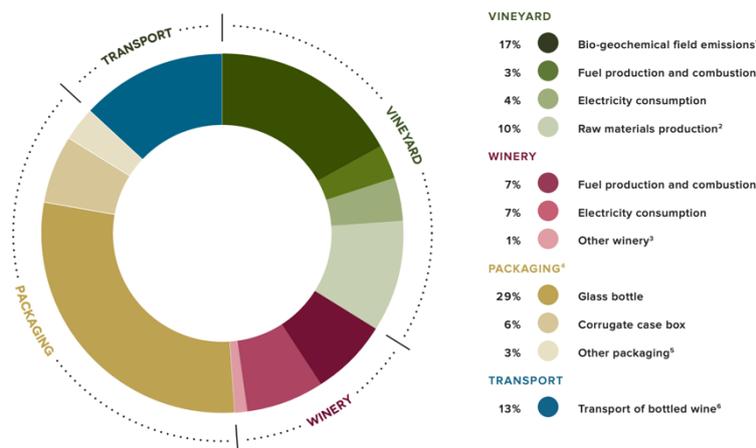
Commitments of the certification	Example
Vine Protection Strategy	<ul style="list-style-type: none"> <li>• The operator only uses products that have a Marketing Authorization (MA) and are authorized in the vineyard.</li> </ul>
Fertilizer Management	<ul style="list-style-type: none"> <li>• The promotion of an integrated approach to the management of soil and vine nutrients, development of decision-making tools.</li> <li>• The monitoring of newly developed and marketed fertilizers.</li> <li>• The recommendations of use, in particular the doses, the mixtures, the limitations, the zones not treated (ZNT) and the delays of re-entry in the plots and before harvest are scrupulously respected.</li> </ul>
Biodiversity Preservation	<ul style="list-style-type: none"> <li>• More than 70 million euros have been invested in the management of groundwater resources on slopes.</li> <li>• The preparation of phytosanitary sprays is carried out with the concern of respecting the unprotected water points (watercourse, ditch, well...).</li> </ul>
Preservation and enhancement of terroir and landscapes	<ul style="list-style-type: none"> <li>• Embankments, hedges, ditches, and other natural elements are preserved and maintained.</li> </ul>
Wine production wastes management	<ul style="list-style-type: none"> <li>• The sprayer filling area and station are designed to avoid any backflow of spray liquid into the environment or into the distribution network and to avoid any overflow of the sprayer tank during filling.</li> <li>• The operator keeps an up-to-date waste register. Waste is not abandoned in the environment, nor buried, nor burned. The waste is sorted, cleaned if necessary and stored in one or more places dedicated to this purpose on the farm until its elimination.</li> </ul>
Reduction of footprint	<ul style="list-style-type: none"> <li>• The farmer initiates treatments in accordance with the control strategies established and advised by the advisors or when the intervention thresholds are reached.</li> </ul>

Currently in Champagne, the producers have managed to reduce the carbon footprint per bottle by 20%, reduced phytosanitary products and nitrogen fertilizers by 50%, treated and recycled 90% of industrial waste and 63% of the region is in environmental certification. However, the Champagne Committee is looking to increase the sustainability of the Champagne region even further by setting the following objectives:

- Reducing the carbon footprint of a bottle by 75% in 2050
- Reducing the use of herbicides by 75% in 2025 (compared to 2000)
- Continue the deployment of the circular economy in the Champagne sector
- 100% of the region in environmental certification in 2030 (*Comité Champagne, 2019*)

There are many factors to consider when attempting to determine champagne’s environmental impact. We have to look at growing practices, cellar practices, packaging size and type, shipping distance, as well as distribution method. To better understand the entire champagne supply chain, the author has created a graph to illustrate it in Appendix B. In this thesis, the author will focus on the winemaking and packaging of Champagne, which, according to Guseva's research (2021), in figure 1, represents more than 50% of the carbon footprint of a wine company.

*Figure 1: Diagram of carbon footprint factors in the wine supply chain (Guseva, 2021)*



Although there are many studies about the champagne (Sharp & Smith, 1990; Statista Research Department, 2020) or sustainability in the wine industry (Santini, 2013; Schäufole, 2017; Warner, 2017; Rugani, 2022), relatively few studies have examined sustainability in Champagne (Comité Champagne, 2019). Or even information about what are the needs of a company to improve their sustainability.

The Champagne Committee's objective can be achieved only if the companies are able to make it happen. This is why researching the needs of champagne companies to improve their sustainability, will allow these producers to understand better what their lacks are to go further in their process, and can help the champagne committee and other organizations to know what the need of the champagne producer are to meet this goal, and so potentially help them. This research will answer the following question:

**What is needed for the champagne producers within the winemaking and bottling process to meet the sustainability objectives in the Champagne region?**

The sub-questions systematically contribute to answering the main question:

- What are the motivations of the champagne producers to develop their sustainability within their winemaking and bottling?
- What are the main objectives of a company in terms of sustainability for winemaking and bottling?

- What are the barriers that companies currently face when they try to be more sustainable in their winemaking and bottling?
- Which actors could have an impact on the sustainability of the champagne producers?

This report will propose company and over factors of the wine industry, answers, and indications for those who wish to develop their sustainability. This paper is addressed to winemakers, organizations, Champagne Committee, and stakeholders interested in improving sustainability in the champagne wine industry or who can help the company to achieve this goal.

## 2. Materials and Methods

In this chapter, the author will explain the methods and materials choose to complete the research.

### 2.1 Materials Methods

The report aims to identify the needs of champagne companies to meet the expectations of the champagne committee in terms of sustainability. The goal is to highlight the necessities of producers of Champagne and show it to the Champagne committee and any other organization, stakeholders who can have an impact and help them. In order to enhance this research, it has been decided that a questionnaire will be sent. The survey will be divided into sub-parts to help answer all sub-questions. This method will allow the author to collect quantitative data. To answer this research, the target group from whom the information will be collected are companies in the Champagne region with particular criteria. This research deals with the Winemaking and Bottling part, only the types of producers who carry out these steps will be selected, this means: Négociant Manipulant (Negotiator Manipulator), Récoltant Manipulant (Harvester Handler), Coopératives de Manipulant (Handling Cooperative), Récoltant Coopérateur (Harvester Cooperator). In order to get diversity in this report the survey will be sent to these 5 different types of wine producers and bottlers. Table 2 shows the number of winemakers by type of producer, to get an idea of the total population surveyed.

*Table 2: Number of the population by type of Champagne producer*

Type of producer	Négociant Manipulant	Récoltant Manipulant	Coopératives de Manipulant	Récoltant Coopérateur	Total
Number	250	2000	100	3000	5350

In order to have a reliable sample size in this survey, taking into account a confidence level of 90%, a margin error of 10%, a population proportion of 50%, and a population size of 5350, it would be necessary to collect a minimum of 68 complete responses from companies in Champagne.

After completing the analysis of the questionnaire data, additional literature research will be done to compare the results of this survey with the problems and needs of other world's wine regions. The goal would be to enrich the results of the surveys with research already conducted to confirm or confront the problems of the Champagne region and the different wine regions of the world. The plan and organization of this literature research is described in the 2.4 sub-part.

### 2.2 Survey

Regarding the questionnaire, it will be written in French as this is the native language of the target group and the author. But an English version, the international language, is attached in Appendix C to help readers understand. It will be created in Word and then written in Google Form. This tool was chosen for this research because it is free, easy to use and very practical for surveys. It realizes an analysis of the data which will be an input to the report. Another

benefit of this tool is that it's adapted to all types of devices, this means that no matter what device the respondent opens the questionnaire on, they will still be able to complete the survey. This tool can also be used to create several types of questions (QCM, multiple choice grids, drop-down lists, checkboxes...) and many other design features to avoid losing respondent interest (*Audrey Tips, 2021*).

In view of the total number of the targeted population, the author chooses a quantitative method because it allows to have the opinion of more people. And as said before, the target is divided into several groups, each respondent may have various ideas. The quantitative method allows to have a more realistic idea of the situation of the champagne producers. The information sought in this questionnaire are quantitative, but some questions can make exception and be asked more for the purpose of collecting qualitative data. It will allow answering the sub-questions to enrich the report and thus answer the main question. The use of closed questions allowed the author to collect quantitative data. The questionnaire was created by the editor of this report and verified by reliable and knowledgeable individuals. It includes about fifteen questions; the number of questions is important because it need not be too many so as not to overwhelm the respondents but sufficiently to have enough to feed the report (*Bruchell & Marsh, 1992*). To come up with the questions for the questionnaire, the writer the author placed himself in the respondent's situation with the aim of facilitating the understanding of the questions. For data analysis purposes and so that the respondent is not lost, the questionnaire will be divided into 4 sub-sections of 3/4 questions. The first is to identify the respondent and introduce them to the topic, the next will be questions that will help the author answer the first sub-question of this thesis (to understand what are their motivations); then the third part will answer the second sub-question (to find out more about their goals), the fourth part will be about the third sub-questions (to be informed of the barriers they face), and finally, the last sub-question will answer the fourth sub-question of this research (to identify the need for external actors). This organization is showed in table 3.

