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WINE AND SUSTAINABILITY: THE MULTIFACETED ROLE OF CERTIFICATIONS

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LIST OF ABBREVIATION

ASTM : American Society of Testing Materials

AWISSP: Australian Wine Industry Standards of Sustainable Practice

CAP: Common Agricultural Policy

CAWG: California Association of Winegrape Growers

CCSW : Certified California Sustainable Vineyard and Winery

CEEV : Comité Européen des Entreprises Vins

CIP: Competitiveness and Innovation Programme

CMO: Common Market Organisation

COP 21: Paris Climate conference agreement

COSME: Competitiveness of Enterprises and Small and Medium-Sized Enterprises

EAFRD: European Agricultural Fund for Rural Development

EAGF: European Agricultural Guarantee Fund

EIP AGRI: European Innovation Partnership for Agricultural Productivity and Sustainability

EIT: European Institute of Innovation and Technology

ERDF: European Regional Development Fund

ESF: European Social Fund

ETP European Technology Platforms

EU: European Union

EYE: Erasmus for Young Entrepreneurs

FIBL: Research Institute of Organic Agriculture

GAP: Green Action Plan

GMO: Genetically modified organisms

IAP: Implementation Action Plan

ISO: International Organization for Standardization

IWSR: International Wine & Spirits Research

KIC: Knowledge and Innovation Community

LIVE: Low Input Viticulture and Oenology

MDG: Millennium Development Goal

NGO: Non-Governmental Organization

OECD: Organisation for Economic Co-operation and Development

OIV: International Organisation of Vine and Wine

PRIMA: Partnership for Research and Innovation in the Mediterranean Area

R&D: Research and Development

RDP: Rural Development Programme

SDG: Sustainable Development Goal

SIP: Sustainability in Practice

SME: Small medium-sized enterprise

SOI: Sustainability-oriented Innovation

SRIA: Strategic Research and Innovation Agenda

UK: United Kingdom

UN: United Nations

US: United States

USDA: United States Department of Agriculture

UVI: Unione Italiana Vini

WCED: World Commission on Environment and Development

INTRODUCTION

Nowadays, sustainability has become a key element of many different policies: since the publication of *Our Common Future* in 1987 by the World Commission on Environment and Development (WCED), there has been growing awareness of this issue, and numerous initiatives have been implemented by many stakeholder groups.
In particular, there has been increasing attention to sustainable practices in the agri-food sector. In fact, according to The World of Organic Agriculture (2019) report elaborated by the Research Institute of Organic Agriculture (FIBL), in 2017, production and sales in the European organic farming sector showed a significant increase. In fact, the European organic food market increased by more than 11% to €37.3 billion in the period 2000-2017 (Figure 1).

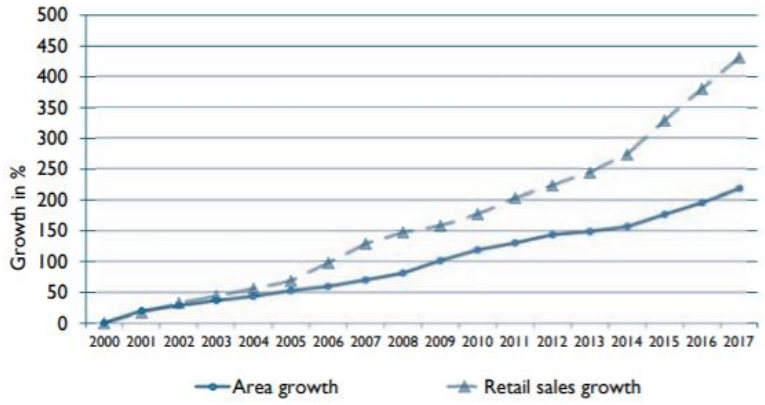

Figure 1-Growth of organic area and retail sales in Europe 2000-2017 compared (source: FIBL-AMI surveys 2006 - 2019, The World of Organic Agriculture)

The wine sector has also been influenced by these trends: according to International Organisation of Vine and Wine (OIV) data (2017), almost 90% of the area dedicated to organic grape vineyards is in Europe. The rest is distributed almost equally between Asia, North America and Latin America. Furthermore, according to the International Wine & Spirits Research (IWSR) Organic Wine Report, by 2022, world consumption of still wine is expected to reach 2.43 billion euros, while organic wines should record the most

significant increases (+9.2% compound annual growth 2017-2022). Europe will account for 78% of the world market for organic wine by 2022.[1]

Since 1999, the OIV has issued a series of resolutions to implement sustainable practices. The latest General Principles of the OIV on Sustainable Viticulture (2016) include environmental, social, economic and cultural aspects. Similarly, the agricultural policies of producer countries have increasingly favoured growth geared towards sustainability.[2]

Most agri-food businesses are small and medium-sized enterprises (SMEs), and are considered the key element for the development of sustainability and innovation. In 2015, 99 % of all enterprises in the European Union (EU) were SMEs. The European Commission has many programs to promote the development of entrepreneurship, many of which identify the relationships among stakeholders as a key principle of sustainable development.[3]

According to research conducted by Riccaboni and Cavicchi (2019), the involvement of stakeholders and global partnerships are essential for fostering sustainability and innovation objectives, especially in the agri-food sector, interconnecting to the economic, social, cultural and environmental dimensions.[4]

Furthermore, as suggested by Pomarici e Vecchio (2019), it is also important to understand how consumers perceive sustainability, to ensure that this choice is not only driven by wineries for regulatory requirements; hence, among the various factors to be investigated, the research needs to understand the taste expectations of consumers arising from the characteristics of sustainability of a wine, also to give more information to producers about their choices.[5]

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[1] International Wine & Spirits Research (2019). *Organic Wine Forecasted to Reach 87.5m Cases Globally by 2022.* European Markets Drive Demand and Growth.

[2] International Organisation of Vine and Wine (2016). *Resolution OIV-CST 518/2016: OIV general principles of sustainable vitiviniculture - environmental - social - economic and cultural aspects.*

[3] Papadopoulos, G., Rikama, S., Alajääskö, P., Salah-Eddine, Z., Airaksinen, A., Luomaranta H. (2018). *Statistics on small and medium-sized enterprises.* Eurostat Statistics Explained.

[4] Riccaboni, A., Cavicchi, A. (2019). *Innovation for Sustainable Food Systems: Drivers and Challenges. In Achieving the Sustainable Development Goals Through Sustainable Food Systems (pp. 131-140).* Springer, Cham.

[5] Pomarici, E., & Vecchio, R. (2019). *Will sustainability shape the future wine market?* Wine Economics and Policy, 8(1), 1-4.

The EU's strategies for encouraging sustainable practices have been implemented through specific programs to give agri-food producers access to funds to facilitate their approach to sustainability. Sustainability in the wine sector and sustainable certification are the main objects of this research.

This work starts with an overview of EU programmes that support sustainability in the agri-food sector, then focuses on how collaboration between universities and small wineries can foster innovation and sustainability. Finally, the importance of labels and sustainable certifications is explored, in particular, how they can influence the perception of wine during tasting sessions by expert consumers.

The main objectives of this dissertation were:

- To investigate the point of view of small wineries regarding collaboration with the university to promote sustainability-oriented innovation (SOI).
- To understand whether and to what degree certifications influence the hedonic perception of a wine.

This research is divided into three parts. The first chapter describes the emergence of the concept of sustainability, with a focus on the agri-food sector, and illustrates programs geared to promote this principle in the practices of stakeholders. The second chapter has a specific focus on SOI and how stakeholder engagement is the key element to favour such practices. The third chapter analyses the role of sustainable certification in consumer choice and how it can influence the hedonic perception of wine.

A series of semi-structured interviews were carried out for The Wine Lab project, an EU project to create the basis for a dialogue between research, business and regional communities based on clustering and networking. It involves twelve partners from Italy, Austria, Cyprus, Greece and Hungary, including exponents of the academic world and wine companies are included.

Questions were framed to gain understanding of the difficulties of small wineries in disadvantaged areas and their willingness to collaborate with local stakeholders, in particular universities. The Grounded Theory method was used for the analysis phase to find the macro-categories that would answer these questions and to identify the challenges.

In order to achieve the second research objective, an experimental study was conducted with wine experts. A focus group discussion explored the participants' perceptions about sustainability; subsequently, three sessions look at expectations and evaluations of conventional, organic, and sustainable Montepulciano d'Abruzzo wines. A first blind tasting session of unlabelled wines was followed by a second session in which participants expressed their expectations about the labelled wines, then a third session in which they tasted the labelled wines. In each session, participants scored the wines on a nine-point Likert scale, and their evaluations were then analysed.

After a description of data and results, a discussion of the phenomena takes into consideration different points of view.

CHAPTER 1- HOW THE EUROPEAN UNION ADDRESSES THE ISSUE OF SUSTAINABILITY IN THE AGRI-FOOD SECTOR

1.1. INTRODUCTION

According to Organisation for Economic Co-operation and Development (OECD) reports of 2015[6] and 2016[7], the need for sustainability has become one of the cornerstones for the world's future actions, and nations must strive continually to balance the needs of the environment, the economy and society. Instruments have been developed to encourage farmers to adopt sustainable farming practices that will improve productivity and optimise efficient use of resources. These approaches include a synergy between traditional regulations and a wide range of support instruments such as information and education, cooperation, research and development, technology and innovation.

