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Analysis of the wine production chain in the municipality of Angatuba & proposal for sustainable culture

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ABSTRACT

This research addresses the wine production chain at the Silva Family Juice Factory, highlighting the evolution of production practices and the environmental impact of viticulture. The study aimed to analyze the wine production chain and propose sustainable solutions to optimize processes and minimize environmental impacts. Wine production has several environmental impacts, such as the excessive use of water and energy, as well as the use of chemicals that can contaminate the soil and water. The adoption of sustainable practices, such as the use of renewable energy and the reduction of chemicals, is crucial for the sustainability of the wine industry. The research has a descriptive character and uses a qualitative approach, based on primary and secondary data and data collection was carried out through a technical visit to the winery. The modeling of the production processes was done using the EKD (Enterprise Knowledge Development) methodology, which involves the creation of diagrams to visually represent the different elements of the process. It was observed that the production chain still lacks sustainable practices, with the main focus being on costs and finances. However, opportunities were identified to differentiate production and make it more sustainable, requiring the collaboration of local residents, market strategies, and factory employees. The research suggests that innovation and sustainability are key to the future of wine production, and replacing wine bottles with cans could be a viable alternative to reduce costs and environmental impacts. In addition, studying and analyzing the wine production chain is crucial to strengthen the sector, modernize production and attract investors, promoting a more sustainable and competitive future for viticulture in the Angatuba region.

Keywords: Environmental sustainability, EKD methodology, Productive efficiency, Sustainable practices, Technological innovation, Waste reduction.

INTRODUCTION

Used culturally extensively around the world, wine is an alcoholic beverage that is based on the fruit of the vine plant *(Vitis sp.)*, commonly known as grape. Around the world, there are about two hundred species that have adapted to viticulture, the name given to the field of study of grape production. These plants are cultivated on practically all continents of the world, having been domesticated by humans approximately, between the years 3300 and 1200 BC between the territories that today correspond to Armenia and Persia. As for wine, it is stipulated that the production occurred by mistake, with the forgetting of containers containing grape juice, which consequently fermented and gave rise to the drink made in the current viniculture (the name viniculture is given to the winemaking process) (PEREIRA et al., 2022; SOUZA, 1996).

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With strong cultural roots cultivated in the ancient societies of Greece and Rome, wine began to be marketed and, consequently, cultivated in the Iberian Peninsula, finally having its production in Portugal, where, in 1532, Martim Afonso de Souza set out for Brazil to introduce the first vines in the national territory, which had its first wine produced in mid-1551, on the Piratininga plateau, located in the northwest of the State of São Paulo (PEREIRA et al., 2022). Currently, Brazil has an impact on the wine market of reasonable importance. In 2021, the country produced 1,697,000 tons of grapes (2.4% of world production), 19.9% more than in 2020; produced 360,000,000 liters of wine (1.4% of world production),

59.5% more than the previous year, and had a consumption of 410,000,000 liters (1.7% of world consumption), being the 13th largest consumer in the world, denoting the importance of viticulture in Brazil (OIV, 2023).

The state of São Paulo represents the largest national consumption, with a share of 32.1% of national consumption, each person consumes, on average, 2.85 L of wine per year (BURGOS, 2022). In Angatuba, in the southwest of São Paulo, is located the Silva Family Juice Factory, founded in 2013, which is created by Nelson José da Silva. The founder started wine production and initially produced whole grape juices, later expanding to wine production.

This study seeks to analyze the wine production chain of the Silva Family Juice Factory, compare it with other production chains and present sustainable alternatives for production in the studied Factory.

In this way, studying and analyzing the wine production chain becomes a fundamental tool to help in its strengthening process, in addition to presenting possible sustainable aspects for its production, making it more modern and aiming at an ecological future and, finally, bringing greater visibility to the sector, as well as possible investors for the chain studied.