*Table 3: Table showing question numbers appropriate to their sub-question*

<b>Sub-questions</b>	<b>Number of questions in the questionnaire</b>
Identification of the respondent	1 - 3
Sub-questions 1	4 - 6
Sub-questions 2	7 - 9
Sub-questions 3	10 - 13
Sub-questions 4	14 - 15

In addition, a simple design with green and brown colors was chosen to be pleasant to read and to remind the world of champagne. The visual elements considered for this questionnaire are smooth, simple and symmetrical shapes, soft colors and repetition of visual elements. (*Jones, 2013*). The design help ensure a better response rate, by not losing the respondent (*Ponto, 2015*). Then grid questions, QCM and drop-down list. were added to vary the type of questions while collecting a maximum of quantifiable data. The style of writing the questions will match the target group so that they understand easily.

The questionnaire will be sent between the 29/11/2022 and the 31/12/2022. It's the busiest period in Champagne, taking place just before the festive season, the events with the most requests of Champagne (*Abellan, 2014*). However, an organized planning, accompanied by numerous reminders will be carried out, to be sure to collect enough responses to the questionnaire. During this period a first mailing will be sent by email, then a second mailing will be made one week after, to remind the respondent. If there is no response after two weeks,

a final call will be realized. These actions are written in table number 4. To organize the sending of questionnaires, the author will create an Excel database where will be referenced the contacts of the targets, their current position (sent/received/made) and the date of the last contact. To fill this database, the author will use his personal contacts (his address book) as well as data from the websites of champagne producers. If companies do not share their email address on the internet, sometimes the possibility to send a message on their website is feasible. In this case, this solution will be used, to share the questionnaire with them. It has been shown in the research of Daryl O. Mckee (1992) that a questionnaire conducted with reminders is much more likely to have a high result rate which justifies the choice of this method. The author cannot transmit the questionnaire or follow up face-to-face as he was not present in this region during this period. To increase the reliability of the answers, the questionnaire will be anonymous, so the respondents will be more honest in their answers (Ong & Weiss, 2006).

*Table 4: Table of methods used to contact companies*

Action	Making contact	First remind	Second remind
Method used	Email	Email	Phone

The questionnaire will be sent to a minimum of 300 wine producers without a maximum. Being a quantitative study, there is no maximum number of questionnaires sent. The higher the number of responses, the more reliable the results will be.

The percentage of responses to the questionnaires will be recorded in the following table number 5, and all these data will be used in this report. The percentage of responses by type of producer received will be recorded in the same table.

*Table 5: Table of the total number of responses collected and by type of producer*

Type of producer	Négociant Manipulant	Récoltant Manipulant	Coopératives de Manipulant	Récoltant de coopérateur	Total
Number of answer	X	X	X	X	X
Share of survey results	X%	X%	X%	X%	100%

## 2.2 Data Analyse

The analyses of this survey will be made in SPSS, The IBM SPSS software platform offers advanced statistical analysis, a vast library of machine learning algorithms, text analysis, open-source extensibility, integration with big data and seamless deployment into applications. The author uses this software because its viable and easy of use (SPSS Software, nd). This questionnaire was based on quantitative research, quantitative and qualitative analysis are not analyzed in the same way. To better understand the results of this quantitative research, graphs and statistical tables will be made. All this is done in order to highlight the regularities in the answers obtained and to give a clearer explanation of the phenomenon studied.

## 2.3 Literature research

Literature research will be carried out to complete and compare the results of the questionnaire. This research will only be done for sub-questions 2 and 3, which are the sub-questions where a comparison of neighboring wine regions can be interesting. These two sub-questions talk about the objectives and barriers that a winery may have and encounter when moving to a more sustainable winemaking. This can be interesting to compare with the answers of the questionnaire. Using a mixed method research approach, this study uses a double approach to examine research and questionnaires to determine what champagne companies need to develop their sustainability. To prepare the research, the tools, methods, keywords, selection criteria and limitations of the research will be given. In terms of tools, the research will be mainly done on the internet, with sites such as Google Scholar, Statista, Science Direct, Springer ... The internal network of the author's school will also be used to access reliable sources not available on the internet. Articles, journals, research, books and other literature can be selected, the author is not limited as long as it remains in the subject. The method will be to enter the keywords chosen beforehand in the search engines and select the literature according to the chosen criteria. The goal being to confirm or confront the ideas of the questionnaire, the author based himself on the keywords of the questionnaire to find his keywords. A total of 10 keywords will be used: Sustainability, Wine, Winemaking, Wine producer, Bottling, Objectif, Barrier, Need, External Actor, and Impact. Then the selection of criteria will allow to select the literatures which can enrich the report. These criteria include the date of completion (the literature search must be carried out within the last ten years), the source (the sources must be reliable, a literature reference check will therefore be done), the theme (the topics of the literature search must be related to the subject of this research) hence the creation of limits. The limits of the subject are the wine industry in the world and the sustainability. If the literature does not include these two points, the article cannot be used. For this literature research, to be reliable and effective the author decided to include at least 10 literatures. The literature can be national and international. For more information, the sources of the articles are listed in the references.

## 2.4 Data Collection

For the retrieval of my research data, a Word document will be created, where summaries of interesting read articles will be listed. The technique of summarizing interesting read research saves time later when using this data in the thesis because the author will not have to re-read the entire research. On this same Word will be assimilated the sub questions to which the literature could be compared. The author decided to use the Word tool because he has free access to the Office suite and because it's a tool that he knows how to use.

## 2.5 Consideration

As mentioned before, this survey will be sent out during the biggest sales period for champagne sellers, so it will probably be difficult for the author to collect more than 68 responses. In addition, the biggest champagne producers, who make more than 70% of the sales, the Négociant Manipulant, are more complicated to reach because of the quantity of emails they receive within a company like this. It will therefore be more difficult to get answers from them. Conversely, the Récoltant Coopérateur will be more likely to respond due to the number of emails they receive. But they will also be less to be able to answer this survey since they do not all produce their wines.

### 3. Results

In order to answer the main question of this research about champagne wine. This chapter gives the results of the methods used, the survey and the literature research.

After sending 537 emails and 295 reminders, the survey had 118 complete responses, 113 of which were used (meeting all criteria). Table 6 shows the number of responses by category. It should be noted that 69% of these responses were provided by the owners of the companies.

*Table 6: Table of the total number of responses collected and by type of producer*

Type of producer	Négociant Manipulant	Récoltant Manipulant	Coopératives de Manipulant	Récoltant de coopérateur	Total
Number of answer	23	54	13	23	113
Share of survey results	20,4%	50%	11,5%	20,4%	100%

The literature, research was focusing on sub-questions 2 and 3 which are talking about the objectives and obstacles of the wine growers to achieve sustainability inside their process. There are 9 research literatures found, listed in the table below. The studies date from 2013 to 2022, one study talks about goals and barriers, three will be useful only for goals while five will talk about barriers.

*Table 7: Table of all the literature research information*

Name	Date	Author	Wine region	Sub-questions
Sustainability in the wine industry: key questions and research trends a - Agricultural and Food Economics	23/08/2013	Santini, Cavicchi, Casini	USA, UK, Europe	2
From Environmental to Sustainability Programs: A Review of Sustainability Initiatives in the Italian Wine Sector	15/01/2014	Corbo. C	Italy	2 & 3
What is sustainability in the wine world? A cross-country analysis of wine sustainability frameworks	20/01/2018	Sabbado Flores. S	Africa, New Zealand, Australia, Canada	2
'Green' Wine through a Responsible and Efficient Production: a Case Study of a Sustainable Sicilian Wine Producer	23/02/2016	Borsellino, Migliore, D'Acquisto, Patrizia Di Franco, Asciuto, Schimmenti	Italy	2

