

A Work Project, presented as part of the requirements for the Award of a Master Degree in
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DESIGN OF A COSTING SYSTEM AT QUINTA DA MATA FIDALGA

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Abstract

This Work Project presents an Empirical Case Study addressing the design of a costing system for a winemaking company. The system was designed with the main objective of achieving the production costs of each type of wine produced by the company, allowing the management to make more accurate and informed strategic decisions regarding price and cost control. Taking into consideration the organization and structure of the company, the chosen method to suggest the company to implement was the homogeneous cost pool method. If the implementation was successful, the method may be improved to a more sophisticated method.

Keywords: Homogeneous Cost Pool Method, Management Accounting, Wine Industry, Empirical Case Study

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I. Introduction

“Anecdotal evidence suggests SMEs are using product costing approaches that would, from an academic perspective, be considered suboptimal” (Reddaway et al., 2011, p. 2). Research in management accounting in large firms has been a trend, while in small firms it has been unusual, despite the economic value that may be derived from it (Mitchell and Reid, 2000).

Many wine firms, do not have yet monitoring and control systems of production costs in place, being it a consequence of lack of resources (e.g. human, knowledge and budget) (Marone et al., 2014) and additionally because it is necessary to analyse not only the costs and benefits, but also the implications of such implementation. However, it is of big importance to offset this deficit through the creation of product costing systems, even if simple, since in a wine firm the majority of the costs are related to the production phase. Furthermore, different organizational segments of the firm will have different costs, due to the different activities performed, which will be possible to estimate through the use of the homogeneous cost pool method.

The growing importance of wine in the Portuguese economy and culture, the fact that there are not many studies in the field of management accounting in the wine industry, nor regarding small companies and finally the importance of monitoring and control systems are the main reasons for the development of this Work Project (WP), with the important contribution of QMF.

Thus, the purpose of this WP is to design a costing system that fits the necessities of QMF, allowing the company to calculate its production costs and to understand the differences in the costs of its different categories of wines, using an experimental case study (Ryan et al., 2002) following the logic of interventionist research, while trying to answer the following research questions (RQ):

RQ1: How to design a new costing system based on the homogeneous cost pool method to QMF?

RQ2: What are the costs of the products produced by QMF according to the homogeneous cost pool method?

The WP is structured in different sections: **Literature Review**, presenting the management accounting context and main hypothesis; **Methodology**, incorporating the explanation of how the research was developed; **Empirical Case Study**, including the specific case of QMF, as well as the main limitations in the development of the homogeneous cost pool method and possible improvements in the future; and lastly **Conclusion**, with the presentation of the main findings and conclusions.

II. Literature Review

Research on management accounting tools in small firms usually find that small businesses have few management information, lack of control and ad hoc decision-making processes (Perren and Grant, 2000). However, the current market conditions impose the need for managers to use accurate accounting information. “The knowledge of the production costs of a good is a key element in business management and the basis for a correct strategy to deal with management issue and/or to check the efficiency of the various production phases” (Marone et al., 2014, p. 3). Thus, the current lack of comprehension regarding the accounting practices in small and family businesses comes out as an important issue (Reddaway et al., 2011).

Even though the homogeneous cost pool method is a traditional costing system, the autonomy of the accounting information of each section provides much more accurate costs, while facilitating the distribution of overhead costs, the control of the operations and the opportunity for managers to make more truthful decisions (Silva, 1991). Therefore, this method can be applied with successful results, since it provides managers more reliable information regarding the costs of different sections, trying to find cause-and-effect relationships between the costs and the final product. However, “in order to achieve these purposes, the analytical business

accounting system must be strictly adapted to the organizational structure of the firm and to the specific business it is involved in” (Lebas, 1994, p. 476).

i. The origin of the homogeneous cost pool method

The homogeneous cost pool method seems to have its origin in Germany. “It was there that first began the distribution of costs among the “places” (*stellen*) in which the products were elaborated and then allocated to the different phases of production, the different activities or the different categories of products in which the costs are incorporated” (Silva, 1991, p. 341).

The method was early adopted in France, implemented by the CEGOS (*Commission Générale d’Organization Scientifique*) in 1927 and officially published in 1937, as the *méthode des sections homogènes*, with the aim of providing “a standardized approach to costing in order to allow firms to compete better through the use of similar costing methods” (Lebas, 1994, p. 475).

This method evolved alongside with changes in the market and was adopted by other countries.

ii. Description of the homogeneous cost pool method

The homogeneous cost pool method may be seen as a two stage allocation process, requiring **four steps**. Step 1 and 2 will relate to the first stage and steps 3 and 4 to the second stage (Drury, 2012, 2018).

The **first step** of the two stage allocation method is “assigning all manufacturing overheads to production and service cost centres” (Drury, 2012, p. 52). In order to do that, it is necessary to create sections (cost centres), taking into consideration the structure of the company and the information needs. Therefore, the number of sections to create depends on the circumstances of the company in analysis. However, there are three conditions that all sections must comply with: the existence of a responsible, the development of similar tasks or set of tasks (homogeneous tasks) and lastly, it should be possible to identify a common unit of measurement for all the costs

of that section, which allows at the same time the control and the allocation of costs to the respective cost object (Major et al., 2015).

Taking the above mentioned aspects into account, it is possible to create the following groups of sections: sections of supply, industrial sections, sections of distribution and administrative sections. The sections of supply are generally related to warehouses of raw materials and finished and semi-finished products. Industrial sections are related with production, and they may be divided into main sections (“production cost centres”) according to Drury, 2012, 2018 and auxiliary sections (“service cost centres”). The main sections are those centres which activity is dedicated to the production of the products of the company. They are usually comprised of production departments, and it is possible to create as many sections as the number of transformations of raw materials that occur in the production process. The auxiliary sections (service centres) are the ones responsible for providing services to other sections (either production or service centres). Finally, the distribution and administrative sections relate to the commercial and administrative departments (Major et al., 2015).

Afterwards, the activity of each section must be identified. The costs of each one must be classified by nature, by function and taking into account the different cost objects and the organizational structure. The direct costs may be allocated directly to each section. Indirect costs should be distributed among the sections using some criteria that must take into consideration the “causality relationships that may exist between the costs and the activity of each department” (Silva, 1991, p. 356). At this stage, the primary allocation of costs is completed (Caiado, 2008).

In case of auxiliary activities were identified, it is necessary to transfer the costs of these activities to the main sections. Therefore, the **second step** of the two-stage allocation method is “reallocating the costs assigned to service cost centres (auxiliary sections) to production cost centres (main sections). (...) The method that is chosen to allocate service centre costs to

production centre should be related to the benefits that the production centres derive from the service rendered” (Drury, 2012, p. 55). This step constitutes the secondary allocation of costs, sometimes called refunds (Caiado, 2008).

When service departments provide services to other service departments or production departments, the process of allocating costs is more complex. There are four different methods to perform this allocation, according to Drury, 2012. In the repeated distribution method, the costs of the service department are allocated sequentially in the corresponding percentages until the value of costs is not significant anymore. The simultaneous equation method uses simultaneous equations, in which x respects to total overhead of service department 1 and y to the total overhead of service department 2. By combining this unknowns with the costs of each service department and the percentages of costs correspondent to each service department, the values of x and y are identified and are apportioned to the production departments in the initially defined percentages. The third alternative is the specified order of closing method, in which the overheads of the service departments are allocated to the production departments in a specific order, being the service department with the largest proportion of work the first to be closed, sacrificing “accuracy for clerical convenience” (Drury, 2012, p. 70). Finally, the direct allocation method ignores the services established between service departments and considers only the reallocation of service department costs to production departments. This last method is usually used due to its simplicity and mainly when inter-service reallocations are not significant (Drury, 2012). After this step, the first stage of the two stage allocation process is completed.

The **third step** of the process is “computing separate overhead rates for each production cost centre” (Drury, 2012, p. 55). The activity of each section is normally expressed in hours (machine hours (Mh), labour hours (Lh), functioning hours (Fh)) and it will allow the allocation of the cost of each section to the products, thus implying that there are homogeneity in the tasks performed

in each section (Major et al., 2015). “The overhead rate to adopt will be the one that expresses better the correlation between the variation of the variable costs of the section and the quantitative variation of the activity performed in that section” (Margerine and Ausset, 1990, p. 136). Furthermore, the adoption of a specific overhead rate will depend on the nature and importance of the costs, as well as the accuracy required (Silva, 1991). The overhead rate is computed by dividing the total cost of the section by the activity.

The section of supply requires a different process of allocating the costs. The most common bases of allocation for the costs of warehouses of raw materials are the quantities bought, the purchasing value, the quantities consumed or the consumption value. The most usual allocation bases of the costs of warehouses of finished and semi-finished products are the quantities produced, the quantities sold or the sales value. In both cases, the approach chosen must be the one that provides a more regular division of the costs and the one that better describes the usual activity of the company. The allocation unit is given by dividing the total cost of the section by the total amount of the allocation base chosen (Major et al., 2015).

Finally, the **fourth step** of the two stage allocation process is “assigning cost centre overheads to products or other chosen cost objects (...) passing through the production centres” (Drury, 2012, p. 56). In order to compute the costs of production, it is necessary to calculate the cost of raw materials and the transformation costs (considering both the main sections and the sections of supply). This final step concludes the two stage allocation process as suggested by Drury.

After the determination of the production costs, it is then possible to construct the income statement by functions (“profit and loss account”), where the costs of the distribution and administrative sections that were not included before are going to show up (Major et al., 2015). At this point, it will be possible for managers to determine the costs of each section as well as the

production cost of each product in a more accurate way, allowing them to make more rational and strategic decisions.

iii. Limitations of the homogeneous cost pool method

There are some limitations pointed out to the homogeneous cost pool method, which were reinforced with the appearance of activity-based costing systems, characterized by having more cost pools and more sophisticated cost drivers (both volume and non-volume), providing consequently greater accuracy of the allocation of resources.

The limitations of the method start with the homogeneity criterion. When the companies in analysis have a multiple and diversified production, it is usually difficult to divide it in homogeneous sections (Margerin and Ausset, 1990). “Homogeneity is all the easier to achieve as more centres of calculation (sections) exist. However, the multiplicity of these sections may have serious practical disadvantages due to the additional work involved” (Silva, 1991, p. 348). Consequently, if not enough sections were created, products with similar times of production but different functioning costs will have different costs of production that are not considered in the model (Margerin and Ausset, 1990). In order to minimize this problem, in a situation in which the same section provides different outputs and it is not possible to divide the sections into more restricted sections, “the most relevant service unit should be retained as the descriptor or the ‘output driver’” (Lebas, 1994, p. 478).

Moreover, the allocation of indirect costs to products constitutes a problem. Even though the costs should be allocated taking into consideration the causality relationships, this process is subjective and sometimes the distribution may be considered arbitrary. “However, if it is difficult to allocate those costs to different products or services produced, it is relatively easier to allocate them between the different offices or divisions of the factory” (Silva, 1991, p. 338). Another disadvantage sometimes appointed to the homogeneous cost pool method is that the costs of the

commercial and administrative departments are not taken into account in the costs of the products, appearing only in the income statement by functions (Major et al., 2015).