THEORETICAL FRAMEWORK

WINE CHAIN

First, it is important to say that in recent years Brazilian viticulture has benefited from important advances in the sector, including the adoption of new cultivars, the use of more sustainable practices and processes, as well as the diversification of production, as well as the implementation of Geographical Indications (analysis of production feasibility *in loco*) and expansion into new regions. However, this production has distinct and peculiar regional characteristics in terms of production cycles, harvest time and type of product. On the other hand, the activity is an important source of income for small properties in some regions, while in others it has contributed to sustainability

through investments made by companies that generate jobs and income, thus becoming an important asset for the local economy in which production is located (MELLO, 2019).

The growth in the wine market caused by the high competitiveness generated by the diversity of products in the market and diversification of the consumer's palate, the quality of the product becomes a key piece for differentiation in the market and establishment of customers. The quality of the wine depends on the characteristics of the grape used as raw material, which is directly related to the territory of.

It is important to emphasize that the quality of the grapes is inversely proportional to the volume produced, since the vineyards with higher productivity often do not allow the intensity of the color of the grape, as well as the amount of sugar necessary for a good wine, to develop, and pruning is of fundamental importance. Therefore, the cost of making a quality wine is higher, which necessarily implies a higher marketing price, thus dictating market prices (SOARES, 2008).

An essential factor for the elaboration of a good wine is the use of production technologies, especially in the processing and storage of the product. Since several wineries have been using sophisticated equipment, aiming to increase the quality and competitiveness of their products, such as bottlers, which provide greater agility and precision in the packaging of the product and stainless steel tanks, and the use of these tanks, instead of wooden barrels, appears as an alternative and possibility for an artificial control of the fermentation temperature, which makes production less dependent on climatic conditions (SOARES, 2008).

In addition, there is a growing concern about the reuse of waste in production. Grape pomace is the largest residue of the raw material, representing 5 to

10% of the grape. With the use of technology, this bagasse, which is composed of the husk and seed, has a very productive purpose in the industry. From the seeds and husk it is possible to extract oils, fibers and phenolic compounds (Christ; Burrit, 2013; Brenes et al., 2016).

WINE PRODUCTION

The wine production chain, according to Rizzon and Dall'agnol (2007), has 11 stages: Receiving the grapes in the canteens (place of wine production): It is also characterized by the point of entry of the grape, at which the general aspects of the fruit are determined;

1. Separation of the rachis (pedicel, commonly known as the handle) from the grape and crushing: An important step, as the separation of the rachis influences the quality of the wine, since this component of the grape can offer bitterness to the wine and dilution, if incorporated into the mixture. It is also the stage in which the must (juice of fresh grapes) comes into contact with yeasts responsible for fermentation (which is not desirable, as

there is a stage exclusively for this) and the forwarding of the crushed grapes to the winemaking container. This process is currently done entirely by machines;

2. Addition of potassium metabisulfite: The addition of the compound brings several results in wine. First, it releases 50% of its weight in the form of sulfur dioxide, bringing several beneficial actions to the wort, such as Antiseptic and disinfectant; antioxidant (prevents the loss of fruit freshness that oxygen causes); solubilizing; anti-oxidasic (blocks the action of rot enzymes) and coagulant;
3. Correction of the must sugar: Method used for the wine to reach the necessary alcohol content;
4. Alcoholic fermentation: Responsible for fermenting sugar, transforming it into ethyl alcohol, through the yeasts Saccharomyces cerevisiae, present in the grape skin, which can also be inserted.
5. Maceration: It is the stage of the red wine receiving its characteristic color, through the mixture between the must and the skins present in the winemaking container (or not, if the production is white wine);
6. Unclaw and pressing: Uncask is the separation of the wort from the rest of the solid part (not mixed during the maceration process) and the press consists of crushing the remaining solid part in order to remove all the liquid that was lodged in the husks;
7. End of alcoholic fermentation (slow fermentation): At this stage, the yeasts ferment the last grams of sugar, while, in an open container, the carbon dioxide generated during fermentation is released little by little. The stage ends when a content of a maximum of 3.0 g/L of sugar in the wine is examined;
8. Malolactic fermentation: Process of transforming malic acid into lactic acid, reducing the acidity of the wine;
9. Clarification and stabilization: Wine sedimentation stage, in which the remains of solid waste suspended in the liquid are at the bottom of the storage place. To solve the problem, the storage process can be carried out in oak barrels so that the process of sedimentation and removal of the wine that will be sent to the last stage occurs;
10. Bottling: The final product of the process is bottled, in which the 750ml bottle is the most common, and then closed by a natural cork stopper or screwed on with metal/plastic caps. The wine can also be aged after the process, making it more complex in odor and flavor (RIZZON, DALL'AGNOL, 2007).