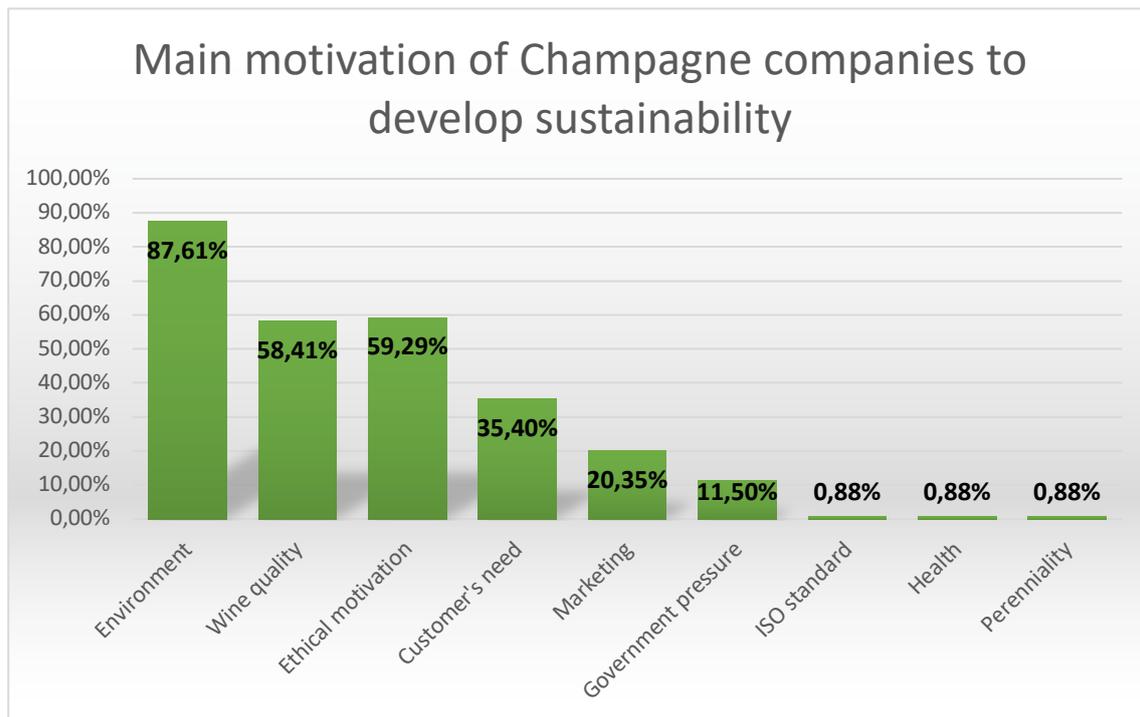
Name	Date	Author	Wine Region	Sub-questions
A cross-national comparison of sustainability in the wine industry	05/04/2013	Szolnoki	Germany, USA, Hungary, Italy, Greece, Spain	3
Consumers' perceptions, preferences and willingness-to-pay for wine with sustainability characteristics: A review	20/03/2017	Schäufele, Hamm	Europe, South America	3
Rebound effects due to economic choices when assessing the environmental sustainability of wine	24/08/2014	Benedetto, Rugani, Vázquez-Rowe	World wine region	3
Development and implementation of a qualitative framework for the sustainable management of wine companies	23/10/2020	Luzzani, Lamastra, Valentino, Capri	Italy	3
Blockchain Technology in Wine Chain for Collecting and Addressing Sustainable Performance: An Exploratory Study	22/11/2021	Luzzani, Grandis, Frey, Capri	World wine region	3

### 3.1 Motivation of the Champagne producers

In this part, the motivations of the champagne producers to develop their sustainability within their winemaking and bottling will be given to help answer the first sub-question.

84.1% of champagne producers think that the region is involved in sustainable development. However, 77.8% think that this is important for their own business. As far as motivating factors are concerned, marketing is a balanced motive for 50.4% of the producers, it is not a motivating factor. On the other hand, 86.7% of respondents say that the environment is a motivating factor. For the government pressure, it does not impact 69% of the producers. At the level of the quality of the wines, we have the extremes, with many answers stating that it is not motivating at all or that it is extremely motivating. The ethical motivation is the second factor to have the most impact on the Champagne producers with 72.6% of responses motivating factor to very motivating. And finally, the requirement of customers is a neutral factor, without too much impact with 52,2% of responses who are motivated by this. Then, as we can read in figure 2, in the answer of their three most motivating reasons for their company, the factors that emerged most often are the environment with 99 answers out of 113, the ethical motivations with 67 answers out of 113 and the quality of wines with 66 answers out of 113. In addition to the answers given in the questionnaire, some producers added their own motivation. Among these we find health, the sustainability of the company and the ISO standards.

*Figure 2: Graph of the main motivation of Champagne companies to develop sustainability*



The results of the motivations by type of producer are also interesting to compare if some motivations are more important for some producers than others. Table 8 shows the number of responses for the motivations by type of producer.

*Table 8: Motivation of champagne companies by type of producer*

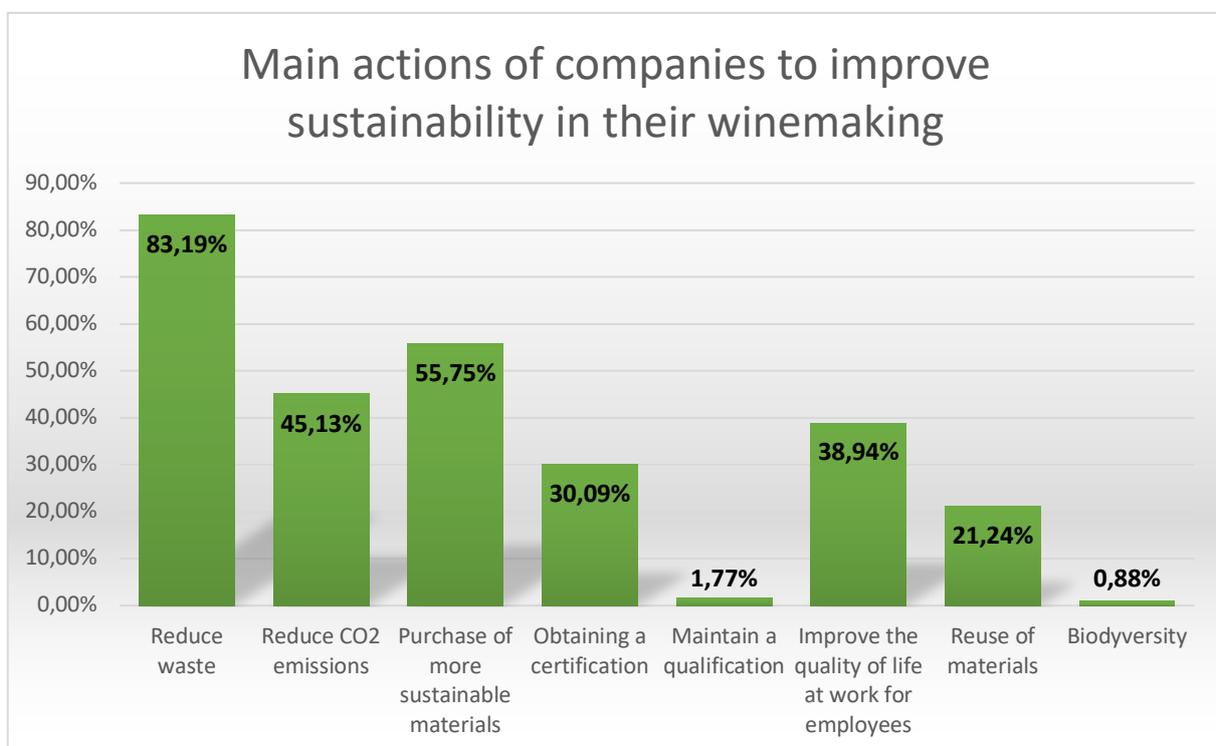
	Coopératives de Manipulant	Négociant Manipulant	Récoltant Coopérateur	Récoltant Manipulant
<b>Environment</b>	34,21%	34,43%	28,57%	31,54%
<b>Wine quality</b>	18,42%	16,39%	19,05%	24,83%
<b>Ethical motivation</b>	21,05%	19,67%	22,22%	22,15%
<b>Customer's need</b>	15,79%	16,39%	14,29%	10,07%
<b>Marketing</b>	2,63%	9,84%	7,94%	7,38%
<b>Government pressure</b>	5,26%	3,28%	6,35%	3,36%
<b>ISO standard</b>	2,63%	0,00%	0,00%	0,00%
<b>Health</b>	0,00%	0,00%	1,59%	0,00%
<b>Perenniality</b>	0,00%	0,00%	0,00%	0,67%

### 3.2 Objectives of Champagne company

So as to answer the second sub-question about the objectives of a company in terms of sustainability, the reply of the survey and literature research will be given here.

Regarding the objectives of the Champagne companies, 11.5% of them have reached their sustainability goal, while 78.8% of the rest think they are on the right track and on target. The reduction of waste is the objective that has aroused the most interest, with 82.3% of respondents stating that it should be an objective to achieve a more sustainable wine production. The rest of the objectives cited in the questionnaire ranged from 67.2 to 74.4% of respondents who thought that these actions were important, except for obtaining certification, which only convinced 49.6% of producers. The top 3 recommended actions to develop sustainability according to the producers are reducing waste, reusing materials and improving the quality of life of employees. And within the companies, the three most mentioned objectives in the vinification of champagne producers are the reduction of waste with 94 answers, the purchase of more sustainable materials, which sticks with the first answer then the reduction of CO2 emissions. These figures are referenced in the figure below.

