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**A Theoretical Approach Towards Sustainable Wine  
Industry in India**

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## **Abstract**

This thesis explores the theoretical aspects of creating a sustainable wine industry in India. The study begins with an overview of wine making approaches, including the history and development of winemaking from ancient times to modern practices. It delves into conventional, organic, biodynamic, and natural winemaking, discussing their differences.

The study focuses on the Indian wine industry, its Sustainable practices, emphasizing the importance of adopting environmentally friendly methods. The methodology section outlines the research aims and methods employed in the study (Google form survey of 125 participants), including details about the participating wineries. The following results and discussion section presents the findings from the research participants, including their habits, preferences, perceptions, and knowledge about different types of wines. It also examines their willingness to pay for different wines and their opinions on potential development, sustainable approaches, labelling, and bottling practices. The section concludes with predictions and implementations for the future of sustainable wines in India.

In conclusion, the study highlights the need for sustainable practices in the Indian wine industry and discusses the potential for development in this area. The findings from both surveys and interviews provide insights into consumer preferences, attitudes, and the feasibility of adopting sustainable approaches. The thesis emphasizes the importance of sustainability in the wine industry and offers recommendations for the implementation of sustainable practices.

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# **Chapter 01 – Wine making Approaches.**

## **1.1 - History and Development of Winemaking**

Wine has a rich history that dates back to ancient times, with evidence of winemaking dating back to around 6000 BCE in present-day Georgia. Over the centuries, winemaking has evolved and developed into a highly specialized and sophisticated industry. In the next paragraphs, we will explore the history and development of winemaking.

### **1.1.1 - The Ancient World**

As mentioned, winemaking can be traced back to the ancient world. The earliest evidence of winemaking comes from the country of Georgia, where archaeologists have discovered clay vessels that were used for fermentation dating back to 6000 BCE (Hornsey 2007). Wine was also popular in ancient Egypt, Greece, and Rome, where it was considered a luxury item and was often associated with the gods (Millon 2013).

In ancient Greece, wine was an important part of daily life, and the Greeks believed that it had medicinal properties. They also believed that the god Dionysus was the patron of wine, and they celebrated him with festivals and ceremonies that included drinking wine (McGovern, Fleming, and Katz 2003).

During the Roman Empire, winemaking became a highly specialized industry. The Romans were the first to use wooden barrels for aging and storing wine, and they also developed new techniques for cultivating grapes, such as pruning and trellising. The Romans also began to export wine to other parts of Europe and to North Africa (Pretorius 2000).

### **1.1.2 - The Middle Ages**

During the Middle Ages, winemaking continued to evolve, but it was largely the domain of the Church. Monks were some of the most skilled winemakers of the time, and they used their knowledge to produce wine for religious ceremonies (McGovern, Fleming, and Katz 2003).

One of the most famous monastic orders involved in winemaking was the Cistercian order. The Cistercians believed that wine was an important part of the religious life, and they developed

new techniques for winemaking that included aging wine in oak barrels and blending different grape varieties (Ballantyne 2011).

### 1.1.3 - The Renaissance

The Renaissance was a time of great change and innovation in many areas, including winemaking. One of the most significant developments of this period was the use of glass bottles for storing and transporting wine (Harutyunyan and Malfeito-Ferreira 2022). Glass bottles were first used in the late 16th century and quickly became popular because they were less fragile than clay vessels and allowed winemakers to see the quality of the wine inside.

Another significant development during the Renaissance was the use of cork as a wine bottle stopper. Cork was discovered to be an ideal material for wine bottle stoppers because it was impermeable to air and could be easily inserted and removed from the bottle (Knight 2001).

### 1.1.4 - Modern Winemaking

In the 19th century, winemaking underwent another major transformation with the discovery of pasteurization. Pasteurization is the process of heating wine to a specific temperature to kill off any bacteria or yeast that may be present in grape must from rotten grapes. This technique allowed winemakers to produce wines that were more consistent in quality and taste (Malletroit et al. 1991; Ough and Amerine 1966).

The 20th century saw even more innovations in winemaking, including the use of stainless-steel tanks for fermentation and the introduction of mechanized grape harvesting ('Innovations in the Winery' 2013). The development of new grape varieties, such as the hybrid grape variety for example Chambourcin, Traminette (Coia and Ward 2017), also contributed to the evolution of winemaking.

Today, winemaking is a highly specialized industry that requires a great deal of knowledge, skill, and expertise. Winemakers use a variety of techniques to produce wines with different characteristics, including aging wine in oak barrels, blending different grape varieties, and using various fermentation methods (Jackisch 1985).



In conclusion, winemaking has a long and fascinating history that spans thousands of years. From its humble beginnings in ancient Georgia to the highly specialized industry of today, winemaking has undergone many changes and innovations. With new technologies and techniques being developed all the time, it will be interesting to see how winemaking continues to evolve in the years.

## 1.2 - Conventional Wines

Traditional winemaking procedures, which often require the use of chemical additions and pesticides to assure uniform quality and avoid spoilage, are used to make conventional wines. These techniques have been utilized for many years and are still employed by the majority of vineyards across the world.

### 1.2.1 – Enhancers for Longevity

Chemical additions used in traditional winemaking include sulphur dioxide (SO<sub>2</sub>), which is used to keep the wine from oxidizing, microbial spoilage and creating off-flavours. Enzymes, yeast nutrients, and fining agents may also be employed to clarify the wine and eliminate any unpleasant odours or smells (Hornsey 2007).

Synthetic pesticides are also commonly used in conventional winemaking to protect the grapes from pests and diseases. These chemicals are applied to the vines and can potentially harm the environment and contribute to the development of pesticide-resistant pests.

While conventional winemaking methods are widely used, there has been a growing movement towards natural and organic winemaking in recent years (Almeida et al. 2021). Natural winemaking is a non-interventionist approach to winemaking that emphasizes minimal use of additives and pesticides, and a reliance on the natural fermentation process to create unique and often unpredictable flavours and aromas (Capretti 2021).

### 1.2.2 – Practices for Longevity

Organic winemaking, on the other hand, involves the use of organic farming practices, such as the use of natural fertilizers and the avoidance of synthetic pesticides and herbicides. Organic winemakers also limit the use of chemical additives in their wines, although they may still use some additives to ensure consistency and quality (Bosco et al. 2022).

While conventional wines have their advantages, including their consistent quality and affordability, many wine drinkers are turning to natural and organic wines because of their unique flavours and aromas, as well as their environmentally friendly production methods. Natural and organic wines may also be less likely to cause allergic reactions or headaches, as they contain fewer chemical additives (Parpinello et al. 2015; Castellini, Mauracher, and Troiano 2017).

However, it is important to note that not all natural and organic wines are created equal. Some natural winemakers may use techniques that result in wine that is flawed or unpalatable, while some organic winemakers may use synthetic additives that are still approved for use under organic regulations (Maykish, Rex, and Sikalidis 2021).

Ultimately, the choice between conventional, natural, and organic wines comes down to personal preference. Conventional wines are still the most widely produced and consumed wines in the world, and many people enjoy their consistent quality and affordability. Natural and organic wines, on the other hand, offer a unique and often unpredictable flavour profile, as well as the peace of mind that comes with knowing that the wine was produced using environmentally-friendly methods (Parpinello et al. 2015).

While conventional wines are still the most widely produced and consumed wines in the world, there has been a growing movement towards natural and organic winemaking in recent years.

## 1.3 - Organic Wines

Organic wine is a type of wine that is made from grapes grown without the use of synthetic pesticides, herbicides, fungicides, or fertilizers. Instead, organic farmers rely on natural methods of pest and disease control, such as crop rotation, composting, and the use of beneficial insects (Almeida et al. 2021).

### 1.3.1 – Popularity and Certifications

The organic wine movement has gained popularity in recent years, as more consumers are looking for healthier and more environmentally-friendly products (Pomarici, Amato, and Vecchio 2016). By choosing organic wine, consumers can support sustainable agriculture practices and reduce their exposure to harmful chemicals. Additionally, many people believe that organic wine tastes better, as it reflects the unique terroir and natural flavours of the grapes (Sogari, Mora, and Menozzi 2016).

To be certified as organic, a wine must meet certain standards set by the government or an authorized third-party organization. However, the regulation of Organic wine is different from country to country. In the United States, the Department of Agriculture (USDA) regulates organic certification for both grapes and wine. To be certified, a vineyard must be free of synthetic pesticides and fertilizers for at least three years, and the winemaking process must follow strict guidelines to ensure that no artificial additives are used ('Organic 101: Organic Wine' n.d.).

### 1.3.2 – Differences in Enhances and Practices

One of the main differences between organic wine and conventional wine is the use of sulphites. Sulphites are a common preservative used in winemaking to prevent oxidation and microbial spoilage. While some sulphites are naturally present in yeast release during the fermentation, many winemakers also add additional sulphites to their wine to ensure stability and freshness. However, sulphites can cause allergic reactions in some people, and many organic winemakers choose to avoid them altogether. Organic wine can still contain some sulphites, but the levels are typically 50mg/L lower than in conventional wine (Costanigro, Appleby, and Menke 2014).

Another difference between organic and conventional wine is the farming practices used to grow the grapes. Organic farmers focus on soil health and biodiversity, using type of chemical inputs (including sulfur and copper) to control pests and disease. This can lead to healthier soil and better yield. Additionally, organic farming practices can help reduce water usage and carbon emissions, making organic wine a more sustainable choice for the environment (Bosco et al. 2022).

