PEFCR PILOT ONWINE

Description of scope and representative product

Technical Secretariat of the PEF pilot on wine, January 2015

This document defines the scope and the representative product for the WINE PEF Pilot. Stakeholders have discussed these contents during the first physical public consultation held on November 25th in Brussels. In addition, several comments have been received during the public consultation period.

Authors

The present document has been prepared by the Technical Secretariat for the WINE PEF pilot that is formed by the following organisations with their representatives:

Comité Européen des Entreprises Vins (CEEV)	Aurora Abad Jose Ramón Fernández
Pernod Ricard Winemakers Spain	Ainhoa Peña
Comité Interprofessionnel du Vin de Champagne (CIVC) and three Champagne producers represented by CIVC	Pierre Naviaux
Unione Italiana Vini (UIV)	Stefano Stefanucci
Soc. Agr. Salcheto	Michele Manelli
The European Container Glass Federation	Adeline Farrelly
Amcor	Gerald Rebitzer Isabelle Jenny
Nomacorc	Olav Aagaard
C.E. Liège	Joao Ferreira
Andalusian Institute of Technology (IAT)	Rafael Rodríguez Acuña Víctor Luis Vázquez
UNESCO Chair in Life Cycle and Climate Change	Cristina Gazulla Santos
European Commission	Jiannis Kougoulis

Abbreviations

BOM	Bill of materials
LCA	Life cycle assessment
PCR	Product category rules
PEF	Product environmental footprint
PEFCR	Product environmental footprint category rules
RP	Representative Product
TS	Technical Secretariat

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1. Introduction

The European Commission is leading the Environmental Footprint pilot phase and has published the guidance for its implementation (EC, 2014). All participants of the PEF pilot phase shall strictly follow this guidance. Before starting the development of a new Product Environmental Footprint Category Rules (PEFCRs) - providing specific guidance for calculating and reporting products' life cycle environmental impacts – the PEF Guidance requires that the scope and representative product are described.

Once the scope of the PEFCRs and the unit of analysis are defined, a representative product (RP) representing all products covered by the PEFCRs has to be defined as it will be the basis for the modelling of the PEF screening aiming at:

- Identifying relevant life cycle stages and processes
- Identifying hotspots
- Identifying relevant impact categories
- Facilitating the meaningful comparison between products that fall within the same RP

To define the RP, the following aspects need to be elaborated:

- Description of the representative product(s)
- Description of the model for the PEF screening studies: bill of materials, flow diagram (entire life cycle), assumptions to transportation systems, use scenario and end of life.

These two aspects are described in this document.

2. The market context

2.1 The world wine market

According to OIV, 80% of the world's wine is produced by 10 countries. While European wine-producing countries show a decreasing trend, third countries are increasing their wine production. In regard to wine consumption, the increased global in trade over the past 20 years has resulted in a shift in the wine consumption patterns: today about 39% of the wine is consumed outside Europe, compared to 31% in 2000 (OIV, 2014).

Figure 1: Wine production in the 10 main producing countries. Source: OIV, 2014

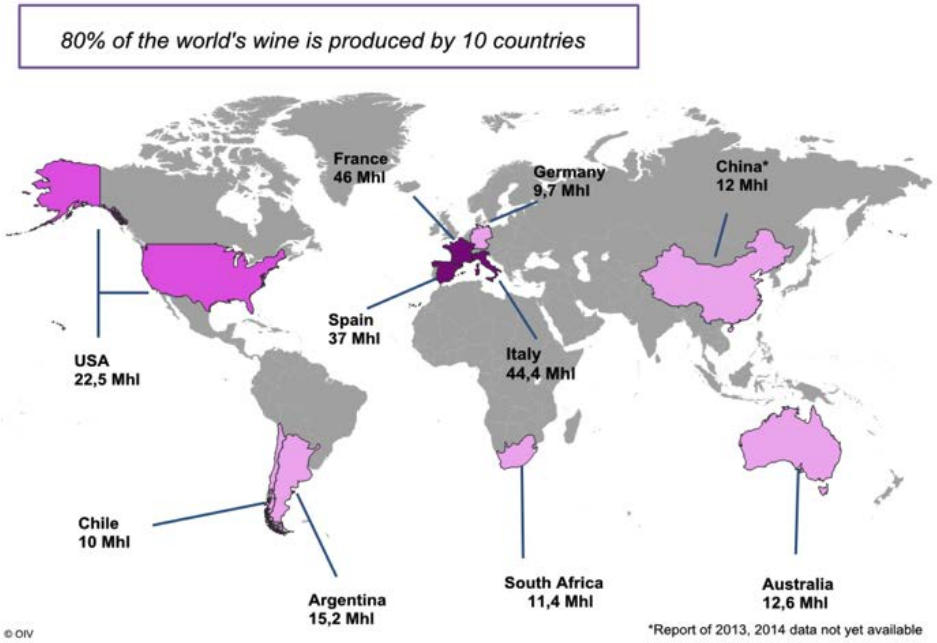


Figure 2: Countries with a decreasing production trend. Source: OIV, 2014

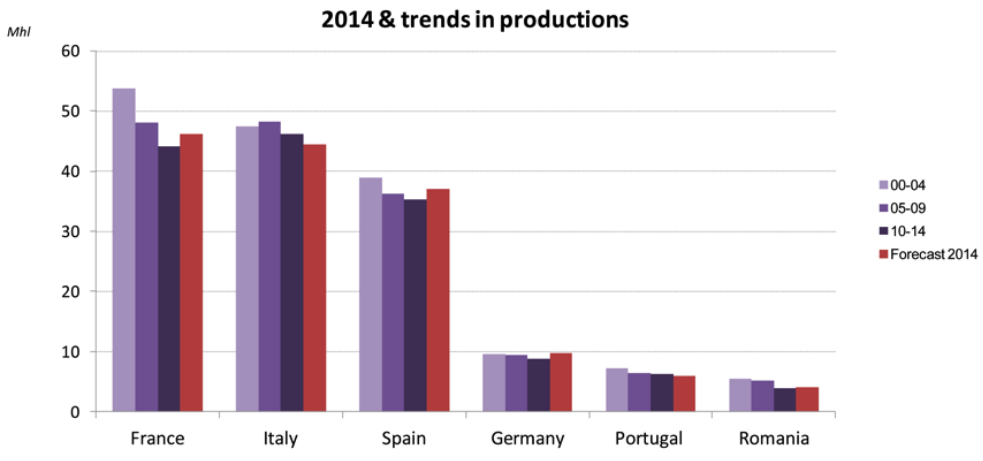


Figure 3: Countries with an increasing production trend. Source: OIV, 2014

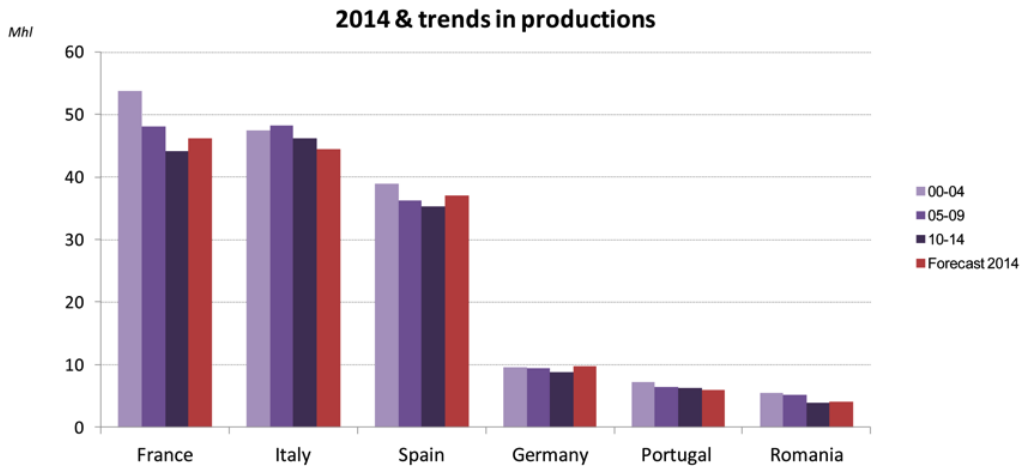
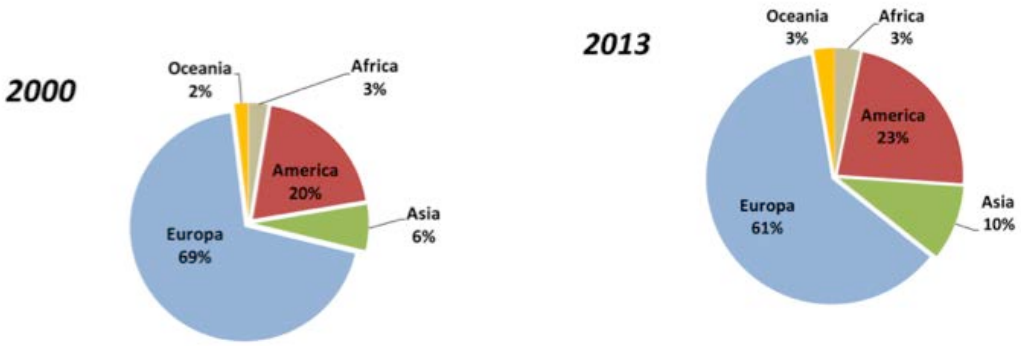


Figure 4: Shift in wine consumption geography. Source: OIV, 2014



2.2 The EU wine sector

The EU is the world's leading producer, consumer, exporter and importer of wine and accounts for:

- 55% of wine-growing areas,
- 66% of wine production,
- 60% of global consumption and
- 70% of exports in global terms.

The sector contributes by some €15 billion annually to the EU economy. Wine products are the second top exported EU agricultural product[1]. The total EU exports to third countries have grown from 17.9 Mio hl in 2007 to 22.8 Mio hl in 2011 (+27%). The total export value of EU wines increased from 5.9 Billion € in 2007 to 8.1 Billion € in 2011 (+36%)[2].