*Figure 3: Graph of the main actions of companies to improve sustainability in their winemaking*



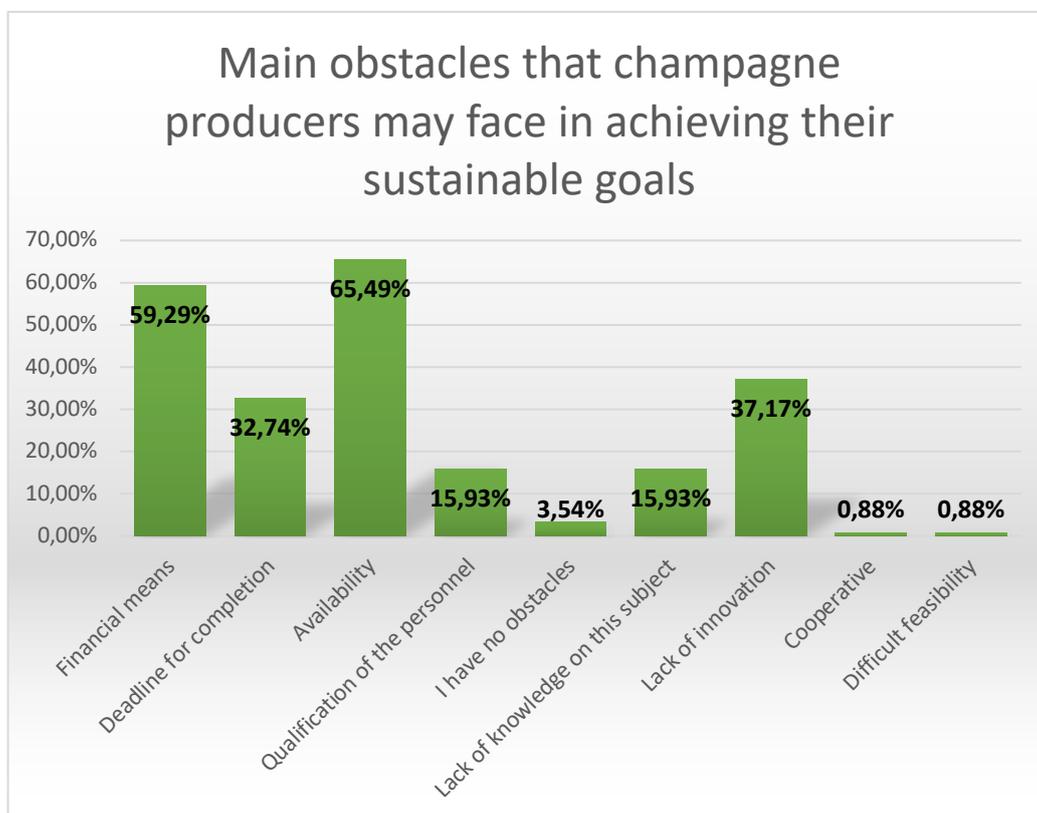
Regarding the objectives found through literature research. Most of the studies found analyze the certifications and rules of different countries and wine regions. This is because the voice of the producer has not often been left. For example, the research of S. Sabbado Flores in 2018 allows to compare the differences and similarities between the certifications/labels of each country. For example, we see that in South Africa, in addition to general regulations similar to other countries, they often have additional guidelines on issues such as waste, biodiversity and emissions. Or this time for New Zealand and South Africa, the certifications require sustainability frameworks for export. S. Sabbado also points out, that only in a few countries, the social side of sustainability is exploited, notably in Australia, California and New Zealand. (Sabbado Flores, 2020) It is in the research of 2013 that we can also see that Europe is much more focused on fertilizer or viticulture, while in the USA, it seeks to replace the bottles, and the packaging (Santini, 2013). Another qualitative research conducted in 2016 interviewed a sustainable Sicilian wine producer to get the details on the motivations of Italian producers. The study explains that Italy itself, with much delay compared to other countries, and now it has

caught up and is invested in the production of sustainable wine. The questioned one, affirmed that its objectives were to fulfill the three criteria of sustainability by carrying out changes in the realization of some phases of production, by maintaining excellent relations with its employees and improving the efficiency of its activities (Borsellino, Migliore, D'Acquisto, Patrizia Di Franco, Ascuito, Schimmenti, 2016). This information on Italy is completed by the study of Corbo in 2014 about the various Italian initiatives in the wine sector, the results show that most certifications take well into account the three points of sustainability in Italy (Corbo, 2014).

### 3.3 Barriers faced by company

Then here, will be present the results of the questions about the barriers that companies in champagne currently face when they try to be more sustainable to answer the third sub questions. Champagne producers are 42.5% to have average difficulty to meet their objectives and 41,6% to find it difficult. Among the obstacles mentioned in the questionnaire, two retained about 60% of the producers' answers: financial means and availability. By availability, the producers are talking about the time that they can spend in this objective. In this case, they say that they do not have time available to realize their goals. The lack of innovation is also a problem for 49.6% of them. On the other hand, 60.2% of these respondents think that the time needed to implement the project is not a problem or not a problem at all. The same is true for 69% of them regarding the qualification of the personnel and 74.4% regarding the lack of knowledge on this subject. As shown in Figure 4, the three main obstacles producers face in moving towards more sustainable production are the availability of time with 74 responses, financial means with 67 and far behind lack of innovation with 42 responses.

*Figure 4: Graph of the main actions of companies to improve sustainability in their winemaking*



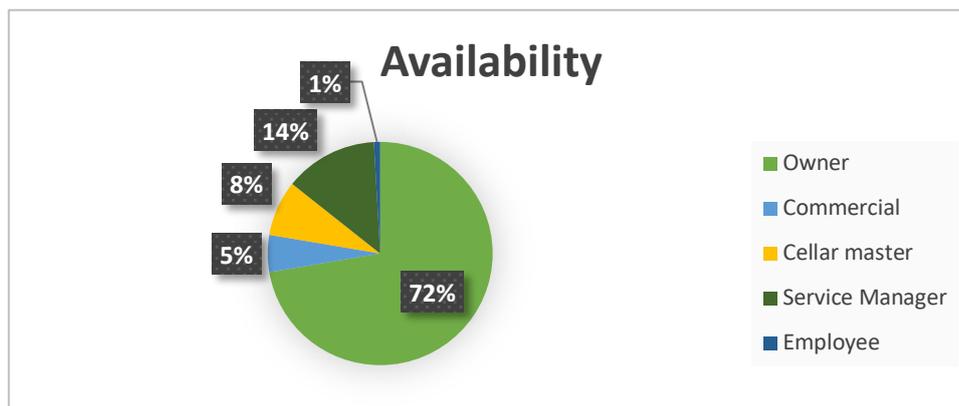
As with the motivations, figures by producer will be given to analyze the level of difficulties by type of producer, to see the inequalities they may face. The table below shows the results of the level of barriers by type of producer. The scale is from 1 to 5, with 1 representing no difficulty and 5 representing a lot of difficulties.

*Table 9: Level of barriers per type of producer*

	1	2	3	4	5
<b>Coopératives de Manipulant</b>	0,00%	7,69%	53,85%	30,77%	7,69%
<b>Négociant Manipulant</b>	4,35%	8,70%	30,43%	52,17%	4,35%
<b>Récoltant de Coopérateur</b>	0,00%	13,04%	60,87%	26,09%	0,00%
<b>Récoltant Manipulant</b>	3,70%	16,67%	37,04%	38,89%	3,70%
<b>Total</b>	2,65%	13,27%	42,48%	38,05%	3,54%

In order to analyze the first barrier, to look at the position within the companies of the people who answered the questionnaire. Figure 5 shows the shares of the position in the company of the respondents by the number of answers of the availability as barriers.

*Figure 5: Graph of the distribution of positions within the company selecting availability as a barrier.*



A literature research has also been done to compare the results of the survey with previous studies on obstacles and barriers that a winery faces when developing their sustainability. In the research of G. Szolnoki, a study was made about the positive and negative points of wine producers from different regions of the world during the transition to sustainability. In a table, many barriers are listed that the producers face, such as for countries like Greece and Hungary, a lack of information and an underdevelopment of this sustainability in the country creates problems. For countries like Italy, Germany or Spain the difficulty producer face is more cost problems, while for France and the USA, it is time management problems. By time management problems, countries talk about time to understand the administration, to implement actions, time to explain to employees and consumers (Szolnoki, 2013). Indeed, the perception of the product by consumers can also be problematic. In a study by I. Schäufole and U. Hamm it can be seen that depending on the country, consumer awareness of the general concept of sustainability in wine can vary. This can create a barrier for producers because if a consumer is not attracted to a product, they will not be willing to buy it (Schäufole; Hamm, 2017). In Corbo's study, this researcher points out that too many certifications or programs can lose the producer and thus put him off implementing such programs. He says that a large number of different strategies, guidelines and practices, indeed, make their comparison extremely complicated, and there is