SUSTAINABILITY IN WINE PRODUCTION

When it comes to sustainability in production, there are some essential factors that need to be taken into account for the manufacture of a certain product to be considered sustainable. These factors are social development, economic interest and protection of the environment, and they need to be in balance and harmony, without one factor harming the other. Considering the wine production in question, the same factors will be considered for this crop. Since it has roots in specific locations and has commercial importance, it is necessary to pay attention to the specificities and environmental needs of each region of the country (EMBRAPA, 2019).

Considering an ideal environment, with sustainable practices in wine production, there are some essential standards to be practiced. According to Flores (2015), a survey was carried out in wineries, in which it concluded that it is necessary to monitor the quality of the water used in the chain, in addition to integrating a rainwater harvesting system. And Conama (1997, apud Flores, 2018) points out the obligation, by Brazilian legislation, to carry out the treatment of effluents, such as spraying with a low volume of mixture.

Also according to Flores (2015), it is necessary to take measures aimed at energy efficiency, such as natural lighting and ventilation, and for thermal insulation it is recommended to use water mirrors with plant walls. Another very important condition is planned agricultural practices. In the implementation of the vineyard, it is necessary to carry out soil studies to improve insolation and optimize moisture runoff. As for the agrochemicals used, according to BRASIL (2000, apud Flores, 2018), responsibility for the waste generated is essential, making the correct destination of pesticide packaging and its storage in an appropriate place, following the current laws of the sector.

Overall, the importance of making wine production more sustainable is highlighted, minimizing its negative impacts on the environment in which the production is inserted, taking into account geographical and population aspects. Although there is still much to be done, the sustainable practices adopted by many wineries around the world indicate that wine production can be carried out in a more responsible and environmentally conscious way, underscoring the importance of public policies that encourage sustainability in wine production and the need for cooperation between producers, government and consumers to achieve more sustainable and responsible practices (ROCHA AND NODARI, 2020).

ECONOMIC AND SOCIAL ADVANTAGES OF WINE PRODUCTION

One of the great benefits of producing wine is interspersed with the health area, since the drink brings many benefits to the quality of life of human beings when consumed in moderation, due to the presence of antioxidants in wine (MORAES, 2010).

Regarding the benefit, the action of the antioxidant present in wine (resveratrol) is scientifically proven in cases of cardiovascular diseases, helps to lower the individual's cholesterol level and also has anticarcinogenic action due to the retention of cell multiplication, inhibiting malignant breast cells and prostate cancer cells, for example, from multiplying and spreading (MORAES, 2010).

Another advantage of producing wine in the country is that Brazil has a very diversified viticulture, since it is possible to produce the drink and its derivatives in all regions of the country, making it possible to have production from the extreme south to the regions close to the Equator (MACEDO, 2022). And, because of this vast area of possible wine production, Embrapa estimates that Brazil has the capacity to supply an important portion for a future growth in demand (PEREIRA, 2008).

Following, through an estimate made from an Almost Ideal Demand System, it was found that the demand for wine is less elastic than for other alcoholic beverages such as beer, for example, being an advantage for its producers because they do not need to be concerned about an eventual increase in the price of their products (ALMEIDA.et.al, 2015).