To conclude, it is important to acknowledge that “the benefit of using a multiple cost-pool system must be balanced against the costs of implementing it” (Horngren et al., 2012, p. 509).

iv. The homogeneous cost pool method in the wine industry

Given the current trends of the wine sector in Portugal (the average volume of the wine business is two times superior to the national average (Banco de Portugal, 2017)), it is important to provide managers the necessary tools to respond to the increasing customers’ requirements and expectations. However, the information regarding the use of the homogeneous cost pool method in the wine industry is scarce and the majority of companies in this sector still do not have costing systems implemented (Marone et al., 2014). Moreover, when companies are small, such as the case of QMF, it is even more difficult to find research in the management accounting field, since researchers tend to focus on the study of larger companies (Mitchell and Reid, 2000). Additionally, in the wine sector, it is common that companies produce different types of wine, which requires a particular expertise and the correct assessment of the costs of each bottle of wine. Some authors defend that it will be possible to achieve through the use of the homogeneous cost pool method or the Activity-Based Costing (ABC) method (Marone et al. 2014).

III. Methodology

This WP, based on QMF information, followed an experimental case study approach. This type of case studies allows the development of tools and instruments of management accounting that may be helpful for managers in solving specific problems. The objective of this type of case study is to examine the specific case, here QMF, instead of creating statistical generalizations. During the WP’s development, the researcher acted as a facilitator (Ryan et al. 2002).

The logic of interventionist research was used with the objective of cross bridging practice and theory. In this type of research, the researcher is directly involved in the case study with an active participant observation that is going to have an effect in the organization (Suomala et al., 2014). “The researcher is directly involved with the actors, systems, or processes in the field and uses (...) observation and interviews, most often in combination – supported by the study of archives” to collect the empirical research materials (Jonsson and Lukka, 2007, p. 373). The conclusions obtained may be further analysed (*ibid*).

The case study approach requires some steps to be followed. The first step was the preparation, which consisted in the analysis of the existent literature in order to define the methods, the methodology as well as the research questions to be answered, taking into consideration some constraints, mainly time constraints (Ryan et al., 2002). After this preparation, the two research questions in focus in this WP were defined as follows:

RQ1: How to design a new costing system based on the homogeneous cost pool method to QMF?

RQ2: What are the costs of the products produced by QMF according to the homogeneous cost pool method?

The process of collecting data occurred after the definition of the research questions. Official financial accounting information was analysed with the main objective of collecting the maximum available costs of QMF. However, this information was not enough, since it does not represent nor explains the normal functioning of the company. Thus, interviews with the general coordinator were performed during the period in which the design of the new costing system was constructed (from September until November 2018). Four interviews occurred in the office of the company: one in the 26th of September, to understand better the business and the functioning of the company as well as collecting data and estimations of the main allocation of time and costs

for each activity; the second one in the 26th of October, with the main objective of collecting additional cost information; the third interview occurred in the 26th of November, with the aim of confirming all the data already collected and to discuss the unit costs of each product obtained; finally, the last interview took place in the 14th of December, to discuss current and future profitability of the company and to compare the obtained costs using the homogeneous cost pool method with the previous assigned costs. Because the design of a costing system implies that new issues and new questions are always showing up, the interviews were unstructured interviews, not tape-recorded, to allow some flexibility in the conversation. Even though the interviews were not tape-recorded, the information collected in each of them was written in the moment, to avoid losses or misrepresentations in the data.

Furthermore, a guided visit by the company, namely the cellar, in the 26th of September, with the general coordinator in a normal working day was important for a better understanding of its functioning, thus facilitating the procedure of allocating costs to each section. Archival information, such as the company organigram, the process of wine production, the list of produced wines and the employees' salaries information was also useful to the design of the new method and to understand the organization and possible needs of QMF. In order to avoid inconsistencies and to facilitate the understanding of all the procedures, some graphs and diagrams (Appendixes 1-6) were constructed (Ryan et al., 2002; Miles et al. 2014).

During the whole process, research regarding the production process of wine, through conversations with people that understand the business as well as through the consultation of news and articles on the Internet were performed, which facilitated the comprehension of the industry as well as the most common procedures and practices, since the wine industry has some specific characteristics that should be understood.

IV. The Empirical Study

i. Quinta da Mata Fidalga Lda.

QMF is a Portuguese company located in the Bairrada region that produces still and sparkling wines of high quality. QMF is surrounded by 24 hectares of vineyard, which will give rise to its wines. The company was founded by Mr. Fabiano Santos and Mr. Augusto Vieira de Sousa in 2004 and it is one of the main producers of the region of Bairrada, having won more than thirteen awards in the editions of the best wines of Bairrada already realized. Nine wines of QMF catalogue received gold medals in 2017 and 2018, namely in the “Portugal Wine Trophy 2017”, the “Portugal Wine Trophy 2018”, the “Asia Wine Trophy 2017” and the “Berliner Wine Trophy 2018” (QMF website).

In the vineyards, QMF has different varieties of wine grapes, 60% white and 40% red. In the last 20 years, most vineyards were installed according to the most modern driving systems adapted to each breed. Moreover, QMF has recently improved its equipment, having nowadays one of the most modern cellars in the Bairrada region, mixing this modernism with classic winemaking concepts. The variety of vineyard allows the company to offer a range of different wines, including mature wines (red, white and rose wine), mature reserve wines (premium red and premium white) and sparkling wines (Appendix 1).

QMF concept has been translated in a positive trend of profits from 2015 onwards. The importance of sales has been increasing relative to other income and provision of services. Sales increased from 507 272.35 € in 2015 to 666 511.43 € in 2017. Regarding the cost structure, in 2017 the biggest proportion of costs respects to cost of goods sold and materials consumed (43.92%) followed by personnel costs (23.49%) and external services and supplies (21.27%). The company is internally organized in four departments: the Production department, the Commercial

department, divided by areas, the Marketing department and lastly, the Financial/Administrative department (Appendix 2).

ii. Process of producing wine

As mentioned above, QMF is responsible for the entire process of wine production (cf. Appendix 3). The first step is the production of grapes. Most grapes are produced by QMF (approximately 130-150 tons, depending on the year) while about 45 tons are bought externally. In 2018, 68 tons were bought externally and the remaining were own produced, due to adverse climacteric conditions, which increased the average cost of a kg of grapes. Usually, in the beginning of October, the harvest starts and the grapes are transported to the cellar.

In the cellar, the grapes are received and crushed, initiating the winemaking process. The product resulting from the crushing is pressed using a special machine, with the objective of separating the peels and seeds from the juice. Afterwards, the grape juice is transformed into wine, in a chemical process called “alcoholic fermentation” and the acidity is reduced during the “malolactic fermentation”, with special importance in the red wines. Finally, the wines will suffer a tunnel or deposit fermentation. The fermentation processes need to be controlled, namely the temperature. Until this stage, the process is the same regardless of the type of wine (white, red, rose or sparkling).

After the above mentioned phases, still wines (white, red and rose) are bottled and labelled. Some of the wines may require a controlled aging process, period in which they are stored in a bottle or in wooden hulls, in order to obtain the desired characteristics.

The sparkling wines, on the other hand, will need to suffer more transformations. The first one is bottle fermentation, through the use of a classical method. In this classical method, the second fermentation with the addition of yeasts occurs inside the bottle, which should have specific characteristics to the production of this type of wine. The next step is the aging, in which the

wine remains in the bottle to develop texture. The time in the aging phase depends on the type of wine. Afterwards, the sediments created during the fermentation are sent near to the wine crock through rotation movements and specific slopes of the bottle, using a manual process of *remouage*. Before the bottling and the labelling phases, sparkling wines are still subject to the *degorgement* phase, in which the deposit of sediments created in the previous stage is removed and a mixture of wine and sugar is added back to the bottle. The bottling of sparkling wines requires the use of special crocks capable of resisting to the big pressure of the carbonic gas of the wine. Then, the safety wire is added, in order to avoid that the crock wine jumps under pressure. After all these phases, the wines are ready to be sold.

iii. Motivation to create a costing system

As previously mentioned, it is of extreme importance for managers to have accurate information regarding the costs of production, since it will allow them to make more rational and strategic decisions, such as price and cost control decisions. Furthermore, it is important to analyse the different production phases and understand if they are efficient (Marone et al., 2014).

Currently, the costs of production are estimated by the general coordinator but without following a specific approach. After obtaining the estimated cost of production, the market is analysed and a margin is applied to the estimated cost of the products, achieving the final sale price. The current way of pricing the products is not the most efficient, not because the general coordinator is making a wrong analysis, but instead due to the fact that some costs are probably not being taken into consideration, such as electricity costs, depreciation costs, costs of equipment of quick wear, etc. Moreover, the current approach does not provide information regarding each section, which means that it is not possible to know the specific costs of each phase of production, preventing QMF to monitor and control costs.

Consequently, given the importance of the wine sector in Portugal, the competition of the market and the recent growth of the company it seems important to give QMF the necessary tools to obtain the information needed. Since the company has not records of the costs divided by activity, the chosen method to suggest QMF to implement was the homogeneous cost pool method. Even though this method is less accurate than the ABC (it has less cost centres and less cost drivers) it is also less demanding regarding information needs and less costly. The costs and benefits should be analysed, and the objective should not be to have the most accurate system but instead the one that provides more benefits taking into consideration the costs (Drury, 2012). In a posterior phase, if the homogenous cost pool method was implemented with success, an improvement to a more sophisticated costing system may be considered.

iv. Design of the homogenous cost pool method

Definition of the sections

The first step was to define the sections taking into consideration the organization of the company. Early in the process, seventeen sections in the production phase were created (cf. Appendix 3). However, since the company had not enough detailed information to compute the costs for all the sections (the costs are generally presented to the entire company, being very difficult to allocate them among the different activities), a reduced number of sections was created. The reduction in the number was achieved with the help of the general coordinator that provided information regarding what would make sense to aggregate without losing accuracy (which sections may be aggregated without compromising the homogeneity criteria), being possible at the same time to estimate the individual costs of each section. Thus, the sections presented are production of grapes, harvest, winemaking process, sparkling processes, bottle preparation of still wines, bottle preparation of sparkling wines and finally finishing. QMF currently has not auxiliary sections (service cost centres) (cf. Appendix 4 and 5).

Allocation of direct costs to cost centres

- Direct labour

Even though there are not official records of the time spent in each section, QMF is capable of estimating the time spent by each employee in each of them. Thus, it was possible to compute the number of effective hours spent in each section, as well as the final cost (cf. Appendix 6 and 7).

- Vineyard Supervisor, Oenological and General Coordinator

Besides its own employees, QMF has as external and supply services a vineyard supervisor, an oenological and a general coordinator. The vineyard supervisor is responsible for the control of the production of grapes. Thus, his salary was completely allocated to the section of production of grapes. The oenological is responsible for creating the wine and controlling the winemaking process. As a consequence, his salary was completely allocated to the section of winemaking process. Finally, the general coordinator is responsible for all the sections of production as well as for the commercial and administrative departments. However, he is able to define the time spent in each section/department (see Appendix 8). Consequently, the proportion of his salary correspondent to the time spent in each section was allocated to the respective production section.

- Agricultural products and oenological products

The costs of agricultural products and oenological products may be directly assigned to the sections of production of grapes and winemaking process, respectively, since each type of products is only used in the mentioned sections.

- Supplies and external services (SES)

QMF has a variety of supplies and external services (cf. Appendix 9). Some of them may be directly allocated to the section(s) to which they belong, while others need some allocation criteria. Additionally, some of the costs do not respect to the production department, but instead to other departments of the company. The company bought some of the grapes externally, to

complement their own production. This cost was directly allocated to the section of production of grapes. The costs respecting to labour and rent of a machine are services that QMF incurs during the harvest time, to complement its existent workforce and consequently were allocated to the harvest section. Moreover, the company uses an external bottling line for still wines. Thus, this cost was allocated to the bottling preparation of still wines (see Appendix 10).