[1] CAP budget in figures, European Parliament, 2013

[2] Report from the Commission to the European Parliament and the Council on the experience gained with the implementation of the wine reform of 2008, European Commission, Directorate General for Agriculture and Rural Development COM (2012)737 final

The EU Wine sector evolves in an extremely competitive context at all levels (national, EU and international), but it is composed by an overwhelming majority of small producers, and is therefore extremely atomised in comparison with other food and drinks industries. In the EU, there are more than 2 million holdings with vineyards. In all Member States, more than 80% of wines occupy less than 20 hectare per farm[3].

2.3 Wine product categories

Regulation 1308/2013[4] defines the following categories of grapevine products (see complete definition in Annex 1):

- **Wine** is the product obtained exclusively from the total or partial alcoholic fermentation of fresh grapes, whether or not crushed, or of grape must. Wine shall have a minimum actual alcoholic strength (specific minimum limits are settled for different wine-growing zones).

- **New wine still in fermentation** in which the alcoholic fermentation is not yet complete and which is not yet separated from its less.

- **Liqueur wine** which has a minimum and maxim alcoholic strength and to which the following has been added: neutral alcohol of vine origin or wine or dried grape distillate.

- **Sparkling wine** which is obtained by first or second alcoholic fermentation from fresh grapes, from grape must or from wine and which, when the container is opened, releases carbon dioxide derived exclusively from fermentation. Further classifications are made for quality sparkling wine, quality aromatic sparkling wine, aerated sparkling wine, semi-sparkling wine and aerated semi-sparkling wine.

- **Grape must** which is the liquid product obtained naturally or by physical processes from fresh grapes and with an actual alcoholic strength of not more than 1% volume. Further classifications are made for concentrated grape must and rectified concentrated grape must.

- Partially fermented grape must be extracted from raisined grapes.

- **Wine from raisined grapes** which is produced without enrichment from grapes left in the sun or shade for partial dehydration.

- **Wine of overripe grapes** which is produced without enrichment.

[3] *Evaluation des mesures appliquées au secteur vinicole dans le cafre de la Politique Agricole Commune* http://ec.europa.eu/agriculture/evaluation/market-and-income-reports/2012/wine-sector/full_text_fr.pdf

[4] Regulation (eu) no 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007

- **Wine vinegar** which is obtained exclusively by acetous fermentation of wine and has a total acidity of not less than 60 g/l expressed as acetic acid.

However statistics are not usually gathered per wine product categories as listed in legislation. Therefore we will use available statistics about trade as a proxy of current market shares of the different wine types. Still and sparkling wines, including the subcategories quality sparkling wine, quality aromatic sparkling wine, aerated sparkling wine, semi-sparkling wine and aerated semi-sparkling wine covered by the scope of this PEFCR represent 99,46% of EU traded wines.

3. Scope of the PEFCR

3.1 Product category definition

The product category for this PEFCR is still and sparkling wines, including the subcategories quality sparkling wine, quality aromatic sparkling wine, aerated sparkling wine, semi-sparkling wine and aerated semi-sparkling wine. They represent 99,46% of EU traded wines.

Other wine products (see section 2.3) are not covered by this PEFCR however it could be used for calculating the whole or part of the PEF of other wine products.

The CPA[5]/NACE[6] class corresponding to wine product category is "11.02 – manufacture of wine from grape", including:

- Manufacture of wine
- Manufacture of sparkling wine
- Manufacture of wine from concentrated grape must
- Blending, purification and bottling of wine
- Manufacture of low or non-alcoholic wine

CPA 11.02 excludes merely bottling and labelling of wine. However, this PEFCR will include all activities that will be identified as environmentally relevant in the life cycle of the product.

3.2 Unit of analysis

The unit of analysis should be defined according to the following aspects:

WHAT	The function(s) /service(s) provided	Moderate consumption of alcoholic beverage
HOW MUCH	The magnitude of the function or service	0.75 litres of wine
HOW LONG	The duration of the service provided or service life time	not applicable
HOW WELL	The expected level of quality	Average serving temperatures are recommended for rosé and white wines (8-12ºC) and champagne (10-12ºC)
THE CPA/NACE CODE (s)	(at least 2 digits)	CPA 11.02

[5] European Classification of Products by Activity.
[6] European Classification of Economic Activities.

Comments:

About the "how much"

The resulting unit of analysis proposed is "0.75 litres of packaged wine". The reasons for doing so are:

- Packaged wine (in e.g. glass bottles, beverage carton, etc.) is a recognisable unit for wineries and consumers.
- 750 ml is a common mandatory nominal quantity for different wine products (see Directive 2007/45/EC).
- 84% of EU wine is put in the market bottled (in <2 litres containers), according to Eurostat (2013).
- 90% of packaged EU wine is put in the market in 750 ml nominal quantity, according to the last data available (EC, 2002)[7].

Also, it is worth mentioning the specific rules on presentation for sparkling wines as laid down by the EU wine legislation. These products «shall be marketed or exported in 'sparkling wine'-type glass bottles»[8]. In addition, the glass bottles are part of the elaboration process of some types of sparkling wine (see chapter 5.3.2).

About the "how long"

Wine is exempted from mandatory indication of the expiry date[9], as the product has a very long shelf life.

On the other hand, the duration of the service provided by the product may widely vary depending not only on the characteristics of the product (quantity, taste, alcoholic strength, etc.) but also on the characteristics of the consumer (age, habits, likes, etc.) and even the circumstance under the product is consumed (special occasion, periodicity, etc.).

Moderate drinking guidelines are set by governments. According to the national drinking guidelines reported by the International Centre of Alcohol Policies (ICAP), a low risk moderate consumption is defined as:

[7] For instance, 92% of the wine produced by Pernod Ricard, one of the major worldwide wine producers, is packaged in 750 ml bottles.

[8] Article 69, Regulation 607/2009 laying down certain detailed rules for implementing Council Regulation (EC) No 479/2008 as regards the vineyard register, compulsory declarations and the gathering of information to monitor the wine market.

[9] Annex X of Regulation (EU) 1168/2011 of 25 October 2011 on the provision on food information to consumers, says that an indication of the date of minimum durability shall not be required for wines, liqueur wines, sparkling wines, aromatized wines and similar products obtained from fruit other than grapes, and beverages falling within CN code 2206 00 obtained from grapes and grape musts

- Up to 2 drink units a day for women
- Up to 3 drink units a day for men
- No more than 4 drink units on any one occasion

Both the consumption of wine per person and the amount of ethanol of a drinking unit differ from country to country. The EU programme “Wine in Moderation” considers that 1 drink unit represents 10 g of pure alcohol which equates to 10 cl of wine at 12% vol., 10 cl of sparkling wine at 12% vol., 6 cl of fortified wine at 20% vol. and 7 cl of aromatised wine at 15% vol.[10]

Taking that into account, the number of drink units resulting from 0.75 litres of wine will differ from one product to another and could range from 6 to 13, depending not only on the characteristics of the wine itself but also on the consumer’s gender.

For all these reasons and for ensuring consistency with the BEER Pilot, the WINE TS suggests not using the “how long” aspect to define the unit of analysis as an objective and generally accepted method to quantify it is lacking.

[10] Source: http://www.wineinmoderation.eu/en/content/How-much-wine-is-too-much.66/

4. Representative product

As listed in Annex 1, different types of grapevine products and processes are involved in the wine sector. Vine and its by-products are used to produce more elaborated products through additional distillation and/or enrichment processes.

Through vinification, wine is produced from grapes. Wine may be marketed then in bulk or in small size containers for the retail market. Wine may also be used for obtaining vinegar or for the production (distillation) of drinkable alcohol and spirits. On the other hand, winery by-products can also be distillate for spirits production (i.e. grape pomace distillation for brandy and grappa production), or to produce industrial alcohol (marc and lees).

Other products of the wine sector are musts, concentrated must and rectified concentrated must which may be sold to wineries (for enriching their products) as well as to other sectors including grape juice and food production.

Based on all the information described in Chapters 2 and 5, it is suggested to develop two different representative products sharing the same function: still wine and sparkling wine (see Table 1). Using EU mix production of different types of wine products and the existing technologies, virtual products have been developed for each product. Different packaging options are considered to create the representative virtual products.

These representative products try to characterize what is produced in the EU. For wine imported to the EU or exported from, additional assumptions will be considered to assess how different transportation, packaging or end-of-life scenarios may impact the PEF results.

Table 1: Description of the representative virtual products

Still wine	• 53% red, 30% rosé and 17% white • 92.7% conventional wine and 7.3% organic wine • 57.3% packaged in glass bottles, 35.4% in bag in box, 4.0% in cubit, 2.9% in PET, 0.3% beverage carton and 0.2% in doypack/pouch • 100% one-way packaging • In the case of glass bottles: 67% with cork closure, 17% synthetic stoppers and 16% screw caps • 84% transported and commercialized bottled (containers < 2 litres) and 16% in bulk (i.e. containers > 2 litres)
Sparkling and semi-sparkling wine	• 78% sparkling and 22% semi-sparkling • 44% produced with the Champenoise/Traditional method and 56% with the Charmat method • Packaging: 100% bottled in glass bottles with natural cork closure • 100% one-way packaging

5. Representative product model

5.1 Bill of materials

Oenological practices are the treatments and substances (both additives and processing aids) permitted for the production of wine. The permitted oenological practices for all categories of wine products are strictly regulated by the EU wine legislation[11] in the form of a positive list largely based on the OIV Code of Oenological Practices[12]. In the EU, any treatment or practice not listed in this EU wine legislation is not permitted.

When building the bill of materials it must also be taken into consideration that, contrary to other foodstuffs, wine is not made to a fixed recipe. Each wine, even from the same producer and from the same terroir, is unique. Soil, weather, geology, varietals are all decisive yet variable factors in regard to the oenological practices to be employed each year. Wine is not made in an entirely consistent way each year and the type and amount of oenological practice used in the production of wine may widely vary depending on the harvest results, the oenologist choice, etc.

In addition, oenological practices and limits will depend also on the applicable rules of geographical indications. There are around 1,560 geographical indications for wine in the EU (AND International, 2012).

Taking into account the above, Table 2 shows the average oenological practices and ranges applicable to a virtual wine. For each treatment the maximum permitted limit (MPL) set up by legislation has been used. In the absence of numerical limit, the highest recommended dose by the producer of the oenological substance has been used. Then, taking into account the percentage of wines using each type of treatment (based on estimations build upon information from the oenological products suppliers), the quantity of each product used per unit of analysis has been calculated (see calculations in Annex 3). Taking as benchmark this conservative scenario where maximum permitted limits (MPL) or the highest dose recommended by the provider has been used, a previous study (Zhang, 2014) has estimated that in one litre of wine, the weight of oenological practices is 3.9 grams.