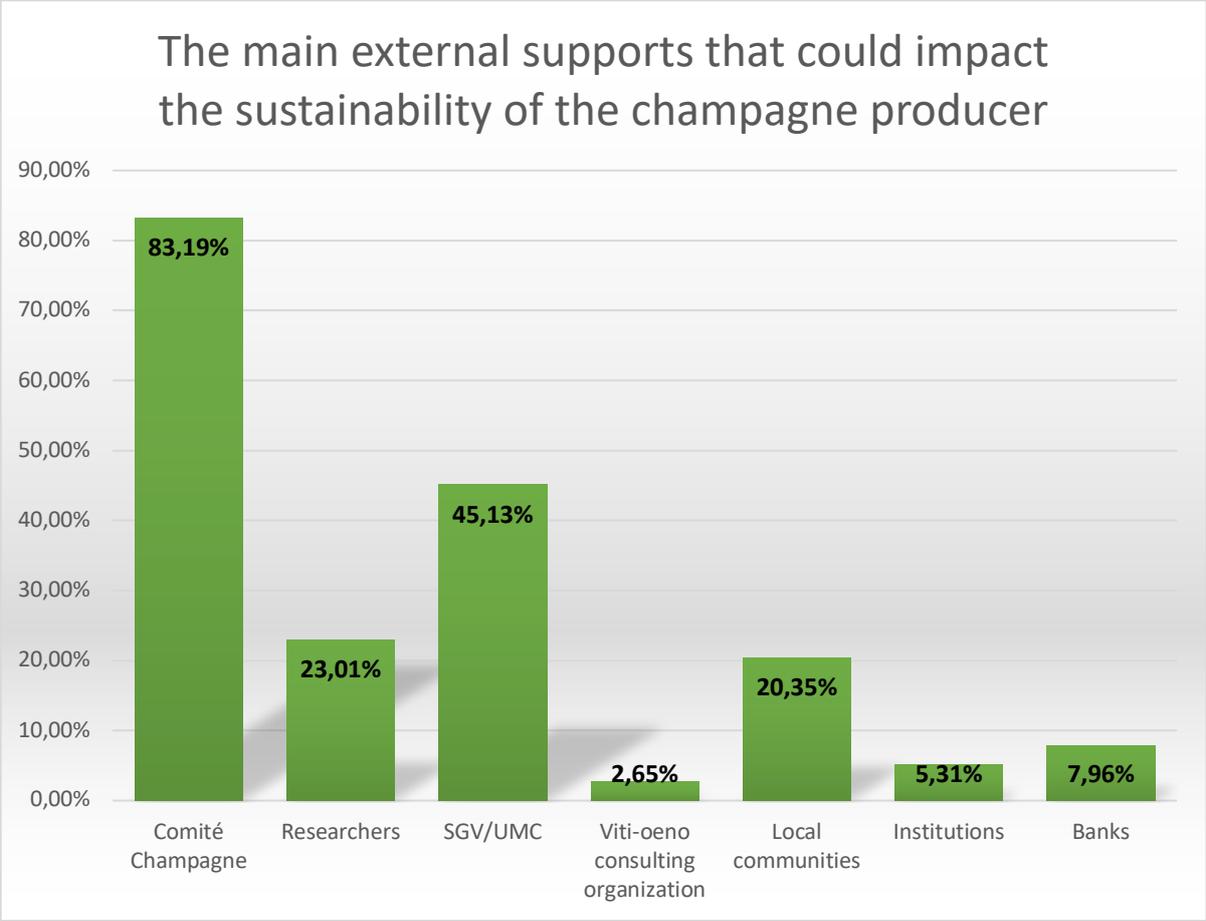
the risk that farmers and producers do not have a clear understanding of the opportunities and benefits deriving from the implementation of a certain sustainability program. Another barrier that may hold back some producers is the fear of side effects on the wines or viticulture. A study has shown that the implementation of such conversion practices on a large scale would imply the existence of new balances in the wine sector that deserve to be evaluated. According to this study, it is necessary to pay attention to the rebound effects (Benedetto, Rugani, Vázquez-Rowe, 2014) Also in the Italian vineyards, research studied sustainability management in Italy. The analysis of the results of the initial survey shows that companies are starting to face the need for sustainability management, but do not have appropriate tools to identify critical issues and to measure their level of sustainability. In a table of positive aspects and critical points of sustainability management, it can be seen that most wineries blame the lack of strategy and information on how to manage sustainability. This can be a hindrance to the implementation of more sustainable management (Luzzani, Lamastra., Valentino, Capri 2020). This threat is also highlighted in another study from 2021. This study shows that integrating sustainability into companies could increase competitive advantage and foster the innovation process, but the implementation of sustainable practices also faces many obstacles. Such as the lack of awareness, knowledge, and information within the organization; the lack of measurement of benefits; the increase of time and costs; the lack of communication and information among stakeholders; and the lack of evaluation tools (Luzzani, Grandis, Frey, Capri, 2021)

### 3.4 Actors that impact these objectives

Finally, the answer to which actors could have an impact on the sustainability of the champagne producers is given in this part to answer the last sub questions.

Like the barriers encountered, the need for external actors is mixed for 39.8% of champagne producers but remains a need for 33.8% of others and an important need for 8%. To the question, which external supports could have an impact on your objectives, the first ticked is the Champagne Committee with more than 90% of champagne producers thinking that they can have an impact on their progress. Then we have the researchers with 71.6% of producers who agree, then not far behind with 63.7% of answers of a potential need, the two second organizations of champagne: the SGV and the UMC. Nevertheless, for local authorities and banks, respondents are mixed with about 50% of producers who think they have no use for it, and the other half yes. And finally, as far as the Institutions are concerned, 62% of the respondents think that they will have no impact. It is the Champagne Committee, the SGV/UMC and the researchers who are the most quoted in the needs of the Champagne producers, with 94 answers for the Champagne Committee, 51 answers for the SGV/UMC and 26 for the researchers. This is given in Figure 6 below.

*Figure 6: Graph of the main external supports that could impact the sustainability of the champagne producer*



## 4. Discussions of Results

After citing the results, we can answer the sub-questions and the main question: What is needed for the champagne producers within the winemaking and bottling process to meet the sustainability objectives in the Champagne region? This will help the producers to make external actors understand how they can move towards more sustainable production, together, in the region.

### 4.1 Motivation of Champagne Producers

With the results provided above, the first sub-question about the motivations of champagne producers can be answered. According to the results of the survey, the Champagne producers say that the region is very involved in sustainable development, as are their companies for 77.80% of them. This still means that 22.20% are not interested or even motivated to turn to sustainability within their company. The main motivation of the Champagne producers is the environment for 86,7% of them. This is explained by the notion of sustainable development itself, one of its pillars being the environment, it is normal that this impacts the motivation of the champagne producers, especially with the last harvest where global warming is felt. As proven in the book of Kanyinda and Ernest on the impact of temperature on the precocity of vine work in Champagne (Kanyinda & Ernest, 2020). Then much further behind we have ethical motivations with 67 selections out of the 113 and the quality of wines with 66 selections out of the 113 answers. By the quality of the wine, they talk about a better taste for the wine in the nose and mouth, better ageing of the wine, and healthier for the consumer. This shows that the Champagne growers are not afraid of losing this quality when they switch to a more sustainable vinification. This is not the case for all producers. In fact, the CBI study of sustainable wines in Europe shows thanks to a survey that European consumers and producers have prejudices about the quality of organic wine. Organic wine is generally perceived as being of lower quality than conventional wine from the same period, the same region and the same grape variety (Ministry of Foreign Affairs, 2016). The ethical motivation shows above all that sustainable production is not a question but a logic for most producers. And this does not only happen to champagne producers, in fact, a case study on a winery in Sicily shows that the company studied was pushed to commit itself to sustainability by reasons essentially internal to the company, this means ethical reasons, personal and economic opportunism (Borsellino, Migliore, D'Acquisto, Patrizia Di Franco, Ascianto, Schimmenti, 2016). The need of the customers is not the main motivation for 47,8% of the producers. This can be explained by the less of interest of the consumer in a more sustainable production shown by the above-mentioned study (Ministry of Foreign Affairs, 2016). Marketing and government pressure are not part of the motivations of producers either, with 80 and 90% of producers not selecting this factor. The marketing would be surely of the same explanation of the need of the customers, the disinterest of the consumers of sustainable champagne. Afterward, if we look at other wine-producing countries we can see similarities, for example in California, the main motivation for turning to sustainability is the viability of the farm, the quality of the environment and the quality of the product, which is quite close to the Champagne winemakers (Santini, Cavicchi, Casini, 2013). For Italy, we can already see that, like the people of Champagne, sustainability is important for producers, a study by Corbo shows that the interest of stakeholders in the subject is growing and a large number of sustainability programs have been launched in recent years in Italy, both by private companies and by consortiums (Corbo, 2014).