According to the analysis by Zezza *et al.* (2017)[8], the European strategy to support green growth employs four main approaches. First, the EU supports research and development activities, that are crucial for developing innovative and sustainable strategies. Farmers must be educated and trained to put these strategies into practice and must be helped to access credit when the enactment of these strategies requires high initial investment. Second, The EU provides economic incentives such as rewards, grants, subsidies, tax exemptions or facilitation measures as market-based instruments to influence economic decision-making and encourage action. The aim of these instruments is to counter market failures by addressing price through taxes, and charges, environmental duties and charges, tradable permits and subsidies to reduce pollution. Third, EU regulations are meant as negative sanctions to prohibit or suppress unwanted actions and developments. Regulatory approaches are common in agriculture to prevent negative impacts on the environment caused by the overuse of chemicals or the dependence on dangerous ones,

[6] OECD. (2015). Fostering Green Growth in Agriculture: The Role of Training, Advisory Services and Extension Initiatives, Oecd Green Growth Studies, Oecd Publishing, Paris.

[7] OECD. (2016). *Farm Management Practices to Foster Green Growth*, Oecd Green Growth Studies, Oecd Publishing, Paris.

[8] Zezza, A., Henke, R., Lai, M., Petriccione, G., Solazzo, R., Sturla, A., van der Meer, R. W. (2017). Research for AGRI Committee-Policy support for productivity vs. sustainability in EU agriculture: Towards viable farming and green growth: study. European Parliament.

for example, and to protect soil, water and air quality, biodiversity, food safety and quality. Fourth, the EU provides other non-market instruments to help farmers improve productivity and environmental sustainability. Examples of such regulatory instruments are France's environmental Certification for Farms for safeguarding biodiversity, Ireland's Origin Green Programme covering the energy, waste, water and water sectors, and The Netherlands' green agreements setting zero-emission targets for agriculture and dairies.

This chapter addresses these concepts, starting with a review of the history of sustainability notions and their application, outlining the main principles and areas of implementation, first from a global point of view and then focusing on the European context.

Next, it indicates the central policies and funds that support sustainable actions in the agri-food industry, involving all the steps of the supply chain. Finally, the partnerships and initiatives that favour the development of sustainable practices in the agri-food sector are presented.

1.2. THE DEVELOPMENT OF THE CONCEPT OF SUSTAINABILITY

During recent decades, the concept of sustainability has become increasingly significant in the decisions of policymakers, and many policies have been implemented to increase the use of sustainable practices in many different economic sectors.

The first document stressing the need to focus on economic and environmental issues and urging conscious use of resources was *Blueprint to survive*, the January 1972 issue of The Ecologist magazine, published just prior to the UN Conference on the Human Environment to be held in Stockholm. The issue sold about 500,000 copies, and was later published in book format.[9] This publication raised consciousness about the urgent importance of this emerging issue, and in the following years, interest focused on defining sustainability and its principles of application.

[9] Hubbard, B. (2012). The Ecologist January 2012: a blueprint for survival. *https://theecologist.org/2012/jan/27/ecologist-january-1972-blueprint-survival.* (consulted on January 2019).

That same year, the UN Brundtland Commission introduced the concept of *sustainable development* as "*a kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (United Nations General Assembly, 1987, p. 37). The two key concepts of sustainable development are *needs* and *limitations* imposed by the state of technology and social organisation on the environment's ability to meet both present and future needs.

Since the Brundtland Commission's work in 1972, sustainable development has been consolidated as a principle of international law through global environmental treaties and numerous regional agreements. The 1990 EU Bergen Declaration on Sustainable Development (1990)[10] underlined the importance of taking precautionary actions to protect the global environment. It sought to persuade policymakers to consider the effects of their actions on the environment before starting their activities[11]. The 1992 United Nations Conference on Environment and Development held in Rio de Janeiro established the empowerment of sustainable development as the most important strategy of the 21st century. The member states confirmed all the principles in the 1972 Declaration of the United Nations Conference on the Human Environment of Stockholm, stressing the importance of equitable global partnerships to respect community welfare and preserve the integrity of the global environmental.[12] The concept of sustainable development was also incorporated into the environmental treaties opened for signature in Rio, namely, the Convention on Climate Change[13], which entered into force in 1994, and the Convention on Biological Diversity[14], which came into force in 1993. The latter described the concept of *sustainable use*, defining "*the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity,*

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[10] United Nations - Economic Commission for Europe. (1990). *Bergen Ministerial Declaration on Sustainable Development.* Bergen. UNECE.

[11] Cameron, J., Abouchar, J. (1991). The precautionary principle: a fundamental principle of law and policy for the protection of the global environment. BC Int'l & Comp. L. Rev., 14, 1.

[12] United Nations. (1992). Conference on Environment and Development. Rio de Janeiro. http://www.un.org/geninfo/bp/enviro.html . (consulted on January 2019).

[13] International Institute for Sustainable Development – Reporting Services Division. *http://enb.iisd.org/process/climate_atm-fcccintro.html.* (consulted on February 2019).

[14] United Nations. (1992). Convention on Biological Diversity, p.3

thereby maintaining its potential to meet the needs and aspirations of present and future generations" (Article 2, p. 3).

In 1993, the EU's Fifth Environmental Action Programme drew attention to the importance of adopting sustainable approaches in the areas of industry, energy, transport, agriculture and tourism. Furthermore, it underlined the need for governments, industry and the public to share the responsibility to agree upon measures to be achieved.[15]

The Johannesburg Conference in 2002, promoted by the United Nations, confirmed a structure of the principle of sustainable development based on three interdependent factors: environmental protection, economic growth and social development.[16]

1.3. THE SUSTAINABILITY CHALLENGE IN EU POLICY

The European Union's environmental actions and policies are grounded on the need for sustainable development; indeed, the EU has taken the lead in the fight against climate change and the promotion of a low-carbon economy. Even so, unsustainable trends persist in many areas. Under the current Structural Funds Programming Period (2014-2020), sustainable development is mainstreamed in key cross-cutting projects as well as in sectoral policies and initiatives.[17]

Over the years, the EU Sustainable Development Strategy has undergone numerous changes; from its launch in 2001, it has been modified several times as the number of member states has increased. Changes made in 2006 addressed the need to gradually change unsustainable consumption and production patterns and move towards a better strategy in terms of policymaking. It confirmed the necessity for global unity and recognised the importance of collaboration with extra EU countries to pursue global sustainable development. [18] In 2009, the Sustainable Development Strategy was

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[15] Official Journal of the European Communities. (1993). A policy and strategy for the environment and sustainable development within European Community N. C 138/7 (pag. 23-80). (in "Towards sustainability").

[16] United Nations. (2002). The Johannesburg declaration on sustainable development. a/conf. n. 199/20

[17] European Commission. *http://ec.europa.eu/environment/eussd/*. (consulted on December 2018).

[18] European Union. (2017). Reviews of the EU Sustainable Development Strategy. http://ec.europa.eu/environment/sustainable-development/strategy/review/index_en.htm. (consulted on January 2019).

reaffirmed, and the EU renewed its commitment to pursue the previously established sustainability objectives, affirming that "*the strategy will continue to provide a long term vision and constitute the overarching policy framework for all Union policies and strategies*".[19] These EU efforts worked to establish a path that should be followed to promote growth according to "*smart, sustainable and inclusive*" development that creates new jobs.[20]

The EU has provided leadership on sustainable development for the entire world community and was instrumental in shaping UN policy. In fact, in 2015, the 70th UN General Assembly used the EU's Sustainable Development Goals in its agreement on a new global sustainable development framework that defined sustainability objectives at a global level: the 2030 Agenda for Sustainable Developments.

1.3.1. THE 2030 AGENDA AND THE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

The UN resolution *Transforming our World: The 2030 Agenda for Sustainable Development* was adopted in September 2015 to face the complex challenges affecting the world.

This document, built on the 1992 Rio Declaration on Environment and Development as well as the 2012 Rio+20 sustainable development goals, expanded upon the 8 Millennium Development Goals (MDGs) defined in the year 2000, (to be achieved by 2015, regarding environmental sustainability as well as issues such as poverty, education, women's rights, child mortality, and disease), in its formulation of 17 Sustainable Development Goals (SDGs).

The Addis Abeba Action Agenda (2015)[21] defined paradigms for use of financial and non-financial means and identified local actions as the centre of the implementation of

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[19] European Council. (2009). *Conclusions. https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/111877.pdf*. (consulted on January 2019).

[20] European Commission. (2010). *Europe 2020. A European strategy for smart, sustainable and inclusive growth.* Brussels.

[21] United Nations. (2015). *Addis Ababa Action Agenda of the Third International Conference on Financing for Development* - Addis Ababa Action Agenda. New York.

policies for sustainable development. The Sendai Framework on Disaster Risk Reduction (2015) [22] underlined the importance of limiting disaster risk and requested that policymakers invest to prevent them. The Paris Agreement on Climate Change (2015)[23] outlined the framework for the implementation of policies to protect the climate and natural resources.