The complete bill of materials of still wine and sparkling wine will be provided for the screening study. In addition, this list will be complemented with all the other inputs required for the cultivation of the grapes as well as for the elaboration and the packaging of wine.

[11] Regulation 606/2009 laying down certain detailed rules for implementing Council Regulation (EC) No 479/2008 as regards the categories of grapevine products, oenological practices and the applicable restrictions

[12] OIV: http://www.oiv.int/oiv/info/enplubicationoiv?lang=en

The WINE TS wants to highlight that the bill of materials represents virtual products which could not be legally produced nor found on the real market, as some oenological products cannot be combined according to existing regulations.

Table 2: Bill of materials used in the manufacture of wine

	Quantity per functional unit (g per 0.75 litres of still wine)	
GRAPE	975	
OENOLOGICAL PRODUCTS	**Still wine**	**Sparkling and semi-sparkling wine**
Enzymes (pectolytics, glucoxidase, betaglucanase)	0.0135	0.0135
Acidification		
Lactic acid	0.0156	0.0156
Malic acid	0.0156	0.0156
Tartaric acid	0.1563	0.1563
Clarification		
Calcium alginate	-	0.0150
Potassium alginate	-	0.0001
Potassium caseinate	0.0225	0.0225
Casein	0.0225	0.0225
Isinglass	0.0011	0.0011
Silicon dioxide	0.0008 (cl)	0.0008 (cl)
Edible gelatine	0.0188	0.0188
Plant proteins	0.0338	0.0338
Ovalbumin	0.0113	0.0113
Kaolin	0.0038	0.0038
Classic filtration aids (Diatomaceus earth, cellulose, etc.)	0.4500	0.4500
Bentonite	0.4500	0.4500
Stabilisation		
Calcium tartrate	0.0750	0.0750
Potassium bitartrate	0.1500	0.1500
Yeast mannoproteins	0.0113	0.0113
Arabic Gum	0.1500	0.1500
CMC Carboxymethylcellulose	0.0300	0.0300
Fermentation		
Fresh lees	TBD	TBD
Ammonium bisulphite	0.0075	0.0075
Thiamine hydrochloride	0.00001	0.00001
Yeast cell walls	0.0900	0.0900
Yeast for wine production	0.1800	0.1800
Diammonium phosphate	0.225	0.225
Ammonium sulphate	0.1125	0.1125
Preservation		
Sorbic acid	0.0015	0.0015
SO2, potassium bisulphite or potassium metabisulphite	0.1262	0.1455

Argon	TBD	TBD
Nitrogen	0.0450	0.0450
DMDC	0.0015	0.0015
Lysozyme	0.0113	0.0113
Ascorbic acid	0.0281	0.0281
Citric acid	0.0008	0.0008
Enrichment		
Concentrated grape must	TBD	TBD
Rectified concentrated must	TBD	TBD
Saccharose	TBD	TBD
Deacidification		
Lactic Bacteria	0.1125	0.1125
Potassium carbonate	0.0075	0.0075
Neutral potassium tartrate	0.0013	0.0013
Potassium bicarbonate	0.0013	0.0013
Calcium carbonate	0.0013	0.0013
Other		
PVPP	0.0300	0.0300
Oenological Charcoal	0.0106	0.0225
Copper sulphate	0.0000	0.0000
Oak chips	0.1125	0.1125
Metatartaric acid	0.0300	0.0300
Tannins	0.0450	0.0450
OTHER INPUTS IN REGARD TO VINIFICATION		
CO2 of chemical origin	**TBD**	**TBD**
Kieselguhr, diatomites, perlites	TBD	TBD
Water	TBD	TBD
PACKAGING (STILL WINE)	Quantity and materials	Comments
Glass bottle	281.42 g of glass with 2.35 g of cork stopper, 0.74 g screw cap and 1.05 g synthetic stopper	Primary packaging of the representative still wine consists of 59.6% glass bottle, 36.8% bag in box, 3.0% PET, 0.3% carton package and 0.2% Doypack
Bag in Box	21.55 g	
PET bottle	1.62 g	
Beverage carton	0.11 g beverage carton	
PACKAGING (SPARKLING WINE)	**Quantity and materials**	**Comments**
Glass Bottles	835 g	Primary packaging of the representative sparkling and semi-sparkling wine consists of 100% glass bottle with natural cork stopper.
Cork closure	9 g	

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5.2 System boundary

The system boundaries considered include all significant material and energy flows associated with grape production, wine making, bottling, distribution, retail, consumption, and end of life of wine. Thus, it will consider:

- Energy and water consumption,
- Emissions,
- Waste management and valorisation,
- Auxiliary materials for grape production (propagating material, fertilizers, pesticides, etc.),
- Auxiliary materials for wine making (oenological practices, cleaning agents, primary, secondary and tertiary packaging, etc.),
- Transport/distribution of grapes,
- Transport/distribution of wine (in bulk and packaged intended to not only “Business to Business”, but also “Business to consumers”),
- Energy, refrigerants and maintenance of the cooling equipment needed for cooling the wine (at home cooling, bars and restaurants),
- Packaging management after consumption of the wine (re-use, recycled, landfilling or incineration).

The description of the processes/technologies used in each relevant life cycle stage is depicted in the following sub-chapters.

The system boundary proposed is shown in Figure 5, whereas Figure 6 provides more detail on the general winemaking process for still wine and sparkling wine.

Figure 5: System boundaries for wine: main steps, inputs and outputs considered.

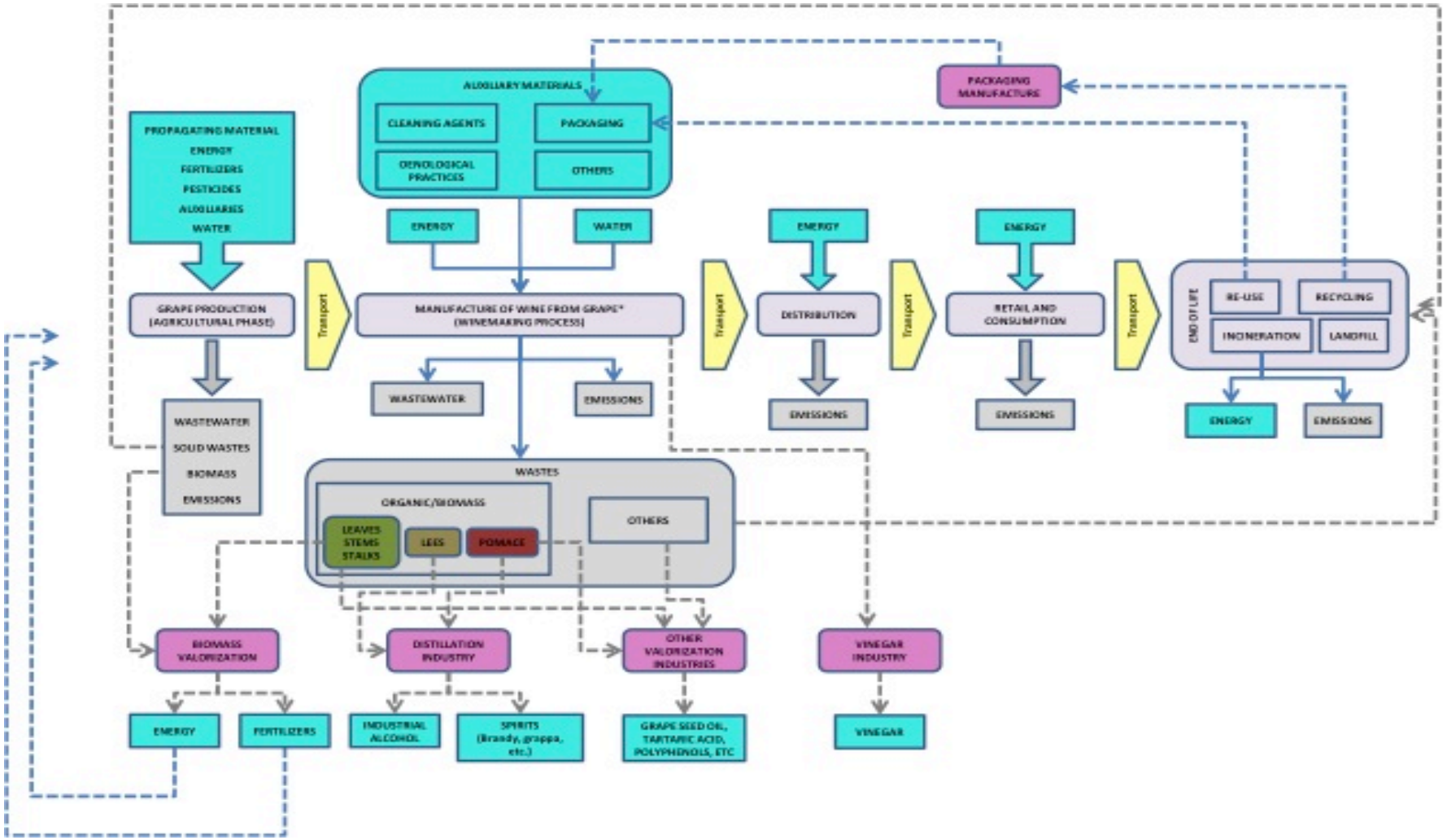
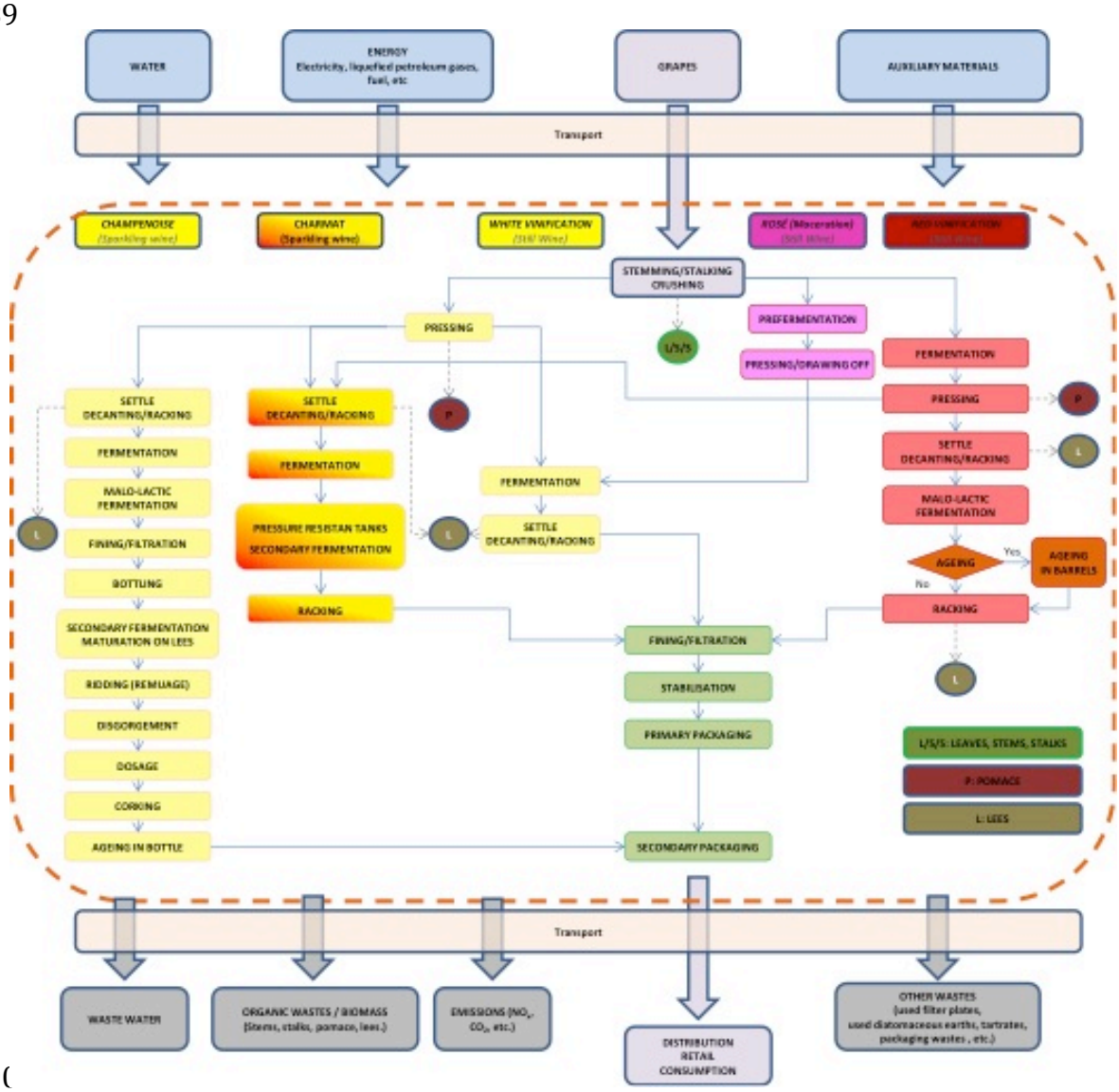