- **Depreciations**

From the map of depreciations provided by QMF it was possible to extract and allocate directly to each section the depreciation of the different equipment used in the production process, taking into consideration the equipment that is used in each phase. The depreciation of the building was not considered, since it was ceded to the company, which means that there are not depreciations or rents associated to it. In appendix 11 are presented the depreciation expenses of all the equipment of the company.

In 2017, there was not depreciation of the tractors, since the two existent vehicles until that date were old and thus already completely depreciated. However, in 2018, QMF acquired a new tractor, which will start to depreciate this year. Consequently, depreciation expenses regarding this new vehicle were included in the calculation of the production costs, since costs should transmit the usual activity of the company and from 2018 onwards this is an expense that needs to be considered.

Allocation of indirect costs to cost centres

- **Tools and utensils of quick wear**

Tools and utensils of quick wear respects mainly to protection equipment, such as masks and boots, as well as tools, such as scissors used in the different activities of the production process. QMF has not records regarding the division of these costs between the sections. Thus, its allocation was based on the estimates of the general coordinator (cf. Appendix 12).

- **Fuel costs**

As happened with the caption above, QMF also does not have records regarding the distribution of fuel costs among the sections. Fuel costs respect only to the costs of the department of production, since the costs of the commercial department as well as the costs of transport are presented in other captions. Thus, it was only needed to allocate the costs among the sections of production of grapes and harvest, since in the remaining sections there is not consumption of fuel. Once again, the allocation was based on the estimates of the general coordinator, since he is the person who has a better knowledge regarding the normal activity of the company and consequently is able to provide accurate estimates of the consumption of this resource (cf. Appendix 13).

- **Electricity and water consumption**

Water consumption was not considered in the computation of production costs since QMF has a water hole from which the majority of the water used in the production process comes from. In what concerns the electricity consumption, many authors, such as Drury (2012, 2018), recommend the allocation to be made taking into consideration the area. However, in the specific case of QMF, this approach is not the most adequate, since all the production process occurs in the same building. Furthermore, even if an area was defined for each activity (which was possible, since the building has different sections) it might not make sense to allocate the electricity costs using the above mentioned approach, since the area of the finishing stage, for instance, is small and it is one of the activities that requires more electricity due to the use of machines. On the contrary, the phase of sparkling processes uses a small amount of electricity and is spread for a wider area. It was also considered the possibility of using the power of the machines in each section to allocate the costs, but it was not possible to obtain this information. As a consequence, the approach used was again the general coordinator estimates (Appendix 14).

It is important to highlight that the financial information on the electricity caption is not correct. In 2017, the annual costs of electricity amounted only to 855.61 €. When looking for historical data, the same problem arises, with the costs being always below the expected value. The explanation given by QMF was that the electricity costs respecting to the production of wines came together with the electricity costs of a restaurant located in the building next door, which belongs to the same owners. Thus, QMF was not able to estimate the real costs of this caption. The problem is expected to be solved in the beginning of 2019, when the costs of electricity will start to be divided among the two businesses.

- **Maintenance and repair costs**

Since QMF has not information specific to each section, the approach used to allocate the maintenance and repair costs was the estimates of the general coordinator. The sections that usually require more maintenance during the normal activity of the company are the winemaking process, the bottling preparation and the section of finishing, since these sections have more machines. The section of sparkling processes is the section that generally needs less maintenance since the only equipment used is the containers (see Appendix 15).

- **Hygiene and safety at work**

QMF pays 200 euros per month to have the service of hygiene and safety at work, provided by an external entity. In this case, the approach used was the cost per employee, since the objective of this service is to provide employees the necessary conditions of safety and health to develop all the activities of their work (Appendix 16).

- **Insurance against occupational accidents and occupational diseases**

QMF has a cost of 425 euros per month, per employee, regarding the insurance against occupational accidents and occupational diseases. Consequently, the approach followed was the same used to allocate the costs of hygiene and safety at work (cf. Appendix 17).

- **Surveillance and security and Insurance**

The costs of surveillance and security as well as the costs of insurance were included in the costs of production since they are incurred in order to protect and secure the expensive equipment of the cellar (see Appendixes 18 and 19).

- **Cleaning, hygiene and comfort**

This cost represents the expenses of cleaning the cellar and the office. Costs were allocated taking into consideration the estimations of the general coordinator (Appendix 20).

Since QMF has not auxiliary sections, the step 2 of the two stage allocation method – “reallocating the costs assigned to service cost centres (auxiliary sections) to production cost centres (main sections)” (Drury, 2012, p. 55) - was not applied.

Compute separate overhead rates for each production cost centre

After allocating the different costs, it was possible to compute the total cost of each section. The next step was to define the most adequate allocation base to use for each production cost centre. For the section of the production of grapes, the chosen base was kg, since the amount of grapes produced is measured in kg. For the sections of bottling preparation of still wines and finishing, the chosen allocation base was machine hours. Even though labour is required in the mentioned sections they are mainly characterized by the fact that the majority of the work is performed by machines. In opposition, in the section of harvest, notwithstanding the use of machines, the costs with a greater impact are associated with human work and the sections of sparkling processes and bottling preparation of sparkling wines are mainly manual. Thus, the allocation base chosen for these sections was labour-hours. Finally, for the section of winemaking process, even though it has a considerable number of machines, the chosen base was also labour-hours, due to the difficulty to control the number of hours each machine functions.

To compute the overhead rate, it was necessary to divide the total cost of the section by the amount of the chosen measure of the activity (Appendix 21). The map of the cost of the sections in appendix 22 provides all the information regarding the total cost of the sections as well as the respective overhead rate. Appendix 23 provides information regarding external labour-hours and machine hours of each section.

Since the wines remain in the bottle while almost finished during different times in order to acquire specific characteristics, the cost of the warehouse of semi-finished products was computed, taking into consideration the minimum time each type of wine needs to acquire the mentioned characteristics (Appendix 24). Thus, APA costs were computed taking into consideration the quantities produced.

The final step was to compute the cost of goods manufactured (COGM) by summing the cost of direct materials (raw materials consumption) and the transformation costs. The map of production costs in appendix 25 provides the final COGM of each product, taking into consideration the specific raw materials used in each one. Finally, it was also possible to construct the profit and loss (P&L) by function, which incorporates information of the remaining departments of the company (Appendix 26).

v. Possible improvements in the future

As noted in the previous section, some limitations and difficulties appeared in the design of the homogeneous cost pool method. Since QMF had not a costing system in place, it was difficult to collect the adequate information for the design of the method. In the future, QMF may improve this aspect, through the previous record of information for each section. With the creation of cost pools, it will be easier to allocate the costs to the right section as soon as the information reaches the accounting. This improvement will allow not only the achievement of more accurate costs but also that some of the costs considered now as indirect costs become direct costs, such as tools and

utensils of quick wear and maintenance and repair costs. Additionally, QMF may ask its employees to fill in time sheets, which will provide more truthful information regarding labour-hours. If the implementation of the homogeneous cost pool method is successful, QMF may improve the method and create, for instance, more sections, as first suggested in this WP.

Moreover, QMF may also invest in a software system able to track the costs of the transformations that grapes suffer since plantation until the transport to the cellar, which will provide a more accurate costing of the final product, since the type of grapes, the quantity and the costs of agricultural products used in each type of wine will be controlled. The software may also be used in the next steps of the winemaking process, allowing for the control of the oenological products used in the production of each quality of wine. Another aspect important to consider in the future is the computation of the costs of transport of the grapes from the field to the cellar, since some vineyards are further away than others, which is translated in higher costs for some qualities. Thus, some wines will have more expensive grapes, instead of the average cost used in the present WP.

After computing the production costs with the homogeneous cost pool method, the gross profit obtained by the company was calculated and amounted to 208 832,87 € (Appendix 27), which was considered low by the general coordinator. Thus, some scenarios were analysed in order to increase profit in 2019. If QMF increases the quantities sold of some types of wines and maintains the average unit price of 2018, gross profit will increase to 262 721,62 € (Appendix 28). If QMF increases prices by 10% (which is not a big increase, since the current average unit price for some of the wines is below the price offered to the distributors), gross profit will increase to 273 382,60 € (Appendix 29). With a combination of increase in both quantities and prices, gross profit will amount to 335 567,81 € (Appendix 30). Thus, to obtain the desired results, QMF should increase the current quantities sold and/or sale prices. The computed

production costs using the homogeneous cost pool method represent a strong advantage in correctly measure these effects.

V. Conclusions

Currently, QMF has not any formal costing system implemented. As analysed in this WP, it is of extreme importance for companies to have accurate information available regarding the cost of its products, since it provides management more information to make more rational and strategic decisions in what concerns price and cost control decisions. The wine sector in Portugal has been increasing in importance as well as the competition in the market of wines, with a wide range of different wines from different regions available to customers. Furthermore, the company has been growing and increasing revenues since 2015, which illustrates the need and motivates the adoption of a costing system. The new costing system is expected to help the company answer the new and more exigent tastes of customers while being able to adapt prices and cost control to the new findings, with the main objective of increasing efficiency and profitability.

Since the company is not yet prepared to introduce a sophisticated costing system (there are not records of the costs divided by activity and the structure of the company is not adequate), the chosen method to suggest QMF to implement was the homogeneous cost pool method that is less accurate than the ABC but is also less demanding regarding information needs and costs of implementation. The costs computed using the homogeneous cost pool method described in this WP considered to the possible extent the relations of causality between the costs and the activity, aiming to achieve the most accurate final costs of each type of wine. After the computation of the production costs of each type of wine, it is possible to conclude that some wines are being undercosted while others are being overcosted (Appendix 31), which provides QMF room to change its pricing and cost strategies. Moreover, the correct measurement of production costs

may be of extreme importance to analyse possible scenarios in the coming years, as discussed in the present WP (Appendix 32).

The findings of this WP bring additional information to the homogeneous cost pool method literature, since this type of studies is not common in the industry. In the future, it would be interesting to conduct similar studies in other companies in the winemaking industry to understand if the results obtained with QMF may be translated to similar companies.

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Appendix 1 – Wine Varieties

Sparkling Wines	DOC* Wines	Late Harvest	Virgilio de Sousa
Gross White Sparkling QMF White Sparkling Baga Bairrada Gross Rose Sparkling QMF Gross Red Sparkling QMF Sparkling Personal Reserve White Sparkling Reserve	White Arinto Bical White Sauvignon Blanc White Reserve QMF Rose Blush Rose Blush Reserve Red Selection Red Premium Red Reserve QMF White Vinha Cru	Late Harvest (DOC)	Virgilio de Sousa (Sparkling)

White Vinha Cru was not produced in the year of 2018.

White Sparkling Reserve, White Reserve QMF and Red Reserve QMF were produced for the first time in 2018.

*DOC: In Portugal, there are three official wine categories: DOC regions (or DOP), Regional wines (IG or IGP) and table wines. DOC (Denominação de Origem Controlada) means Controlled Denomination of Origin and has strictly defined geographical areas. DOC regulations establish maximum grape yields, recommended and allowed grape varieties among other things. Furthermore, all the wines with this classification need to be officially tested and approved. (Wines of Portugal).