The United Nations (UN) 2030 Agenda sets goals for eliminating poverty and achieving sustainable development by 2030 worldwide, in the hope of ensuring equality among all the member states. It combines the three dimensions of sustainable development - *economic, social and environmental* - and is the first international agreement by all UN member states to pursue peace, security, justice for all, and social inclusion.[24]

The 17 SDGs of the UN's 2030 Agenda for Sustainable Development and their 169 associated targets are global, universally valid and interlinked; all countries have a shared responsibility to respect these principles in their policy activities.[25] The goals and targets will stimulate engagement for the next years to focus on crucial issues that involve the planet and humanity itself. The central challenge reaffirms the commitment to eliminate poverty.[26] Five 'Ps' summarise its main themes: *people, planet, prosperity, peace and partnership.*

The main goals on which all the Member states have agreed to work are *1)No Poverty, 2) Zero Hunger, 3) Good Health and Well-being, 4) Quality Education, 5) Gender Equality, 6) Clean Water and Sanitation, 7) Affordable and Clean Energy, 8) Decent Work and Economic Growth, 9) Industry, Innovation and Infrastructure, 10) Reduced Inequality, 11) Sustainable Cities and Communities, 12) Responsible Consumption and Production,*

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[22] United Nations. (2015). *Sendai framework for disaster risk reduction 2015-2030*. Geneva.

[23] United Nations. (2015). *Paris agreement on Climate Change.* New York.

[24] European Commission. (2016*). Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions; next steps for a sustainable European future European action for sustainability*. COM(2016) 739 final. Strasbourg.

[25] Sustainable Development Goals. *https://sustainabledevelopment.un.org/*. (consulted on February 2019).

[26] Kydland, F., Stokey, N., Schelling, T. *Smart development goals*. *https://www.copenhagenconsensus.com/post-2015-consensus/expert-panel-downloads.* (consulted on February 2019).

13) Climate Action, 14) Life Below Water, 15) Life on Land, 16) Peace and Justice, Strong Institutions and 17) Partnerships to achieve the Goal.[27]

The SDGs can be grouped into three categories. The first group comprises the first seven SDGs, which are an extension of the MDGs. The second group (points 8, 9 and 10) provides a global perspective on issues such as jobs, infrastructure, industrialisation, and distribution. Finally, the third group addresses sustainability and urbanisation, focusing on sustainable cities and communities, life below water, consumption and production, climate action, resources and environment, peace and justice and the means of implementation and global partnership for them.[28]

Europe's progress in achieving these sustainable development goals in the last five years is depicted in the *Figure 2* graph developed on the basis of Eurostat data (2018)[29]. It shows that there has been significant progress on SDGs 3, 4 and 7, as well as significant growth for SDGs 11, 12, 5, 8, 17 and 1, while progress on SDGs 15, 2, 9 has been moderate. The EU seems to have experienced a moderate movement away from SDG 10 over the past five years, and the continued rise of income inequality in EU Member states indicates the lack of positive actions to solve this problem. Concerning SDGs 6, 13, 14 and 16, it is difficult to estimate their status because of insufficient data.

Figure 2 - EU progress towards the SDGs (Source: Eurostat 2018).

[27] United Nations. (2015). *Transforming our World: The 2030 Agenda for Sustainable Development*.

[28] United Nations. (2015). *Millennium Development Goals Report*; p. 3. New York.

[29] Eurostat. (2018). *Sustainable development in the European Union - Monitoring Report on Progress Towards The SDGs in an EU Context.* Luxembourg.

The EU is committed to playing an active role to maximise progress towards the SDGs, by acting in their respective policy areas and identifying possible gaps in the implementation of sustainable development objectives; in addition, each member state should plan the actions to be taken to ensure the full, coherent and effective implementation of Agenda 2030 across the EU area.[30]

1.3.2. SDGs AND THE AGRIFOOD SECTOR

It is possible to identify an interaction between international agricultural policies and the SDGs; specifically, we can find in its objectives links with agricultural issues.

This connection is emphasised in the FAO (2018) document *Transforming food and agriculture to achieve the SDGs - 20 interconnected actions to guide decision-makers*[31], where the organisation develops 20 action points for the development of the agri-food sector, according to their 5 principles of sustainable food and agriculture (*Increase productivity, employment and value addition in food systems, Protect and enhance natural resources, improve livelihoods and foster inclusive economic growth, Enhance the resilience of people, communities and ecosystems, adapt governance to new challenges*) and the 17 SDGs. Subsequently, a table was created (*table 1*) to identify the influence of the different areas of action contributing to the objectives of the SDGs.

[30] Council of European Union. (2017). *A sustainable European future: The EU response to the 2030 Agenda for Sustainable Development.* Brussels.

[31] FAO. (2018). *Transforming Food and Agriculture to Achieve the SDGs: 20 interconnected actions to guide decision-makers.* Technical Reference Document. Rome.

Action Areas (Pillars)	Increase productivity, employment and value addition in food systems	Protect and enhance natural resources	Improve livelihoods and foster inclusive economic growth	Enhance the resilience of people, communities and ecosystems	Adapt governance to new challenges
SDG 1: No Poverty	MAJOR (1.4)	CONTRIBUTING (1.4, 1.5)	MAJOR (1.1, 1.2, 1.3, 1.4, 1.5)	CONTRIBUTING (1.5)	MAJOR (1.a, 1.b)
SDG 2: Zero hunger	MAJOR (2.1, 2.2, 2.3, 2.4)	MAJOR (2.4, 2.5, 2.a)	MAJOR (2.1, 2.2, 2.3, 2.4)	MAJOR (2.4)	MAJOR (2.1, 2.3, 2.4, 2.a)
SDG 3: Good health and well being			CONTRIBUTING (3.4)		
SDG 4: Quality education	CONTRIBUTING (4.3, 4.4)				
SDG 5: Gender equality	CONTRIBUTING (5.b)		MAJOR (5.1, 5.5, 5.a)		CONTRIBUTING (5.a, 5.b, 5.c)
SDG 6: Clean water and sanitation	CONTRIBUTING (6.3, 6.4)	MAJOR (6.3, 6.4, 6.5, 6.6, 6.a)	CONTRIBUTING (6.4)	CONTRIBUTING (6.4, 6.6)	CONTRIBUTING (6.5, 6.a)
SDG 7: Affordable clean energy	CONTRIBUTING (7.2, 7.3)	CONTRIBUTING (7.2, 7.3)			CONTRIBUTING (7.2, 7.3)
SDG 8: Decent work and economic growth	CONTRIBUTING (8,2, 8,6, 8,10, 8.a)	CONTRIBUTING (8.4)	MAJOR (8.3, 8.5, 8.6, 8.7, 8.8, 8.10, 8.b)		
SDG 9: Industry, innovation and infrastructure	MAJOR (9.3, 9.b, 9.c)	CONTRIBUTING (9.1)	CONTRIBUTING (9.1)	CONTRIBUTING (9.a)	CONTRIBUTING (9.3, 9.a, 9.b)
SDG 10: Reduced inequalities			MAJOR (10.1, 10.2, 10.3, 10.4)		CONTRIBUTING (10.2, 10.3, 10.4)
SDG 11: Sustainable cities and communities	CONTRIBUTING (11.4, 11.a)	CONTRIBUTING (11.4)		CONTRIBUTING (11.5)	MAJOR (11.5, 11.a)
SDG 12: Sustainable consumption and production	CONTRIBUTING (12.1, 12.3)	MAJOR (12.2, 12.3, 12.4, 12.5, 12.6, 12.c)	CONTRIBUTING (12.5)		CONTRIBUTING (12.1, 12.6)
SDG 13: Climate action	CONTRIBUTING (13.3)	CONTRIBUTING (13.1)	MAJOR (13.1, 13.3)	MAJOR (13.1, 13.2, 13.3, 13.b)	MAJOR (13.2)
SDG 14: Life under water	MAJOR (14.b)	MAJOR (14.1, 14.2, 14.5, 14.c)	CONTRIBUTING (14.b)	CONTRIBUTING (14.5, 14.b)	MAJOR (14.4, 14.6, 14.c)
SDG 15: Life on land	CONTRIBUTING (15.2)	MAJOR (15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.8, 15.9, 15.a, 15.b)		CONTRIBUTING (15.1, 15.3, 15.4, 15.5, 15.9, 15.a, 15.b)	MAJOR. (15.9, 15.a, 15.b)
SDG 16: Peace, justice and strong institutions			CONTRIBUTING (16.5, 16.6, 16.7		MAJOR (16.3, 16.5, 16.6, 16.7)
SDG 17: Partnerships for the goals					MAJOR (17.1, 17.14, 17.17)

Table 1- Areas of action contributing to the objectives of the SDGs (source FAO, 2018).