Figure 6: General winemaking processes (main stages and vinification processes*)



5.3 Description of technologies used in each relevant life cycle stage

5.3.1 Grape production

The grape production (or the agricultural phase of the wine production) includes all the operations related to the cultivation of grapes, from selection of the place for cultivation to harvesting the grapes. The main steps includes in this phase are the following (Smyth and Russell, 2009):

- **Place selection:** Good site selection implies, at least, the selection of a properly soil type, water retention and appropriate solar exposition.

- **Land preparation and vine planting**: In the year before to planting, the ground used to be conditioned to promote the vine growing. After that, the vines should be planted to ensure a properly solar distribution across the vines. Moreover, it is common practice to have a vine tutor along with the young plant. Site preparation and planting used to be mechanically intensive.

- **Establishment and training**: The young vines should be trained in the first 2 years with the aim of establishing a large healthy root system by promoting maximum amounts of healthy and well-exposed foliage. Moreover, a trellis is usually used after planting to provide the necessary support. Finally, a properly pruning of the vines is also needed to ensure a vigorous growing of the plants and its fruits.

- **Pests and disease control/management**: It is necessary to control pests and diseases in vineyards, for instance weeds (it can compete for water and nutrients; they can interfere with vineyard operations, etc.) or fungus diseases (mildew, botrytis…). Vine protection usually requires the application of pesticides. The use of these materials must be reasoned due to their potential toxicity (to animals and people), the complexity of treatment and their cost. Moreover, it usually requires vehicles for spraying the vine rows.

- **Fertilizing/nutrient management**: This practice aims to improve the available nutrients to the optimum levels required for grapevine growth and yield. There are a wide variety of fertilizers (including composts and manures). Moreover, it usually requires mechanization.

- **Irrigation:** a wide range of irrigation systems can be used, from unirrigated (only natural precipitation is used to meet water demand) to drip irrigation.

- **Harvesting:** once the grapes have reached the ripeness needed for obtaining the desired wine, they are harvested (either by hand or by mechanical harvesters).

The potential environmental impact of different production techniques will be taken into account, including fertilization (different type and amount of fertilizers used), pest management (different type and amount of pesticides used) as well as the use (or not) of irrigation systems and machinery for land and vine preparation and harvesting. To this end, different scenarios will be assessed through sensitivity analysis in order to detect those having a significant impact on the environmental footprint of the system assessed.

One of the scenarios to assess will be organic viticulture. The production of organic grapes involves significant restrictions in viticulture, since the use of soluble fertilisers is strictly limited and organic farmers are not allowed to use synthetic pesticides or herbicides, according to relevant EU legislation

EU organic vineyards are mostly located in the EU-15 and, especially in Spain, France and Italy. The organic grape is for the mentioned countries are in constant increasing trend (EC, 2014).
It has to be noted that during the grape production, the organic residues (leaves and pruning residues) which are deposited in the vineyard soil can contribute to increase its organic carbon stock. In addition, vines can contribute to carbon sequestration in its permanent structure during long periods. Both effects will be taken into account during the screening phase and presented separately in the additional information section.

5.3.2 Wine production

Wine production process

Although there are some variations in wine production process (mainly due to the type of wine to be produced and the technologies implemented in the winery itself), most of steps are common. Therefore, the wine production process can be summarized as follows (Galitsky et al., 2005; Smyth and Russell, 2009; Toscano et al., 2013):

Once in wineries, the grapes are weighed and classified. After that, all unwanted vegetal material (mainly leaves, stems and stalks) are removed. Then, the grapes are broken to liberate the juice without squashing the seeds. The mixture obtained at the end of this step (sum of juice, pulp, skins, and seeds) is called must. At this point, there are two main winemaking processes that can be selected: “white vinification”, if the must is transferred directly to the pressing stage (prior to fermentation), and “red vinification”, if the must goes directly to the fermentation stage. During the fermentation step the sugars of the must are transformed by yeasts into ethyl alcohol and CO2.

Once fermentation is finished, the dead yeasts and suspended solids (also named lees) are removed to obtain a clear wine in a process called clarification. These techniques can include sedimentation of the solids, racking (transfer of the clear wine from one tank to another after solids sedimentation), fining (addition of substances that precipitate particles in suspension) and filtration.

After clarification, the wine is usually stored for a period of time. This step depends on the wine type and winery. Thus, the wine can be stored in large tanks or in wooden (mainly oak) barrels (ageing stage). During this stage a second fermentation (also called malolactic fermentation) may take place. This reaction converts malic acid into lactic acid and CO2, reducing the acidity of the wine. Most of red wines (and some white wines) go through this stage.

Then, the finished wine is bottled, packaged and distributed. The latter steps may occur at the same winery, at another winery and/or at a bottling facility which may be located near the production site or, if the wine is distributed in bulk, at the target market.

Red, white and rosé

There is an intermediate type of vinification that produces the so-called rosé wines. Rosé wines have some similarities to red and white wines (they have a slightly red colour and use to be refreshing). Rosé wines are usually made by direct pressing or by maceration methods (Grainger & Tattersall, 2005; Ribéreau-Gayon et al., 2006):

Direct Pressing: This method consists on using the white vinification process after pressing red grapes. In this method the colour is extracted while the liquid phase of the must is in contact with the solids phase during the pressing crushed grapes. So in rosé wines obtained by direct pressing, the pressing step is slower than in the white vinification process.

Maceration methods: those methods produced deeper-coloured rosé wines. In this method the colour is extracted during short time periods (less than 36 hours) where the juice and the grape solids kept in contact (prefermentation). After that, the solids are separated from the must, either by pressing (also named skin contact method) or by drawing off (also named Saignée or bleeding), and fermented in a similar way as in the white vinification process.

Also, in regard to red, white and rosé still wines, some relevant national sales figures available may be used as a proxy of current market shares.[13]

Sparkling and semi-sparkling wine production process

At the uncorking, sparkling wines produce a significant quantity of foam resulting from the release of carbon dioxide. The main difference between sparkling and semi-sparkling wines is the pressure of the gas in the bottle[14]. The sparkling wine production process introduces some differences regarding the aforementioned general process. Thus, once the wine has been obtained may be submitted to a second fermentation in order to produce carbon dioxide. There are two main production methods: Champenoise method (also named classical or traditional method) and Charmat method (Stefenon et al., 2010 and 2014; Buxaderas and López-Tamames, 2012; Chircu Brad et al., 2012; CIVC)[15].

The principal differences between the methods occur in the second fermentation and ageing steps.

[13] The latest figures for France (2014) show that red wine represents 53% of the total still wine (in volume), rosé wine 30% and white wine 17% (source: FranceAgrimer, 2015).

[14] Using the available statistics on trade between EU and non-EU countries for wine as a proxy, it can be said that 78% of the sparkling wine corresponds to semi-sparkling wines, whereas 22% is sparkling. Source: Eurostat, 2013

[15] Based on the production data in France (the largest world producer with 22% of the global market share in volume), we can estimate that 44% of the sparkling wine is produced using the Champenoise/Traditional method whereas 56% is produced with the Charmat method. Source: France Agrimer (2015).