IMPACTS OF WINE PRODUCTION AND MEASURES ADOPTED ON PRODUCTION

One of the main impacts of wine production is the excessive use of water. Irrigation of vineyards can lead to water scarcity in regions with low water availability, in addition to the possibility of affecting the quality and productivity of production. In addition, wine production also requires large amounts of energy, especially during the fermentation process, which can be responsible for a large part of the greenhouse gas emissions associated with production (ROCHA AND NODARI, 2020).

Another negative impact is the use of chemicals, such as pesticides and fertilizers, which can contaminate the soil, water, and affect the health of workers and the local population. In addition, wine production can affect local biodiversity, especially when it occurs in sensitive natural areas (ROCHA AND NODARI, 2020).

Despite these negative impacts, many wineries are adopting sustainable production practices, such as using renewable energy, reducing the use of chemicals, and preserving natural areas. It is notorious that it is important for the wine industry as a whole to get involved in sustainability initiatives and that consumers are increasingly interested in consuming sustainable products. Therefore, companies that adopt sustainable practices can benefit from this interest, creating a positive image for their products and supporting sustainability initiatives (ROCHA AND NODARI, 2020).

RESEARCH METHOD

The work in question has a descriptive character, its purpose is to represent, in a clear and succinct way, as well as to analyze the wine production chain and present, test, and, finally, study sustainable solutions for the study, that is, for wine production (FAO, 2021).

It was guided by a qualitative approach, because, after describing the problem, it originated results from the research through analysis and perceptions.

However, the research itself was developed and based on primary data, acquired mainly through information from a face-to-face study carried out at the Silva Family Juice Factory. In addition, it was also based on bibliographic research, that is, constituting the investigation of theoretical material on the subject addressed, resulting in the study of knowledge stored in electronic documents, from secondary data.

The data were analyzed in a comparative and systematic way, as well as the drawings made of the production chain were made by Microsoft PowerPoint, describing the chain in a logical way, modeling the processes in order to facilitate their understanding, thus enabling technical improvements through the EKD, which is the acronym for "Enterprise Knowledge Development", a tool and methodology that seeks the development and management of organizational knowledge of certain company, in this case, the Silva Family Juice Factory.

RESULTS AND DISCUSSIONS

HISTORY OF THE SITE AND TECHNICAL VISIT

The data and results of the research were obtained from a technical visit carried out by the project authors on 03/03/2023 at the Família Silva Juice Factory. Being considered the only one in the region, its history begins in 1996, with the purchase of a property in Angatuba. Originally from Osasco-SP, with no familiarity with wine production, the owner is from the Information Technology area and very connected to the family. He used to receive numerous visits from colleagues and family. Once together, they decided to try something new, they faced the challenge of producing the wine that was much appreciated by family and friends. In this way, 800 kilos of grapes were purchased during the 2008 Carnival holiday and managed to produce

200 liters of wine from the family production carried out by themselves and put to the test with their friends and family, since they were always visiting. The wine and juice served was approved by all and encouraged to be made for commercialization.

Since then, the techniques and tools have been perfected, and in 2013 the factory was inaugurated. Currently, the Silva Family Juice Factory has a modern infrastructure and state-of-the-art machinery, with three fixed employees and hiring sporadically during the harvest period, all of