After this review, 20 points were drawn up reflecting the actions that policymakers need to take to create a sustainable system: 1*) Facilitate access to productive resources, finance and services, 2) Connect smallholders to markets, 3) Encourage diversification of production and income, 4) Build producers' knowledge and develop their capacities, 5) Enhance soil health and restore land, 6) Protect water and manage scarcity, 7)*

Mainstream biodiversity and protect ecosystem functions, 8) Reduce losses, encourage reuse and recycle, and promote sustainable consumption, 9) Empower people and fight inequalities, 10) Promote secure tenure rights for men and women, 11) Use social protection tools to enhance productivity and income, 12) Improve nutrition and promote balanced diets, 13) Prevent and protect against shocks: enhance resilience, 14) Prepare for and respond to shocks, 15) Address and adapt to climate change, 16) Strengthen ecosystem resilience, 17) Enhance policy dialogue and coordination, 18) Strengthen innovation systems, 19) Adapt and improve investment and finance, 20) Strengthen the enabling environment and reform the institutional framework. As the FAO declared, targeted actions by policymakers to implement Agenda 2030 are essential to ensure real change, showing the way forward for sustainable food and agriculture to help countries achieve their development goals.

From a European perspective, agriculture and rural development policies are in line with achieving the 2030 UN Agenda for Sustainable Development; in fact, in November 2016, the European Commission outlined its strategic approach towards the implementation of the 2030 Agenda, including the Sustainable Development Goals. Specifically, the document issued by the European Commission (2017) entitled *Communication on the next steps for a sustainable European Future* [32] highlights the EU commitment to integrate the 17 goals of sustainable development into its policies.

Goals closely related to agriculture and Europe's strategy for implementing them are contained in SDG 2, *Zero Hunger*, for which the Commission has defined three objectives, according to the Common Agricultural Policy (CAP): sustainable food production, sustainable management of natural resources and climate action, and balanced territorial management. Also, the EU supports actions of member states to provide sufficient quantities of safe and nutritious food to the most disadvantaged people through the FOOD 2030 programme, a platform for dialogue to foster research and innovation in the field of food and nutrition security. The FOOD 2030 [33] conference in 2016, held in Brussels, provided an opportunity for discussion with stakeholders and

[32] European Commission. (2017). *Communication on the next steps for a sustainable European Future.* Strasbourg.

[33] European Commission. (2016). *FOOD 2030: research and innovation for tomorrow's nutrition and food systems.* Brussels.

addressed the main future challenges in the field of nutrition and the food supply system, identified as *Re-use of food chain waste, Transformation of the European supply system given the growing demand for food, Improving the quality of diets and consumers' awareness of health risks, increasing accessibility to food in poorer countries*. [34]

Several SDGs have a strong environmental dimension, including SDG 6, SDG 14 and SDG 15; in Community policy, the protection of the environment is essential for the quality of life of present and future generations, and thus actions are taken to counter desertification, protect biodiversity, safeguard the fishing world and provide governance of the oceans, which sets out actions to ensure safety, cleanliness and sustainability.

Ensuring sustainable production and consumption patterns (SDG 12) is another of the EU's objectives for achieving the goals of Agenda 2030. In fact, as people become more aware of our resources and the value of moving toward a circular economy, they will become more responsive in supporting sustainable economic growth and environmental protection. All these objectives are also focused on final consumers, who, perceiving sustainable consumption as a priority, will be able to make conscious, well-informed choices.

Regarding energy and the climate (SDG 7 and SDG 13), the EU agreed that by 2030 there would be a reduction in greenhouse gas emissions, an improvement in energy efficiency and an increase in the share of renewable energy. Also, there is a political commitment to allocate at least 20% of the EU budget to climate action.

The Commission has already proposed how to reduce greenhouse gas emissions in all the sectors of the European Union by encouraging the member states to promote the transition to clean energy through a series of initiatives.[35]

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[34] European Commission. (2017). *Harnessing Research and Innovation for FOOD 2030: A science policy dialogue Conference outcome report - 16 Oct 2017*. Brussels.

[35] European Commission. (2016). *Communication from the commission to the European parliament, the council, the european economic and social committee and the committee of the regions - Next steps for a sustainable European future European action for sustainability*. COM(2016) 739 final. Strasbourg.

1.4. EU FUNDINGS FOR SUSTAINABILITY IN THE AGRIFOOD SECTOR

According to United Nations estimates (2015)[36], the world population will increase to 8.5 billion in 2030 and reach over 9 billion by 2050. It is essential to create active policies for productive and sustainable agriculture.

Europe is one of the world's leading producers of food, and it already guarantees food security for over 500 million European citizens, according to the European Commission's 2017 publication on *The Future of Food and Farming*. In addition, Europe is the world's biggest importer and exporter of agri-food. As indicated in a 2017 World Bank report [37], 7.5% of all goods exported by Europe are agri-food products, while 6.6% of all goods exported by the nations of the world as a whole are agricultural, ranking fourth in importance after machinery, chemical products and pharmaceuticals. Moreover, a 2016 Eurostat report indicated that in the EU, farming provides regular work for 22 million people, and the food sector, comprising farming, food processing and related retail and services, provides around 44 million jobs. Over half of EU citizens live in rural areas (55%), and they develop their activities in these regions, enhancing employment, recreation and tourism.

According to a 2017 EU report on the future of food and farming, EU farmers are the first guardians of the natural environment, as they care for the natural resources of soil, water, air and biodiversity.[38] The FIBL reported that in 2016, almost 14 million hectares of EU farmland were organic, and there were 300,000 organic producers. It stated that sales of organic foods in the EU increased 11.4% from 2015 to 2016, totalling nearly 33.5 billion euros. Finally, the report indicated that on average, EU consumers spend 61€ per person to buy organic food.[39] In short, EU agricultural policy has been encouraging agri-food

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[36] United Nations. (2015). *World population projected to reach 9.7 billion by 2050*. New York.

[37] The World Bank. (2017). *Thinking CAP – Supporting Agricultural Jobs and incomes in the EU*. New York.

[38] European Commission. (2017). *The future of food and farming*. Brussels.

[39] FIBL. (2018*). European organic market grew by double digits and organic area reached 13.5 million hectares in 2016.* Nuremberg.

producers to implement sustainable practices; it has invested in farmers and the development of rural areas.[40]

1.4.1. COMMON AGRICULTURAL POLICY (CAP)

The EU's CAP is a joint venture between Europe and its farmers in all the countries of European Union, managed at the European level and amounting to about 39% of the European Union's budget.

Since its launch in 1962, the CAP set specific objectives, among them ensuring a fair standard of living for the agricultural community, satisfying farmers, and guiding them towards higher production capacity by limiting the factors of production, increasing technological development and using better agronomic techniques. Furthermore, it has also aimed to stabilise the markets and ensure fair prices for the consumer.[41] Currently, it works to achieve 9 main objectives: *1) to ensure a fair income to farmers 2) to increase competitiveness 3) to rebalance the power in the food chain 4) climate change action 6) environmental care 7) to preserve landscapes and biodiversity 8) to support generational renewal 9) vibrant rural areas to protect food and health quality.* [42]

Member states identify their needs and manage them through the Rural Development Programme (RDP), executed at the regional level, which has the objective of giving direct support to farmers of a specific EU rural region, and providing them incentives to encourage production with the least possible negative environmental impact.[43] Organic farming is an essential focus, and there are incentives to promote it. Also, the CAP environmental measures aim at limiting climate change through the production of renewable energy from agriculture and forestry.[44]

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[40] European Union. *Vibrant rural areas and quality agricultural products*. *https://europa.eu/european-union/topics/agriculture_en.* (consulted on February 2019).

[41] European Commission. *The common agricultural policy at a glance. https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-glance.* (consulted on February 2019).

[42] European Commission. *Future of Common Agricultural Policy. https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en.* (consulted on February 2019).

[43] European Commission. (2018). *EU Budget: the Common Agricultural Policy beyond 2020*. Brussels.

[44] Blizkovsky, P. (2015). *New focus of the agricultural policy in Europe: response to sustainability challenges*. Current Politics & Economics of Europe, 26(3).

Two pillars of the CAP strategy are *the European Agricultural Guarantee Fund* (EAGF) and the *European Agricultural Fund for Rural Development* (EAFRD), financed by the EU budget[45].

The EAGF is co-financed with the member states and provides direct funding to farmers who cultivate their land with respect for food safety, environmental sustainability and animal welfare. The Common Market Organisation (CMO) is the framework for the market measures provided for under the CAP, and intervenes together with the member states to deal with the management of agricultural imports and exports within and outside the EU, the balance between supply and demand and the problems related to global competition, economic and financial crises and climate change.[46]

The EAFRD, together with the European Social Fund (ESF) and the European Regional Development Fund (ERDF) form the European Structural and Investment Funds, which encourage everything related to the modernisation, promotion, employment, retraining and support of farms.[47]

The EU's CAP was updated in 2018 to encompass goals beyond 2020. Groundwork for these proposals was laid with the 2017 communication by EU Commission, *The future of food and farming* [48], examining how to make the CAP more open to current and future challenges such as climate change and generational renewal, while continuing to support European farmers for a sustainable and competitive agricultural sector. This document indicates the need for the CAP to follow the principle of equality among the member states. While the agronomic potential and the labour costs of the various nations differ significantly, support must be based on their potential, in order to reduce these differences. Furthermore, the document underlined how crucial it is to provide investment support under the CAP through better integration of business advice and promotion of collective investments and mechanisms to achieve profitable synergies with research and innovation.