In the Champenoise method the juice is extracted by whole-cluster pressing, limited to 25.5 hectolitres per 4,000kg of grapes in the Champagne area. Primary alcoholic fermentation takes place immediately after pressing, usually in thermostatically controlled stainless steel tanks, though some producers still ferment their wines in wood. Most Champagne producers allow malolactic fermentation after alcoholic fermentation. The wines are then blended, stabilized, and bottled with yeast and a small amount of sugar (liqueur de tirage). The bottles are then stored in the cellars during the secondary alcoholic fermentation, the aging on lees and the riddling. At the end of the riddling, bottleneck are frozen before disgorging. After disgorging, bottles are filled with the liqueur de dosage and closed with a cork.

In the Charmat method the second fermentation of base wine takes place in stainless steel tanks (not in bottles) resistant to pressure and thermostatically controlled. Once the base wine is in the tank, yeast and liqueur de tirage are added. After the second fermentation, the wine is transferred to another tank, filtered and bottled.

Organic wine

Organic (sparkling or still) wine is covered by the general organic regulation 834/2007, which set up the principles for organic grapes production. Furthermore, Regulation 203/2012 [16] establishes the EU rules for organic winemaking defining oenological treatments and substances authorized.

On the top of organic viticulture practices, a number of restrictions are set up for the organic winemaking, namely the prohibition of physical treatments such as partial concentration through cooling, elimination of sulphur dioxide by physical process, electrodyalisys, partial dealcoholisation and treatment with cation exchangers. Also, the limits for use of sulphur dioxide on organic wine are reduced in regard to conventional wines.

According to AgenceBIO (2013) 7.31% of the EU wine production is organic.

5.3.3 Primary packaging

EU wine is mostly transported and commercialised bottled, whereas 16% is commercialised in bulk and containers (Eurostat, 2013). However it has to be mentioned that bulk statistics include packaging of 2 litres and more (such as bag in box) and therefore the final figure of packaged wine is higher.

Different volumes and packaging options may be used for **still wine** (based on BioIntelligence 2010):

[16] COMMISSION IMPLEMENTING REGULATION (EU) No 203/2012 of 8 March 2012 amending Regulation (EC) No 889/2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007, as regards detailed rules on organic wine.

- Glass bottle with a closure made out of natural cork, plastic or aluminium.
- PET bottle with a plastic screw cap closure.
- Bag in Box consisting on a flexible plastic bag (composed of an outer barrier film and an inner polyethylene film, equipped with a tap for pouring) placed in a cardboard box[17].
- Beverage carton primarily made of paperboard laminated with a thin aluminium foil and polymer layers.
- Doypack/stand up pouch consisting on a sealed plastic bag made of a multilayer laminate film with a layer of aluminium foil and a tap.
- Others: aluminium cans, plastic carafes, etc.

In the case of still wine glass bottle is the most used packaging option followed by bag in box, cubit, PET, beverage carton and doypack/pouch (France AgriMer, 2015)[18].

In the case of **sparkling and semi-sparkling wine**, it is worth noting the specific rules on presentation for sparkling wines as laid down by the EU wine legislation. These products «shall be marketed or exported in 'sparkling wine'-type glass bottles» and «closed with a mushroom-shaped stopper made of cork or other material permitted to come into contact with foodstuffs, held in place by a fastening, covered, if necessary, by a cap and sheathed in foil completely covering the stopper and all or part of the neck of the bottle»[19].

For example, Champagne is marketed in glass bottles (835 grams) with natural cork closure in 100% of the cases; the re-use of bottles is not allowed since the 90s due mainly to security and hygiene related issues (source: CIVC). Rives et al (2012) identifies 9 g as the representative weigh of champagne cork stopper.

Glass bottles

According to FEVE, in 2012 the average recycled content of glass packaging produced in the EU, Switzerland and Turkey was 52%. Remarkable variations on this rate exist depending on cullet availability and quality and type of production.

Currently re-using of glass bottles is a practice in extinction due mainly to: economic and logistic reasons (i.e. variety of types and colours of bottles used, distance between consumption and production, complex logistics for bottles to

[17] In France, the most used formats are 5 litres (61%), 3 l (27%) and 10 l (12%) (France Agrimer 2013).

[18] Available data for the French market (including still wine imported) show that 0.75 glass bottles are used to package 54.4% of the wine sold (in volume) whereas bag in box represents 35.4%, "cubit" 4.0%, other glass formats 2.9%, PET 2.9%, beverage carton 0.3% and doypack/pouch 0.2% (France AgriMer, 2015).

[19] Article 69, Regulation 607/2009 laying down certain detailed rules for implementing Council Regulation (EC) No 479/2008 as regards the vineyard register, compulsory declarations and the gathering of information to monitor the wine market.

be collected, washed, reconditioned, delivered, etc.) and quality reasons (i.e. risks of spoiling wine due to under-performing cleaning process). In addition, the unclear environmental benefits deriving from re-using bottles is another reason explaining why this practice has been abandoned by wineries.

Annex 2 describes the production process of glass bottles.

Closures

There is a wide range of closure systems that can be used by the wine sector. In general, the most used are cork stoppers, followed by synthetic stoppers and screw caps. The market shares vary depending on the type of product and specific market. A broad approach (to be refined) in the case of still wine: cork stoppers represent 67-72% of the global market, synthetic stoppers 17-14% and screw caps 16-14% (sources: Kounina et al., 2012, Euromonitor International – 2013 and information provided by closure producers).

Within cork stoppers family, there are also huge variety of stoppers, such as natural cork stoppers, natural cork stopper multiparts, agglomerate stoppers with or without natural cork discs and mixed stoppers (that are part cork and part other materials). However, two specific stoppers are the most produced: the natural cork stopper and a cork stopper made up of an agglomerated cork topped with two superposed discs of natural cork. The latter is conceived to seal champagne, cava, and other sparkling wines (Rives et al., 2012).

In summary, the natural cork stopper production process is as follows: First, cork is extracted manually (stripping) from the cork oak trees (once every nine years) and then it is transported to the factory. In the factory the cork are classified and selected before to its stabilisation. During the stabilization the slabs are immersing in hot water with the aim to eliminate organic solids and to reach the humidity that allows it processing. Afterwards, those slabs that are not properly to manufacture of natural cork stoppers are rejected (and sent to the cork agglomerate industry). In the following stage, the stabs are boiling again, cutting into strips, punching it into cylindrical pieces. The resulting stoppers are classified. In the finishing stage, the stoppers are washed and sterilised in order to eliminate microorganisms and, after that, a thin film of paraffin and/or silicone is applied to facilitate the insertion/removal of the corks. Finally, the stoppers are branded or printed, packaged, and transported to wineries (Rives et al., 2011).

Information regarding the production process of synthetic stoppers and screw caps is available at CORTICEIRA, 2008; Kounina and Dauriat, 2013; Kounina et al., 2012 and Pereira, 2014, amongst others. In the case of screw caps the main stages are: the extraction of the natural resources to the production of aluminium sheets as well as those polymeric compounds, transport of aluminium sheets and polymeric compounds to the closures production site, closure production, transport of aluminium closures from the production site to bottling centres.

Synthetic stoppers are a mix of products and usually split by production technology: extrusion or injection moulding, being extrusion the dominant one with roughly 80% of total of synthetics (source: Nomacorc). The process of synthetic stoppers production includes the extraction of the natural resources to the production of different types of plastic granules used as raw material for the closures production, transport of plastic granules to the production site, closure production, and transport of plastic closures from the production site to bottling centres. In the specific case of Nomacorc, closures are manufactured through a patented co-extrusion process consisting of two stages: 1. Raw materials are mixed, melted, and extruded to create a long, foamed cylinder forming the closure's core; 2. A second extrusion process applies a flexible outer skin, which is thermally bonded to the inner cylinder. The shape is then stabilized in cooling water before a high-speed cutting machine cuts the closures to the proper length using alcohol as a lubricant (Pereira, 2014).

5.4 Assumptions related to transportation systems

Transportation occurs in different life cycle stages of wine:

- Transportation of fertilizers and other products used at the vine, as well as of the wastes generated (e.g. organic residues, waste packaging, etc.).
- Transportation of grape from the vine to the winery.
- Transportation of oenological products and auxiliary materials used in the vinification, as well as of the wastes and by-products generated.
- Transportation of packaged wine from wineries to wholesaler.
- Transportation of packaged wine from the winery to retailers and then to the point of consumption.
- Transportation of bulk wine to other wineries or to bottling plants.
- Transportation of packaging waste at the end of life.

Different media may be used in these transportation processes (i.e. boat, truck, train, plain) and therefore will be taken into account in the screening. The mix of transport modalities will be part of the data needs for the screening and data will be collected from wineries.

New technologies in wine bulk transportation (namely the introduction of the Flexitank replacing steel containers) have had key consequences for international wine trade. Since 2007, a gradual substitution of bottled wine with bulk wine exports for some of the major wine exporting countries such as Australia, the US and South Africa. These increased exports of bulk wine entail a transfer of bottling operations from wine producer to wine consumer countries (COGEA, 2014). The environmental effects of such changes will be addressed when developing the screening study.

5.5 Assumptions on distribution

Transport distances

The increase in international trade for wine is leading to major transportation distances between wineries and final sales points. These distances can vary widely between local, regional and international markets.

The distance will be part of the data needs for the screening and data will be collected from wineries.

Secondary and tertiary packaging

The type and amount of secondary and tertiary packaging required depend on the type of wine transported and marketing choices. For example, in the case of still wines produced by Pernod Ricard, cases for containing 6 bottles are used (weight: 172 gr/ case). On the other hand, Champagne, for example, may be transported in 6 bottles cardboard cases (from 172 to 700 gr), individual cardboard or plastic cases (about 90 gr per case), wooden cases, etc. Therefore, different options exist and will be taken into account during the screening phase.

5.6 Assumptions on storage

Distributors and retailers may be required by wineries to not exceed specific storage temperatures and humidity grades in order to guarantee the preservation of the product quality. Apart from that, no other special requirements for wine storage at the point of sale are required.

5.7 Assumptions related to use scenario

Serving temperature

Still Rosé and white wines are commonly recommended to be served at 8-12ºC. In the case of sparkling (i.e. Champagne), the recommended serving temperature is between 10 and 12ºC that can be achieved by storing the product in the fridge for about 4 hours before serving.