Organic wine is not without its challenges, however. Because organic farming methods rely on biological pest control, yields can be lower and more variable than in conventional farming (Muneret et al. 2018) . This can lead to higher costs for both farmers and consumers, as well as a smaller selection of organic wines on the market. Additionally, organic winemakers must be vigilant in preventing contamination from neighbouring vineyards that may not follow organic practices (Muneret et al. 2018).

Despite these challenges, the organic wine movement continues to grow, as more consumers seek out sustainable, environmentally friendly products. Many winemakers are also experimenting with biodynamic and regenerative farming practices, which take organic farming to the next level by focusing on holistic, interconnected systems. As the demand for organic wine continues to rise, it's likely that we'll see more innovation and experimentation in the world of organic winemaking (Bouzdine-Chameeva and Krzywoszynska 2011).

## 1.4 - Biodynamic Wines

Biodynamic wines are wines that are produced using agricultural techniques that are in harmony with the natural environment. Biodynamic agriculture is a holistic approach to farming that aims to create a self-sustaining ecosystem. This type of farming goes beyond just organic farming, as it also focuses on the spiritual and mystical aspects of nature (Castellini, Mauracher, and Troiano 2017).

### 1.4.1 – History and Methods

The principles of biodynamic farming were first introduced by Austrian philosopher Rudolf Steiner in 1924. Steiner believed that farms should be seen as living organisms, and that the health of the soil, plants, animals, and people are all interconnected. Biodynamic farming aims to create a balanced and self-sustaining ecosystem that takes into account the unique characteristics of each farm (Steiner 1958).

Biodynamic wine production starts with the use of natural and organic farming practices. This means that synthetic fertilizers, pesticides, and herbicides are not used in the vineyard. Instead,

They also use organic fertilizers, such as compost and manure, to improve the health of the soil (Phillips and Rodriguez 2006).

### 1.4.2 – Use of Enhancers

In addition to these practices, biodynamic farmers also use special preparations (often referred to as field preparation 500) that are made from natural materials. These preparations are used to stimulate the soil and enhance the growth of plants. For example, one of the most well-known preparations is made from cow manure, which is buried in a cow horn and left to ferment over the winter. This Cow horn manure is then mixed with water and sprayed on the soil to stimulate microbial activity (Döring et al. 2019).

Another important aspect of biodynamic wine production is the use of lunar and astrological calendars to determine when to plant and harvest the grapes. Biodynamic farmers believe that the position of the moon and the planets can have an effect on the growth of plants, and they use these calendars to time their farming activities (Castellini, Mauracher, and Troiano 2017).

The result of all these practices is wine that is not only free from synthetic chemicals, but also reflects the unique characteristics of the terroir.

## 1.5 - Natural Wines

Till date there is no exact definition of what a natural wine is. The term Natural wine that is becoming increasingly popular in the wine industry. These are wines that are mostly made without the use of any chemicals or additives, and the grapes are grown without any artificial fertilizers or pesticides. Natural wines are often produced using traditional methods, with minimal intervention from the winemaker, in order to allow the true character of the grapes and terroir to shine through (Fabbrizzi et al. 2021).

The term "natural wine" is not regulated, so there is some debate within the industry about what constitutes a natural wine. Some producers take a more purist approach and believe that natural wines should be made using only wild yeasts, without any added sulphites or other additives. Others take a more pragmatic approach and believe that small amounts of sulphites can be used if necessary to ensure the wine's stability (Maykish, Rex, and Sikalidis 2021).

One of the defining characteristics of natural wines is that they are often unfiltered and unfined. Settling and Racking are techniques used by certain winemakers to clear sediment and particles in the wine, there is still some sediment in wine after that. which can give the wine a cloudy appearance. Some people enjoy the added complexity and texture that this can bring to the wine, while others find it off-putting (Maykish, Rex, and Sikalidis 2021; Alonso González and Parga-Dans 2020).

### 1.5.1 – Grapes and its Farming

Another characteristic of natural wines is that they are often made using grapes that are grown using biodynamic or organic farming practices. These methods prioritize the health of the soil and the ecosystem and aim to create a self-sustaining agricultural system that is in harmony with nature. This can result in grapes that are more expressive of their terroir and have a unique character that is not found in conventionally farmed grapes (Bouzdine-Chameeva and Krzywoszynska 2011).

Natural wines can be made from any grape variety, but some regions and styles are particularly well-suited to this style of winemaking. For example, the Loire Valley in France is known for its natural wines made from Chenin Blanc and Cabernet Franc, while the Jura region is known for its oxidative-style natural wines made from Sauvignon and Pinot Noir.

### 1.5.2 – Quality and Popularity

Because natural wines are often made in small quantities and with minimal intervention from the winemaker, they can be quite variable in terms of quality and consistency. Some natural wines can be quite funky and unusual, with flavours and aromas that are unexpected and unconventional. Others can be quite delicate and nuanced, with a unique expression of the terroir and grape variety (Fabbrizzi et al. 2021).

Despite the variability and lack of regulation surrounding natural wines, they are becoming increasingly popular among wine enthusiasts who are looking for something different and unique. Natural wine bars and shops are popping up in cities around the world, and many traditional wine shops and restaurants are starting to offer a selection of natural wines alongside their more conventional offerings (Alonso González and Parga-Dans 2020; Maykish, Rex, and Sikalidis 2021).

In conclusion, natural wines are an increasingly popular style of wine that is made using traditional methods and minimal intervention from the winemaker. These wines are often made using biodynamic or organic farming practices and are unfiltered and un fined. While they can be quite variable in terms of quality and consistency, natural wines offer a unique expression of the terroir and grape variety and are becoming increasingly sought-after by wine enthusiasts.

## 1.6 - Difference between Conventional v/s Organic, Biodynamic, and Natural Winemaking

Below table are the differences based on the discussion above.

Table 01 Some of the main differences between Convention, Organic, Biodynamic and Natural winemaking.

	<b>Conventional Winemaking</b>	<b>Organic Winemaking</b>	<b>Biodynamic Winemaking</b>	<b>Natural Winemaking</b>
<b>Key Practices</b>	Uses chemical fertilizers and pesticides	Organic grapes grown without synthetic fertilizers, pesticides, and herbicides	Follows biodynamic principles, uses manure, compost, and cover crops to maintain vineyard health, uses biodynamic preparations	Grapes grown with minimal intervention and no synthetic chemicals, fertilizers, or pesticides
<b>Fermentation</b>	Cultured yeast strains	Natural or organically selected yeast and bacteria	Wild yeast found naturally in the vineyard	Natural yeasts found in the vineyard



<b>Additives</b>	Utilizes additives to modify and enhance taste and texture	additives or preservatives are used	May use some natural additives or preservatives	May or May not use of additives or preservatives
<b>Intervention</b>	Moderate intervention	Minimal intervention	Minimal intervention	Minimal intervention

### Comparison/Differences

- All four winemaking styles involve minimal intervention and use natural yeast for fermentation.
- Conventional winemaking involves the use of synthetic additives and fertilizers, while organic and biodynamic winemaking does not.

Natural winemaking does not involve the use of any additives or preservatives, while organic and biodynamic winemaking may use some natural additives or preservatives.(Capretti 2021; Maykish, Rex, and Sikalidis 2021; Almeida et al. 2021)

## 1.7 - The Indian Wine and its approaches towards to Wine Industry

India has a rich cultural history of winemaking that dates back to ancient times. However, it is only in the last few decades that the Indian wine industry has seen significant growth and development. The Indian wine industry is relatively new compared to other wine-producing countries such as France, Italy, and Spain, but it has quickly gained recognition for its unique approach to winemaking (Kumar and Pathak 2014)

### 1.7.1 – Grapes Varieties and Modern Techniques

One of the most distinctive aspects of Indian wine is the use of indigenous grapes. Unlike other wine-producing countries that rely heavily on imported grape varieties, India has a wide variety of local grape species that are uniquely adapted to the Indian climate and soil. Some of the popular Indian grape varieties include *Bangalore Blue*, *Anab-e-Shahi*, and *Thompson Seedless*. These grapes produce wines with distinct flavours and aromas that reflect the terroir of the region (Chavan et al. 2009).

Another unique aspect of Indian wine is the use of modern winemaking techniques. Many Indian winemakers have adopted the latest technological advancements in winemaking to produce high-quality wines that can compete with international brands. For instance, some winemakers use stainless steel tanks for fermentation, which helps to preserve the fruit flavours and aromas of the grapes (Saranraj, Sivasakthivelan, and Naveen, n.d.).

Moreover, Indian wine producers have embraced sustainable winemaking practices, which include organic farming methods (Staff 2021). These practices help to reduce the use of synthetic pesticides and fertilizers, promote soil health, and protect the environment. Many Indian wineries also have green initiatives such as solar power generation and water conservation measures (Singh and Srivastava 2018).

### 1.7.2 – Concentration and Governance

The Indian wine industry is mainly concentrated in the states of Maharashtra, Karnataka, and Tamil Nadu. Maharashtra, in particular, is home to some of the most prominent wineries in India such as Sula Vineyards, Grover Zampa, and Four Seasons. These wineries produce a wide range of wines, including red, white, rosé, and sparkling wines (Bheemathati 2015).

## Major Wine Regions of India



Source ('India Wine Regions | Wine Map, Wine Education, Wine Region Map' n.d.)

One of the challenges facing the Indian wine industry is the high taxes on wine production and sales. This has led to a high cost of production, which is passed on to the consumers, making Indian wines relatively expensive compared to imported wines. However, the government has recently taken steps to reduce taxes on wine production and sales, which is expected to encourage more investment in the industry (Singh and Srivastava 2018).