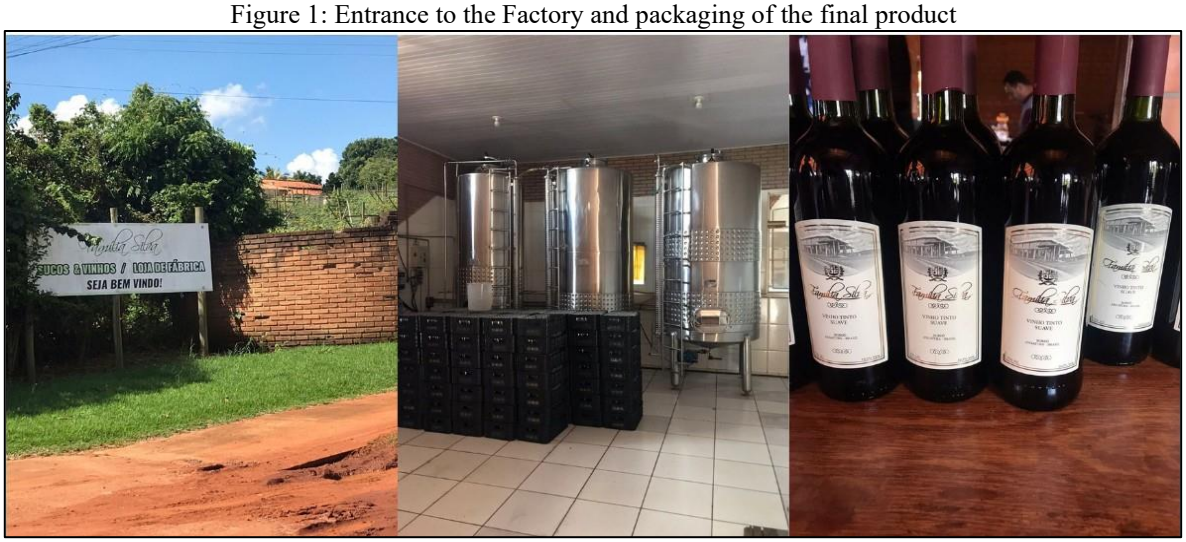
whom are hired from the region, meeting all the necessary demands, and boosting the local market, characterizing a family-type company.

They develop four-day courses for the training of winegrowers, taking education as a social project in the region. The main objective is through the factory to develop the region and be a den of regional tourism, bringing a significant economic impact to the place. The farm has its own production of grapes that corresponds to 5% of the raw material, 95% of which comes from imports from different places, such as Rio Grande do Sul and São Miguel. Harvesting is currently manual, mechanization is very expensive for the current moment, and wine production is mechanized.

The selection of grapes is carried out during the year with the producers, based on specific orders. The portion imported from Rio Grande do Sul comes from a harvest carried out at night, for technical reasons, while the portion imported from the region of São Miguel is very careful not to ferment at the wrong time. The production has a traditional fermentation process, and this process is carried out over a period of 6 months, later with a laboratory analysis.

The annual production of wines is approximately 4 thousand liters, the current production offers B2B (Business-to-Business) services in bars and restaurants and B2C (Business to Consumer) in some markets, with high competitiveness and little entry into this market, starting only in the commercialization of juices and later expanding to the production of wines, using different types of grapes such as: Bordeaux grape, Niagara Rosada. Once, a biological pesticide was used in production, resulting in loss of grape quality, and was no longer used later.

Figure 1: Entrance to the Factory and packaging of the final product



Source: prepared by the authors.