The analysis by type of producer is also very interesting. First of all, one thing does not change, no matter the type of producer, the environment remains the first motivation for all. Now at the level of the Récoltant Manipulant, the second motivation is not the ethical motivation but the

quality of the wines. The Récoltant Manipulant are the producers who take care of all the stages of production with their own grapes and their own cellar. On the other hand, only 10.07% of these producers are motivated by consumer needs. This is not the case of the Négociant Manipulant, in other words, producers who produce their wine through their own grapes and grapes purchased by suppliers. They are the ones who voted the most for consumer needs and marketing but the ones who voted the least for wine quality. These two types of producers do not have the same motivation for sustainability. The Cooperatives de Manipulant are the least motivated by marketing and the Récoltant Coopérateur are the ones whose government pressure has the most impact. Other than these things, the opinions of each type of producer are similar to the overall results.

## 4.2 Sustainability Objectives of a company

The second sub-question about the objectives of a company to develop their sustainability is answered by the literature research and some part of the survey.

The results of the questionnaire show that most of the producers are on track to achieve their goals while 11,5% have already achieved their goals. Less than 10% of them think they are far from having reached their objectives. This means that the people of Champagne think they are quite advanced in their development. Or it means that they underestimate their development goals. The most important actions according to the companies are not necessarily the ones that they carry out. The questionnaire included 2 questions on the objectives of the companies, classifying the given actions according to their efficiency to have a sustainable champagne winemaking and what actions you are carrying out within your champagne production. This means what they think is the best action and what they are doing for their company. The two results are not quite similar. Indeed, as said above, for the producers the reduction of waste, the reuse of materials and the improvement of the quality of life at work of the employees, are the three recommended actions for a sustainable production. However, the results in figure 3 show that we still have the reduction of waste in the first position, but in the second and third positions, it's the purchase of more sustainable materials and the reduction of CO<sub>2</sub> emissions that are mostly done in the company. So, purchasing more sustainable materials is more realized than reusing materials. This would be explained by a lack of materials capable of being reused, especially since one producer left in comments "unfortunately we can only reuse cardboard". The objectives of the respondents correspond to their motivation because the improvement of the quality of life at work of the employees can be due to an ethical motivation and the actions of waste reduction and purchase of more sustainable materials can flow from environmental motivation. The Champagne region, therefore, has a complete set of sustainability objectives including all 3 pillars. And the champagne is not the only wine region to work as much in the environment, the social as the economy. Indeed, as proven in the study of C. Corbo on Italian initiatives on the sustainability of wines. Italy is a new country in terms of sustainable wine, but this last year, this country has been able to update and respond to the need for sustainability and all its criteria. (Corbo, 2014). And this study is confirmed by the qualitative research in 2016 on the interrogation of a Sicilian Wine producer which also claims to develop the three parts of sustainable development (Borsellino, Migliore, D'Acquisto, Patrizia Di Franco, Asciano, Schimmenti, 2016). In other studies, we can see that the objectives of other countries are all turning towards the same goal, a more sustainable environment, but not the same expectations. For example, in the study by C. Santini, it is shown that European wine producers tend to focus on viticulture and fertilizers while in the US they are more likely to replace bottles (Santini, 2013) responsible for 29% of the carbon footprint of a winery (Guseva, 2021). To return to the three main objectives for producers, we can find the reduction of waste and CO<sub>2</sub> emissions which are also the main objectives of South African regulations. Indeed, as the study by S.

Sabbado Flores (2020) shows, the overall framework of indicators and parameters for South African initiatives includes additional guidance on issues such as waste, biodiversity and emissions, and to add a similarity to this, a Champagne producer has also listed biodiversity as one of his main objectives

### 4.3 Barriers faced by companies

To better answer the third sub-question and understand the obstacles of the Champagne companies, the analysis of the results of the survey and the literature research in relation to the barriers that the companies face in achieving their sustainable objective will be presented in this sub-section.

As far as barriers are concerned, a good part of the champagne producers seems to face more or less barriers. When ranking the level of constraints to reach their objectives, 42.5% of them placed their cursor in the middle. However, among the rest, 41,6% have some difficulties. This number is evidence of the need for this thesis to be written. In the analysis of the level of constraints encountered by types of producers, we can see that those who encounter the most problems are the Négociant Manipulant with 52% of them selecting to experience some problems. As for the others, they are quite mixed, like the total results with 50% of Coopérative de Manipulant selecting the middle slider and 60% of Récoltant Coopérateur the same.

Among the biggest barriers of the Champagne producers, we find in the first place the availability of time. Given that 69% of the respondents were the owners of the domains, it is understandable that they have less time to devote to this part of their business. However, this figure could also mean that sustainability is not a pillar of the companies, if their main problem is availability, perhaps the priorities of the Champagne companies should be reviewed. This data is confirmed by the study of G. Szolnoki, who studied the negative and positive points of wine producers around the world. In this study, we can see that in France and USA, the first barrier to sustainable development is time and mostly time management. He underlines in particular a loss of time in the administration, the implementation of new actions, the time of explanation to the employee and consumers... In this same study, we can see that for Italy, Spain and Germany, their main barrier is the cost that this will generate (Szolnoki, 2013). And not surprisingly, this is also the second barrier that Champagne winegrowers face. These cost problems imply that the investment for a more sustainable production is too expensive for the Champagne wine producers and that they cannot realize it by themselves. In third place, we find the lack of innovation. This third barrier can be linked to the objectives or the comment of the producer who underlined that unfortunately for the moment they can only reuse cartons. The wine producers criticize that there is not yet enough innovation to allow them to meet their objectives. On the other hand, the qualification of the staff is not a barrier in champagne, as well as the lack of knowledge. The lack of information on this theme is not to be missed compared to countries like Greece or Hungary, which is the main problem, still according to the study of Solnoki (Szolnoki, 2013). Only 3.54% of the respondents admitted to having no obstacles. One Champagne producer underlined the problem of making his production in a cooperative. Indeed, for the cooperative harvesters, only a small part of the winemaking is done in their hands, the will of some can be compromised in the cooperative. So the type of producers that they are, can also be a barrier for some of them. With regard to the barriers found through literature research, champagne producers do not mention the barrier of consumer need. This may be related to the fact that it is not one of their motivations. But, if champagne consumers are not interested in more sustainable wines, this will create a barrier. As discussed in the study by I. Schäufole and U. Hamm, the perception of the product by the consumers can be a problem because they can, don't be interested in this product and don't buy it (Schäufole, Hamm, 2017). Then, in Corbo's research, he points out the risk of too much sustainability programming could

lose producers and consumers (Corbo 2014). However, this doesn't seem to be a problem for the champenois. Surely because there is a main certification champenois managed by the Committee Champagne, called VDC (Viticulture Durable en Champagne). It allows not to lose the producers in what they have to realize. Nevertheless, the producers are still facing numerous French and European certifications and labels. Another barrier that champagnes producers do not have to face at the moment is the fear of the rebound effect. In a 2014 analysis, the risk of a second effect is pointed out if a quantity of winery turns to a sustainable production (Benedetto, Rugani, Vázquez-Rowe, 2014). Probably a lack of knowledge on this subject prevents wine producers from being wary of rebound effects. And finally, a last point is addressed in one of G. Luzzani's studies in relation to sustainability management. In this research, Italian wineries reproach of lacking information on how to manage a more sustainable development, on the strategies to tackle and on the tools to verify the results (Luzzani, Lamastra, Valentino, Capri, 2020). This barrier is also validated by another study of Luzzani, Grandis, Frey and Capri in 2021 that lists several obstacles that a winery may encounter in its transition to sustainability. Among these are lack of awareness, knowledge, and information within the organization and the lack of evaluation tools. This barrier reminds us that the results of this study are only the estimation of the companies and that they have no tool to measure their sustainability. This will probably also be a problem for the Champagne producer

#### 4.4 Impact of external supports

And finally, in this part a discussion on the last sub-part, the impacts of external actors will be given thanks to the above results.

By all logic the answers on the question, “did you need external support” are quite similar to the question did you have constraints to achieve your objectives. With still a majority of people thinking that one or more external actors would be useful. Within the questionnaire, this section was rotated in two ways. First, the respondents were asked to rank the different ideas for external support that had been previously thought of by the author, and then they were asked about their needs for external actors. And here again, producers have advised outside support that they do not particularly need for themselves. As expected, the champagne committee remains the first institution they need in both cases, 83.14% of the people who answered these questionnaires ticked it among the two most important external supports. However, in the second position, the producers think that the Champagne producers would need more help from the researchers, and yet according to their personal needs, they turn more in the second position to the SGV/UMC. This may be understandable, as the researchers will only provide results in the long term, while the Champagne Committee and SGV/UMC will provide results in the short term. Nevertheless, the response of the researchers' needs is linked of course with their barriers about the lack of innovation. What is surprising, is the result of the need for banks which is low (only 7.96%) compared to the barrier that the financial means provides. The people of Champagne, therefore, do not rely on banks to invest. The institutions have succeeded in attracting very little demand, but this is in line with the low barrier that the knowledge and skills of the employees have.