## 1.8 - Sustainable practices on Wine Production

Sustainable practices in wine production refer to methods and techniques that prioritize environmental conservation, social responsibility, and economic profitability. Sustainable wine production ensures that the grape-growing and wine-making processes are carried out in a manner that is not only beneficial to the environment but also to the communities where the vineyards are located(Christ and Burritt 2013). In this thesis, we will explore some of the sustainable practices in wine production.

1. **Sustainable Viticulture** Sustainable viticulture refers to the use of environmentally friendly methods to grow grapevines. Sustainable viticulture practices aim to minimize the use of pesticides and herbicides, reduce soil erosion, and promote biodiversity. Sustainable viticulture practices also emphasize water conservation by using drip irrigation systems and other water-efficient techniques(Chaves et al. 2007).
2. **Carbon Footprint Reduction** Wine production is known to have a significant carbon footprint due to the energy required to produce wine bottles, transport wine to different markets, and power wine production facilities. To reduce their carbon footprint, many winemakers are using renewable energy sources such as solar panels and wind turbines to power their facilities. They are also using lighter-weight glass bottles and investing in more efficient transportation methods to reduce emissions(Christ and Burritt 2013).
3. **Waste Management** Waste management is another critical aspect of sustainable wine production. Winemakers are taking steps to reduce waste by using recyclable materials for wine packaging and investing in innovative waste management techniques such as composting and anaerobic digestion. Many wineries are also implementing programs to reduce the amount of waste generated during the wine production process(Gabzdylova, Raffensperger, and Castka 2009).
4. **Social Responsibility** Sustainable wine production also involves social responsibility practices that prioritize the well-being of the communities where the vineyards are located. Winemakers are partnering with local organizations to provide education and job training programs to the local communities. They are also investing in initiatives that promote social equality, fair labour practices, and community engagement(Leal Filho et al. 2022).

Sustainable wine production practices prioritize environmental conservation, social responsibility, and economic profitability. Sustainable wine production practices involve using natural methods to grow grapevines, reducing carbon footprints, waste management, and promoting social responsibility practices. These practices help to create a sustainable future for the wine industry and promote the health and well-being of the environment, local communities, and the wine industry(Gabzdylova, Raffensperger, and Castka 2009; Christ and Burritt 2013).

## Chapter 02 – Methodology

### 2.1 Research Aims

As wine production and consumption have significant environmental, social, and economic implications, sustainability in the wine industry has emerged as a critical global issue. The majority of wine-producing regions around the world, including Napa Valley in the United States, Australia, France, Germany, and many more, have embraced sustainable winemaking methods, such as organic, biodynamic, and natural ones (Baiano 2021; Patnaik and Sahoo 2009). The wine industry in India is still relatively new, but it has recently experienced significant growth. The sustainable growth of the Indian wine industry, however, has received little attention from researchers. Therefore, the purpose of this study is to develop a theoretical framework for the Indian wine industry's transition to sustainability by exploring new paradigms of various approaches towards sustainable winemaking practices.

To achieve it, several interviews were conducted with producers and winemakers about the potential for Indian wine companies to adopt grape-growing and winemaking approaches alternative to the conventional ones, namely organic, biodynamic, and natural ones, by taking into account the country's current wine market. India's wine market has expanded significantly over the past few years, making it a potential market for wine makers around the world. However, the Indian wine industry faces several sustainability-related issues, such as water scarcity, degraded soil, and pesticide use (Singh and Srivastava 2018). A significant gap in the existing literature is the lack of research on sustainable wine production and consumption in India. The findings of this thesis can provide valuable insights for policymakers, wine producers, and consumers in India and other emerging wine regions.

This analytical report used various existing literature on sustainable wine production and consumption, and its applicability to the Indian wine industry and combines them with interviews with Indian winemakers. Based upon their responses, further inferences are to be made to reflect on the ways to develop a theoretical framework for sustainable wine industry

in India. These inferences are then used to make various conclusions about the key challenges faced by the Indian winemakers and industry in achieving sustainable development. Suitable questions are designed that are tailored in various ways to extract opinions and responses on above mentioned topics, all of them are mentioned in Appendix 01.

## 2.2 Research Methods

A “Google Form” survey was used, and 125 respondents provided their thoughts on India's wine consumption and the viability of the country's wine industry. Since the consumer's opinion can be considered as the most important factor to consider for a producer to adopt sustainable winemaking, these data were used to prepare a PowerPoint presentation in detail to show the producers of Indian wineries. Most of the Survey procedures were automatically done through Google Forms inbuilt features, that involves, Preparation of the Form and data collection from the participants. Then it was all stored in Google Sheets, which was processed using various Google Sheets Formulas. Then depending on the Wine Producer's availability, 3 interviews were conducted via Zoom meeting in which all the survey data was presented to them for their reference. After that, they were given a questionnaire to fill out in order to get their thoughts on sustainable winemaking (while taking the general participants survey's findings presented in Presentation into consideration). With the consent of the interview subjects, the sessions were recorded. The average discussion lasted 13 to 15 minutes, and the producers were alerted in advance about the process' timing.

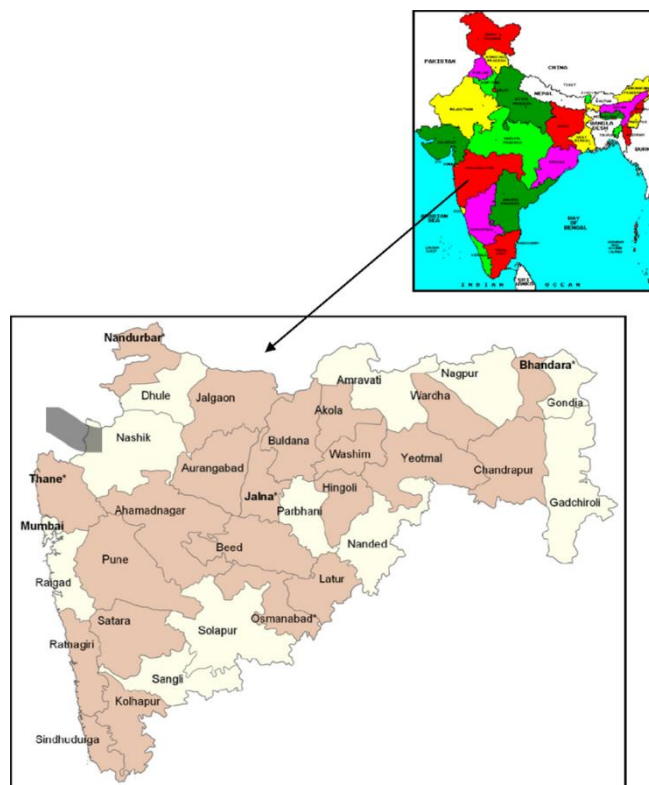
The initial survey questions were designed to collect information about the participants' background and their general relation and knowledge about wine. Then the questions advanced to get their opinions and views on various types of Wines and their making procedures. Questions were designed in a way such that some specific data could be extracted on the key and fundamental topics that are of most interest for the Winemakers. Also, enough options were given regarding for each segment of the question so that the participant can express their views with least possible constraints and at the same time it would be possible to categorise them. Later the questions aimed at understanding their financial status on wines and also explored the limits they are comfortable spending.

This was then contrasted with their previously answered questions regarding awareness and interest and finally was used to measure and get a sense of their practical implementation and

validity of all responses in general. The survey was very helpful in not just understanding the participants and general people, but also was very helpful for curating and conducting precise and useful interviews with the Winemakers. Since it was already presented to them for review and validation, their responses were based on actual data gathered and provided as part of this research. The interview questions were straightforward and to the point while keeping the professionalism and knowledge of the winemakers in mind. The practical and experiential knowledge of the winemakers were extracted through examining their personal preferences and predictions regarding future of the industry. Below in appendix 01 and 02 the survey and interview questions are mentioned for further references.

## 2.3 Winery Details

Three India's leading wine companies and their winery producers took part in the interview research procedure of this project.



Source ('The Unique Geography and Terroir of India's Wine-Growing Regions' 2021)



1. **Good Drop Wine Cellars** (Winery A) is in Vinchur village, Nasik district, Maharashtra state, India. Every year, they produce 1.6 million litres of wine, and their total capacity is 2.1 million litres, making it one of the largest in the country. They work with grape varieties of Cabernet Shiraz, Cabernet Sauvignon, Chenin Blanc, Shiraz, and Shiraz Rose.
2. **Reveilo Wines** (Winery B) is located in Nasik, Maharashtra, India. The origin of their name comes from the word “Reveal”, which indicates towards “revealing the mystery”. The winery Yatin and Kirana (Husband and wife) from the Patil’s family transformed their 100 acres of ancestral farmland into vineyards and an estate Bottled winery. They imported the rootstocks of Italian grape varieties Sangiovese, Grillo, and Nero D’Avola from Italy and grew them on Indian soil in 2006. Their first vintage production was in 2009.
3. **York Winery** (Winery C) is located in Nasik, Maharashtra, India. The winery consists of 80 acres of vineyards with Black volcanic soil. Widely planted red and white grape varieties are Chenin Blanc, Chardonnay, Shiraz, Cabernet Sauvignon, Merlot, Zinfandel, and Tempranillo. They use a combination of various winemaking techniques including Australian, South African and some old-world French techniques.