<http://www.winesofportugal.com/us/wine-and-grapes/country-of-blends/>

Appendix 2 – QMF internal structure

Administration

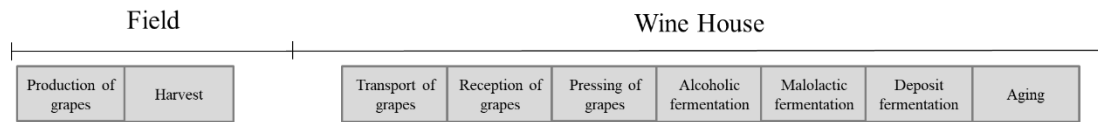
Executive Secretary

Overall Coordination

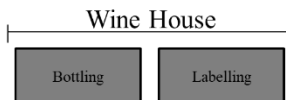
Department of Production	Commercial Department	Marketing Department	Financial/ Administrative Department
Responsible Winemaker Cellar Inventory/Records	Responsible North Commercial South Commercial Exports Store	Responsible Bottle's pictures/photos Labels Advertising Marketing Events/tastings Typographies Advertising campaigns Communication Cellar visits Bairrada commission	Responsible Accounting Shopping record, HR, salary Billing, issue of receipts Financial Management

Appendix 3 – Process of producing wine; Plan of the sections

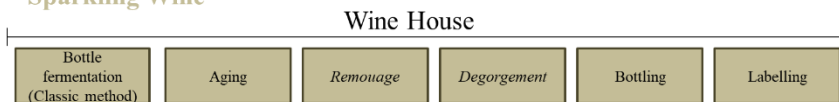
Still wines (White, Red and Rose) and Sparkling wines



Still wines (White, Red and Rose)

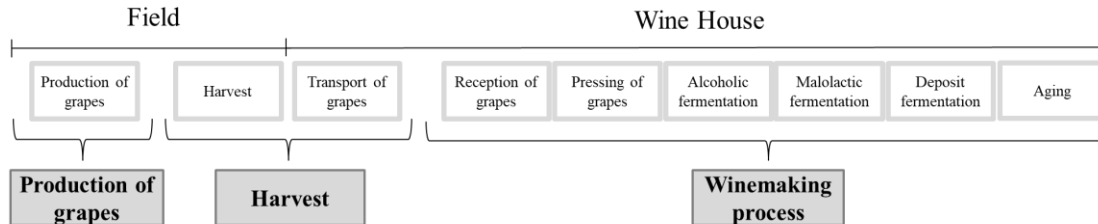


Sparkling Wine

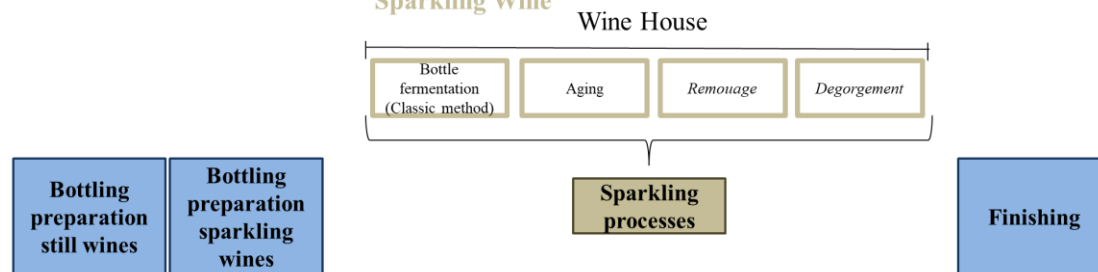


Appendix 4 – Second plan of the sections

Still wines (White, Red and Rose) and Sparkling wines



Sparkling Wine



Appendix 5 – Description of the sections

Production of grapes	Includes both the costs of grapes produced at QMF and grapes bought externally. This phase occurs in the field. Includes the preparation of the soil, the use of fertilizers and chemical treatments, as well as the maintenance of the grapes. The amount of grapes produced may vary, depending on the year, due to climatic factors, for instance. The quantity bought externally will depend on the quantity QMF is able to produce.
Harvest	Includes the costs of the 1,5 months of the harvest, as well as the costs of transporting the grapes to the cellar. This phase occurs in the field. At QMF, the harvest usually starts in the beginning of October.
Winemaking process	Includes the costs respecting to the reception of grapes, pressing of grapes, alcoholic fermentation and malolactic fermentation, deposit fermentation and aging. This phase occurs in the cellar. Reception of grapes: In the cellar, the grapes are received and crushed, initiating the winemaking process. Pressing of grapes: The product resulting from the crushing is pressed using a special machine, with the objective of separating the peels and seeds from the juice. Alcoholic fermentation: Through this chemical process, the grape juice is transformed into wine. The sugar present in the juice is degraded by unicellular yeasts, in an anaerobic environment (in the absence of oxygen), originating ethyl alcohol and releasing dioxide and heat. Malolactic fermentation: The acidity of the wine is reduced, which is specially important in red wines. It consists of a biological deacidification, in which the malic acid of wine is transformed into lactic acid, in an anaerobic environment by lactic bacteria, releasing carbon dioxide. This type of fermentation is spontaneous, which creates the need of stopping it. The interruption of the malolactic fermentation may occur through the use of sulphur dioxide (SO ₂). The environment near the fermentation vats is toxic, requiring the use of masks. These processes need to be controlled, namely the temperature. In order to do that QMF has special equipment to monitor the temperature in each vat and with information for how long the wine is fermenting. Finally, wines will pass through a deposit fermentation and aging processes, in which they are stored in bottles or wooden hulls to age in a controlled environment.
Sparkling processes	Includes the costs of the stages that occur only in the production of sparkling wines, namely bottle fermentation, aging, <i>remouage</i> and <i>degorgement</i> . This phase occurs in the cellar. Bottle fermentation: QMF uses a classical method, in which this second fermentation with the addition of yeasts occurs inside the bottle, which should have some specific characteristics to the production of this type of wine. Aging: The wine remains in the bottle to develop texture. The time in this phase depends on the type of wine. Remouage: The sediments created during the fermentation are sent near to the wine crock through rotation movements and specific slopes of the bottle, using a manual process. Degorgement: The deposit of sediments created in the previous stage is removed and a mixture of wine and sugar is added back to the bottle.
Bottling preparation	Includes the costs of bottling the wine, without considering the material (bottles, corks, labels, counter-labels and boxes). Two sections of bottling preparation were created, one for still wines and other for sparkling wines, since the process is different for each type of wine. For the still wines, the company uses a supply and external service, through the use of a machine, meaning that the process is mainly mechanic. For the bottling of sparkling wines, QMF uses its own employees and the process is mainly manual. This phase occurs in the cellar.
Finishing	Includes the costs of labelling and put into boxes. This phase occurs in the cellar.

Appendix 6 – Employees' salaries

Department	Sector	Number of employees	Monthly salary	Individual monthly salary
Production	Vineyard/ field	6	7 964,00 €	1 327,33 €
Production	Cellar	3	3 166,06 €	1 055,35 €
Commercial	North/ South/ Exports/ Store	3	4 680,86 €	1 560,29 €
Administrative/ Financial	Secretariat/ Administrative	1	831,40 €	831,40 €
Administration	Managers	1	1 550,27 €	1 550,27 €
Supplies and external services	Vineyard supervisor	1	120,00 €	120,00 €
Supplies and external services	Oenology	1	1 115,00 €	1 115,00 €
Supplies and external services	General coordination	1	2 000,00 €	2 000,00 €

Appendix 7 – Direct labour costs per section

Description	Number of employees	Number of months	Number of effective months	Number of employees	Number of months	Number of effective months	Number of hours worked	Total Cost
Production of grapes*	6	10,5	9,5	-	-	-	10032	83 622,00 €
Harvest**	4	1,5	1,5	-	-	-	1056	7 964,00 €
Winemaking Process***	3	3	2,75	2	0,375	0,375	1584	10 493,68 €
Sparkling processes***	3	3	2,75	2	0,375	0,375	1584	10 493,68 €
Bottling preparation still wines****	3	0,75	0,6875	2	0,09375	0,09375	396	2 623,42 €
Bottling preparation sparkling wines****	3	2,25	2,0625	2	0,28125	0,28125	1188	7 870,26 €
Finishing***	3	3	2,75	2	0,375	0,375	1584	10 493,68 €

Additional Notes:

The number of hours worked in each section was computed assuming that each employee works 8 hours a day, 22 days per month, 11 months a year (since 22 days (1 working month) are vacation days).

*In the production of grapes, there are 6 employees working permanently 10,5 months a year. During the harvest time (1,5 months), 4 work in the harvest and 2 in the cellar. Since each employee has 22 days of vacations (1 working month), and this section is their principal work section, it was assumed that the time of effective work is 9,5 months.

**In the harvest, there are 4 employees working permanently during 1,5 months per year (harvest time). In the remaining time, they work in the production of grapes. Additionally, the firm spends 4 800 € with an external supply of work.

***The time spent performing each activity in the cellar (winemaking process, sparkling processes, bottling preparation and finishing) is approximately the same, according to the firm. There are 3 permanent workers and 2 workers coming from the field during the harvest time (1,5 months). Since each employee has 22 vacation days (one month of work), it was assumed that the effective time of work in the cellar is 11 months. With the division between the four sections, each section has 3 employees working effectively during 2,75 months and 2 working effectively during 0,375 months. Since the bottling preparation phase is divided in bottling preparation of still wines and bottling preparation of sparkling wines, labour costs for these sections required further calculations. It was assumed that $\frac{3}{4}$ of the three employees' time is spent in the bottling preparation of sparkling wines (manual process) and only $\frac{1}{4}$ is spent in the bottling preparation of still wines (mechanic process).

Appendix 8 – Allocation of the general coordinator time

General coordination	% of time allocated to each activity	Total Cost
Production of grapes	5%	1 200,00 €
Harvest	5%	1 200,00 €
Winemaking process	3%	600,00 €
Bottling preparation still wines	1,25%	300,00 €
Bottling preparation sparkling wines	1,25%	300,00 €
Sparkling processes	3%	600,00 €
Finishing	3%	600,00 €
Commercial	50%	12 000,00 €
Administrative	30%	7 200,00 €
Total	100%	24 000,00 €

Appendix 9 – Supplies and External Services (SES)

Description	2017	2016	2015
Subcontracts	15 558,03 €	13 760,20 €	21 721,72 €
Specialized services	96 565,36 €	85 238,25 €	109 325,86 €
Specialized jobs	31 348,83 €	28 381,08 €	57 629,52 €
Advertising and marketing	5 219,83 €	8 190,31 €	6 812,22 €
Surveillance and security	268,30 €	117,00 €	157,91 €
Fees	29 353,02 €	24 663,80 €	24 529,58 €
Commissions	-	289,00 €	-
Maintenance and repair	17 757,48 €	12 325,69 €	9 889,28 €
Others	12 617,90 €	11 271,37 €	10 307,35 €
Materials	5 762,53 €	9 193,26 €	5 962,11 €
Tools and utensils of quick wear	4 852,09 €	8 085,50 €	5 362,70 €
Books and technical documentation	55,97 €	11,68 €	-
Office supplies	854,47 €	1 096,08 €	309,41 €
Energy and fluids	3 457,94 €	2 453,28 €	5 544,80 €
Electricity	855,61 €	121,44 €	1 482,43 €
Fuel	2 502,03 €	2 258,90 €	3 971,50 €
Water	100,30 €	72,94 €	90,87 €

Description	2017	2016	2015
Travels, stays and transport	20 328,25 €	14 827,59 €	20 689,48 €
Travels and stays	1 718,56 €	802,67 €	190,84 €
Transport of goods	18 609,69 €	14 024,92 €	20 498,64 €
Miscellaneous services	23 570,86 €	23 843,46 €	NA
Incomes and rents	179,29 €	588,54 €	NA
Communication	3 526,56 €	2 391,29 €	NA
Insurance	9 405,67 €	9 629,92 €	NA
Litigation and notary	130,00 €	414,10 €	NA
Representation expenses	9 369,87 €	7 459,16 €	NA
Cleaning, hygiene and comfort	959,47 €	3 360,45 €	NA

Notes:

The costs of subcontracts, specialized jobs (services outsourced by QMF, for instance, accounting), fees, commissions and litigation and notary were not considered in the costs of production since they are not related to the production process. These costs belong to the administrative/financial department as well as the costs of books and technical documentation and office supplies.