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[45] Reg. n. 1290/2005. *On the financing of the Common Agricultural Policy*. Brussels.

[46] Reg. n. 1307/2013 *of the European Parliament and of the Council. Establishing rules for direct payments to farmers under support schemes within the framework of the Common Agricultural Policy*. Brussels.

[47] Reg. n. 1305/2013 *of the European Parliament and of the Council. On support for rural development by the European Agricultural Fund for Rural Development (EAFRD)*. Brussels.

[48] European Commission. (2017). *The future of food and farming*. Brussels.

Lastly, the document focused on the importance of the interaction between the CAP, the Paris Climate conference agreement (COP 21) and on the United Nations' sustainable development objectives. The goals proposed in the post-2020 development plan include more ambitious targets for protection of the environment and amelioration of climate change, and the goal of making EU citizens more aware of the importance of sustainable agricultural production.

1.4.2. HORIZON 2020

Horizon 2020 is an EU programme that contributes to fostering sustainability and innovation in member countries; it is the EU's most extensive research and innovation programme, and aims to support research for smart, sustainable and inclusive growth. It provides funds for innovative research activities that promote sustainable growth and job creation. In fact, for the reference period 2014-2020, the EU has invested around €80 billion in this project. Private investors also dedicate resources to these goals through their own initiatives.

This programme works to achieve these objectives by linking research to innovation, and focuses on three key areas: *excellent science, industrial leadership and societal challenges*.[49]

In the area of scientific excellence, the programme seeks to exploit the superiority of the EU's scientific base and to consolidate Europe as a research centre in order to make its research and innovation systems more competitive globally. The Horizon 2020 programmes to further this goal are managed through the *European Research Council, Future and Emerging Technologies, Marie Skłodowska-Curie Actions, Research Infrastructures*.[50]

Industrial leadership is the second key area of Horizon 2020. The aim is to foster the development of technologies and innovations that will support future businesses and help innovative European SMEs to grow into world-leading companies. It has three main

[49] European Commission. (2014). *HORIZON 2020 in brief - The EU Framework Programme for Research & Innovation*. Brussels.

[50] European Commission. *Excellence Science*. *https://ec.europa.eu/programmes/horizon2020/en/h2020-section/excellent-science*. (consulted on February 2019).

objectives: *Leadership in enabling and industrial technologies, Access to risk finance and innovation in SMEs.*[51]

The Social Challenges objective fully supports the development targets outlined by Europe 2020, and its programme is reflected in goals such as *1) Health, Demographic Change and Wellbeing, 2) Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bio-economy, 3) Secure, Clean and Efficient Energy, 4) Smart, Green and Integrated Transport, 5) Climate Action, Environment, Resource Efficiency and Raw Materials, 6) Europe in a changing world - Inclusive, innovative and reflective societies, 7) Secure societies – Protecting freedom and security of Europe and its citizens.*[52]

The Horizon 2020 objectives to meet social challenges address the importance of innovation and research to achieve sustainability in the agri-food sector. The EU has allocated almost €4 billion to social challenge 2 *Food security, sustainable agriculture and forestry, marine and maritime research, and inland waterway research, and the bio-economy* of which around €1.8 billion are for agriculture, forestry and rural development. In addition to social challenge 2, several parts of Horizon 2020 cover agriculture, forestry and the agri-food chain.[53]

For the period 2014 – 2016, there were 3443 signed grants related to social challenges (25% of the total), and of the total EU financial contribution allocated through Horizon 2020, 65% was sustainability-related, and 28% was climate-related.[54]

According to the 2016 European Commission paper, *A strategic approach to EU agricultural research and innovation*[55], there are five priority areas for research and innovation in agri-food sector, clustered under two thematic headings. The first one

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[51] European Commission. *Industrial Leadership. https://ec.europa.eu/programmes/horizon2020/en/h2020-section/industrial-leadership.* (consulted on February 2019).

[52] European Commission. *Social Challenges. https://ec.europa.eu/programmes/horizon2020/en/h2020-section/societal-challenges*. (consulted on February 2019).

[53] European Commission. (2016). *Agricultural research and innovation.* Brussels.

[54] European Commission. (2018). *HORIZON 2020 in full swing - Three years on - Key facts and figures 2014-2016. Directorate-General for Research and Innovation Horizon 2020*. Brussels.

[55] European Commission. (2016). *A strategic approach to EU agricultural research and innovation*. Brussels.

regards the creation of value from land in sustainable primary production, and refers to resource management (notably soil, water, and biodiversity), healthier plants and animals and integrated ecological approaches from farms to the landscape. The second one focuses on enhancing agricultural innovation through the modernisation of rural territories and policies, in order to provide new openings for agricultural growth and to enhance the human and social capital in rural areas. As EU Regulation n. 1291/2013[56] asserted, research findings are crucial to the definition of targeted EU policies and serve in the development of legislation that corresponds to the needs of stakeholders. In fact, the findings of research and the development of innovation achieved through funding from the 2020 social challenge for the fields of food security, sustainable agriculture and forestry, as well as those of marine and maritime issues, inland waterways and the bio-economy, support the implementation of a range of EU policies, including the CAP, to foster international development, safeguard human health, protect and improve the environment, deal with climate change, and wisely manage waste. The advances in agricultural research and the development of innovation achieved under the aegis of the Horizon 2020 programme, serve to support the main objectives of the CAP in these fields. This programme will also support the implementation of the SDGs adopted in the EU's internal and external policies; most of the agricultural action plan is in particular under Goals 2, 12, 13 and 15, and the Horizon 2020 programme will be contributing to innovation in the agricultural sector.[57]

The next innovation and research programme to achieve EU objectives will be Horizon Europe 2021 – 2027.[58] Supported through a budget of about € 100 billion, it will continue to fund the previous projects (European Research Council, the Marie Skłodowska-Curie

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[56] Reg. n. 1291/2013 *of the European Parliament and the Council. Establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decision n. 1982/2006/EC.* Brussels.

[57] European Commission. *Climate action and sustainable development. http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/climate-sustainable-development_en.htm.* (consulted on February 2019).

[58] European Union. *Horizon Europe - the next research and innovation framework programme. https://ec.europa.eu/info/designing-next-research-and-innovation-framework-programme/what-shapes-next-framework-programme_en*. (Consulted on April 2019).

and the Joint Research Center) and will add a new level of ambition to boost the scientific, economic and societal impact of EU funding.[59]

1.4.3. OTHER FUNDING

In the EU funding strategy, other resources can be used to support stakeholders of the agri-food sector to stimulate sustainable actions.

The Competitiveness of Enterprises and Small and Medium-Sized Enterprises (COSME) programme provides economic support to these EU enterprises to facilitate their access to financing and markets and to improve framework conditions for their competitiveness and sustainability. It contributes to achieving the Europe 2020 priorities of smart, sustainable and integrated growth and, together with Horizon 2020, carries on the current activities of the Competitiveness and Innovation Programme (CIP).[60]

The LIFE+ programme, launched in 1992, continues to provide funding for environmental and nature conservation projects, and to improve EU environmental and climate policy and legislation.[61]

There are several funds in the European strategic plan designed for human capital and sustainability, focusing on job opportunities and the university-business relationship. For example, the ERASMUS programme encourages relations between the academic world and the business world in order to increase knowledge and professionalism. Furthermore, it contributes to the Europe 2020 strategy for growth, jobs, social equity and inclusion, as well as the aims of ET2020, the EU's strategic framework for education and training, promoting sustainable development of its partners in higher education.[62] The Erasmus programme also serves young entrepreneurs through Erasmus for Young Entrepreneurs

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[59] European Commission. (2018). *EU funding for Research and Innovation 2021-2027*.

[60] European Commission. *COSME*. *http://ec.europa.eu/enterprise/initiatives/cosme/*. (consulted on April 2019).

[61] European Commission. LIFE. *http://ec.europa.eu/environment/life/funding/life2014/index.htm.* (consulted on April 2019).

[62] European Commission. *Erasmus +*. *https://ec.europa.eu/programmes/erasmus-plus/about_en.* (consulted on April 2019).

(EYE), and provides young farmers with the opportunity to work for six months in a foreign EU company, to learn new skills and create new connections.[63]

1.5. THE EU AND THE AGRI-FOOD SECTOR: ACTIVITIES TO FOSTER SUSTAINABLE PRACTICES

Farmers, foresters, food and bio-based industries need new knowledge and innovations to face future challenges in the agri-food sector. Several EU initiatives aim to foster the development of sustainable practices. In the next sections we will describe partnerships, platforms and initiatives supported by EU institutions.

1.5.1. EUROPEAN INNOVATION PARTNERSHIP FOR AGRICULTURAL PRODUCTIVITY AND SUSTAINABILITY (EIP-AGRI)

The EIP AGRI was launched in 2012 to support the European Union's Europe 2020 strategy for smart, sustainable and inclusive growth, because "*promoting knowledge transfer and innovation in agriculture, forestry and rural areas*" is the priority of the EU 2014-2020 rural development policy.