# Chapter 03 – Results & Discussion

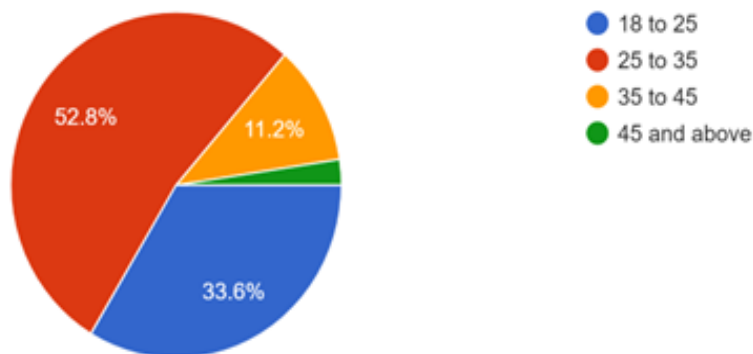
## 3 Research Participants

This study's analysis was carried out using SPSS 25.0 (IBM Corp, Armonk, NY). To interpret the data, frequency and percentage statistics were used. Participants' drinking habits, preferences, knowledge, and perceptions of sustainability were all taken into consideration when assessing their opinions on the sustainable wine industry.

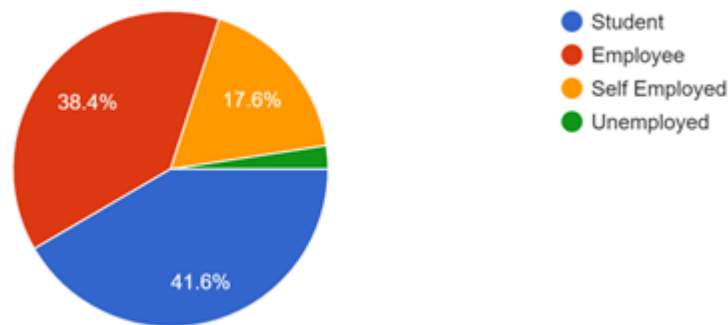
Table 01 Demographics data of the Participants

Nationality	Frequency	Percentage
Indian	116	92.8%
Italian	3	2.4%
Pakistani	2	1.6%
French	1	0.8%
Peruvian	1	0.8%
Sri Lankan	1	0.8%
Anonymous	1	0.8%
Total	125	100%

Age



## Occupation



Results indicate that the vast majority of participants are Indian (92.8%), between ages of 26-35 (52.8%) and students (41.6%).

### 3.1 – Preferences and Frequencies Distribution

The survey procedure on preferences and frequencies distribution aimed to comprehensively investigate participants' wine consumption habits, preferences based on production method, and frequencies of experience with different types of wine. By gathering detailed information, the survey sought to provide valuable insights into participants' wine-related behaviours. This included inquiries about participants' favoured varietals, regions, and styles, as well as the frequency of their wine consumption. Moreover, the survey examined participants' preferences regarding traditional and modern production methods, aiming to discern trends and preferences in wine selection. Additionally, the survey explored participants' experiences with different types of wine, ranging from red, white, rosé, sparkling, to fortified wines, to understand their familiarity and consumption frequencies. Through meticulous data collection and analysis, the survey aimed to contribute valuable insights to the understanding of wine consumption patterns for winemakers, researchers, and wine enthusiasts.

### 3.1.1 – Participants Habits and Preferences of Wines

Table 02 Data on habits and preferences of respondents (n=125)

Habits and Preferences		Frequency	Percentage
Frequency of drinking wine	At least once a month	45	37.5%
	At least once or twice a week	38	31.7%
	Every three months	37	30.8%
Type of wine	Red wine	82	66.7%
	White wine	18	14.7%
	Sparkling wine	13	10.5%
	Sweet wine	8	6.5%
	Rosé wine	2	1.6%
Willingness to try different wines	Yes	104	83.9%
	Maybe	19	15.3%
	No	1	0.8%

Above table indicates that 37.5% of participants were drinking wine at least once a month while 31.7% were drinking at least once or twice a week and 30.8% were drinking every three months. Findings related to preference for different types of wine suggested that participants were mostly preferred red wine (66.7%). Other preferences on drinking habits were white wine (14.7%) and sparkling wine (10.5%), respectively. 83.9% of participants also stated that they would like to try different types of wines.

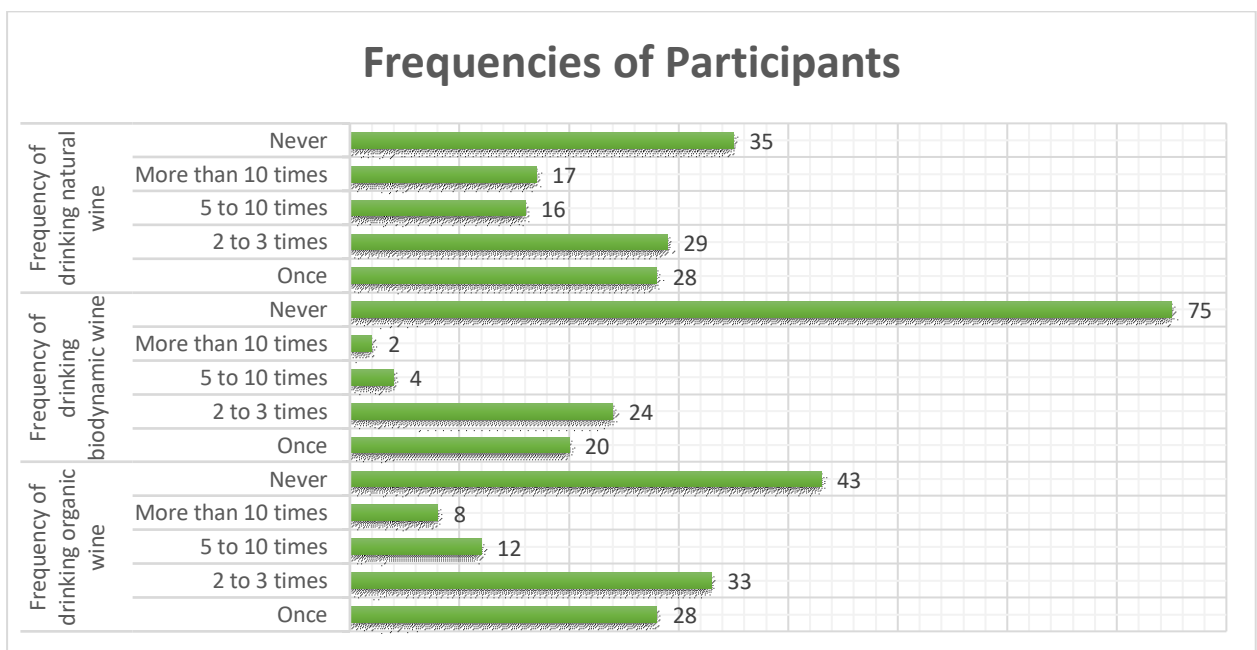
### 3.1.2 – Participants Preferences by Production Method

Table 03. Participants’ wine preferences by production method.

Production Method	Frequency	Percentage
Conventional wine	35	28.2%
Biodynamic wine	17	13.7%
Organic wine	63	50.8%
Natural wine	74	59.7%

Table 03 and graph indicates that 59.7% of participants prefer to drink natural wine. Secondly, they prefer organic wine while conventional and biodynamic wines are less interested in. This may conclude that production process where chemicals and additives were not used forms a “naturalness” perception in consumers’ minds. Also, the term “organic” can be understood as natural or similar to that.

### 3.1.3 – Frequencies of Experience of different types of Wine.



**Figure 1.** Frequencies of consumption of different types of wine (n=125)

Figure 1 indicates that biodynamic wine is the least tasted type among others in accordance with previous findings related with knowledge about types of different processed wines. 60.0% of participants have never tasted biodynamic wine while most of them tasted once or 2-3 times while organic wine is mostly preferred by once or 2-3 times. Participants who have tried natural and organic wine at least once are almost equal (22.4% vs. 22.6). Frequency of drinking natural wine for 5 or more times (both for 5 to 10 and more than 10 times) are higher than frequencies of biodynamic and organic wines. Overall, participants' responses suggested that natural wine is more preferred but significant amount of them also never experienced any types of these wines. This can be clearly reflected through a Horizontal Bar graph lengths of peaks and troughs.

## 3.2 – Perception on Wine types Description

The survey on the perception of wine types description aimed to comprehensively investigate participants' understanding and perceptions of conventional wine, organically produced wine, biodynamic wine, and natural wine.

The survey examined participants' familiarity and perception of conventional wine, focusing on their understanding of traditional winemaking practices and perceptions of taste, quality, and production methods. It also explored participants' awareness and perception of organically produced wine, assessing their comprehension of organic farming practices, as well as their views on taste, sustainability, and health aspects.

Furthermore, the survey investigated participants' knowledge and perspectives on biodynamic wine, assessing their understanding of biodynamic farming principles, opinions on unique qualities and environmental impact, and its influence on wine choices. Lastly, the survey explored participants' understanding and perceptions of natural wine, covering familiarity with the concept, thoughts on minimal intervention, and views on taste and authenticity.

The following gathered data contributes to the knowledge of winemakers, researchers, and wine enthusiasts, enhancing comprehension and appreciation of these wine categories.

### 3.2.1 - Conventional Wine

Table 05. Perceptions on the description of a conventional wine

<b>Conventional Wine</b>	<b>Frequency</b>	<b>Percentage</b>
Wine made by additives and chemicals in vineyards and winery	64	51.2%
Wine with free of chemicals	61	48.8%
Grape must that has been fermented and bottled	98	78.4%
Wine made using selected yeast	69	55.2%
Wine with low price	60	48.0%
Wine with high alcohol percentage	41	32.8%

Table 5 and indicates that participants mostly describe a conventional wine as a grape must that has been fermented and bottled. Besides, wine is referred as a drink produced with selected yeast by using additives and chemicals in vineyards and winery. On the other hand, several participants claimed that wines are free of any chemicals. It was determined that there is a controversy about chemical ingredients for production of wines. Moreover, almost half of the participants perceived wines as a low-priced drink. Finally, high alcohol percentage of wine was the least significant response.