BPX 30-323 provides a formula to calculate the electricity required to cool the wine. Considering the characteristics of an average fridge (net storing volume: 175 l, energy consumption: 236 kWh/year) the electricity consumption is 0.000154 kWh/l/h. It is planned to use this formula in the screening to calculate the minimum energy consumption and then, as part of a sensitivity analysis, check the relevance of this parameter in the case of a higher electricity consumption (i.e., considering that the wine is storage in the fridge more time than strictly required to cool it down). In addition, alignment with the BEER Pilot on this topic will be sought.

Alteration rates

Wines may be altered by different causes including cork taint, sulphides, oxidation, excess of sulphur dioxide, etc. Miranda (2010) shows the percentage of different faults in wine during the Wine Challenge competition between 2006 and 2009, being 6.8% the average rate of altered wine. Kounina & Dauriat (2013) use a trend study on Swiss consumers (2008) concluding than 77% of the altered wine bottles will be thrown away and replaced.

Recent comparative LCA study that integrate alteration rates of bottled wine for different types of closures are scarce and the results are not consistent. However, it is worth mentioning the LCA study (Kounina & Dauriat, 2013) based on the rates of replacement by wine experts in the International Wine and Spirit Competition and the previous study of Kounina et al (2012) in which alteration rates were estimated for cork stoppers and screw caps (plastic closures were not considered in this case).

During the screening phase, a sensitivity analysis will be carried out for the whole range of alteration rates in order to conclude if it a relevant parameter and, therefore, if further studies are needed to define more precisely the different alteration rates.

Use of wine glasses

The use of wine glasses will be taken into account, including their production and washing. Based on expert judgment and the reference values used by the EU programme “Wine in Moderation” the use and washing of 8 glasses per functional unit will be considered (i.e.9.4 cl of wine per glass). Wine glasses may be dish-washed or washed by hand.

During the screening phase, this transversal aspect related to all food pilots will be tackled and further developed.

5.8 Assumptions related to End of Life (EoL)

Once the wine is consumed, the packaging materials are recycled or discarded. Table 3 shows the end-of-life assumptions for the waste treatment of packaging used by the representative products.
In the case of spoiled wine it seems reasonable to consider that altered wine is poured down the drain (as done by Kounina & Dauriat, 2013).

Table 3: Waste management scenario for packaging waste

Material	Recycling (%)	Incineration (%)	Landfill (%)
Glass	72.8	0	27.2
Plastic	35.3	27.8	36.9
Paper and cardboard	83.8	7.5	8.7
Metallic	72.5	0	27.5
Wooden	37.9	29.7	32.4
Other packaging materials	41.3	30.7	28

Source: Statistical Office of the European Union (Eurostat) – Recovery and recycling data of different packaging waste flows in EU-27 (2012).

During the screening phase, this transversal aspect related to all pilots will be tackled and further developed.

5.9 Allocation

The allocation or partitioning of input or output flows between the product system under study (wine) and one or more other product systems will be addressed in different life cycle processes, including:

Grape production:

- Grape may be used to produce wine, sparkling and semi-sparkling wine as well as other grapevine products. In that case, the environmental impacts of the grape production should be allocated to the different grapevine products based on product mass (physical relationship).
- Biodegradable waste that is left on the field can be considered as part of fertilization.

Wine processing:

- Usually wineries produce different types of products simultaneously some of them requiring longer periods of ageing or storage. In that cases where allocation cannot be avoided, the different inputs and outputs will be allocated based on mass and referred to the wine product.
- By-products of wine can be distillate for spirits production (i.e. grape pomace distillation for brandy and grappa production), used to produce industrial alcohol (marc and lees) or non-alcoholic products (grape seed oil, tartaric acid, polyphenols, fertilizers, etc.). In those cases, an allocation of the environmental impacts of the upstream processes based on market value is foreseen as it better reflects the causality and hierarchy between each product.
    - In the case of grape pomace, the upstream processes are the viticulture and grape crushing processes.
    - In the case of lees, upstream processes entail viticulture and the vinification processes until the separation of lees.

The allocation of both generated impacts and avoided impacts derived from marc and lees management (i.e., distillation, composting, methanisation, etc.) will be tackled during the screening, as these outputs may be considered as raw materials for downstream uses or as waste from the winemaking process.

End of life: packaging waste may be recycled and, therefore, the formula recommended by the PEF Guide to deal with multi-functionality in end-of-life situations will be applied. During the screening the application of other formulas will be considered.

During the screening, these allocation criteria will be compared with other options (mass, economic value, energetic content) to assess their effect on the results.

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7. Glossary

- **Additional Environmental Information –** EF impact categories and other environmental indicators that are calculated and communicated alongside PEF results.
- **Allocation –** An approach to solving multi-functionality problems. It refers to "*partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems*" (ISO 14040:2006).
- **Average Data –** Refers to a production-weighted average of specific data.
- **Background processes –** Refers to those processes in the product life cycle for which no direct access to information is possible. For example, most of the upstream life-cycle processes and generally all processes further downstream will be considered part of the background processes.
- **Business to Business (B2B)** – Describes transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer.
- **Business to Consumers (B2C)** – Describes transactions between business and consumers, such as between retailers and consumers. According to ISO 14025:2006, a consumer is defined as "*an individual member of the general public purchasing or using goods, property or services for private purposes*".
- **Comparative Assertion –** An environmental claim regarding the superiority or equivalence of products, based on the results of a PEF study and supporting PEFCRs (based on ISO 14040:2006).
- **Comparison** – A comparison, not including a comparative assertion, (graphic or otherwise) of two or more products regarding the results of their PEF, taking into account their PEFCRs, not including a comparative assertion.
- **Co-product** – Any of two or more products resulting from the same unit process or product system (ISO 14040:2006).
- **Cradle to Gate –** An assessment of a partial product supply chain, from the extraction of raw materials (cradle) up to the manufacturer's "gate". The distribution, storage, use stage and end-of-life stages of the supply chain are omitted.
- **Cradle to Grave –** An assessment of a product's life cycle including raw material extraction, processing, distribution, storage, use, and disposal or recycling stages. All relevant inputs and outputs are considered for all of the stages of the life cycle.

- **Critical review** – Process intended to ensure consistency between a PEF study and the principles and requirements of this PEF Guide and PEFCRs (if available) (based on ISO 14040:2006).
- **Data Quality –** Characteristics of data that relate to their ability to satisfy stated requirements (ISO 14040:2006). Data quality covers various aspects, such as technological, geographical and time-related representativeness, as well as completeness and precision of the inventory data.
- **Environmental impact –** Any change to the environment, whether adverse or beneficial, that wholly or partially results from an organisation's activities, products or services (EMAS regulation).
- **Flow diagram** – Schematic representation of the flows occurring during one or more process stages within the life cycle of the product being assessed.
- **Foreground Processes** – Refer to those processes in the product life cycle for which direct access to information is available. For example, the producer's site and other processes operated by the producer or its contractors (e.g. goods transport, head-office services, etc.) belong to the foreground processes.
- **Gate to Gate –** A partial assessment looking only at the processes carried out on a product within a specific organisation or site.
- **Gate to Grave** – An assessment including only the distribution, storage, use, and disposal or recycling stages of a product.
- **Generic Data** – Refers to data that is not directly collected, measured, or estimated, but rather sourced from a third-party life-cycle-inventory database or other source that complies with the data quality requirements of the PEF method.
- **Input** – Product, material or energy flow that enters a unit process. Products and materials include raw materials, intermediate products and co-products (ISO 14040:2006).
- **Intermediate product** – Output form a unit process that is input to other unit processes that require further transformation within the system (ISO 14040:2006).
- **Life cycle** – Consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal (ISO 14040:2006).
- **Life-Cycle Approach –** Takes into consideration the spectrum of resource flows and environmental interventions associated with a product from a supply-chain perspective, including all stages from raw material

acquisition through processing, distribution, use, and end-of-life processes, and all relevant related environmental impacts (instead of focusing on a single issue).

- **Life-Cycle Assessment (LCA)** – Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle (ISO 14040:2006).
- **Life-Cycle Impact Assessment (LCIA) –** Phase of life cycle assessment that aims at understanding and evaluating the magnitude and significance of the potential environmental impacts for a system throughout the life cycle (ISO 14040:2006). The LCIA methods used provide impact characterisation factors for elementary flows to aggregate the impact to a limited number of midpoint and/or damage indicators.
- **Multi-functionality –** If a process or facility provides more than one function, i.e. it delivers several goods and/or services ("co-products"), it is “multifunctional”. In these situations, all inputs and emissions linked to the process must be partitioned between the product of interest and the other co-products in a principled manner.
- **Output** – Product, material or energy flow that leaves a unit process. Products and materials include raw materials, intermediate products, co-products and releases (ISO 14040:2006).
- **Product** – Any goods or services (ISO 14040:2006).
- **Product category –** Group of products that can fulfil equivalent functions (ISO 14025:2006).
- **Product Category Rules (PCR)** – Set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories (ISO 14025:2006).
- **Product Environmental Footprint Category Rules (PEFCRs)** – Are product-type-specific, life-cycle-based rules that complement general methodological guidance for PEF studies by providing further specification at the level of a specific product category. PEFCRs can help to shift the focus of the PEF study towards those aspects and parameters that matter the most, and hence contribute to increased relevance, reproducibility and consistency.
- **Product system** – Collection of unit processes with elementary and product flows, performing one or more defined functions, and which models the life cycle of a product (ISO 14040:2006).
- **Reference Flow –** Measure of the outputs from processes in a given product system required to fulfil the function expressed by the unit of analysis (based on ISO 14040:2006).