The costs of advertising and marketing and the costs of communication are related to the marketing department. Consequently, they were not considered in the costs of production.

The costs of travels and stays and representation expenses respects to the commercial department. Thus, these costs were not taken into consideration in the computation of production costs.

The remaining costs were allocated to the different sections of the production process. The costs of tools and utensils of quick wear, electricity, fuel, maintenance and repair costs, surveillance and security, insurance and cleaning, hygiene and comfort belong to more than one

section. Thus, they were considered indirect costs and it was necessary to use some criteria to allocate these costs among the sections.

The cost of water was not considered in the costs of production because QMF has a water hole from which the majority of the water used in the production process comes from. The water expenses presented in the table respect to the water consumed in the office.

Appendix 10 – Direct allocation of supplies and external services

Description	Production of grapes	Harvest	Winemaking process	Bottling preparation still wines	Bottling preparation sparkling wines	Sparkling processes	Finishing
Grapes bought externally	38 760,00 €						
Labour		4 800,00 €					
Rent of a machine		2 800,00 €					
Still wine bottle line				17 300,00 €			

Appendix 11 – Depreciation expenses

Description	Book Value	Depreciation
Production of grapes	43 100,10 €	12 834,07 €
Wood pole+wires+propelle+tensioner-vineyards	5 368,42 €	205,16 €
Sticks vineyards 2011	12 423,40 €	414,11 €
Zinc-plated folding container	1 380,63 €	81,21 €
Plantation vineyard Mealhada (2016)	16 523,77 €	446,59 €
Sticks vineyards 2017	1 095,73 €	28,84 €
Sticks vineyards 2,2 mt – Year 2017	490,05 €	12,90 €
Stick vineyards 2,5 mt – Year 2017	1 540,08 €	40,53 €
Wire Ecover Hard 2,2 mt – Year 2017	764,64 €	20,12 €
Metal pole+wires+propelle+tensioner-valley vineyards	2 911,72 €	76,62 €
Metal pole 2,20 mt	470,37 €	12,38 €
Stretcher Griple Med	131,29 €	3,46 €
Tractor	51 714,67 €	11 492,15 €
Harvest	1 460,19 €	439,68 €
Scissors Vinion 150 Pellenc	912,62 €	182,52 €
Scissors Vinion 150 Pellenc	547,57 €	91,26 €
Tractor	5 972,33 €	165,90 €

Description	Book Value	Depreciation
Winemaking process	63 764,90 €	7 148,51 €
Multifunctional mill	3 246,00 €	270,25 €
Fermentation tank FPI 316/304 15,000 Lt	4 821,55 €	600,70 €
Multifunctional mill 304 4,500 Lt	3 246,00 €	270,25 €
Stainless steel 10,000 Lt	347,29 €	43,26 €
Stainless steel 316/304 STD 20,000 L	2 788,04 €	347,36 €
Stainless steel 316/304 STD 20,000 L	2 788,04 €	347,36 €
Multifunctional mill 304 4,500 Lt	3 246,00 €	270,25 €
Multifunctional mill 304 4,500 Lt	3 246,00 €	270,25 €
Barrel – Fut Bordeaux	1 293,78 €	107,54 €
Air treatment system	15 906,00 €	1 325,50 €

Description	Book Value	Depreciation
Winemaking process	63 764,90 €	7 148,51 €
Stainless steel tank 20,000 Lts	3 703,70 €	307,84 €
Fermentation tank F.P.I. 316/304 15,000 Lts	3 490,00 €	872,50 €
Fermentation tank 15,000 Lts	3 625,00 €	906,25 €
Wine barrels “Tonnellerir de Cognac” – 500L 27mm Chene Fr	4 011,56 €	154,22 €
Oak barrels	1 648,30 €	164,34 €
Oak barrels	470,94 €	46,95 €
Oak barrels	728,97 €	72,68 €
Oak barrels	486,00 €	48,45 €
Stainless steel wine tank 316 PBC10000	793,84 €	197,39 €
Stainless steel wine tank 304 P.B. 1000	141,28 €	35,14 €
Stainless steel wine tank 304 P.B. 500	120,10 €	29,86 €
Stainless steel wine tank Algor B/S 520 L	77,22 €	19,21 €
Stainless steel 20,000 L	751,25 €	93,60 €
Stainless steel wine tank 316/304 STD 20,000 L	2 788,04 €	347,36 €

Description	Book Value	Depreciation
Bottling preparation	2 318,74 €	165,63 €
Semi-automatic capsule machine	2 318,74 €	165,63 €
Finishing	78 726,90 €	10 285,31 €
Labeller VIERINOX	71 738,33 €	9 782,50 €
SLEEP RING (labeller accessory)	688,57 €	52,81 €
Stopper machine/ muselete semi-automatic	6 300,00 €	450,00 €
Office equipment	2 299,68 €	283,12 €
Total	189 370,83 €	30 873,20 €

Appendix 12 – Allocation of costs of tools and utensils of quick wear

Tools and utensils of quick wear	% of total costs	Total cost
Production of grapes	65%	3 153,86 €
Harvest	15%	727,81 €
Winemaking Process	5%	242,60 €
Bottling preparation still wines	1,25%	60,65 €
Bottling preparation sparkling wines	3,75%	181,95 €
Sparkling processes	5%	242,60 €
Finishing	5%	242,60 €
Other departments	0%	0 €
Total	100%	4 852,09 €

Notes:

80% of the costs regarding tools and utensils of quick wear respects to the field, since it is the area that requires more equipment of protection, (with approximately 65% in the production of grapes and 15% in the harvest (the harvest activity has a smaller duration and less employees)) and 20% respects to the cellar, with an approximate equal distribution between the four sections.

The bottling preparation phase required further attention. Since it was considered that $\frac{3}{4}$ of the employees' time is spent in the bottling preparation of sparkling wines and the utensils of quick wear correspond mainly to protection equipment used by them, it was assumed that from

the 5% allocated to the entire section of bottling preparation, $\frac{3}{4}$ of the costs belong to the bottling preparation of sparkling wines and the remaining $\frac{1}{4}$ respects to the bottling preparation of still wines.

Appendix 13 – Allocation of fuel costs

Fuel costs	% of total costs	Total cost
Production of grapes	80%	2 001,62 €
Harvest	20%	500,41 €
Winemaking Process	0%	0 €
Bottling preparation still wines	0%	0 €
Bottling preparation sparkling wines	0%	0 €
Sparkling processes	0%	0 €
Finishing	0%	0€
Other departments	0%	0 €
Total	100%	2 502,03 €

Appendix 14 – Allocation of electricity costs

Electricity	% of total costs	Total cost
Production of grapes	0%	0 €
Harvest	0%	0 €
Winemaking Process	40%	342,24 €
Bottling preparation still wines	11%	96,26 €
Bottling preparation sparkling wines	4%	32,09 €
Sparkling processes	10%	85,56 €
Finishing	30%	256,68 €
Other departments	5%	42,78 €
Total	100%	855,61 €

Notes:

It was assumed that 40% of electricity costs respects to the winemaking process, 30% to the finishing section, 10% to the section of sparkling processes and 15% to the bottling preparation phase. For this last section, since it is divided in two, it was assumed that $\frac{3}{4}$ of the 15% respects to the bottling preparation of still wines, since it is a mechanic process and consequently requires the consumption of more electricity. $\frac{1}{4}$ of the 15% respects to the bottling preparation of sparkling wines.

Appendix 15 – Allocation of maintenance and repair costs

Maintenance and repair costs	% of total costs	Total cost
Production of grapes	10%	1 775,75 €
Harvest	10%	1 775,75 €
Winemaking Process	25%	4 439,37 €
Bottling preparation still wines	19%	3 329,53 €
Bottling preparation sparkling wines	6%	1 109,84 €
Sparkling processes	5%	887,87 €
Finishing	25%	4 439,37 €
Other departments	0%	0 €
Total	100%	17 757,48 €

Appendix 16 – Allocation of hygiene and safety at work costs

Hygiene and safety at work	Total cost	Cost per employee	Number of effective employees	Cost of the section
Production of grapes		171,43 €	$\frac{6 \text{ employees} \times 10,5 \text{ months}}{12 \text{ months}} = 5,25$	$171,43 \times 5,25 = 900,00 \text{ €}$
Harvest		171,43 €	$\frac{4 \text{ employees} \times 1,5 \text{ months}}{12 \text{ months}} = 0,5$	$171,43 \times 0,5 = 85,71 \text{ €}$
Winemaking Process		171,43 €	$\frac{3 \text{ employees} \times 3 \text{ months} + 2 \text{ employees} \times 0,375 \text{ months}}{12 \text{ months}} = 0,8125$	$171,43 \times 0,8125 = 139,29 \text{ €}$
Bottling preparation still wines		171,43 €	$\frac{3 \text{ employees} \times 0,75 \text{ months} + 2 \text{ employees} \times 0,09375 \text{ months}}{12 \text{ months}} = 0,203125$	$171,43 \times 0,203125 = 34,82 \text{ €}$
Bottling preparation sparkling wines		171,43 €	$\frac{3 \text{ employees} \times 2,25 \text{ months} + 2 \text{ employees} \times 0,2815 \text{ months}}{12 \text{ months}} = 0,609375$	$171,43 \times 0,609375 = 104,46 \text{ €}$
Sparkling processes		171,43 €	$\frac{3 \text{ employees} \times 3 \text{ months} + 2 \text{ employees} \times 0,375 \text{ months}}{12 \text{ months}} = 0,8125$	$171,43 \times 0,8125 = 139,29 \text{ €}$
Finishing		171,43 €	$\frac{3 \text{ employees} \times 3 \text{ months} + 2 \text{ employees} \times 0,375 \text{ months}}{12 \text{ months}} = 0,8125$	$171,43 \times 0,8125 = 139,29 \text{ €}$
Other departments		171,43 €	5	$171,43 \times 5 = 857,14 \text{ €}$
Total	2 400,00 €		14	2 400,00 €

Notes:

The cost per employee was computed, followed by the number of employees taking into consideration the number of months worked in each section. For instance, in the section of production of grapes there are 4 employees working during 10,5 months. Thus, the effective “number of employees” in that section is $(4 \text{ employees} \times 10,5 \text{ months})/12 \text{ months}$.

The workers classified as supply and external services do not benefit from this service.

Finally, to obtain the cost of the section, it was just needed to multiply the obtained number of employees by the cost per employee.