### 3.2.2 - Organically Produced Wine

Table 06. Perceptions on the description of an organically produced wine.

<b>Organically Produced Wine</b>	<b>Frequency</b>	<b>Percentage</b>
Grapes grown by organic farming	106	84.8%
Grapes grown without fertilizers and pesticides	97	77.6%
Wine certified as organic	93	74.4%
Wine containing sulfites	16	12.8%
Wine that use different type of bottles during bottling stage.	29	23.2%
Wine produced from single grape variety	45	36.0%

Table 6 indicates that participants mostly describe an organically produced wine as a product which contains grapes grown by organic farming, thus, organic wine production is matched with organic farming. Besides, organic wine is referred as a drink which involves grapes grown without fertilizers and pesticides and certified as organic. 36.0% of participants thought wine has been produced from single grape variety, However, there is a lack of knowledge among Indian wine consumers about the differences between organic, natural, and conventional wines. while less of them considered organic wine as a different bottled product and/or involving sulphites.

### 3.2.3 - Biodynamic Wine

Table 07. Perceptions on the description of a biodynamic wine

<b>Biodynamic Wine</b>	<b>Frequency</b>	<b>Percentage</b>
Grapes grown with biodynamic methods	104	83.2%
Grapes in particular terriors	94	75.2%
Wine made by native yeasts without yeast nutrients	83	66.4%
Wine without sulfites and additives	62	49.6%
Wine produced by organic farming methods	49	39.2%

Table 7 indicates that participants mostly describe a biodynamic wine as a product which contains grapes grown with biodynamic methods which shows similarity with findings of organic wine. Besides, biodynamic wine is referred as a drink which involves grapes grown in particular terroirs and made by native yeasts without yeast nutrients. Half of participants thought biodynamic wine has been produced without sulphites and additives. Lastly, 39.2% of participants were considered that biodynamic wine is produced by organic farming methods.

### 3.2.4 - Natural Wine

Table 08. Perceptions on the description of a natural wine

<b>Natural Wine</b>	<b>Frequency</b>	<b>Percentage</b>
Wine produced by traditional and simple methods	109	87.2%
Wine with grapes grown by organic agricultural methods	108	86.4%
Wine produced by natural way with sulfites as preservatives	75	60.0%
Wine filtered before bottling	65	52.0%
Wine contains chemicals and additives	27	21.6%

Table 8 indicates that participants mostly describe a natural wine as a product which contains grapes grown by organic agricultural methods and/or by traditional and simple methods. Many participants considered both of these responses, therefore, there is a conceptual confusion about production methods among both wine consumers and non-consumers. On the other hand, natural wine is described as a product which produced by natural ways and included a certain number of sulphites as preservatives. However, these “natural” ways are implied a knowledge gap due to lack of detailed information about production process across participants. 52% of participants were associated natural wine with filtration before bottling stage. As expected, unlike other types of wines, it is determined that natural wine was less related to chemicals and additives due to its production nature.

### 3.3 – Knowledge and Popularity based Expenses

The section of the survey on knowledge and popularity-based expenses aimed to explore participants' understanding of different wine processing methods, factors influencing wine popularity and preference, and participants' willingness to pay for various wine types. Through inquiries, the survey provided valuable insights into participants' knowledge, preferences, and financial considerations related to wine consumption.

Participants' knowledge about wine processing methods was assessed, covering fermentation, aging, and blending techniques. The survey further examined factors influencing the popularity and preference of wines, including grape varietals, origin regions, labelling information, and ratings. These insights aimed to identify the key factors shaping participants' preferences.

Additionally, the survey investigated participants' willingness to pay for different wines, capturing their budgetary considerations, price sensitivity, and allocation of financial resources for specific wine types. Understanding participants' financial perspectives shed light on the perceived value and economic considerations associated with wine purchases.

By comprehensively examining participants' knowledge, factors influencing popularity, and willingness to pay for wines, the survey contributed valuable insights into consumer behaviour in the wine market. The following gathered data informs winemakers, researchers, and industry professionals, enabling informed decisions regarding production, marketing, and pricing strategies.

### 3.3.1 - Knowledge about Different Processed of Wines

Table 09 participant's knowledge on different processed wines.

<b>Type of Wine</b>	<b>Frequency</b>	<b>Percentage</b>
Conventional wine	75	96.4%
Biodynamic wine	23	18.5%
Organic wine	67	54.0%
Natural wine	30	24.2%
None	1	6.4%

Table 9 indicates that participants have commonly heard about conventional wine (96.4%) followed by organic (54.0%) and natural wine (24.2%), respectively. As expected, biodynamic wine was the least known type for participants. Responses revealed that if a participant have known biodynamic wine, he/she almost has also heard of all other types of different processed wines.

### 3.3.2 - Popularity and Preference factors for different Wines

Table 10 key factors that leads consumers to prefer different wines.

<b>Popularity and Preference</b>		<b>Frequency</b>	<b>Percentage</b>
<b>Organic wine</b>	Benefit for health	93	75.0%
	Environmental concern	63	50.8%
	Sustainability	55	44.3%
	Higher quality	58	46.7%
	Geographical and local origin	31	25.0%
	Marketing strategy	24	19.3%
<b>Biodynamic wine</b>	Benefit for health	63	50.4%
	Environmental concern	51	40.8%
	Sustainability	58	46.4%
	Higher quality	53	42.4%
	Geographical and local origin	32	25.6%
	Marketing strategy	47	37.6%
<b>Natural wine</b>	Benefit for health	102	81.6%
	Environmental concern	48	38.4%
	Sustainability	52	41.6%
	Higher quality	67	53.6%
	Geographical and local origin	37	29.6%
	Marketing strategy	24	19.2%

Table 10 indicates that majority of participants emphasized the health benefits of wines while their least concern was marketing strategy for organic and natural wine and geographical and

local origin for biodynamic wine. For organic wine, environmental concerns such as chemical use, terroir issues, energy use, and solid waste were highlighted by 50.8% of the participants. For biodynamic wine, sustainability was highlighted by 46.4% of the participants and higher quality was considered significant by 53.6% of the participants for natural wine.

### 3.3.3 - Participants Willingness to pay for different Wines.

Table 11 Data on participants willingness to pay.

<b>Participants Willingness</b>		<b>Frequency</b>	<b>Percentage</b>
<b>For a bottle of wine</b>	Less than 10 USD	38	30.6%
	10-11 USD	27	21.8%
	12-15 USD	30	24.2%
	16-19 USD	22	17.8%
	Above 19 USD	7	5.6%
<b>For organically produced wine</b>	Less than 10%	58	46.4%
	10-15%	45	36.0%
	15-25%	8	6.4%
	No	14	11.2%
<b>For biodynamically produced wine</b>			
	Less than 10%	52	41.9%
	10-20%	19	15.3%
	More than 25%	5	4.1%
<b>For naturally produced wine</b>	No	18	14.5%
	Less than 10%	64	51.6%
	10-20%	33	26.6%
	More than 25%	9	7.3%

Table 11 indicates that 30.6% of participants were willing to pay less than 10 USD for a bottle of wine while 21.8% of them were willing to pay 10-11 USD and 24.2% of them were willing to pay 12-15 USD. For organically, biodynamically and naturally produced wines, there is generally descending willingness as the extra price goes up. For organically produced wine, 46.4% of participants were willing to pay extra for less than 10% while it was 41.9% for biodynamically produced wine and 51.6% for naturally produced wine. Also, 38.7% of participants didn't want to pay extra for biodynamically produced wine. There is a consensus for all findings related to biodynamically produced wine among participants in terms of habits, preferences, and knowledge.

Through this intricate process, surveys become more than mere questionnaires. The conclusions and inferences derived from the survey data transcend the boundaries of the general population, shedding light on the intricacies of winemaking and illuminating new paths for exploration. With the guidance of industry experts and the finesse of insightful inferences, the research blossoms into a comprehensive and robust body of knowledge, poised to contribute to the advancement of the winemaking field and captivate the minds of researchers and enthusiasts alike.



## 3.4 – Opinions and Preferences

### 3.4.1 - Potential Development

**Question:** What is your opinion for potential development of a sustainable wine industry in India?

**Responses:** The potential development of a sustainable wine industry in India is a topic that elicits varying opinions from different wineries. Three wineries, Good Drops Wine Cellars, Reveilo Wines, and York Winery, provide insights into the current state and future prospects of sustainability in the Indian wine industry.

Good Drops Wine Cellars, represented by Ashwin Francis Rodrigues, acknowledges that the wine industry in India is still in its nascent stage compared to Western countries. There is a general lack of awareness and appreciation for wine culture among Indian consumers. However, Rodrigues believes that this presents an opportunity for the development of a sustainable wine industry. He notes that people in India are increasingly curious about sustainability and are open to trying sustainable wines. While it may take around five years for sustainability to be fully embraced, there is a positive trend towards its adoption.

Reveilo Wines, represented by Kirana producers, acknowledges the small size of the wine culture in India but highlights its significant growth in recent years. This growth is seen as a positive sign for the future of the wine industry, including the potential development of a sustainable wine segment. They emphasize the importance of creating awareness and promoting sustainable wines through effective marketing and advertisement strategies. By educating consumers about the benefits of sustainable practices in winemaking, they believe that the demand for sustainable wine could increase in India.