Its objective is to support the agricultural and forestry sectors in production, market understanding, and dealing with climate change, as well as to foster research and innovation. It aims to be a meeting point for people with different professional backgrounds, through operational groups and discussion groups. Thus, different players of innovation and agriculture such as farmers, consultants, researchers, farmers, NGOs and other stakeholders will work together, sharing their ideas and turning their knowledge into innovative and practical solutions that can then be implemented.[64]

There are different types of funding sources that can facilitate the launch of an innovation project in sustainable agriculture; the EIP-AGRI helps to make it possible to integrate different sources of funding so that they contribute synergistically to the same objective in order to support implementation of innovative ideas.[65]

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[63] EYE. *https://www.erasmus-entrepreneurs.eu/index.php#.U8a4Ddr8Ifl.* (consulted on April 2019).

[64] Eip Agri. (2015). *EIP-AGRI Brochure EIP-AGRI Network*. Brussels.

[65] Eip Agri. (2015). *Eip-Agri Brochure on EU funding opportunities related to innovation in agriculture, food and forestry.*

1.5.2. EUROPEAN TECHNOLOGY PLATFORMS (ETP 2020)

The ETP 2020 unite public and private stakeholders operating on a European scale in a specific area of technological innovation, to provide the external advice and societal engagement needed to implement Horizon 2020. These entities cooperate to map technological priorities and guidelines for the development of innovation and competitiveness in Europe in all industrial sectors of strategic importance.[66]

One of the actions proposed in this programme is ETP Food for Life. Launched in 2005, it aims to foster effective integration of research on food, nutrition, food and consumer sciences and food chain management.[67] Its 2014 Strategic Research and Innovation Agenda (SRIA) 2013-2020 and beyond[68] for the food and beverage industry established the priorities of providing strategic solutions for safe food and healthy diets for all, encouraging informed consumer choice, and creating a sustainable and competitive agri-food industry through innovation in food processing, so that the European food sector could become more successful in an increasingly globalized and competitive market. [69]

In 2018, the SRIA published an Implementation Action Plan (IAP)[70] for developing the agri-food sector and facilitating the transition from a conventional mass production model to a more personalised one marked by flexibility and resource efficiency in its strategy for consumers.

The IAP takes up the leading research and innovation objectives described in the SRIA and focuses on how research, innovation, training and education, communication and dissemination can provide solutions to the challenges that the food and drink sector are facing. Essential to these goals is cooperation between the different public and private

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[66] European Commission. (2013). *Commission staff working document. Strategy for European Technology Platforms: ETP 2020.*

[67] Food for Life. *http://etp.fooddrinkeurope.eu/about-us/about.html*. (consulted on April 2019).

[68] European Technology Platform - Food for Life. (2014). *Strategic Research and Innovation Agenda (2013-2020 and Beyond).*

[69] Stančová, K. C., & Cavicchi, A. (2019). *EU Policies and Instruments to Support the Agri-food Sector. In Smart Specialisation and the Agri-food System (pp. 25-42).* Palgrave Pivot, Cham.

[70] Food for Life. (2018). *Implementation Action Plan 2018.*

actors in each European area, from different sectors of activity, with a real focus on the consumer.[71]

1.5.3. THE EUROPEAN INSTITUTE OF INNOVATION AND TECHNOLOGY (EIT)

Established in 2008, the EIT is an independent body of the European Union and is supported by Horizon 2020 programme. Through the collaboration between higher education institutions, research labs and companies to form dynamic cross-border partners, it seeks to increase entrepreneurship and innovation in Europe.[72] The goal is to establish dynamic international partnerships, known as the Knowledge and Innovation Community (KIC), contributing to "*create Europe's competitiveness, sustainable economic growth and job creation, promoting and strengthening synergies and cooperation between enterprises, educational institutions and research organisations*"[73]. In 2016, this programme proposed policies for the development of the agri-food sector through the EIT Food consortium, formed of fifty partners from leading businesses, research centres and universities across thirteen countries, with the common objective of making the food system more efficient, safe and transparent, improving nutrition, and involving consumers in the process of change. It defined four initial action points important for the achievement of these objectives: boosting consumer confidence, promoting a healthier diet, creating a digital network of the food supply through relationships between consumers and industry, and increasing sustainability and innovation.[74]

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[71] Food for Life. *http://etp.fooddrinkeurope.eu/news-and-publications/news/8-implementation-action-plan-2018.html.* (consulted on April 2019).

[72] EIT - European institute of innovation and technology. *https://eit.europa.eu/eit-community/eit-food%20(accessed%20on%20February%202017)*. (consulted on April 2019).

[73] Eit. (2017). *Making innovation happen*!. European Union.

[74] Eit Food. *https://eit.europa.eu/eit-community/eit-food*. (consulted on April 2019).

1.5.4. PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA (PRIMA)

The PRIMA programme was created by the 2017 Treaty on the Functioning of the EU (Article 185), an initiative under Horizon 2020, and was the culmination of an effort begun in 2014 when Croatia, Cyprus, France, Greece, Italy, Malta, Portugal, Slovenia and Spain put forth a proposal to involve the EU in a joint research and innovation programme to develop innovative solutions to support food systems and water resources in the Mediterranean basin.

Now 19 countries are part of this project, as it has also welcomed Germany, Luxembourg, Algeria, Egypt, Morocco, Tunisia, Turkey, Israel, Jordan, and Lebanon (European Commission data).

Its purpose is to "*develop research and innovation capacities and develop common knowledge and innovative solutions for agri-food systems, to make them sustainable and for the integrated supply and management of water in the Mediterranean area, to make such systems and such supply and management more climate-resilient, efficient, efficient, economically and socially sustainable and environmentally, and to contribute to solving upstream the problems of water scarcity, food security, nutrition, health, welfare and migration*". (PRIMA) Furthermore, it seeks to contribute to the UN Agenda 2030, supporting the achievement of Sustainable Development objectives. [75]

PRIMA builds on a common Strategic Research and Innovation Agenda (SRIA), based on its work plans and calls for proposals, which started in 2018. The PRIMA SRIA gathered input from numerous sources, analyses, workshops, and events involving experts and multiple stakeholders from all sectors of society, and on this basis defined its primary objectives to promote excellence, to support communities, consumers and businesses able to address challenges in the water and agri-food sector, and to build cooperation between researchers and innovators.[76] PRIMA will support these activities through a combination of funding from participating countries (currently €274 million) and an EU contribution through Horizon 2020 (€220 million).[77]

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[75] PRIMA. *http://prima-med.org/*. (consulted on October 2019).

[76] PRIMA. (2017). *Strategic Research and Innovation Agenda 2018/2028.*

[77] European Commission. Partnership for Research and Innovation in the Mediterranean Area (PRIMA). *https://ec.europa.eu/research/environment/index.cfm?pg=prima.* (consulted on October 2019).

1.6. CONCLUSIONS

This chapter explored the issue of sustainability and how European Union policies encourage and support companies through specific actions. Subsequently, with focus on the agri-food sector, it outlined the potential budgets and programmes available to push sustainability in terms of production, research and innovation and job creation.

According to researchers and international organisations, sustainability has become one of the fundamental elements of global politics; since the first publication on this theme in the Ecologist in 1972, which urged conscious use of the environmental heritage and natural resources, this principle has been included as a keyword in several conferences and subsequent international policies. The 1972 Brundtland Commission report defined the concept of *sustainable development* as "*a kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" and clarified the principles of *needs* and *limitations*. Since then, sustainability has become a significant element in international policies, pushing the emergence of specific treaties on the environment.

In the EU, sustainable development is one of the main features of Community programmes. In fact, the EU approved the 17 SDGs as the primary points of its policy, aligning itself with the UN's global objectives. In the agri-food sector, the EU has excellent potential for sustainable production and organic farming, and through specific funds invests in farmers and the development of rural areas. The main supports for disseminating sustainable practices are the CAP, (through the EAGF and the EAFRD) and Horizon 2020, which fund innovative research activities that promote sustainable growth and job creation. There are other supports for job creation and implementation of knowledge, as well: COSME provides economic support for SMEs, facilitating their access to finance and markets and improving framework conditions for the competitiveness and sustainability of EU enterprises.

The LIFE+ programme contributes to developing EU environmental and climate policy and legislation, supporting environmental and nature conservation projects. The objective of ERASMUS programmes is to implement knowledge and professionalism and encourage the relationship between business and higher education; through EYE, young entrepreneurs can learn new skills during an internship in a foreign country.

There are also specific projects to foster innovation and sustainability in the agri-food sector. The EIP AGRI facilitates the collaboration of various stakeholders to find the best solutions for the best ideas, combining the different funds available to support sustainable activities. The ETP connects cooperative bodies so they can bring their real-world experience to bear in mapping technological priorities and guidelines for the development of innovation and competitiveness in Europe in all industrial sectors of strategic importance. ETP Food for life was launched in 2005 specifically for the agri-food sector, to encourage research activities and foster the dissemination of information regarding food, nutrition, food and consumer sciences, and food chain management. Furthermore, the EIT consortium serves to increase entrepreneurship and innovation in Europe. In 2016 they created the EIT Food consortium specifically to address farming; partners are working to make the food system more efficient, safe and transparent in nutrition and to involve consumers in the process of change.