- **Sensitivity analysis** – Systematic procedures for estimating the effects of the choices made regarding methods and data on the results of a PEF study (based on ISO 14040: 2006).
- **Specific Data –** Refers to directly measured or collected data representative of activities at a specific facility or set of facilities. Synonymous with “primary data.”
- **Subdivision –** Subdivision refers to disaggregating multifunctional processes or facilities to isolate the input flows directly associated with each process or facility output. The process is investigated to see whether it can be subdivided. Where subdivision is possible, inventory data should be collected only for those unit processes directly attributable to the products/services of concern.
- **System Boundary –** Definition of aspects included or excluded from the study. For example, for a “cradle-to-grave” EF analysis, the system boundary should include all activities from the extraction of raw materials through the processing, distribution, storage, use, and disposal or recycling stages.
- **System boundary diagram –** Graphic representation of the system boundary defined for the PEF study.
- **Uncertainty analysis** – Procedure to assess the uncertainty introduced into the results of a PEF study due to data variability and choice-related uncertainty.
- **Unit of Analysis –** The unit of analysis defines the qualitative and quantitative aspects of the function(s) and/or service(s) provided by the product being evaluated; the unit of analysis definition answers the questions “what?”, “how much?”, “how well?”, and “for how long?”
- **Unit process** – Smallest element considered in the Resource Use and Emissions Profile for which input and output data are quantified (based on ISO 14040:2006).
- **Waste** – Substances or objects which the holder intends or is required to dispose of (ISO 14040:2006).

8. Annexes

Annex 1: Categories of grapevine products according to Regulation 1308/2013

Wine" means the product obtained exclusively from the total or partial alcoholic fermentation of fresh grapes, whether or not crushed, or of grape must.

Wine shall:

(a) have, whether or not following application of the processes specified in Section B of Part I of Annex VIII, an actual alcoholic strength of not less than 8.5 % volume provided that the wine derives exclusively from grapes harvested in wine-growing zones A and B referred to in Appendix I to this Annex, and of not less than 9 % volume in other wine-growing zones;

(b) have, by way of derogation from the otherwise applicable minimum actual alcoholic strength, where it has a protected designation of origin or a protected geographical indication, whether or not following application of the processes specified in Section B of Part I of Annex VIII, an actual alcoholic strength of not less than 4.5 % volume;

(c) have a total alcoholic strength of not more than 15 % volume. However, by way of derogation:

— the upper limit for the total alcoholic strength may reach up to 20 % volume for wines which have been produced without any enrichment from certain wine-growing areas of the Union, to be determined by the Commission by means of delegated acts pursuant to Article 75(2),

— the upper limit for the total alcoholic strength may exceed 15 % volume for wines with a protected designation of origin which have been produced without enrichment;

(d) have, subject to derogations which may be adopted by the Commission by means of delegated acts pursuant to Article 75(2), a total acidity content, expressed as tartaric acid, of not less than 3.5 grams per litre or 46.6 miliequivalents per litre.

"Retsina" means wine produced exclusively in the geographical territory of Greece using grape must treated with resin from the Aleppo pine. The use of Aleppo pine resin is permitted solely for the purpose of obtaining "Retsina" wine under the conditions laid down in Greece's applicable provision.

By way of derogation from point (b) of the second subparagraph "Tokaji eszencia" and "Tokajská esencia" are considered to be wine.

However, Member States may allow the use of the term "wine" if:

(a) it is accompanied by the name of a fruit in the form of a composite name to market products obtained by the fermentation of fruit other than grapes; or

(b) it is part of a composite name.

(2) New wine still in fermentation

"New wine still in fermentation" means the product in which the alcoholic fermentation is not yet complete and which is not yet separated from its lees.

(3) Liqueur wine

"Liqueur wine" means the product:

(a) which has an actual alcoholic strength of not less than 15 % volume and not more than 22 % volume;

(b) which has a total alcoholic strength of not less than 17.5 % volume, except for certain liqueur wines with a designation of origin or with a geographical indication appearing on a list to be drawn up by the Commission by means of delegated acts pursuant to Article 75(2);

(c) which is obtained from:

— grape must in fermentation,

— wine,

— a combination of the above products, or

— grape must or a mixture thereof with wine for certain liqueur wines with a protected designation of origin or a protected geographical indication, to be determined by the Commission by means of delegated acts pursuant to Article 75(2);

(d) which has an initial natural alcoholic strength of not less than 12 % volume, except for certain liqueur wines with a protected designation of origin or a protected geographical indication appearing on a list to be drawn up by the Commission by means of delegated acts pursuant to Article 75(2);

(e) to which the following has been added: (i) individually or in combination:

— neutral alcohol of vine origin, including alcohol produced from the distillation of dried grapes, having an actual alcoholic strength of not less than 96 % volume,

— wine or dried grape distillate, having an actual alcoholic strength of not less than 52
% volume and not more than 86 % volume;

(ii) together with one or more of the following products where appropriate:

— concentrated grape must,

— a combination of one of the products referred to in point (e)(i) with a grape must referred to in the first and fourth indent of point (c);

(f) to which, by way of derogation from point (e), has been added, in so far as certain liqueur wines with a protected designation of origin or a protected geographical indication are concerned which appear on a list to be drawn up by the Commission by means of delegated acts pursuant to Article 75(2):

(i) either of products listed in point (e)(i) individually or in combination; or

(ii) one or more of the following products:

— wine alcohol or dried grape alcohol with an actual alcoholic strength of not less than 95 % volume and not more than 96 % volume,

— spirits distilled from wine or from grape marc, with an actual alcoholic strength of not less than 52 % volume and not more than 86 % volume,

— spirits distilled from dried grapes, with an actual alcoholic strength of not less than 52 % volume and of less than 94,5 % volume; and

(iii) one or more of the following products, where appropriate:

— partially fermented grape must obtained from raisined grapes,

— concentrated grape must obtained by the action of direct heat, complying, with the exception of this operation, with the definition of concentrated grape must,

— concentrated grape must,

— a combination of one of the products listed in point (f)
(ii) with a grape must referred to in the first and fourth indents of point (c).

(4) Sparkling wine

"Sparkling wine" means the product:

(a) which is obtained by first or second alcoholic fermentation:

— from fresh grapes,

— from grape must, or

— from wine;

(b) which, when the container is opened, releases carbon dioxide derived exclusively from fermentation;

(c) which has an excess pressure, due to carbon dioxide in solution, of not less than 3 bar when kept at a temperature of 20 °C in closed containers; and

(d) for which the total alcoholic strength of the cuvées intended for their preparation shall not be less than 8,5 % volume.

(5) Quality sparkling wine

"Quality sparkling wine" means the product:

(a) which is obtained by first or second alcoholic fermentation:

— from fresh grapes,

— from grape must, or

— from wine;

(b) which, when the container is opened, releases carbon dioxide derived exclusively from fermentation;

(c) which has an excess pressure, due to carbon dioxide in solution, of not less than 3,5 bar when kept at a temperature of 20 °C in closed containers; and

(d) for which the total alcoholic strength of the cuvées intended for their preparation shall not be less than 9 % volume.

(6) Quality aromatic sparkling wine

"Quality aromatic sparkling wine" means the quality sparkling wine:

(a) which is obtained only by making use, when constituting the cuvée, of grape must or grape must in fermen- tation which is derived from specific wine grape varieties on a list to be drawn up by the Commission by means of delegated acts pursuant to Article 75(2).

Quality aromatic sparkling wines traditionally produced using wines when constituting the cuvée shall be determined by the Commission by means of delegated acts pursuant to in Article 75(2);

(b) which has an excess pressure, due to carbon dioxide in solution, of not less than 3 bar when kept at a temperature of 20°C in closed containers;

(c) of which the actual alcoholic strength may not be less than 6 % volume; and

(d) of which the total alcoholic strength may not be less than 10 % volume.

(7) Aerated sparkling wine

"Aerated sparkling wine" means the product which:

(a) is obtained from wine without a protected designation of origin or a protected geographical indication;

(b) releases, when the container is opened, carbon dioxide derived wholly or partially from an addition of that gas; and

(c) has an excess pressure, due to carbon dioxide in solution, of not less than 3 bar when kept at a temperature of 20 °C in closed containers.

(8) Semi-sparkling wine

"Semi-sparkling wine" means the product which:

(a) obtained from wine, new wine still in fermentation, grape must or grape must in fermentation in so far as these products have a total alcohol strength of at least 9 % vol;

(b) has an actual alcoholic strength of not less than 7 % volume;

(c) has an excess pressure, due to endogenous carbon dioxide in solution of not less than 1 bar and not more than 2,5 bar when kept at a temperature of 20 °C in closed containers; and

(d) is placed in containers of 60 litres or less.

(9) Aerated semi-sparkling wine

"Aerated semi-sparkling wine" means the product which:

(a) obtained from wine, new wine still in fermentation, grape must or grape must in fermentation;

(b) has an actual alcoholic strength of not less than 7 % volume and a total alcoholic strength of not less than 9 % volume;

(c) has an excess pressure of not less than 1 bar and not more than 2,5 bar when kept at a temperature of 20 °C in closed containers due to carbon dioxide in solution which has been wholly or partially added; and

(d) is placed in containers of 60 litres or less.

(10) Grape must

"Grape must" means the liquid product obtained naturally or by physical processes from fresh grapes. An actual alcoholic strength of the grape must of not more than 1 % volume is permissible.

(11) Partially fermented grape must

"Grape must in fermentation" means the product obtained from the fermentation of grape must which has an actual alcoholic strength of more than 1 % volume but less than three fifths of its total alcoholic strength by volume.

(12) Partially fermented grape must extracted from raisined grapes

"Grape must in fermentation extracted from raisined grapes" means the product obtained from the partial fermentation of grape must obtained from raisined grapes, the total sugar content of which before fermentation is at least 272 grams per litre and the natural and actual alcoholic strength of which shall not be less than 8 % volume. However, certain wines, to be determined by the Commission by means of delegated acts pursuant to Article 75(2), that meet these requirements shall not be considered to be grape must in fermentation extracted from raisined grapes.

(13) Concentrated grape must

"Concentrated grape must" means uncaramelised grape must which is obtained by partial dehydration of grape must carried out by any authorised method other than by direct heat in such a way that the figure indicated by a refractometer used in accordance with a method to be prescribed in accordance with the first subparagraph of Article 80(5) and point (d) of the first subparagraph of Article 91 at a temperature of 20 °C is not less than 50,9 %.

An actual alcoholic strength of the concentrated grape must of not more than 1 % volume is permissible.