York Winery, represented by Kailash Gurnani, also recognizes the slow pace of development for a sustainable wine industry in India. Gurnani points out that wine is relatively new to most Indians, who are more accustomed to other alcoholic beverages. As a result, it can be challenging to shift people's attention and preferences towards sustainable wines. Gurnani implies that building interest in wine itself needs to be prioritized before sustainable wine practices can gain traction.

**Inference:** All three wineries agree that the development of a sustainable wine industry in India will take time. There is a consensus that the wine culture in India is still evolving and that awareness about sustainability needs to be raised among consumers. However, there are optimistic views regarding the potential for growth. Good Drops Wine Cellars highlights the willingness of Indian consumers to embrace sustainability, Reveilo Wines emphasizes the importance of marketing and advertisement to increase awareness, and York Winery underscores the need to first establish a strong wine culture in the country. These insights collectively indicate that the future of a sustainable wine industry in India lies in educating consumers, promoting awareness, and gradually cultivating a broader appreciation for wine and sustainable practices.

### 3.4.2 – Sustainable Approach

**Question:** Most Indian wineries produce wine in a conventional way. Why, in your opinion, no or few wineries produce wine using a sustainable approach? (Terroir, wine growing techniques)?

**Responses:** The current state of wine production in India predominantly follows conventional practices, and there are limited wineries that adopt sustainable approaches. Three wineries, Good Drops Wine Cellars, Reveilo Wines, and York Winery, provide their insights into why this is the case.

Good Drops Wine Cellars attributes the prevalence of conventional wine production to the comparatively low market demand for wine in India. With the market still evolving, there may be limited incentives for wineries to invest in sustainable viticulture and adopt sustainable approaches. However, they suggest that as the market grows and consumer preferences evolve, the opportunity for cultivating sustainable wine production may increase in the future.

Reveilo Wines agrees with the viewpoint of Ashwin Francis Rodrigues, emphasizing that the adoption of sustainable approaches in winemaking depends on market demand. While sustainability trends, such as organic, biodynamic, and natural wines, are gaining popularity in Western countries, they have not yet become mainstream in India. However, they express optimism that as the wine industry continues to develop in India, there is potential for the emergence of sustainable wine production practices.

York Winery offers a different perspective, highlighting the importance of not only customer demand but also the training and knowledge of the staff involved in winemaking. They suggest that while there may be qualified employees in the industry, not all workers possess professional expertise in winemaking. This lack of specialized knowledge and training can hinder the implementation of new winemaking approaches, including sustainable practices. This implies that the absence of skilled personnel and a possible resistance to change contribute to the limited adoption of sustainable approaches in Indian wineries.

**Inference:** The limited number of wineries producing wine using sustainable approaches in India can be attributed to multiple factors. Good Drops Wine Cellars and Reveilo Wines both mention the role of market demand, highlighting that the Indian wine market is still developing and sustainability trends are not yet widely embraced. York Winery emphasizes the importance of skilled staff and their training, suggesting that a lack of specialized knowledge and resistance to change within the industry may hinder the adoption of sustainable winemaking practices. Overall, these perspectives suggest that as the market matures, consumer preferences shift, and the industry becomes more educated and skilled, the adoption of sustainable approaches in Indian wineries may increase in the future.

### 3.4.3 – Labelling and Bottling

**Question:** Do you consider sustainable labelling and bottling will have an impact on the consumers preferences?

**Response:** The impact of sustainable labelling and bottling on consumer preferences is a topic discussed by three wineries.

Good Drop Wine Cellars acknowledges that sustainable labelling can have a positive impact on consumers' wine choices. In the Indian market, where sustainable wines are still relatively scarce, labelling becomes a crucial factor in helping consumers make informed decisions. According to Aswin, labelling plays a small but significant role in the wine selection process.

Revelio Wines also agrees that labelling and bottling can influence consumer preferences. They emphasize that a clear and informative description on the label can instil confidence in consumers when choosing a sustainable wine bottle. This suggests that sustainable labelling practices can contribute to the perception and trustworthiness of a wine brand.

York Winery highlights the broader significance of labelling and bottling in the winemaking process. They state that not only for sustainable wines but also for any variety of wines, labelling plays a significant role in attracting consumers' attention. Different styles of labelling and bottling can capture consumers' interest and influence their choices. This implies that effective labelling strategies can have a positive impact on consumers' preferences for sustainable wines, as well as wines in general.

**Inference:** All three wineries agree that sustainable labelling and bottling have an impact on consumer preferences. Good Drop Wine Cellars emphasizes that labelling helps consumers in choosing wines, especially when sustainable options are limited. Revelio Wines highlights the importance of clear and informative labelling for building consumer confidence. York Winery acknowledges the broader role of labelling in attracting consumer attention to wines. Collectively, these insights suggest that sustainable labelling and bottling can play a significant role in influencing consumer preferences and choices, contributing to the growth of sustainable wine consumption.

In summary, the opinions and preferences of the wineries suggest that while there are challenges and varying timelines, there is potential for the development of a sustainable wine industry in India. The adoption of sustainable approaches, particularly organic winemaking, is viewed favourably, and wineries express an interest in incorporating sustainability into their practices. Clear labelling and informative bottling are seen as essential in guiding consumer preferences towards sustainable wine options.

## 3.5 – Predictions and Implementations

The wineries acknowledge that consumer choice plays a crucial role in the adoption of sustainable wines. While there is a growing interest in wine culture and a shift towards wine consumption in India, the level of awareness and preference for sustainable wines is still developing. However, there is optimism that as consumers become more educated and curious about sustainability, the demand for sustainable wines will increase over time.

Regarding the adoption of sustainability, the wineries express varying degrees of commitment and interest. Some wineries already have plans to implement sustainable practices, such as utilizing solar energy and focusing on organic winemaking. However, there is also recognition that the adoption of sustainability may require a gradual transition and the consideration of market demand and producer interest.

To achieve sustainability, wineries emphasize the need for consumer demand, producer interest, and awareness. The market demand for sustainable wines, combined with consumer preferences, is seen as a significant driver for wineries to adopt sustainable practices. Additionally, the wineries highlight the importance of education and knowledge dissemination to overcome misconceptions and confusion surrounding sustainable winemaking approaches.

In terms of conversion to sustainability, the wineries generally express a willingness to embrace sustainable practices, particularly organic winemaking. However, there are differing opinions on certain approaches like biodynamics and natural winemaking, with some wineries being more cautious or skeptical. The focus is primarily on gradual implementation and the ability to meet market demands while ensuring consumer understanding and acceptance.

### 3.5.1 – Choice for Sustainable Wines

**Question:** Considering availability of conventional wine in the market, if India was to introduce more sustainable wines, do you think that consumers would choose them over conventional wines? (Considering key Characteristics)

**Response:** The potential preference of consumers for sustainable wines over conventional wines in India is discussed by three wineries.

Good Drop Wine Cellars believes that consumer choices between sustainable and conventional wines may vary. Aswin highlights that several factors come into play, including consumers' knowledge of wine and their individual preferences. This suggests that consumer awareness and understanding of sustainability, along with personal taste preferences, will influence their choices.

Reveilo Wines considers the rising wine market in India and the changing preferences of consumers towards wine. They express confidence that there is a growing space for sustainable wines in the Indian market. Based on the shifting consumer alcohol preferences and the overall trend towards wine consumption, they believe that consumers will choose sustainable wines over conventional ones. This indicates an expectation that the increasing demand for wine, coupled with a growing interest in sustainability, will drive consumer preferences towards sustainable options.

York Winery highlights the potential acceptance of sustainable wines, particularly organic and biodynamic wines, by consumers in the future. However, they point out that the concept of natural wine remains controversial. Consumers may choose natural wines solely based on the term "natural" without fully understanding its specific characteristics. This suggests that while there may be acceptance and preference for sustainable wines, the distinction and understanding of natural wines could be a challenge for consumers.

**Inference:** The three wineries present differing perspectives on whether consumers would choose sustainable wines over conventional wines in India. Good Drop Wine Cellars emphasizes the influence of consumer knowledge and personal preferences, suggesting that choices may vary. Reveilo Wines expresses confidence in the growing market for wine in India and believes that consumers will increasingly choose sustainable wines. York Winery acknowledges the potential for consumer acceptance of sustainable wines but highlights the controversy surrounding natural wines. These insights indicate that while there is potential for consumer preference for sustainable wines, factors such as consumer education and understanding of different sustainability characteristics may play a role in influencing their choices.

### 3.5.2 – Adoption of Sustainability

**Question:** Would you think is there a chance of current wine industry will adopt sustainability in future? (Soil fertility, impacts on grape growing).

**Responses:** The potential for the current wine industry in India to adopt sustainability in terms of soil fertility and impacts on grape growing is discussed by three wineries.

Good Drop Wines believes that considering the current state of the wine industry in India and the positive response from the market, there is a chance of adopting sustainable winemaking practices in the future. This suggests an optimistic outlook for the industry's potential transition towards sustainability.

Reveilo Wines acknowledges the key characteristics of sustainability, such as increasing soil fertility and positive impacts on grape growing. They believe that these characteristics make sustainability an appealing choice. However, they also consider the perspective of producers who often have a business-oriented vision and need to compete in the market. This creates a potential conflict, and the adoption of sustainability might or might not occur, depending on individual producers' priorities and considerations.