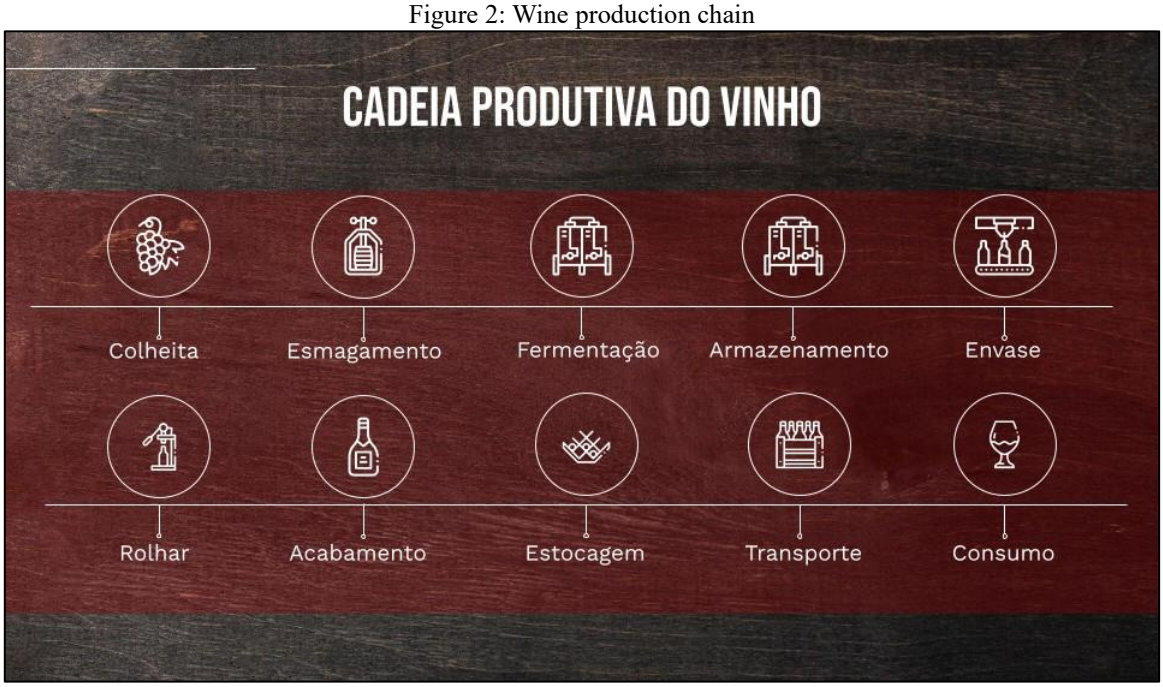
The critical processes highlighted by the owner are based on the selection of raw materials and preventive maintenance. The industry has the goal of delivering a quality product, while the company has the goal of producing products for them and for the brands. The farm has interesting

social projects for the development of the region, among them some projects that should be implemented in the future such as: Harvest and Pay, Pizzeria, Colonial Coffee and incentive to viticulture in the region. Nowadays, the company's main challenge is cost reduction, proving to be a challenge for the entire sector: numerous fees, taxes and high freight values make the cost of production high. The inventory is only of inputs and final product (manual management), while financial management is carried out by the owner manually through Excel spreadsheets and financial projections are carried out annually.

EKD AND PARAMETERS

Process modeling with EKD involves creating diagrams that visually represent the different elements of the process, including inputs, outputs, activities, and decisions. To model the processes of a wine production chain, it is necessary to identify all the processes involved in the wine production chain, from the production of grapes to the bottling of the wine. This stage involves interviews with those responsible for the different stages of the process, analysis and direct observation of the activities. After the identification of the processes, this information is documented using EKD techniques, such as interviews, questionnaires, and workshops.

Figure 2: Wine production chain



Source: Prepared by the authors.

The information collected is used to create diagrams that visually represent the different elements of the process. Process modeling is performed using EKD techniques such as mind maps, flowcharts, and activity diagrams. These diagrams help to understand how activities are carried out,

what the inputs and outputs are, and how the different activities relate to each other. After the diagrams are created, they are analyzed to identify strengths and weaknesses in the process and identify opportunities for improvement.

This analysis can help identify bottlenecks, waste, and opportunities for process optimization, and from there, improvements are proposed to optimize the process and reduce environmental impacts. These improvements can include changes in procedures, the implementation of more efficient technologies, and the adoption of sustainable practices. In summary, the EKD methodology is a systematic approach to modeling and optimizing the processes of a wine production chain, with the aim of improving efficiency and reducing environmental impacts.