(14) Rectified concentrated grape "Rectified concentrated grape must" means:

(a) the liquid uncaramelised product which:

(i) is obtained by partial dehydration of grape must carried out by any authorised method other than direct heat in such a way that the figure indicated by a refractometer used according to a method to be prescribed in accordance with the first subparagraph of Article 80(5) and point (d) of the first subparagraph of Article 91 at a temperature of 20 °C is not less than 61,7 %;

(ii) has undergone authorised treatment for de-acidification and elimination of constituents other than sugar; (iii) has the following characteristics:

— a pH of not more than 5 at 25 Brix,

— an optical density at 425 nm for a thickness of 1 cm of not more than 0,100 in grape must concentrated at 25 Brix,

— a sucrose content undetectable by a method of analysis to be defined,

— a Folin-Ciocalteu index of not more than 6,00 at 25 Brix,

— a titratable acidity of not more than 15 millequivalents per kilogram of total sugars,

— a sulphur dioxide content of not more than 25 milligrams per kilogram of total sugars,

— a total cation content of not more than 8 milliequivalents per kilogram of total sugars,

— a conductivity at 25 Brix and 20°C of not more than 120 micro-Siemens/cm,

— a hydroxymethylfurfural content of not more than 25 milligrams per kilogram of total sugars,

— presence of mesoinositol.

(b) the solid uncaramelised product which:

(i) is obtained by crystallisation of liquid rectified concentrated grape must without the use of solvents;

(ii) has undergone authorised treatment for de-acidification and elimination of constituents other than sugar; (iii) has the following characteristics after dilution in a solution at 25 Brix:

— a pH of not more than 7,5,

— an optical density at 425 nm for a thickness of 1 cm of not more than 0,100,

— a sucrose content undetectable by a method of analysis to be defined,

— a Folin-Ciocalteu index of not more than 6,00,

— a titratable acidity of not more than 15 millequivalents per kilogram of total sugars,

— a sulphur dioxide content of not more than 10 milligrams per kilogram of total sugars,

— a total cation content of not more than 8 millequivalents per kilogram of total sugars,

— a conductivity at 20 ℃ of not more than 120 micro-Siemens/cm,

— a hydroxymethylfurfural content of not more than 25 milligrams per kilogram of total sugars,

— presence of mesoinositol.

An actual alcoholic strength of the rectified concentrated grape must of not more than 1 % volume is permissible.

(15) Wine from raisined grapes

"Wine from raisined grapes" means the product which:

(a) is produced without enrichment, from grapes left in the sun or shade for partial dehydration;

(b) has a total alcoholic strength of at least 16 % volume and an actual alcoholic strength of at least 9 % volume; and

(c) has a natural alcoholic strength of a least 16 % volume (or 272 grams sugar/litre).

(16) Wine of overripe grapes

"Wine of overripe grapes" means the product which: (a) is produced without enrichment;

(b) has a natural alcoholic strength of more than 15 % volume; and

(c) has a total alcoholic strength of not less than 15 % volume and an actual alcoholic strength of not less than 12 % volume.

Member States may prescribe a period of ageing for this product.

(17) Wine vinegar

"Wine vinegar" means vinegar which:

(a) is obtained exclusively by acetous fermentation of wine; and

(b) has a total acidity of not less than 60 grams per litre expressed as acetic acid.

Annex 2: Wine bottle production

The glass industry is very diverse and covers a variety of very different types of products and technologies, including bottles and jars, flat glass, continuous filament glass fibres (not to be confused with mineral glass wool), flaconnage, tableware, mineral wool, optical fibres and special glass (lighting glass, optical glass, laboratory and technical glassware, borosilicate and glass ceramic (cookware), etc.).

Glass is well known for its inertness properties (no interaction with the product it contains) and is therefore particularly well suited for food and drink packaging.

Container glass (bottles and jars) is made by melting together several largely naturally occurring minerals The most common raw materials used to produce glass are:

- Cullet (the name for post-consumer recycled glass)
- Silica sand soda ash (used to reduce the melting temperature)
- Limestone (to enhance the durability of glass)
- Other materials can be added to produce different colours or properties.

The manufacturing process of glass consists of the following steps:

- Selection and controlling of raw materials.
- Preparation of materials: essentially weighing and mixing materials to a set batch recipe.
- Melting: the raw materials undergo fusion at high temperature (1,300 to 1,550 °C in a furnace.
- Forming: the molten glass is shaped and allowed to solidify
- Annealing: internal stresses in the container are removed by reheating the bottle and cooling it slowly.
- Finishing: finishing includes in particular quality control.

Container glass furnaces are generally designed to melt large quantities of glass over a continuous period of more than 15 years and range in output from 150 tonnes of glass per day to over 600 tonnes of glass per day. The glass is contained in a tank constructed of blocks of refractory materials closed by a vaulted ceiling or crown.

Heat is provided by burning fossil fuels (natural gas or heavy fuel oil) above the glass bath. The mass of molten glass contained in the furnace is held constant, and the mean residence time is of the order of 24 hours of production for container furnaces. A conditioning phase at lower temperatures follows the primary melting stage. During this process, the melt cools slowly to a working temperature between 900°C and 1350°C.

At the end of the furnace, the glass stream is distributed to different forehearths which feed the production lines. Here, the glass article will receive its final shape.

Glass containers are produced in a two stage moulding process by using either the press and blow, or blow-blow techniques. There are five essential stages in automatic bottle production.

1. Obtaining a piece of molten glass (gob) at the correct weight and temperature.
2. Forming the primary shape in a first mould (blank mould) by pressure from compressed air or a metal plunger.
3. Transferring the primary shape (parison) into the final mould (finish mould).
4. Completing the shaping process by blowing the container with compressed air to the shape of the final mould.
5. Removing the finished product for post forming processes.

Annex 3: Bill of materials

Treatment	Oenological practice	% of wines applying it	Maximum Permitted Limit (MPL) or Good Manufacturing Practice (GMP)/recommended dose	Remarks	Quantity per Representative product - still wine (g/0.75 l)	Quantity per Representative product - sparkling wine (g/0.75 l)
Enzymes (pectolytics, glucoxidase, betaglucanase)		60	GMP. Recommended dose 3g/hl		0.0135	0.0135
Acidification	Lactic acid	2,5	250 g/hl singly or in combination		0.0156	0.0156
	Malic acid	2,5			0.0156	0.0156
	Tartaric acid	25			0.1563	0.1563
Clarification	Calcium alginate	25	GMP recommended 8 g/hl	Only sparkling	-	0.0150
	Potassium alginate	25	GMP recommended 0.06 g/hl	Only sparkling	-	0.0001
	Potassium caseinate	5	GMP recommended 60 g/hl		0.0225	0.0225
	Casein	5	GMP recommended 60 g/hl		0.0225	0.0225
	Isinglass	10	GMP recommended 1.5 g/hl		0.0011	0.0011
	Silicon dioxide	1	GMP recommended 10 cl/hl		0.0008 cl	0.0008 cl
	Edible gelatine	25	GMP Recommended 10 g/hl		0.0188	0.0188
	Plant proteins	9	GMP Dose maximal 50 g/hl		0.0338	0.0338
	Ovalbumin	15	GMP recommended 10 g/hl		0.0113	0.0113
	Kaolin	0,5	GMP 100 g/hl recommended		0.0038	0.0038
	Classic filtration aids (Diatomaceus earth, cellulose, etc.)	30	GMP recommended 200 g/hl		0.4500	0.4500

	Bentonite	60	GMP recommended 100 g/hl		0.4500	0.4500
Stabilisation	Calcium tartrate	5	200 g/hl		0.0750	0.0750
	Potassium bitartrate	5	GMP recommended 400 g/hl		0.1500	0.1500
	Yeast mannoproteins	5	GMP recommended 30 g/hl		0.0113	0.0113
	Arabic Gum	25	GMP recommended 80 g/hl		0.1500	0.1500
	CMC Carboxymethyl-cellulose	40	10 g/hl		0.0300	0.0300
Fermentation	Fresh lees	20	Quantity not exceeding 5% of the volume of the product treated		TBD	TBD
	Ammonium bisulphite	5	20 g/hl		0.0075	0.0075
	Thiamine hydrochloride	2	0.06 g/hl		0.00001	0.00001
	Yeast cell walls	30	40 g/hl		0.0900	0.0900
	Yeast for wine production	80	GMP recommended 30 g/hl		0.1800	0.1800
	Diammonium phosphate	30	100 g/hl		0.225	0.225
	Ammonium sulphate	15	100 g/hl		0.1125	0.1125
Preservation	Sorbic acid	1	20 g/hl		0.0015	0.0015
	SO2, potassium bisulphite or potassium metabisulphite	97	15 g/hl for red wines; 20 g/hl or white and rosé wines.	Still wine: 53% red / 47% white & rosé. Sparkling wine: 100% white	0.1262	0.1455
	Argon	2	GMP recommended 2 to 3 times the volume corresponding to the volume of headspace to be inerted.		TBD	TBD
	Nitrogen	30	20 g/hl		0.0450	0.0450
	DMDC	1	20 g/hl		0.0015	0.0015
	Lysozyme	3	50 g/hl		0.0113	0.0113

	Ascorbic acid	15	25 g/hl		0.0281	0.0281
	Citric acid	0,1	100 g/hl		0.0008	0.0008
Enrichment	Concentrated grape must	25	Limits for the increase of the alcoholic strength: - 3% vol. in wine-growing zone A - 2% vol. in wine-growing zone B - 1.5% vol. in wine-growing zone C		TBD	TBD
	Rectified concentrated must	25			TBD	TBD
	Saccharose	35			TBD	TBD
Deacidification	Lactic Bacteria	15	GMP recommended: 10 g/hl		0.0113	0.0113
	Potassium carbonate	1	100 g/hl		0.0075	0.0075
	Neutral potassium tartrate	0,5	100 g/hl singly or in combination		0.0013	0.0013
	Potassium bicarbonate	0,5			0.0013	0.0013
	Calcium carbonate	0,5			0.0013	0.0013
Other	PVPP	5	80 g/hl		0.0300	0.0300
	Oenological Charcoal	3	100 g/hl	Only white wine	0.0106	0.0225
	Copper sulphate	0,1	1 g/hl		0.0000	0.0000
	Oak chips	3	GMP recommended 500g/hl		0.1125	0.1125
	Metatartaric acid	40	10 g/hl		0.0300	0.0300
	Tannins	20	GMP recommended 30 g/hl		0.0450	0.0450