York Winery sees the possibility for the current wine industry to adopt sustainability, noting that any industry has a chance to embrace new trends. They highlight that some wineries in India have already started adopting sustainable environmental practices, such as using solar energy as a substitute for electricity. This indicates a gradual movement within the wine industry towards adopting sustainable practices. While the shift may be slow, the awareness and implementation of sustainable approaches are gradually gaining traction.

**Inference:** The three wineries express varying degrees of optimism regarding the potential adoption of sustainability in the current wine industry in India. Good Drop Wines believes there is a chance for adoption based on the positive response from the market. Reveilo Wines acknowledges the appeal of sustainability but highlights potential conflicts from a producer's perspective. York Winery emphasizes the ongoing movement towards sustainability, with some wineries already implementing sustainable practices. These insights suggest that while there is a chance for the wine industry in India to adopt sustainability in terms of soil fertility

and impacts on grape growing, it will depend on various factors such as market dynamics, producer priorities, and the overall industry's readiness for change.

### 3.5.3 – Requirements for Sustainability

**Question:** What do you think it would take for the Indian wine industry to adopt more sustainable practices in the future?

**Responses:** The factors that could facilitate the adoption of more sustainable practices in the Indian wine industry are discussed by three wineries.

Good Drop Wine Cellars emphasizes the importance of consumer demand in driving the adoption of sustainable practices. According to Ashwin, when there is a higher demand for sustainable products in the market, producers are more likely to consider implementing them. Consumer preferences and demand play a pivotal role in shaping the decisions of producers.

Reveilo Wines recognizes that it's not solely consumer demand that drives the adoption of sustainability in the wine industry. They highlight the importance of the winemakers and producers themselves being interested in introducing new practices. While consumer choices and demands are essential to consider, the willingness and interest of winemakers and producers to embrace sustainability are crucial factors in driving change.

York Winery looks at the changing trends in India across various markets, using the example of the organic sugarcane industry. They note that consumer preferences have evolved over time, and the rising demand for wine indicates a positive sign for the wine industry. They believe that as consumer preferences continue to change and wine gains popularity, the current wine industry will eventually adopt more sustainable practices.

**Inference:** The three wineries provide different perspectives on the factors that would drive the Indian wine industry to adopt more sustainable practices. Good Drop Wine Cellars emphasizes the role of consumer demand, Reveilo Wines emphasizes the interest of producers and winemakers, and York Winery points to the changing trends in consumer preferences. Collectively, these insights suggest that a combination of consumer demand, producer interest, and evolving market trends will likely contribute to the future adoption of more sustainable practices in the Indian wine industry.



### 3.5.4 – Conversion to Sustainability

**Question:** Would you like (or do you have plans) to adopt or to convert your conventional winery into sustainable winery (like Organic, Biodynamic, Natural Winemaking)?

**Responses:** The three wineries, Good Drop Wine Cellars, Reveilo Wines, and York Winery, express their perspectives on adopting or converting their conventional wineries into sustainable wineries.

Good Drop Wine Cellars, represented by Ashwin Francis Rodrigues, states that he would like to adopt sustainable winemaking practices, particularly organic winemaking. However, he expresses scepticism about biodynamic winemaking and believes that making wine without any chemicals, such as SO<sub>2</sub> for preservation, is impossible. He acknowledges the importance of sustainability but emphasizes the practicalities and challenges of completely eliminating chemical use in winemaking.

Reveilo Wines has already taken steps towards sustainability by implementing environmental practices, such as utilizing solar energy in their vineyards and winery. Kirana, a representative of the winery, mentions their willingness to convert their winery into a sustainable one. They plan to start with small batches of sustainable wine to gauge market demand. Like Good Drop Wine Cellars, they lean towards organic winemaking and are not fully committed to biodynamic winemaking.

York Winery sees adopting sustainable winemaking practices as a better choice for the future, given the booming wine market in India. The representative expresses confidence that people will become curious about sustainable winemaking and notes that there is already a good level of education regarding sustainable agriculture in India. While there is some confusion between organic and biodynamic winemaking, York Winery is inclined to focus on organic winemaking and would consider producing biodynamic wine based on consumer demand.

**Inference:** All three wineries express a willingness to adopt or convert their conventional wineries into sustainable ones. They are primarily interested in organic winemaking practices, with varying degrees of enthusiasm for biodynamic winemaking. The decision to adopt

sustainability is influenced by considerations of consumer demand, practicality, and market trends.

The wineries generally agree that there is potential for the development of a sustainable wine industry in India, although they differ in their assessment of the timeline for adoption. Good Drop Wine Cellars and York Winery believe that it will take time for Indian consumers to fully embrace sustainability, while Reveilo Wines is optimistic about the rising interest in wine culture and the potential for sustainable wine to gain traction in the market.

Regarding the adoption of sustainable approaches, all three wineries express an interest in incorporating sustainability into their practices. They specifically mention organic winemaking as a preferred approach, with varying degrees of enthusiasm for biodynamic and natural winemaking. While there may be some reservations and confusion surrounding certain practices, such as biodynamics, the overall sentiment is a willingness to explore and adopt sustainable methods.

The wineries acknowledge the impact of labelling and bottling on consumer preferences. They agree that clear labelling and informative descriptions can positively influence consumers' choices, especially in a market where sustainable wine options are still relatively limited. The importance of transparent labelling is emphasized, with a recognition that it instils confidence in consumers and helps them make informed decisions.

In summary, the predictions and implementations in the Indian wine industry suggest that the choice for sustainable wines will grow as consumer awareness and education increase. The adoption of sustainability will require a combination of consumer demand, producer interest, and knowledge dissemination. Gradual implementation and a focus on organic winemaking are expected, although there may be varying levels of enthusiasm for other approaches. Ultimately, the Indian wine industry's conversion to sustainability will depend on the alignment of market demand, consumer preferences, and producer commitment to meeting sustainability requirements.

## Conclusions

The rise in wine consumption in India signifies a significant shift in consumer behaviour and attitudes. With increasing urbanization, rising affluence, and changing perceptions about the health benefits of wine, the industry is poised for growth and expansion. By fostering awareness, targeting the appropriate consumer segments, and embracing innovation, marketers and producers can tap into the immense potential that the Indian market offers. The wine industry in India has the opportunity to establish itself as a vibrant and thriving sector, enriching the lives of consumers and contributing to the cultural fabric of the nation.

## From Surveys

Literature studies supported the findings on wine preference factors. Sluik, Bezemer, Sierksma, and Feskens (2016) discovered a strong relation between wine preference and healthy dietary habits. In India, young consumers have become significant consumers for global wine producers, as wine has gained popularity among them. Indian Millennials show a positive attitude towards different types of wine, with wine consumption acquiring symbolic value for this segment due to their openness to change and new experiences (Mehta and Bhanja, 2018). With India's largest population under the age of 30, wine marketers should not overlook the development of the wine market in the country (Castellini and Samoggia, 2018).

- The preference for different types of wine revealed that red wine was the most consumed, followed by white wine and sparkling wine. This aligns with similar findings by Atkin and Sutanonpaiboon (2007), who found that dry red wine was the most preferred. A focus group study in India indicated that women wine consumers preferred white wine over red and sparkling wine, while red wine was considered the healthiest and sparkling wine as expensive and meant for celebrations (Mehta and Bhanja, 2018). Although the frequency of natural wine is comparatively higher than other types of wine but in India most of the consumers would have not tried natural wine since it is not very widely present. The presented data differs from this because of

lack of knowledge regarding specificity of types, that is, mostly “Wine” is referred as “Natural Wine” synonymously.

- Perceptions regarding the description of organically produced wine were consistent with other studies. The term "organic" was found to be more significant than the colour of wine but less important than price and country of origin, as consumers perceive organic wine as being healthy (Mann, Ferjani, and Reissig, 2012). However, there is a lack of knowledge among Indian wine consumers about the differences between organic, biodynamic, natural, and conventional wines. India, being one of the largest organic producers in the world, faces limitations in promoting organic agriculture due to government policy gaps (Das, Chatterjee, and Pal, 2020). Major drawbacks for organic farming in India, such as lack of awareness, marketing policies, farming infrastructure, and financial support, have been identified (Bhardwaj and Dhiman, 2019). This research gap in Indian literature is being addressed as the disposable income of young Indians increases and wine consumption grows (Patnaik and Sahoo, 2009).
- Participants' perceptions of conventional wine vary widely. While some view it as a fermented and bottled grape must, others believe it is produced with selected yeast and the use of additives and chemicals in vineyards and wineries. Additionally, almost half of the participants perceive wine as a low-priced drink, while the alcohol percentage of wine holds little significance in their overall perception. However, they perceive biodynamic wine as like organic wine, as both involve grapes grown using biodynamic methods. Additionally, half of the participants think biodynamic wine is produced without sulphites and additives. These perceptions highlight the association of biodynamic wine with sustainable farming practices. It's important to note that perceptions may vary, and the characteristics of biodynamic wine can differ among producers. In case of natural wine, they perceive it as a product made from grapes grown using organic agricultural methods and produced through traditional and simple techniques. However, there is a conceptual confusion among both wine consumers and non-consumers regarding the specific production methods of natural wine. It is also perceived as being less related to chemicals and additives compared to other types of wines.