The wine production chain of the Silva Family Juice Factory involves several stages, from the cultivation of the grapes to the commercialization of the bottled drink. Below, follows a step-by-step guide:

1. Soil preparation and planting of Bordeaux and Niagara rosé grapes.
2. Vine care: during the development of the vine, it is necessary to carry out activities such as pruning, irrigation, pest and disease control, and harvesting.
3. Harvesting: grape harvesting can be done manually or mechanically. The analysis of the grapes at harvest is carried out in a sensory and Brix degree with a refractometer. In addition to the sensory analyzes done weekly, an analysis of acidity, sugar levels and bitterness is carried out in a third-party laboratory. It is important that the grapes are at the right point of ripeness to ensure the quality of the wine.
4. Crushing: the grapes from both the property's harvest and imports are taken to the winery and go through the crushing process by machine, with the extraction of the must, which is the juice of the grape, discarding the pit and skin.
5. Fermentation: the wort is put into polypropylene fermentation tanks, the transformation of sugar into alcohol takes place. During this process, temperature, oxygen concentration, and other variables are controlled to ensure the desired flavor and aroma.
6. Storage: the wine is placed in stainless steel tanks to be stored and sensory tests and laboratory analyses are carried out.
7. Filling: the wine is bottled through a bottling machine and the bottles are reusable and sterilized by a partner of the factory.
8. Cork: The bottles go through a semi-automatic machinery and the cork stopper is placed in the bottles.
9. Finishing: the paper label is placed on the wine bottle manually and a plastic seal is also placed around the mouth of the bottle through a heat shrink film.

10. Storage: the wines are stored horizontally in plastic boxes for transport.
11. Distribution and sale: wine is distributed and sold in restaurants, bars (B2B) and free market (B2C).

It is worth mentioning that at each stage of the wine production chain there are specific and detailed processes that may vary according to the producing region and the winery responsible for production.

From the point of view of the processes presented, it can be noted that the model presented by Rizzon and Dall'agnol in 2007 has similarities to the production method of the Silva Family, but the authors cited do not take into account the viticultural part of the winemaking process. The studied producer plants part of the grapes used, performs the necessary care with the vines and also harvests, in addition to carrying out the labeling, storage and distribution/sale processes of the product. Such aspects were not addressed in the authors' theoretical framework of 2007, and may vary according to the producer. Therefore, it is possible to check a level of standardization of wine production, both in the theoretical and practical fields.

SUSTAINABILITY

At the Silva Family Juice Factory, the product is stored on the property, in bottles that are in a horizontal position, thus having a maximum duration of 2 years. The factory has sustainability proposals based on the use of bottles that have been reused, coming from an outsourced company, however, there is a problem of lack of bottles, generating the need to import the material. Despite the aforementioned need, they offer the possibility of collecting the bottles used by customers.

A possible sustainability proposal for the previous paragraph would be to carry out a commercial loyalty agreement between partners and customers (most of them restaurants and bars). One possibility would be to promote loyalty clubs by collecting the bottles and providing discounts according to the number of bottles collected. In this way, it would ensure a greater reuse of bottles or even an appropriate disposal in broken bottles, also solving the problem of lack of bottles in the national market.

In addition, the bags and packaging used in the sale of products are biodegradable, however, there is no waste management, and seeds are not separated, since they are dumped in the septic tank used in the factory, which is negative for the factory because, in order to be in accordance with Brazilian legislation, effluent treatment must be carried out, as pointed out by Conama (1997, apud Flores, 2018), who suggests spraying with a low volume of syrup.

Thus, to comply with the legislation, the owner has the plan to implement machinery for the transformation of one of the most valuable by-products of the grape, the oil from its seed, reducing and giving a more appropriate destination to the grape pomace. As mentioned, grape pomace is the largest residue of the raw material, representing 5 to 10% of the grape. With the use of technology, it is possible to extract oils, fibers and phenolic compounds from the skin and seed of grape pomace (Christ; Burrit, 2013; Brenes et al., 2016).

Next, the part of repairs and monitoring of the equipment, already aiming at the seed separation machinery, are divided into two stages: the first is through a cleaning CPI system, being carried out before and after the use of equipment, in the second stage periodic repairs are carried out by the employees themselves.