Finally, the PRIMA programme was founded by EU member states to develop and apply solutions for food systems and water resources in the Mediterranean area; it also contributes to the UN Agenda 2030, supporting the achievement of Sustainable SDGs. In PRIMA SRIA, which has collected contributions from numerous sources, analyses, workshops, and events, the first objectives to be implemented are to build cooperation between researchers and innovators, to promote excellence, and to support to communities, consumers and businesses able to address the challenges of the water and agri-food sector.

CHAPTER 2 - BUILDING PARTNERSHIPS BETWEEN WINERIES AND UNIVERSITIES TO FOSTER SUSTAINABILITY-ORIENTED INNOVATION DEVELOPMENT: A STUDY OF EUROPEAN SMEs LOCATED IN RURAL AREAS

2.1. INTRODUCTION

Europe is well known as a producer and exporter of wine, which for thousands of years been an integral part of European identity, culture and history. Considering that "*between 2013 and 2018, the average annual production was 167 million hectolitres. In 2018 it accounted for 43.3% of wine-growing areas, 56% of production, 63.4% of global consumption and 68.5% of exports in global terms*" (European Commission, 2019), one can understand the significance of this economic sector for sustainable development in the EU.[78]

Wine producers are mostly small and micro enterprises: according to CEEV (Comité Européen des Entreprises Vins, 2016) most European wineries are small producers in rural areas. Thus, they have to deal with problems related to difficulties of the terroir, isolation, limited access to learning opportunities and the small quantities of wine they produce, which only in part satisfy the market needs. Nonetheless, grape growing and wine production support rural development and provide jobs in various European regions.[79]

Sustainable development in this multifaceted reality can be sought through a coordinated system of relationships among different stakeholders of a specific area and their synergetic actions. Sustainability-oriented innovation (SOI) involves understanding and satisfying the needs and demands of different stakeholders (Carroll and Buchholtz, 2014)[80] and requires more collaborative and open system approaches (Chesbrough,

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[78] European Commission. (2019). *Agriculture and rural development – Wine. https://ec.europa.eu/agriculture/wine_en*. (consulted on October 2019).

[79] Comité Européen des Entreprises Vins. (2016). *European Wine: a solid pillar of the European Union economy*. Brussels.

[80] Carroll, A., Buchholtz, A. (2014). *Business and society: Ethics, sustainability, and stakeholder management.* Toronto: Nelson Education.

2010).[81] The company's approach could be reactive to stimuli from stakeholders or proactive through anticipating or pushing needs and expectations. (Cagliano, R. *et al*., 2016)[82]

Different actors in an area must work together to understand its strengths and weaknesses, identify opportunities for synergies, and develop strategies to find practical solutions for current and future challenges. Universities could be facilitators of dialogue and play a fundamental role in knowledge transfer (see Cavicchi, Rinaldi and Corsi, 2013).[83]

This chapter investigates the needs to be taken into account in the creation of a strong and productive relationship between universities and small wineries to foster sustainability-oriented innovation of rural areas.

The paper first outlines the theoretical framework related to the situation of European SMEs and SOI, underlining the importance of stakeholder engagement for its development. Next, it examines the wine sector, discussing the potential of the university-business relationship to foster the exchange of knowledge and sustainable and innovative practices. Finally, it describes research carried out under the aegis of The Wine Lab, a project funded by the EU. The research analysed the challenges of small and medium-sized wine companies in rural areas of Italy, Austria, Hungary, and Greece, explored their propensity to collaborate with stakeholders, in particular with universities and research institutes, and assessed the potential of these relationships.

2.2 EUROPEAN AGRI-FOOD SMEs AND SUSTAINABILITY-ORIENTED INNOVATION DEVELOPMENT

According to the European Commission definition, a SME is a business with fewer than 250 employees and a maximum turnover of €50 million. In Europe, there are 24,483,495

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[81] Chesbrough, H. (2010). *Business model innovation: opportunities and barriers,* Long Range Planning, 43(2/3), 354–363.

[82] Cagliano, R., Worley, C. G., Caniato, F. F. (2016). *The challenge of sustainable innovation in agri-food supply chains. In Organizing Supply Chain Processes for Sustainable Innovation in the Agri-Food Industry (pp. 1-30)*. Emerald Group Publishing Limited.

[83] Cavicchi, A., Rinaldi C., Corsi, M. (2013). *Higher Education Institutions as Managers of Wicked Problems: Place Branding and Rural Development in Marche Region, Italy*. International Food and Agribusiness Management Review, Volume 16, Special Issue A.

SMEs (+3.8% between 2008 and 2017), most of which work in manufacturing, construction, business services, accommodation and food, or are wholesale or retail trade companies. [84]

As pointed out in the Annual Report on European SMEs (2018), they significantly contribute to the economy, accounting for 47% of the overall increase in value added generated by the non-financial business sector from 2008 to 2017, and 52 % of employment growth.[85]

A group of researchers (Dey *et al*., 2018[86]; Zhu *et al*., 2008[87]) identified several obstacles that hinder SMEs from attaining sustainability: intense competition, liquidity problems, uncertainties and immaturity of business processes. In addition, SMEs suffer from skills shortages and high staff turnover.

Innovation is considered a key factor contributing to sustainability. Scholars, industry professionals and government representatives share the view that sustainable development is an urgent issue, requiring rapid action and significant change (Silvestre and Ţîrcă, 2019).[88]

According to the 2017 dossier by the European Commission Research Centre, Europe is far behind China, Russia, the US, Japan and South Korea in terms of innovation in the agriculture sector. Thus, EU political strategy aims to encourage member nations to invest in knowledge by implementing financial supports and specific policies to overcome this gap.[89]

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[84] European Commission. (2018). *2018 SBA Fact Sheet & Scoreboard.*

[85] European Commission. (2018). *Annual Report on European SMEs 2017/2018. The 10th anniversary of the Small Business* Act SME Performance Review 2017/2018.

[86] Dey, P. K., Petridis, N. E., Petridis, K., Malesios, C., Nixon, J. D., & Ghosh, S. K. (2018). *Environmental management and corporate social responsibility practices of small and medium-sized enterprises*. Journal of cleaner production, 195, 687-702.

[87] Zhu, Q., Sarkis, J. Lai, K.H. (2008). *Confirmation of a measurement model for green supply chain management practices implementation.* International journal of production economics, 111(2), pp. 261-273.

[88] Silvestre, B. S., Ţîrcă, D. M. (2019). *Innovations for sustainable development: Moving toward a sustainable future*. Journal of Cleaner Production, 208, 325-332.

[89] European commission research centre. *My region, My Europe, Our future: The seventh report on economic, social and territorial cohesion.*

To facilitate the sustainable development of SMEs, the EU has developed the Green Action Plan (GAP) to help them take advantage of the opportunities offered by the transition to a green economy. It provides a way for SMEs to turn environmental challenges into business opportunities by raising awareness of SME managers about improved resource efficiency and the potential of the circular economy for productivity, competitiveness and business opportunities and by informing them about EU resource efficiency actions under its programmes (COSME, Horizon 2020 and LIFE and the European Structural and Investment Funds).[90]

The *Green Action Plan for SMEs - Implementation Report* of 2018 outlined work on these actions. To foster development of green entrepreneurship, it has tried to remove obstacles to innovative solutions through technologies for resource efficiency and circular economy business models. Key actions for promoting an eco-innovative mindset and partnership are the establishment of incentive programs for research and development, building entrepreneurial skills and knowledge, and supporting networking and collaboration between member states.[91]

To foster this change, companies can pursue sustainability-oriented innovation (Hansen and Große-Dunker, 2013)[92], which entails the deliberate management of economic, social and ecological aspects so they are integrated into the design of new products, processes and organizational structures (Rennings *et al*., 2006).[93]

These solutions, applicable to large, medium-sized, and small enterprises, create more sustainable production methods, market structures and consumption patterns.

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[90] European Commission. *Business-friendly environment. Green Action Plan for SMEs. https://ec.europa.eu/growth/smes/business-friendly-environment/green-action-plan_en.* (consulted on October 2019).

[91] European Resource Efficiency Knowledge Centre – EREK. (2018). *Green Action Plan for SMEs – implementation report.Addressing resource efficiency challenges and opportunities in Europe for SMEs.* European Union.

[92] Hansen, E.G., Große-Dunker, F. (2013). *Sustainability-oriented innovation. In: Idowu, S.O., Capaldi, N., Zu, L., Das Gupta, A. (Eds.),* Encyclopaedia of Corporate Social Responsibility. Springer, Heidelberg, Germany; New York, pp. 2407e 2417.

[93] Rennings, K., Ziegler, A., Ankele, K., Hoffmann, E. (2006). *The influence of different characteristics of the EU environmental management and auditing scheme on technical environmental innovations and economic performance*. Ecological Economics, 57(1), 45-59.