- Regarding willingness to pay for different wines, more than half of the respondents expressed a willingness to pay extra for naturally produced wine. A study on willingness to pay for wines revealed that factors such as drink frequency and occasion, organic production method, sulphite content, income, attitudes towards healthy eating and the environment are positively associated with a higher willingness to pay for natural wine (Migliore et al., 2020). Another study suggested that consumers are willing to pay extra for organically labelled wines, regardless of the country of origin. Age, eco-certification, and likelihood to buy eco-certified wine were identified as important factors for consuming organically labelled wines. Traditional/old world wine countries also showed a slightly higher likelihood to buy and pay extra for organic wines compared to new world wine countries (Moscovici et al., 2022). Therefore, sustainability characteristics of the product are considered in wine preference factors. While knowledge and awareness of sustainability for wine consumption are still emerging among Indian consumers, more research should be conducted on this topic.
- Findings on sustainable wine production indicated that more than half of the respondents did not consider sustainability as a factor, although there is a growing interest in it. Traditional attributes such as country of origin, region of production, grape variety, brand, price, and vintage were found to be the most significant drivers of wine consumption (Drennan et al., 2015). However, sustainability characteristics have been increasingly influencing consumer perceptions and preferences for different wines, with a focus on environmental aspects rather than economic and social aspects (Klohr et al., 2013; Szolnoki, 2013; Fabbri et al., 2021).

## From Interviews

In the vast landscape of the Indian wine industry, the concept of sustainability seems to be tiptoeing on the outskirts of awareness. Producers, with their keen eye on the market, cautiously contemplate the potential development of a sustainable wine culture in a country where the wine culture itself is still in its nascent stages. The responses garnered during interviews with these wine artisans reveal a tapestry of perspectives and opinions, painting a fascinating picture of the industry's trajectory.

- Some producers express their concern that Indian consumers are yet to fully embrace the nuances of wine appreciation as seen in the western world. The wine culture in India is modest, and the sustainable wine movement even more so. The concept of sustainability remains a mystery to many, as people lack awareness of its practices and benefits. However, these very same producers recognize that education and awareness are key catalysts for change. They acknowledge that as people's understanding of wine deepens, their curiosity about sustainability will likely blossom. It is a delicate dance between introducing something new and the readiness of the industry to embrace it.
- Interestingly, when it comes to adopting sustainable practices, producers lean towards organic winemaking rather than venturing into the realms of biodynamic and natural winemaking. Some producers hold reservations about the validity and differentiation of biodynamics, questioning whether it offers anything significantly distinct from organic practices. The term "natural wine" invokes both intrigue and confusion, leaving the industry divided. While there is a possibility of future adoption, some producers express their personal reservations, confessing that they are not ardent admirers of the taste profiles associated with natural wines.
- As the wine industry in India continues to evolve and expand, a myriad of factors will shape its path towards sustainability. Consumer demand and market dynamics play a vital role, driving producers to reconsider their practices and explore sustainable alternatives. Producers are open to the idea of converting their wineries into sustainable havens, envisioning a future where organic winemaking takes centre stage. With time, education, and a growing market, the Indian wine industry may witness the emergence of a sustainable wine culture that marries the aspirations of producers with the preferences of consumers.

## Overview

The landscape of wine consumption in India is undergoing a fascinating transformation, fuelled by a multitude of factors that reflect the changing dynamics of the nation. Urbanization, the surge in disposable income, a rising affluence among the people and a growing exposure to new cultures have collectively contributed to the increasing popularity of wine. Moreover, there has been a gradual shift in the perception surrounding the health benefits associated with wine consumption (Payini, Mallya, and Piramanayagam, 2022). It is an exciting time for the wine industry in India, as it has the potential to tap into a broader consumer base and transcend the confines of the upper class.

Historically, wine consumption in India was primarily limited to the affluent segments of society, with limited availability in smaller towns acting as a barrier to widespread adoption (Kumar, Pathak, and Kumar, 2014). However, recent studies indicate that perceptions are changing, and a growing awareness of the usefulness and qualitative aspects of wine is permeating through various sections of the population. This shift in perception presents a vast untapped market that holds immense potential for growth and development.

For marketers and producers in the wine industry, these evolving dynamics open up a world of possibilities. It is a call to action, urging them to craft innovative strategies that effectively target Indian consumers and cater to their unique preferences and aspirations. This includes not only making wine more accessible across different regions and towns but also educating the masses about the various aspects that make wine a compelling choice. By creating awareness about the health benefits, the cultural significance, and the qualitative characteristics of wine, producers can actively shape consumer perceptions and forge stronger connections with their target audience.

Furthermore, this changing landscape calls for a reimagining of the wine industry's strategies. Producers can explore innovative approaches to branding, packaging, and distribution that resonate with the diverse tastes and preferences of Indian consumers. They can harness the power of storytelling, leveraging the rich heritage and tradition associated with wine to captivate the imagination of the masses. By blending tradition with modernity, the wine industry can position itself as a symbol of sophistication, indulgence, and cultural appreciation.

## Appendix 1: Survey Questions

1. What is your Nationality?

- Varied Answer

2. Which age group are you belong to?

- 18 to 25
- 35 to 35
- 35 to 45
- 45 and above

3. What's your professional Status?

- Student
- Employee
- self employed
- Unemployed

4. How frequently do you drink wine?

- At least once or twice a week
- At least once a month
- Every three months

5. Which wine styles from a list of commonly found in India are your favourite's?

- Red wine
- White wine
- Sparkling wine
- Rose wine
- Fortified wine
- Sweet wine



6. Would you like to try different wine styles?

- Yes
- No
- Maybe

7. Please select the types of wines that you have previously heard of

- Biodynamic wine
- Organic wine
- Normal [Conventional] wine
- Natural Wine
- None of the above

8. Which of the following options, in your opinion, best describes a "Conventional wine"?

- Wines produced by using additives and chemicals in vineyards and winery
- Wines that are low price are referred as conventional wines
- Wine made by selected yeast
- Wine with free of chemicals
- Wine is a grape must that has been fermented and bottled
- Wine with a high alcohol percentage is classified as conventional wine

9. In your opinion, which of the following describes organically produced wine?

- Grapes grown accordance with the principles of organic farming
- Wine produced only from single grape variety
- Grapes grown without use of synthetic Fertilizers and pesticides
- Wine that uses different type of bottles during bottling stage.
- Wine that has been certified as organic
- Wine which contains some amount of Sulfites

10. Which of the following, in your opinion, best defines biodynamic wine?

- Grapes are grown by using biodynamic methods (e.g., avoiding pesticides and using compost as fertilizer)

- In the winemaking process, only native yeasts are used, with no yeast nutrients added
- Wine with free of sulfites and no use of additives
- Wine production uses organic farming methods

11. In your perspective, which of the following best represents Natural wine?

- Wine produced using traditional and simple methods [like hand picking].
- Wine contains chemicals and additives
- Grapes are grown using organic agricultural methods
- Wine that has been filtered before bottling
- Wine produced in natural way which has some number of sulfites as preservatives

12. How often have you tried an organic Wine?

- Once
- 2to 3 times
- 5 to 10 times
- More than 10 time
- Never

13. How many times have you tasted or tried biodynamic wine?

- Once
- 2to 3 times
- 5 to 10 times
- More than 10 time
- Never

14. How often have you tried a natural wine?

- Once
- 2to 3 times
- 5 to 10 times
- More than 10 time
- Never

15. Which type of wine do you prefer?

- Conventional wines
- Organic Wines
- Natural wines
- Bio dynamic wine

16. What is the most you are willing to pay for a bottle of wine?

- Less than 800 rupees [ $<10$  USD]
- Between 800 to 900 rupees [10 -11USD]
- Between 950 to 1150 rupees [12 - 15 USD]
- Between 1200 to 1500 rupees [15 - 19USD]
- More than 2000 Rupees [ $>19$  USD]

17. Would you be willing to pay extra for an Organically produced wine?

- Yes, less than 10%
- Yes, more than 10%
- Yes, more than 10 to 15%
- Yes, more than 15 to 25 %
- No

18. Would you be willing to pay extra for a biodynamic wine?

- More than 10%
- More than 10 to 20%
- More than 25%
- No

19. Would you be willing to pay extra for a Natural wine?

- More than 10%
- More than 10 to 20%
- More than 25%

- No

20. In your opinion, what are the key characteristics driving the popularity of Organic wine?

- Benefits for health
- Sustainability
- Environmental concern [ like chemical use, terroir issues, energy use, solid waste]
- Marketing strategy
- Higher Quality
- Geographical and local Origin

21. According to you what are the factors that driving the popularity of biodynamic wine?

- Benefit for health
- Sustainability
- Marketing strategy
- Environmental concern [like chemical use, terroir issues, energy use, solid waste]
- Geographical and local Origin
- Higher Quality

22. What, in your opinion, are the factors that lead people to prefer natural wine?

- Benefit for health
- Sustainability
- Marketing strategy
- Higher Quality
- Geographical and local Origin
- Environmental concern [ like chemical use, terroir issues, energy use, solid waste]

## Appendix 2: Interview Questions

1. What is your opinion for potential development of a sustainable wine industry in India?
2. Most Indian wineries produce wine in a conventional way. Why, in your opinion, no or few wineries produce wine using a sustainable approach? (Terroir, wine growing techniques)?
3. Considering availability of conventional wine in the market, if India was to introduce more sustainable wines, do you think that consumers would choose them over conventional wines? (Considering key Characteristics)
4. Do you consider sustainable labelling and bottling will have an impact on the consumers preferences?
5. Would you think is there a chance of current wine industry will adopt sustainability in future? (Soil fertility, impacts on grape growing).
6. What do you think it would take for the Indian wine industry to adopt more sustainable practices in the future?
7. Would you like (or do you have plans) to adopt or to convert your conventional winery into sustainable winery (like Organic, Biodynamic, Natural Winemaking)?

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