However, looking at some cases, such as the Washington State wine industry, it can be said that university research has helped the wine industry develop. One study suggests that successful diffusion of sustainable practices among winemakers depends on two factors: rigorous science and its effective transmission to winemakers, two issues that partly explain the differences in penetration and diffusion of sustainable winemaking practices. Institutions and researchers are also key to successful sustainable production. Another case worth mentioning is that of the Australian Wine Research Institute, which has actively promoted wine research in general and has played an important role in spreading a sustainable culture among wineries (Santini,

Cavicchi, Casini, 2013). An external support has been added, the Viti-Oeno consulting organization. This is again some help at short term, to help make decisions in the present moment.

## 4.5 Critical Reflection of the research methods

Regarding the two methods used, the survey and the literature research. Both went as planned. One of them yielded much more results, while the other one was not easy.

### 4.5.1 Survey

During the realization or sending of the questionnaire, the author faced some obstacles. In this part, we will analyze the author's management method in the face of the realization of a survey to answer his thesis. First of all, it is necessary to know that the questionnaire was sent a few days after the date normally granted (29/11/2022) due to a problem of anonymity. The author wanted the questionnaire to be anonymous in order to respect the policies of certain champagne houses, and therefore to get more answers. The problem is that a completely anonymous survey was risky because no follow-up could be done and if the link of the questionnaire was leaked, anyone could have answered it and therefore skew the results. The author, therefore, chose not to make the questionnaire anonymous but that no names would be used when writing the results. Subsequently, the creation of a database listing all email addresses, phone numbers and other company information was created and was very useful. The author recommends tools like Excel to create such a database. Time saving and good organization were the advantages of this database. However, conducting this type of survey also requires a lot of work. Most of the time spent on this survey is not the realization of the survey, the sending of the emails or the management of the answers but the creation of the database and the analysis time of the answers. Finding valid company email addresses that meet all the criteria is a workload that should not be neglected. As for the analysis of the responses, it was carried out on the IBM SPSS software, which has many advantages, but which is a software that requires time to understand and adapt. Entering the data into this software also required a lot of time. As said before, a sending of 300 emails, a reminder by email and by phone was planned to be sure to reach the minimum number of responses of 68. The first two weeks of emails had already collected 71 responses after 535 emails sent. This gives a low response rate of about 13%. However, the author did not stop there, being a quantitative study, he decided to carry out the follow-up by mail to have even more data and more representative answers. 295 companies that had not yet responded were re-contacted and this re-contact obtained a response rate of 16%, which is equivalent to 47 new responses. Unfortunately, not all responses met the criteria, and some were sent after the deadline. The deadline was January 1st to allow time to analyze the responses and enter the data into the software. The author, therefore, recommends carrying out a follow-up that allowed him to increase the number of responses by 66% in a short period of time. The good thing about this questionnaire is that it was made on Google Form, which is an easy-to-use tool that has many formulas available. For example, one of them, which was useful to use, is the obligation to answer all the questions. This allowed me to have no questionnaires with missing answers. To conclude on the survey conducted in this thesis, the author is satisfied with the results. He had a lot of fear due to the period and the fact that he was not present in the region when the survey was sent. But the results are there, many more answers were given, representative results of the champagne with a little of each type of producer and a big part of the respondents' owner or responsible of service. This proves that the answers are representative of the companies. The strengths were the software and platforms used, including Excel and Google Form, which would be used again if another opportunity arose. However, the database creation would be

done beforehand to save time. And the anonymity issues or on IBM SPSS would be solved by learning these platforms during this research.

#### 4.5.2 Literature research

As far as the research literature is concerned, the author is already less pleased since he did not manage to find the 10 articles he wanted, only 9 were selected. However, some of them are exactly what the author was looking for, with all the criteria and explanations. The few articles are therefore filled by the rich content of the others. The other reproach that could be made is the lack of words left to the producers, even if the data are very relevant to what the author was looking for, still few studies address the thoughts of the producers. As with the survey, literature research is time-consuming in terms of searching for articles and analyzing those articles. The method used was very effective for the author. It consisted of reading the summary and the conclusions & recommendations to see if the article met the criteria and to read in more detail the interesting parts. The notes made in Word were very helpful in writing the results and discussion of the thesis. Access to ScienceDirect for free through the student's school made it possible to collect the articles for free. Even though the author was sometimes bothered by interesting paid articles, he found similar articles on this software.

In conclusion, the author was quite satisfied with the results, despite some research gaps, due to the quality of the studies. The strong points were the topic, which is global and affects everyone, as well as the research platforms such as ScienceDirect which was available to the author. If another literature search were to be organized, the author would use the same software and methods of recording. The data collected will be sufficient to answer the sub-questions and the main question.

## 5. Conclusions and Recommendations

### 5.1 Conclusions

Nowadays, sustainable development has become an important theme in the wine industry. In the Champagne region, the Champagne Committee and the producers try to move their region towards this development. However, this is not always easy for the producers. This study was therefore focused on the need of champagne producers to meet the sustainability objectives in the Champagne region. An analysis of the goals, motivations, barriers, and actors that could impact producers' needs would help them move forward by reaching their own sustainability goals as well as the sustainability objectives of the Champagne region. In order to realize this, a survey among the producers of Champagne and a literature research have been conducted. This study is specialized on the winemaking and bottling process as many studies are done on the viticulture part. It will highlight the improvements that can be made in the short and long term, in this region, to advance in its sustainable development.

The results showed that Champagne producers are motivated to improve their production chain, as stated in Buttler's 2022 study, compared to wineries in general. 77.8% of champagne producers think that sustainability is important for their own business. Their main motivation is the environment, due to the climate change that is felt in the harvests. In addition, the so-called ethical motivation is present in its champagne companies, which personally motivates the owners of the domains to increase sustainability. And finally, the quality of the wines of sustainable winemaking has a good reputation among the producers, which also motivates them to improve their winemaking towards sustainable development.

The companies' goals were consistent with their motivation, they are more attracted to a circular economy with actions such as waste reduction or reuse of materials, which is similar to South Africa's certification. But also interested in improving the quality of life of employees at work to meet their ethical motivation. While taking into account the three pillars of sustainable development as Italy. 11.5% of the producers have already reached their personal goal but 78.8% think they are not finished but are on the right track.

We can also underline that their reasoning on the methods of sustainability is not the same as their actions, due to barriers. At least 37.5% of the producers encounter obstacles to achieving their goals. And these obstacles are mainly their availability to focus or work on sustainable development in their business. This is a potential sign on the level of importance of sustainable development for them in their business strategy. Their main other barrier is the financial means, which is also the reason for not switching to sustainability in many wine regions around the world. Finally, the lack of innovation available in Champagne is also a problem for producers who wish to develop.

Like the barriers encountered, the need for external actors is a necessity for 41.8% of the champagne producers. Among these actors, we find mainly the Champagne organizations: the Champagne Committee, the Syndicat Général des Vignerons and the Union des Maisons de Champagne. 83,19% of the producers affirm that the Champagne Committee must and can impact wine production in terms of sustainability. Then a good part of them think that researchers can also impact their needs, especially to cover the lack of innovation.

The real needs of producers to meet their objectives in terms of more sustainable winemaking are therefore motivation for another 22% of them, new innovations such as new materials more sustainable or techniques to reduce CO2 emissions. They would need financial means to be able to invest in new innovations or to pay the price of changes and implementation of new winemaking methods. To be able to have access to all this, they need external actors like the Comité Champagne, the Syndicat Général des Vignerons or the Union des Maisons de Champagne. If the region wishes to advance in sustainable development, these external supports must take into account the needs and follow the recommendations below.

## 5.2 Recommendations

The recommendations will therefore be addressed mainly to the champagne organizations, such as the Comité Champagne, the Syndicat Général des Vignerons or the Union des Maisons de Champagne. They should help in the short term the champagne entrepreneurs who wish to develop their sustainability with financial aid or viti-oeno advice. Even if the producers and their employees are well informed, continue to educate the actors of the region about the progress of sustainability. This will allow the producers to advance quickly in their objectives but not in the long term.

For this, external support like the champagne committee or local communities should find ways to educate producers who are not motivated or do not realize the importance of sustainability, through events or campaigns. They can even do marketing activities and advertise for sustainability, but they have to do something. This is an equally important task, because even with all the solutions for sustainable viticulture, if producers are not motivated, nothing will change. If they want to see even more in the long term, they could have an agreement on adding a class on the importance of sustainability for future Champagne producers. For example, with the school located in Avize, which is specialized in Champagne wines. A class on future techniques and the importance of sustainability would help educate the next generation of producers

The region should also invest in researchers to find solutions and new innovations for Champagne products. For example, with the reuse of materials, such as glass bottles, which can not be replaced due to pressure, despite their carbon footprint, but find new materials.