Although there is no water reuse policy, it comes from the property from its own supply (artesian well) and does not have an irrigation system. In this sense, based on research carried out in wineries, according to Flores (2015), the importance of monitoring the quality of water and its flow was understood. Therefore, a possible improvement that can be applied to the Silva Family Juice Factory, considering its lack of water reuse policy, is the integration of a rainwater harvesting system, increasing the reuse of water and reducing the consumption of water outsourced by SABESP, making the water used in production more sustainable.

In addition, the energy used at the site is supplied by the concessionaire. Some companies contacted to offer solar energy, however, the cost for installation, maintenance and tariffs proved to be too high for possible investments.

Nowadays, innovation and sustainability are still intertwined, that said, as the wine from the Silva Family Juice Factory has no tradition in the market, market research can be carried out to analyze the replacement of wine bottles with cans. Being fundamental for sustainability and savings in production costs, emerging as a differentiated and ideal alternative for reducing production costs and being able to bring a larger and new audience. In addition, the cans are recyclable, which can help reduce the environmental impact of wine, without losing its properties. In addition, because cans protect wine from light and air, it can help preserve the taste and quality of the wine for longer, and they are more durable than glass bottles. In short, because it has many restaurants as customers, canned wine could be very well accepted and widespread.

In summary, due to the characteristics of the region studied, and the opportunities of the residents of this location, bearing in mind the productive growth of companies in the sector, and also following the environmentally acceptable practices mentioned above, it is pertinent to state that there is a possibility of achieving greater sustainability in local wine production, reaching better standards and with more positive impact on the production chain in terms of sustainability.

FINAL CONSIDERATIONS

This research aimed to critically analyze the wine production chain in the region of Angatuba (São Paulo), focusing on a factory in the sector, the Fábrica de Sucos Família Silva. Therefore, it was possible to achieve the objective through a technical visit carried out on the farm, being essential to capture primary data from the research, as well as to carry out bibliographic research acquiring secondary data for the research material. With these primordial factors, it was possible to obtain satisfactory and essential results to better understand the viticulture dynamics of the municipality, as well as the proposition of improvements for production.

Among the results, it can be noted the existence of technical differences in the production chain used in the region and in the production chain of the theoretical framework, thus bringing necessary and essential analysis materials to capture data and metrics of the chain. Among them, it was possible to observe that the region's production chain still does not have many sustainable practices for wine production, since the factory's focus is directed to the cost and financial aspects. As it is a smaller market, sustainable production practices still do not follow the minimum necessary that is required, since the infrastructure is not ideal and resources and capital are limited, bringing sustainability as a second plan. However, even with the facts presented and with the analysis of this chain, points can be explored to differentiate production and make it increasingly sustainable, requiring the collaboration of local residents, market strategies and factory employees.

The Brazilian wine sector has been going through an important moment of transformation, driven mainly by the evolution of the consumer's palate and the high competitiveness generated by the diversity of products in the market. So, based on this, one of the recommendations for improvement is to add value to the brand from innovative ideas, it is a challenge that is part of the daily life of companies and should be placed as a priority, especially for companies with a smaller market, such as Fábrica de Sucos Família Silva. Among this aspect, there is the possibility shown by the authors of increasing the production of aluminum cans instead of wine bottles, implementing an innovative, versatile and more sustainable idea.

In addition, implementing more sustainable and low-cost ideas are shown to be tangible and accessible ideas, such as structuring the loyalty club for restaurants and ensuring the return of reusable bottles and also inserting rain gutters for storage and reuse of rainwater for the process.

As future studies, it is suggested that new research on the region's chain will be implemented, implementing and deepening the sector, bringing even more visibility to the region and finally, improving the technique of reusing grape pomace, more specifically the stone for the extraction of the by-product (grape oil), showing ways for technical improvement and reuse.

Therefore, it was possible to demonstrate the importance and complexity of an increasingly expanding chain, both in the productive, technical, technological and sustainable issue, thus consolidating a regional trade heated by tourist attractiveness and boosting the local economy of the municipality of Angatuba.

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