Appendix 17 – Allocation of costs of insurance against occupational accidents and occupational diseases

Insurance against occupational accidents and occupational diseases	Total cost	Cost per employee	Number of effective employees	Cost of the section
Production of grapes		364,29 €	$\frac{6 \text{ employees} \times 10,5 \text{ months}}{12 \text{ months}} = 5,25$	$364,29 \times 5,25 = 1\,912,50 \text{ €}$
Harvest		364,29 €	$\frac{4 \text{ employees} \times 1,5 \text{ months}}{12 \text{ months}} = 0,5$	$364,29 \times 0,5 = 182,14 \text{ €}$
Winemaking Process		364,29 €	$\frac{3 \text{ employees} \times 3 \text{ months} + 2 \text{ employees} \times 0,375 \text{ months}}{12 \text{ months}} = 0,8125$	$364,29 \times 0,8125 = 295,98 \text{ €}$
Bottling preparation still wines		364,29 €	$\frac{3 \text{ employees} \times 0,75 \text{ months} + 2 \text{ employees} \times 0,09375 \text{ months}}{12 \text{ months}} = 0,203125$	$364,29 \times 0,203125 = 74,00 \text{ €}$
Bottling preparation sparkling wines		364,29 €	$\frac{3 \text{ employees} \times 2,25 \text{ months} + 2 \text{ employees} \times 0,2815 \text{ months}}{12 \text{ months}} = 0,609375$	$364,29 \times 0,609375 = 221,99 \text{ €}$
Sparkling processes		364,29 €	$\frac{3 \text{ employees} \times 3 \text{ months} + 2 \text{ employees} \times 0,375 \text{ months}}{12 \text{ months}} = 0,8125$	$364,29 \times 0,8125 = 295,98 \text{ €}$
Finishing		364,29 €	$\frac{3 \text{ employees} \times 3 \text{ months} + 2 \text{ employees} \times 0,375 \text{ months}}{12 \text{ months}} = 0,8125$	$364,29 \times 0,8125 = 295,98 \text{ €}$
Other departments		364,29 €	5	$364,29 \times 5 = 1\,821,43 \text{ €}$
Total	5 100,00 €		14	5 100,00 €

Notes:

The cost per employee was computed, followed by the number of employees taking into consideration the number of months worked in each section. For instance, in the section of production of grapes there are 4 employees working during 10,5 months. Thus, the effective “number of employees” in that section is $(4 \text{ employees} \times 10,5 \text{ months})/12 \text{ months}$.

The workers classified as supply and external services do not benefit from this service.

Finally, to obtain the cost of the section, it was just needed to multiply the obtained number of employees by the cost per employee.

Appendix 18 – Allocation of surveillance and security costs

Surveillance and security	Book value of equipment	Imputation coefficient	Total cost of the section
Production of grapes	0,00 €	0	0,00 €
Harvest	0,00 €	0	0,00 €
Winemaking Process	63 794,90 €	$\frac{43\,794,90}{147\,110,22} = 0,433449831$	$0,433449831 \times 268,30 = 116,29 \text{ €}$
Bottling preparation still wines	0,00 €	0	0,00 €
Bottling preparation sparkling wines	2 318,74 €	$\frac{2\,318,74}{147\,110,22} = 0,015761923$	$0,015761923 \times 268,3 = 4,23 \text{ €}$
Sparkling processes	0,00 €	0	0,00 €
Finishing	78 726,90 €	$\frac{78\,726,90}{147\,110,22} = 0,535155885$	$0,535155885 \times 268,3 = 143,58 \text{ €}$
Other departments	2 299,68 €	$\frac{2\,299,68}{147\,110,22} = 0,015632361$	$0,015632361 \times 268,3 = 4,19 \text{ €}$
Total	147 110,22 €	1	268,30 €

Notes:

In order to obtain the cost of each section, the book value of the equipment in each one was divided by the book value of all the equipment, achieving an imputation coefficient. Finally, the cost of the section was obtained through the product of the imputation coefficient by the book value of the equipment in each section.

Appendix 19 – Allocation of insurance costs

Insurance	Book value of equipment	Imputation coefficient	Total cost of the section
Production of grapes	51 714,67€	$\frac{51\,714,67}{204\,797,22} = 0,252516449$	$0,252516449 \times 9\,405,67 = 2\,375,09 \text{ €}$
Harvest	5 972,33€	$\frac{5\,972,33}{204\,797,22} = 0,02916218$	$0,02916218 \times 9\,405,67 = 274,29 \text{ €}$
Winemaking Process	63 794,90 €	$\frac{43\,794,90}{204\,797,22} = 0,311356277$	$0,311356277 \times 9\,405,67 = 2\,928,51 \text{ €}$
Bottling preparation still wines	0,00 €	0	0,00 €
Bottling preparation sparkling wines	2 318,74 €	$\frac{2\,318,74}{204\,797,22} = 0,011322126$	$0,011322126 \times 9\,405,67 = 109,49 \text{ €}$
Sparkling processes	0,00 €	0	0,00 €
Finishing	78 726,90 €	$\frac{78\,726,90}{204\,797,22} = 0,38441391$	$0,38441391 \times 9\,405,67 = 3\,615,67 \text{ €}$
Other departments	2 299,68 €	$\frac{2\,299,68}{204\,797,22} = 0,011229059$	$0,01122905 \times 9\,405,67 = 105,62 \text{ €}$
Total	204 797,22 €	1	9 405,67 €

Notes:

In order to obtain the cost of each section, the book value of the equipment in each one was divided by the book value of all the equipment, achieving an imputation coefficient. Finally, the cost of the section was obtained through the product of the imputation coefficient by the book value of the equipment in each section.

Appendix 20 – Allocation of cleaning, hygiene and comfort costs

Cleaning, hygiene and comfort	% of total costs	Costs
Production of grapes	0%	0,00 €
Harvest	0%	0,00 €
Winemaking Process	80%	767,58 €
Bottling preparation still wines	2,5%	23,99 €
Bottling preparation sparkling wines	2,5%	23,99 €
Sparkling processes	5%	47,97 €
Finishing	5%	47,97 €
Other departments	5%	47,97 €
Total	100%	959,47 €

Appendix 21 – Allocation bases and overhead rates of each section

Description	Allocation Base	Total cost of the section	Overhead Rate
Production of grapes	185 000 kg	157 174,82 €	$\frac{\text{Total cost of the section}}{\text{Activity}} = \frac{157\,174,82}{185\,000} = 0,85 \text{ €/kg}$
Harvest	4 employees x 1,5 months x 8h x 22 days + 1 230 (external labour hours) = 2 286 labour-hours	20 749,79 €	$\frac{\text{Total cost of the section}}{\text{Activity}} = \frac{20\,749,79}{2\,286} = 9,08 \text{ €/labour-hour}$
Winemaking Process	3 employees x 2,75 months x 8h x 22 days + 2 employees x 0,375 months x 8h x 22 days = 1584 labour hours	61 489,06 €	$\frac{\text{Total cost of the section}}{\text{Activity}} = \frac{61\,489,06}{1584} = 38,82 \text{ €/labour-hour}$
Bottling preparation still wines	133 100 bottles x 8h / 14 000 bottles = 76,05714286 machine hours	23 842,66 €	$\frac{\text{Total cost of the section}}{\text{Activity}} = \frac{23\,842,66}{76,05714286} = 168,20 \text{ €/machine hour}$
Bottling preparation sparkling wines	3 employees x 2,0625 months x 8h x 22 days + 2 employees x 0,28125 months x 8h x 22 days = 1 188 labour hours	10 120,93 €	$\frac{\text{Total cost of the section}}{\text{Activity}} = \frac{10\,120,93}{1\,188} = 25,72 \text{ €/labour-hour}$
Sparkling processes	3 employees x 2,75 months x 8h x 22 days + 2 employees x 0,375 months x 8h x 22 days = 1 584 labour hours	12 792,96 €	$\frac{\text{Total cost of the section}}{\text{Activity}} = \frac{12\,792,96}{1\,584} = 15,05 \text{ €/labour-hour}$
Finishing	274 600 bottles / 1 500 bottles = 183,0(6) machine hours	30 560,14 €	$\frac{\text{Total cost of the section}}{\text{Activity}} = \frac{30\,560,14}{183,0(6)} = 166,93 \text{ €/machine hour}$

Appendix 22 – Map of the cost of the sections

Description	Production of Grapes*	Harvest	Winemaking Process	Bottling Preparation Still Wines	Bottling Preparation Sparkling Wines	Sparkling Processes	Finishing	Total
1. Direct Costs								
1.1. Direct labour	83 622,00 €	7 964,00 €	10 493,68 €	2 623,42 €	7 870,26 €	10 493,68 €	10 493,68 €	133 560,72 €
1.2. Vineyard supervisor	1 440,00 €							
1.3. Oenology			13 380,00 €					
1.4. General coordination	1 200,00 €	1 200,00 €	600,00 €	300,00 €	300,00 €	600,00 €	600,00 €	4 800,00 €
1.2. Agricultural products	7 200,00 €							7 200,00 €
1.3. Oenological products			20 595,00 €					20 595,00 €
1.4. Depreciation of machines	12 834,07 €	439,68 €	7 148,51 €		165,63 €		10 285,31 €	30 873,20 €
1.5. Supplies and External Services (SES)								63 660,00 €
1.5.1. Grapes bought externally	38 760,00 €							38 760,00 €
1.5.2. Labour		4 800,00 €						4 800,00 €
1.5.3. Rent of machine		2 800,00 €						2 800,00 €
1.5.4. Quiet wine bottle line				17 300,00 €				17 300,00 €
Total Direct Costs	145 056,07 €	17 203,68 €	52 217,19 €	20 223,42 €	8 335,89 €	11 093,68 €	21 378,99 €	260 688,92 €
2. Indirect Costs								
2.1. Supplies and External Services (SES)								41 221,51 €
2.1.1. Tools and utensil of quick wear	3 153,86 €	727,81 €	242,60 €	60,65 €	181,95 €	242,60 €	242,60 €	4 852,09 €
2.1.2. Fuel Costs	2 001,62 €	500,41 €						2 502,03 €
2.1.3. Electricity			342,24 €	96,26 €	32,09 €	85,56 €	256,68 €	812,83 €
2.1.4. Maintenance and repair costs	1 775,75 €	1 775,75 €	4 439,37 €	3 329,53 €	1 109,84 €	887,87 €	4 439,37 €	17 757,48 €
2.1.5. Hygiene and safety at work	900,00 €	85,71 €	139,29 €	34,82 €	104,46 €	139,29 €	139,29 €	1 542,86 €
2.1.6. Insurance against occupational accidents and occupational diseases	1 912,50 €	182,14 €	295,98 €	74,00 €	221,99 €	295,98 €	295,98 €	3 278,57 €
2.1.7. Surveillance and security			116,29 €	- €	4,23 €	- €	143,58 €	264,11 €
2.1.8. Insurance	2 375,09 €	274,29 €	2 928,51 €	- €	106,49 €	- €	3 615,67 €	9 300,05 €
2.1.9. Cleaning, hygiene and comfort			767,58 €	23,99 €	23,99 €	47,97 €	47,97 €	911,50 €
Total Indirect Costs	12 118,82 €	3 546,11 €	9 271,87 €	3 619,24 €	1 785,04 €	1 699,28 €	9 181,15 €	41 221,51 €
3. Total Costs (Direct+Indirect)	157 174,89 €	20 749,79 €	61 489,06 €	23 842,66 €	10 120,93 €	12 792,96 €	30 560,14 €	301 910,43 €
Allocation Base	185000	2286	1584	76,05714286	1188	1584	183,0666667	
Overhead rate	0,85 €	9,08 €	38,82 €	168,20 €	25,72 €	15,05 €	166,93 €	
Allocation rate	Kg	Labour hours	Labour hours	Machine hours	Labour hours	Labour hours	Machine hours	

*Production of grapes	
Average cost of producing grapes (including own produced grapes and externally bought grapes)	0,85 €
Average cost of own produced grapes	1,74 €
Average cost of grapes bought externally	0,57 €

Appendix 23 – Labour-hours and machine hours

Description	Machine hours/ machine	Number of machines	Total machine hours
Production of grapes	1600	3	1600 x 3 = 4800
Harvest	400	3	400 x 3 = 1300
Preparation still wines			$\frac{133\ 100\ bottles \times 8\ hours}{14\ 000\ bottles} = 76,05714286^*$
Finishing			$\frac{274\ 600\ bottles}{1\ 500\ bottles} = 183,0(6)^{**}$

Description	Total hours/ tractor	% of hours	Total hours/ machine
Production of grapes	2000	80%	1600
Harvest	2000	20%	400

Description	Total hours	Total cost	Cost/ hour
Harvest	100	2 800,00 €	28,00 €
Description	Total hours	Total cost	Cost/ hour
Labour (SES)	1230	4 800,00 €	3,90 €

*Assuming that 14 000 bottles are bottled per day and that in 2018, 133 100 bottles of still wines were produced.