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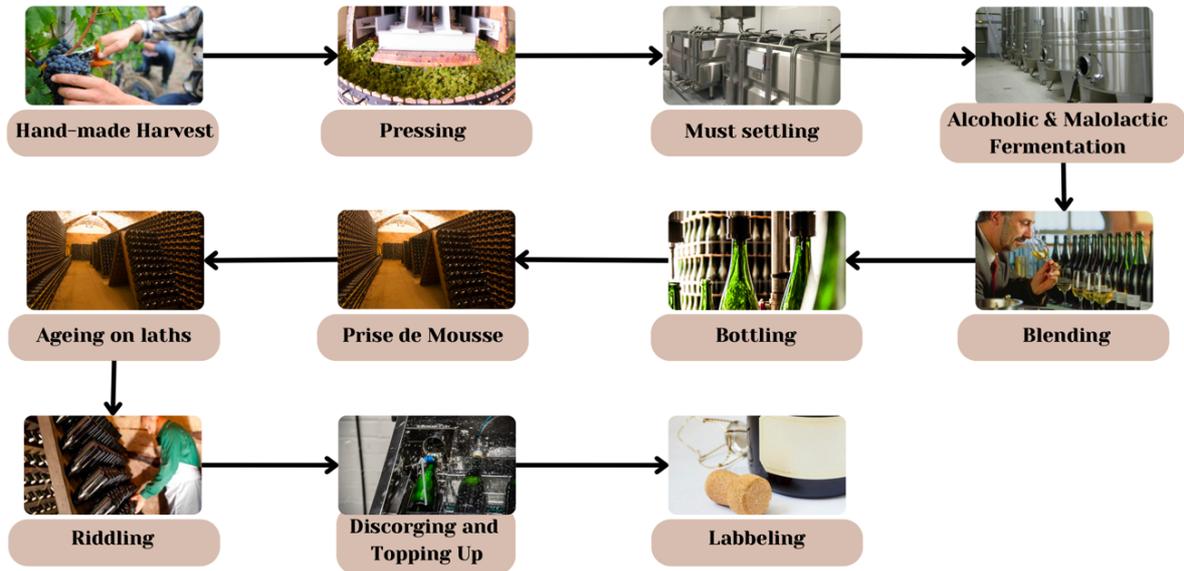
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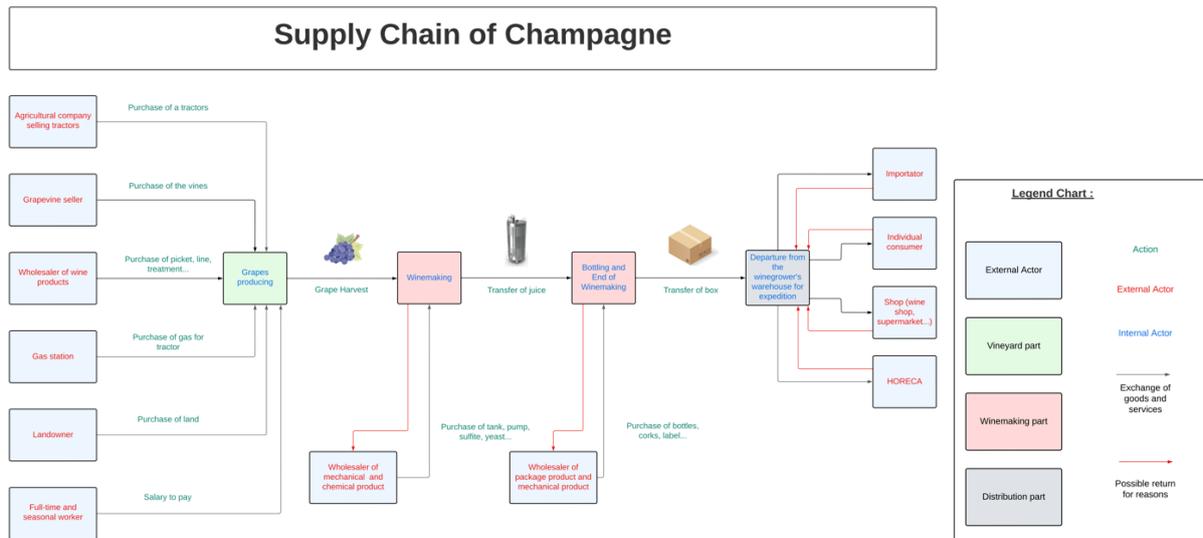
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# Appendix

## *Appendix A: Schema of the Champagne wine making process*



## Appendix B: Champagne supply chain diagram



*Appendix C: Questionnaire of the survey of this thesis*

**1) What kind of Champagne producers are you?**

- Négociant Manipulant
- Récoltant Manipulant
- Coopératives de Manipulant
- Récoltant de Coopérateur
- Other...

**2) What is your position within the company?**

- Owner
- Service Manager
- Cellar master
- Salesman
- Employee
- Other...

**3) Rank on a scale of 1 to 5 the level of importance of the sustainability in Champagne (1 lowest important and 5 the highest)**

1 – 2 – 3 – 4 – 5

**4) Rank on a scale of 1 to 5 the level of importance of the sustainability in your company (1 lowest important and 5 the highest)**

1 – 2 – 3 – 4 – 5

**5) Place on a scale of 1 to 5 the motivations for developing sustainability within a company (1 not motivating and 5 more motivating)**

<b>Motivation</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Marketing					
Environnement					
Governmental pression					
Quality of wine					
Ethical motivation					
Customer requirement					

**6) What are your main motivations to develop the sustainability within your company? (3 answer only)**

*A drop-down list of motivations will be created on google forms, with the motivations mentioned in the question above. And a new box "others" will be added to allow the producer to add new motivations if they want.*

<i>Marketing</i>
<i>Environnement</i>
<i>Governmental pression</i>

<i>Quality of wine</i>
<i>Ethical motivation</i>
<i>Customer requirement</i>
<i>Other : ...</i>

7) Place on a scale of 1 to 5 your level of sustainability within your champagne winemaking (from pressing to distribution) (1 lowest and 5 the highest)

1 – 2 – 3 – 4 – 5

8) Place on a scale of 1 to 5 the level of importance of the following actions to achieve a more sustainable wine production: (1 less important and 5 more important)

<b>Actions</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Reduce waste					
Reduction of CO2 emissions					
Purchasing more sustainable materials					
Improved the quality of work for employees					
Achieving certification					
Re-using materials					

9) What are your sustainability goals within your winemaking part? (3 answer max)

*A drop-down list of actions will be created on google forms, with the actions mentioned in the question above. And a new box "others" will be added to allow the producer to add new actions if they want.*

<i>Reduce waste (wine, water, energy, materials...)</i>
<i>Reduction of CO2 emissions</i>
<i>Use of more sustainable materials (corks, bottles, labels, cardboard, barrels, etc.)</i>
<i>Improved the quality of work for employees</i>
<i>Achieving certification</i>
<i>Re-using materials</i>
<i>Other : .....</i>

10) On a scale of 1 to 5, how difficult is it to meet your objectives? (1 it's not difficult and 5 it is)

1 – 2 – 3 – 4 – 5

11) Place on a scale of 1 to 5 the difficulties you may encounter in meeting your objectives: (1 it's not a difficulty and 5 it is)

<b>Obstacles</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Financial means					
Deadline for completion					
Availability					

Qualification of the personnel					
Lack of innovation					
Lack of knowledge on the subject					

**12) What are the main obstacles you face in achieving your sustainable goals in winemaking? (3 answer max)**

*A drop-down list of obstacles will be created on google forms, with the obstacles mentioned in the question above. And a new box "others" will be added to allow the producer to add new obstacles if they want.*

<i>Financial means</i>
<i>Deadline for completion</i>
<i>Availability</i>
<i>Qualification of the personnel</i>
<i>Lack of innovation</i>
<i>Lack of knowledge on the subject</i>
<i>I don't have any obstacles</i>
<i>Others: .....</i>

**13) Place on a scale of 1 to 5, the need of external actors, for a champagne producer who wishes to develop his sustainability within his winemaking. (1 is no need and 5 is really need)**

1 – 2 – 3 – 4 – 5

**14) Tick whether or not you think this external actor could have an impact on your objectives**

<b>Acteur</b>	<b>Not important</b>	<b>Not very important</b>	<b>Important</b>	<b>Very important</b>
SGV/UMC				
Champagne Comitee				
Institution Knowledge partners like universities				
Local government like (State, Region, Department, City...)				
Bank				
Researchers				

**15) Which is the most important external actor that you think could help producers? (2 answers only)**

*A drop-down list of external actors will be created on google forms, with the external actors mentioned in the question above. And a new box "others" will be added to allow the producer to add new external actors if they want.*

<i>SGV/UMC</i>
<i>Champagne Comitee</i>

<i>Institution Knowledge partners like universities</i>
<i>Local government like (State, Region, Department, City...)</i>
<i>Bank</i>
<i>Researchers</i>
<i>Other : ....</i>