**Assuming that 1 500 bottles are labelled per hour, 1 day comprises 8 hours of work and that in 2018 were produced 274 600 bottles of all the types of wine.

Appendix 24 – Time spent in the warehouse

Type of wine	Aging Time
White Arinto Bical	180
White Sauvignong Blanc	180
White Reserve QMF	360
White Vinha Cru	360
Rose Blush	180
Red Selection	540
Red Long Stage	900
Red Reserva QMF	360
Gross White Sparkling QMF	360
White Sparkling Baga Bairrada	540
Gross Rose Sparkling QMF	270
Gross Red Sparkling QMF	540
Sparkling Personal Reserve	1080
Sparkling Virgilio de Sousa	1200
Rose Blush Reserve	270
White Sparkling Reserve	720
Total	8040

Appendix 25 – Map of production costs

Description	Unit	White Arinto Bical			White Sauvignon Blanc			White Reserve QMF		
		17000 bottles			12000 bottles			2000 bottles		
		Unit cost	Q	V	Unit cost	Q	V	Unit Cost	Q	V
1. Materials										
Bottle	Unit	0,20 €	17000	3 400,00 €	0,20 €	12000	2 400,00 €	0,52 €	2000	1 040,00 €
Capsules	Unit	0,01 €	17000	170,00 €	0,01 €	12000	120,00 €	0,03 €	2000	60,00 €
Corks	Unit	0,06 €	17000	1 020,00 €	0,06 €	12000	720,00 €	0,06 €	2000	120,00 €
Labels	Unit	0,05 €	17000	850,00 €	0,07 €	12000	840,00 €	0,15 €	2000	300,00 €
Counter-labels	Unit	0,03 €	17000	510,00 €	0,05 €	12000	600,00 €	0,09 €	2000	180,00 €
Packaging	Unit	0,08 €	17000	1 360,00 €	0,08 €	12000	960,00 €	0,08 €	2000	160,00 €
Total		0,43 €		7 310,00 €	0,47 €		5 640,00 €	0,93 €		1 860,00 €
2. Transformation Costs										
Production of grapes	Kg	0,85 €	17000	14 443,10 €	0,85 €	12000	10 195,13 €	0,85 €	2000	1 699,19 €
Harvest	Lh	9,08 €	141,5222141	1 284,58 €	9,08 €	99,898	906,76 €	9,08 €	16,6497	151,13 €
Winemaking process	Lh	38,82 €	98,06263656	3 806,68 €	38,82 €	69,2207	2 687,07 €	38,82 €	11,5368	447,84 €
Bottle preparation still wines	Mh	168,20 €	9,714285714	1 633,96 €	168,20 €	6,85714	1 153,38 €	168,20 €	1,14286	192,23 €
Bottle preparation sparkling wines	Lh	25,72 €					- €			- €
Sparkling processes	Lh	15,05 €		- €			- €			- €
Finishing	Mh	166,93 €	11,333333333	1 891,92 €	166,93 €	8	1 335,48 €	166,93 €	1,33333	222,58 €
APA	Bottle	0,00020 €	3060000	625,71 €	0,00020 €	2160000	441,68 €	0,00020 €	720000	147,23 €
Total				23 685,96 €			16 719,50 €			2 860,20 €
3. Final Cost				30 995,96 €			22 359,50 €			4 720,20 €
4. Unit Cost				1,82 €			1,86 €			2,36 €

White Vinha Cru			Rose Blush			Red Selection			Red Long Stage			Red Reserva QMF		
2500 bottles			6000 bottles			2550 bottles			3800 bottles			8500 bottles		
Unit cost	Q	V	Unit cost	Q	V	Unit cost	Q	V	Unit cost	Q	V	Unit cost	Q	V
1,09 €	2500	2 725,00 €	0,20 €	60000	12 000,00 €	0,20 €	25500	5 100,00 €	1,09 €	3800	4 142,00 €	0,52 €	8500	4 420,00 €
0,22 €	2500	550,00 €	0,01 €	60000	600,00 €	0,01 €	25500	255,00 €	0,09 €	3800	342,00 €	0,03 €	8500	255,00 €
0,18 €	2500	450,00 €	0,06 €	60000	3 600,00 €	0,06 €	25500	1 530,00 €	0,18 €	3800	684,00 €	0,06 €	8500	510,00 €
0,25 €	2500	625,00 €	0,04 €	60000	2 400,00 €	0,06 €	25500	1 530,00 €	0,22 €	3800	836,00 €	0,15 €	8500	1 275,00 €
0,11 €	2500	275,00 €	0,02 €	60000	1 200,00 €	0,03 €	25500	765,00 €	0,09 €	3800	342,00 €	0,09 €	8500	765,00 €
0,17 €	2500	425,00 €	0,08 €	60000	4 800,00 €	0,08 €	25500	2 040,00 €	1,17 €	3800	4 446,00 €	0,08 €	8500	680,00 €
2,02 €		5 050,00 €	0,41 €		24 600,00 €	0,44 €		11 220,00 €	2,84 €		10 792,00 €	0,93 €		7 905,00 €
0,85 €	2500	2 123,98 €	0,85 €	60000	50 975,64 €	0,85 €	25500	21 664,65 €	0,85 €	3800	3 228,46 €	0,85 €	8500	7 221,55 €
9,08 €	20,8121	188,91 €	9,08 €	499,4902	4 533,82 €	9,08 €	183,1464	1 662,40 €	9,08 €	31,63437728	287,14 €	9,08 €	70,76110706	642,29 €
38,82 €	14,421	559,81 €	38,82 €	346,1034	13 435,34 €	38,82 €	126,9046	4 926,29 €	38,82 €	21,91988347	850,90 €	38,82 €	49,03131828	1 903,34 €
168,20 €	1,42857	240,29 €	168,20 €	34,28571	5 766,92 €	168,20 €	12,57143	2 114,54 €	168,20 €	2,171428571	365,24 €	168,20 €	4,857142857	816,98 €
		- €			- €			- €			- €			- €
		- €			- €			- €			- €			- €
166,93 €	1,66667	278,22 €	166,93 €	40	6 677,38 €	166,93 €	14,66667	2 448,37 €	166,93 €	2,533333333	422,90 €	166,93 €	5,666666667	945,96 €
0,00020 €	900000	184,03 €	0,00020 €	10800000	2 208,39 €	0,00020 €	13770000	2 815,70 €	0,00020 €	3420000	699,32 €	0,00020 €	3060000	625,71 €
		3 575,24 €			83 597,49 €			35 631,94 €			5 853,97 €			12 155,83 €
		8 625,24 €			108 197,49 €			46 851,94 €			16 645,97 €			20 060,83 €
		3,45 €			1,80 €			1,84 €			4,38 €			2,36 €

Gross White Sparkling QMF			White Sparkling Baga Bairrada			Gross Rose Sparkling QMF			Gross Red Sparkling QMF			Sparkling Personal Reserve		
72000 bottles			23000 bottles			12500 bottles			17000 bottles			4200 bottles		
Unit cost	Q	V	Unit cost	Q	V	Unit cost	Q	V	Unit cost	Q	V	Unit cost	Q	V
0,33 €	72000	23 760,00 €	0,33 €	23000	7 590,00 €	0,33 €	12500	4 125,00 €	0,33 €	17000	5 610,00 €	1,34 €	4200	5 628,00 €
0,03 €	72000	2 160,00 €	0,03 €	23000	690,00 €	0,03 €	12500	375,00 €	0,03 €	17000	510,00 €	0,08 €	4200	336,00 €
0,12 €	72000	8 640,00 €	0,12 €	23000	2 760,00 €	0,12 €	12500	1 500,00 €	0,12 €	17000	2 040,00 €	0,12 €	4200	504,00 €
0,05 €	72000	3 600,00 €	0,08 €	23000	1 840,00 €	0,05 €	12500	625,00 €	0,06 €	17000	1 020,00 €	0,20 €	4200	840,00 €
0,04 €	72000	2 880,00 €	0,04 €	23000	920,00 €	0,04 €	12500	500,00 €	0,04 €	17000	680,00 €	0,09 €	4200	378,00 €
0,07 €	72000	5 040,00 €	0,26 €	23000	5 980,00 €	0,07 €	12500	875,00 €	0,07 €	17000	1 190,00 €	2,50 €	4200	10 500,00 €
0,64 €		46 080,00 €	0,86 €		19 780,00 €	0,64 €		8 000,00 €	0,65 €		11 050,00 €	4,33 €		18 186,00 €
0,85 €	72000	61 170,77 €	0,85 €	23000	19 540,66 €	0,85 €	12500	10 619,92 €	0,85 €	17000	14 443,10 €	0,85 €	4200	3 568,29 €
9,08 €	599,3882	5 440,59 €	9,08 €	191,4712	1 737,97 €	9,08 €	104,06	944,55 €	9,08 €	141,522	1 284,58 €	9,08 €	34,9643	317,37 €
38,82 €	415,3241	16 122,41 €	38,82 €	132,673	5 150,21 €	38,82 €	72,1049	2 799,03 €	38,82 €	98,0626	3 806,68 €	38,82 €	24,2272	940,47 €
25,72 €	604,4947	15 550,04 €	25,72 €	193,1025	4 967,37 €	25,72 €	104,947	2 699,66 €	25,72 €	142,728	3 671,54 €	25,72 €	35,2622	907,09 €
15,05 €	805,9929	12 131,95 €	15,05 €	257,47	3 875,49 €	15,05 €	139,929	2 106,24 €	15,05 €	190,304	2 864,49 €	15,05 €	47,0163	707,70 €
166,93 €	48	8 012,86 €	166,93 €	15,33333	2 559,66 €	166,93 €	8,33333	1 391,12 €	166,93 €	11,33333	1 891,92 €	166,93 €	2,8	467,42 €
0,00020 €	25920000	5 300,13 €	0,00020 €	12420000	2 539,65 €	0,00020 €	3375000	690,12 €	0,00020 €	9180000	1 877,13 €	0,00020 €	4536000	927,52 €
		123 728,74 €			40 371,01 €			21 250,64 €			29 839,44 €			7 835,86 €
		169 808,74 €			60 151,01 €			29 250,64 €			40 889,44 €			26 021,86 €
		2,36 €			2,62 €			2,34 €			2,41 €			6,20 €

Rose Blush Reserve	White Sparkling Reserve	Total
- €	- €	681 645,03 €
- €	- €	422 652,02 €
- €	- €	208 832,87 €
		- €
		208 832,87 €
		37 421,42 €
		84 757,85 €
		88 005,14 €
		- 32 729,80 €
		53 923,80 €
		- €
		13 952,39 €
		39 971,41 €
		- €
		39 971,41 €

Description	Total
Sales and service rendering	681 645,03 €
Cost of goods sold	422 652,02 €
Sub-total	208 832,87 €
Industrial costs not incorporated	- €
Gross Profit	208 832,87 €
Distribution Costs	37 421,42 €
Administrative Costs	84 757,85 €
Commercial Costs	88 005,14 €
Other operating income	- 32 729,80 €
Operating income	53 923,80 €
Interest and similar income	- €
Interest and similar costs	13 952,39 €
Current result	39 971,41 €
Extraordinary income and gains	
Extraordinary costs and losses	- €
Profit before tax	39 971,41 €

Appendix 27 – Sales and cost of goods manufactured in 2018

Description	Quantities Sold	Average Unit Price	Total Revenue	Unit Cost	Total Cost
White Wine in Bulk	10100	1,09 €	11 009,00 €	0,60 €	6 060,00 €
Rose Wine in Bulk	70	0,82 €	57,50 €	0,60 €	42,00 €
Red Wine in Bulk	6450	1,14 €	7 330,00 €	0,60 €	3 870,00 €
Extra	22500	2,32 €	52 200,00 €	1,45 €	32 625,00 €
White Arinto Bical	13145	2,36 €	31 022,20 €	1,82 €	23 967,17 €
White Sauvignon Blanc	9099	2,83 €	25 714,37 €	1,86 €	16 954,09 €
White Reserve QMF	0	- €	- €	2,36 €	- €
White Vinha Cru	1050	6,81 €	7 146,84 €	3,45 €	3 622,60 €
Rose Blush	47300	2,24 €	105 996,43 €	1,80 €	85 295,69 €
Red Selection	18246	2,33 €	42 576,27 €	1,84 €	33 523,94 €
Red Long Stage	3038	9,43 €	28 640,03 €	4,38 €	13 308,01 €
Red Reserva QMF	0	- €	- €	2,36 €	- €
Gross White Sparkling QMF	46597	3,30 €	153 770,10 €	2,36 €	109 896,91 €
White Sparkling Baga Bairrada	12600	5,69 €	71 732,18 €	2,62 €	32 952,29 €
Gross Rose Sparkling QMF	13445	3,35 €	45 040,75 €	2,34 €	31 461,99 €
Gross Red Sparkling QMF	15586	3,28 €	51 176,49 €	2,41 €	37 488,40 €
Sparkling Personal Reserve	0	- €	- €	6,20 €	- €
Sparkling Virgílio de Sousa	900	14,90 €	13 410,00 €	7,69 €	6 921,20 €
Rose Blush Reserve	0	- €	- €	3,81 €	- €
White Sparkling Reserve	0	- €	- €	2,80 €	- €
Total	220126		646 822,16 €		437 989,29 €
			208 832,87 €		

Appendix 28 – Scenario 1 for 2019: Sales and cost of goods manufactured assuming an increase in quantities sold

Description	Quantities Sold	Average Unit Price	Total Revenue	Unit Cost	Total Cost
White Wine in Bulk	10100	1,09 €	11 009,00 €	0,60 €	6 060,00 €
Rose Wine in Bulk	70	0,82 €	57,50 €	0,60 €	42,00 €
Red Wine in Bulk	6450	1,14 €	7 330,00 €	0,60 €	3 870,00 €
Extra	27000	2,32 €	62 640,00 €	1,45 €	39 150,00 €
White Arinto Bical	14500	2,36 €	34 220,00 €	1,82 €	26 437,73 €
White Sauvignon Blanc	11200	2,83 €	31 696,00 €	1,86 €	20 868,86 €
White Reserve QMF	1600	3,50 €	5 600,00 €	2,36 €	3 776,16 €
White Vinha Cru	750	6,81 €	5 107,50 €	3,45 €	2 587,57 €
Rose Blush	58000	2,24 €	129 920,00 €	1,80 €	104 590,91 €
Red Selection	20000	2,33 €	46 600,00 €	1,84 €	36 746,62 €
Red Long Stage	2500	9,43 €	23 575,00 €	4,38 €	10 951,29 €
Red Reserva QMF	3000	3,50 €	10 500,00 €	2,36 €	7 080,29 €
Gross White Sparkling QMF	55000	3,30 €	181 500,00 €	2,36 €	129 715,01 €
White Sparkling Baga Bairrada	13500	5,69 €	76 815,00 €	2,62 €	35 306,03 €
Gross Rose Sparkling QMF	15000	3,35 €	50 250,00 €	2,34 €	35 100,77 €
Gross Red Sparkling QMF	16000	3,28 €	52 480,00 €	2,41 €	38 484,18 €
Sparkling Personal Reserve	0	- €	- €	6,20 €	- €
Sparkling Virgílio de Sousa	1000	14,90 €	14 900,00 €	7,69 €	7 690,22 €
Rose Blush Reserve	6500	6,50 €	42 250,00 €	3,81 €	24 770,22 €
White Sparkling Reserve	6800	4,20 €	28 560,00 €	2,80 €	19 060,52 €
Total	268970		815 010,00 €		552 288,38 €
			262 721,62 €		

Appendix 29 – Scenario 2: Sales and cost of goods manufactured assuming an increase of 10% in the average unit price

Description	Quantities Sold	Average Unit Price	Total Revenue	Unit Cost	Total Cost
White Wine in Bulk	10100	1,20 €	12 109,90 €	0,60 €	6 060,00 €
Rose Wine in Bulk	70	0,90 €	63,14 €	0,60 €	42,00 €
Red Wine in Bulk	6450	1,25 €	8 088,30 €	0,60 €	3 870,00 €
Extra	22500	2,55 €	57 420,00 €	1,45 €	32 625,00 €
White Arinto Bical	13145	2,60 €	34 124,42 €	1,82 €	23 967,17 €
White Sauvignon Blanc	9099	3,11 €	28 325,19 €	1,86 €	16 954,09 €
White Reserve QMF	0	- €	- €	2,36 €	- €
White Vinha Cru	1050	7,49 €	7 865,55 €	3,45 €	3 622,60 €
Rose Blush	47300	2,46 €	116 547,20 €	1,80 €	85 295,69 €
Red Selection	18246	2,56 €	46 764,50 €	1,84 €	33 523,94 €
Red Long Stage	3038	10,37 €	31 513,17 €	4,38 €	13 308,01 €
Red Reserva QMF	0	- €	- €	2,36 €	- €
Gross White Sparkling QMF	46597	3,63 €	169 147,11 €	2,36 €	109 896,91 €
White Sparkling Baga Bairrada	12600	6,26 €	78 863,40 €	2,62 €	32 952,29 €
Gross Rose Sparkling QMF	13445	3,69 €	49 544,83 €	2,34 €	31 461,99 €
Gross Red Sparkling QMF	15586	3,61 €	56 234,29 €	2,41 €	37 488,40 €
Sparkling Personal Reserve	0	- €	- €	6,20 €	- €
Sparkling Virgílio de Sousa	900	16,40 €	14 760,90 €	7,69 €	6 921,20 €
Rose Blush Reserve	0	- €	- €	3,81 €	- €
White Sparkling Reserve	0	- €	- €	2,80 €	- €
Total	220126		711 371,89 €		437 989,29 €
			273 382,60 €		

Appendix 30 – Scenario 3: Sales and cost of goods manufactured assuming both an increase in quantities and a 10% increase in the average unit price

Description	Quantities Sold	Average Unit Price	Total Revenue	Unit Cost	Total Cost
White Wine in Bulk	10100	1,20 €	12 109,90 €	0,60 €	6 060,00 €
Rose Wine in Bulk	70	0,90 €	63,14 €	0,60 €	42,00 €
Red Wine in Bulk	6450	1,25 €	8 088,30 €	0,60 €	3 870,00 €
Extra	27000	2,55 €	68 904,00 €	1,45 €	39 150,00 €
White Arinto Bical	14500	2,60 €	37 642,00 €	1,82 €	26 437,73 €
White Sauvignon Blanc	11200	3,11 €	34 865,60 €	1,86 €	20 868,86 €
White Reserve QMF	1600	3,50 €	5 600,00 €	2,36 €	3 776,16 €
White Vinha Cru	750	7,49 €	5 618,25 €	3,45 €	2 587,57 €
Rose Blush	58000	2,46 €	142 912,00 €	1,80 €	104 590,91 €
Red Selection	20000	2,56 €	51 260,00 €	1,84 €	36 746,62 €
Red Long Stage	2500	10,37 €	25 932,50 €	4,38 €	10 951,29 €
Red Reserva QMF	3000	3,50 €	10 500,00 €	2,36 €	7 080,29 €
Gross White Sparkling QMF	55000	3,63 €	199 650,00 €	2,36 €	129 715,01 €
White Sparkling Baga Bairrada	13500	6,26 €	84 496,50 €	2,62 €	35 306,03 €
Gross Rose Sparkling QMF	15000	3,69 €	55 275,00 €	2,34 €	35 100,77 €
Gross Red Sparkling QMF	16000	3,61 €	57 728,00 €	2,41 €	38 484,18 €
Sparkling Personal Reserve	0	- €	- €	6,20 €	- €
Sparkling Virgílio de Sousa	1000	16,40 €	16 401,00 €	7,69 €	7 690,22 €
Rose Blush Reserve	6500	6,50 €	42 250,00 €	3,81 €	24 770,22 €
White Sparkling Reserve	6800	4,20 €	28 560,00 €	2,80 €	19 060,52 €
Total	268970		887 856,19 €		552 288,38 €
			335 567,81 €		

Appendix 31 – Comparison of the production costs computed by the company and the production costs obtained using the homogeneous cost pool method

Description	Production Cost as computed by the company	Production Cost with homogeneous cost pool method
White Arinto Bical	1,85 €	1,82 €
White Sauvignon Blanc	1,85 €	1,86 €
White Reserve QMF		2,36 €
White Vinha Cru	3,06 €	3,45 €
Rose Blush	1,85 €	1,80 €
Red Selection	1,77 €	1,84 €
Red Long Stage	4,30 €	4,38 €
Red Reserva QMF		2,36 €
Gross White Sparkling QMF	2,48 €	2,36 €
White Sparkling Baga Bairrada	3,50 €	2,62 €
Gross Rose Sparkling QMF	1,60 €	2,34 €
Gross Red Sparkling QMF	2,00 €	2,41 €
Sparkling Personal Reserve		6,20 €
Sparkling Virgílio de Sousa	6,00 €	7,69 €
Rose Blush Reserve		3,81 €
White Sparkling Reserve		2,80 €

Appendix 32 – Important aspects to consider

- When computing the production cost of each type of wine, some limitations that were not possible to overcome in this first stage, which may have some influence in the obtained results. In the future, it may be possible to improve the costing system.
- Some products are overcosted while others are undercosted.

- The correct measurement of the production costs may be of extreme importance for the management to make more rational and strategic decisions regarding costing and price control.
- The average unit sale price is below the price offered to the distributors for some types of wines, which leads to the conclusion that the bottles QMF is offering are having a significant influence in the average unit sale price and consequently on revenues.
- In order to achieve the objectives desired, QMF should look in deep to the average unit sale price. According to the possible scenarios analysed for 2019, it will be possible to increase the gross margin by increasing the quantities sold and/or the sale price.
- The quantities sold are more difficult to control. QMF could invest more in both marketing and commercial areas in order to increase the quantities sold. However, it could lead to big increases in the costs of those departments, consequently increasing the gross margin with a simultaneously decrease in results.
- A 10% increase in the average price is easily controlled by the company and would also lead to an increase in the gross margin. Since the average unit price of some wines is low, it may not be difficult to introduce this measure.
- A combination of both an increase in the quantities sold and in the average unit price would result in the biggest increase in the gross margin.
- With the correct information of the costs per section, QMF may also analyse what are the more expensive sections and found possibilities to control costs in each of them.