According to the study by Klevitz and Hansen (2013), there will be different levels of innovation of SMEs in relation to their different levels of innovative capacity, understood in terms of skills, competences, and abilities.

To strengthen these skills, competences and abilities, SMEs can modify their innovation processes to include the action of external actors. In fact, collaboration is recognized as fundamental for accelerating sustainability processes: they ensure that companies understand their shortcomings, open the door to new resources and implement their knowledge and problem-solving skills.[94]

2.3 THE ROLE OF STAKEHOLDER ENGAGEMENT TO FOSTER SUSTAINABILITY-ORIENTED INNOVATIONS

In order to achieve effective sustainable development, there must be synergy between politics and society in the form of a guiding principle for the daily choices of citizens and the great political and economic decisions that must be made by leaders (European Commission).[95]

There are several studies of stakeholder engagement (Greenwood, 2007).[96] One in particular, outlined by Frooman (1999), defines this relationship as "*managing potential conflicts arising from divergent interests.*"[97] Stakeholder engagement research often concentrates on multi-stakeholder initiatives and platforms and processes, where stakeholders are distant from business activities (Mena and Palazzo, 2012 [98]; Selsky and Parker, 2005 [99]). According to the results shown in the study by Goodman *et al*. (2016), which analysed the activities of stakeholders in sustainability-oriented innovation

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[94] Klewitz, J., Hansen, E. G. (2014). *Sustainability-oriented innovation of SMEs: a systematic review.* Journal of cleaner production, 65, 57-75.

[95] European Commission. *Environment. Sustainable development. https://ec.europa.eu/environment/eussd/*. (consulted on October 2019)

[96] Greenwood M. (2007). *Stakeholder engagement: beyond the myth of corporate responsibility.* Journal of Business Ethics 74(4): 315–327.

[97] Frooman J. (1999). *Stakeholder influence strategies.* Academy of Management Review 24(2): 193.

[98] Mena, S., Palazzo, G. (2012). *Input and output legitimacy of multi-stakeholder initiatives.* Business Ethics Quarterly 22(3): 527–556

[99] Selsky, JW., Parker, B. (2005). *Cross-sector partnerships to address social issues: challenges to theory and practice.* Journal of Management 31(6).

processes in thirteen countries around the world, stakeholder involvement is crucial because they act as a stimulator, initiator, intermediary/mediator, concept perfectionist, legitimiser, educator, context enabler and impact extender. Stakeholders can be proactive and highly collaborative subjects.[100]

Innovation in sustainability can be understood as "*a process in which sustainability considerations (environmental, social and economic) are integrated into business systems, from idea generation to research and development (R&D) and marketing. This applies to products, services and technologies, as well as to new business and organisational models*." (Charter and Clark, 2007)[101]

Adams and colleagues (2016) mapped and categorized SOI activities according to established categories in the innovation management literature.[102]

Strategy	Organisations and management to foster sustainability.
Innovation process	Planning the innovation process to ensure sustainability, from new ideas to transformation into products and services.
Learning	Knowledge as a vehicle for assimilating, applying and supporting sustainability.
Linkages	Internal and external relations to contaminate and learn about sustainability.
Innovative Organisation	Organisational system that favours the SOI development environment (e.g. enabling structures, communications, training and development, leadership and, reward and recognition).

Table 2- SOI categories (Authors: Adams, R. et al. (2016) on elaboration).

[100] Goodman, J., Korsunova, A., Halme, M. (2017). *Our collaborative future: Activities and roles of stakeholders in sustainability-oriented innovation.* Business Strategy and the environment, 26(6), 731-753.

[101] Clark, T., Charter, M. (2007). *Sustainable innovation: Key conclusions from sustainable innovation conferences 2003–2006 organised by the centre for sustainable design.*

[102] Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., Overy, P. (2016). *Sustainability-oriented innovation: A systematic review.* International Journal of Management Reviews, 18(2), 180-205.

In an earlier study, Adams *et al.* (2012) indicated that sustainability and innovation develop at the same level. In fact, both deal with technological changes and involve evolutions in processes, practices and business models. The orientation towards sustainability incorporates social and environmental dimensions alongside economic ones and introduces new challenges. Businesses need to reconsider their skills, stakeholder relations, management, leadership and cultural knowledge.[103]

According to Chen (2008), companies that create interactive relationships with stakeholders regarding business management and green innovation have a stronger competitive advantage than those who do not.[104] Since innovation is multidimensional and far-reaching, it involves other stakeholders who are not part of business contacts, among them, knowledge institutions (such as universities), which promote the development of eco-efficient technologies (Noci and Verganti, 1999)[105]

2.4 POTENTIALITIES OF THE RELATIONSHIP UNIVERSITY-WINERIES

An extensive body of research has focused on innovation in the wine industry. There are many actors involved in the exchange of innovation and knowledge, including farmers, producers, educational institutions, federations of wine producers, industry associations and regulatory bodies (Dana and Winstone, 2008).[106]

Networks and clusters can foster the diffusion of innovation, as Giuliani and Bell demonstrated in their 2005 study of a Chilean wine cluster.[107] Some countries are more innovative than others, due to a set of conditions that include a stable set of relationships

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[103] Adams, R., Bessant, J., Jeanrenaud, S., Overy, P., Denyer, D. (2012). *Innovating for sustainability: a systematic review of the body of knowledge.*

[104] Chen, Y. (2008). *The driver of green innovation and green image - Green core competence.* Journal of Business Ethics 81 (3 2008a): 531-543.

[105] Noci, G., Verganti, R. (1999). *Managing 'green' product innovation in small firms.* R&D Management 29: 3-15.

[106] Dana, L.P. Winstone, K.E. (2008). *Wine cluster formation in New Zealand: Operation, evolution and impact.* International Journal of Food Science and Technology, 43: 2177-2190.

[107] Giuliani, E., Bell, M. (2005). *The micro-determinants of meso-level learning and innovation: evidence from a Chilean wine cluster.* Research policy, 34(1), 47-68.

among stakeholders (Aylward, 2003). [108] Ratten (2018) explored the role of eco-innovation in the competitiveness of the Barossa Valley wine region and observed that clusters foster the exchange of knowledge, support innovation and promote sustainability:[109] knowledge sharing in a network influences eco-innovation (Cainelli *et al.*, 2012).[110]

Smith (2007) contended that wineries do not innovate on their own but need to interact with other external partners.[111] According to an empirical study on the Hungarian wine industry (Dries *et al*., 2013), external stakeholders positively influence the innovative performance of these companies.[112]

In the case study reported by Alonso (2011), it was shown that collaborations among different wineries and organizations are important means for sharing ideas and experiences, as well as creating a social environment that fosters cooperation, social integration and trust. However, these benefits are not always understood, according to the author, and collaboration depends greatly on the maturity of the sector in the various wine-growing regions. [113] Involving wineries with stakeholders fosters innovation (Lorentzen, 2011)[114]

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[108] Aylward, D. K. (2003). *A documentary of innovation support among New World wine industries.* Journal of Wine Research, 14(1), 31-43.

[109] Ratten, V. (2018). *Eco-innovation and competitiveness in the Barossa Valley wine region.* Competitiveness Review, Vol. 28 No. 3, pp. 318-331.

[110] Cainelli, G., Mazzanti, M., Montresor, S. (2012). *Environmental innovations, local networks and internationalziation,* Industry and Innovation, 19(8): 697-734.

[111] Smith, K. (2007). *Technological and economic dynamics of the world wine industry: An introduction.* International Journal of Technology and Globalisation, 3(2-3), 127–137.

[112] Dries, L., Pascucci, S., Torok, A., Toth, J. (2013). *Open innovation: a case-study of the Hungarian wine sector.* EuroChoices, 12(1), 53–59.

[113] Alonso, D.A. (2011). *"Standing alone you can't wine anything": The importance of collaborative relationships for wineries producing muscadine wines.* Journal of Wine Research 22(1): 43–55.

[114] Lorentzen, J. (2011). *Knowledge, science and interactions in South Africa's wine industry. In Innovation and technological catch-up: The changing geography of wine production, ed. E. Giuliani, A. Morrison, and R. Rabellotti, 177–198.*Cheltenham, UK and Northampton, MA: Edward Elgar.

Some studies have indicated that a relationship between wine businesses, universities and research institutes can foster innovation (see Giuliani *et al.*, 2010).[115] As Dada and Fogg (2014) asserted, in a new approach, "engaged" universities, focused on knowledge transfer, are producers of knowledge for businesses. These phenomena create a growing acceptance of the economic value of knowledge as a source of discontinuous innovation and competitive advantage.

Firms can create partnerships with universities to acquire knowledge. According to Wilson (2012), "*universities are the source of strength in the knowledge-based economy of the twenty-first century*". [116]

In this way, through collaboration with universities, companies can be continually updated about the latest innovation and research in their field, and expand networks with other stakeholders (Dada and Fogg, 2014). [117]

2.5. BACKGROUD CONTEXT: THE WINE LAB PROJECT

Hubs empower the development of innovation and provide answers for local needs. As the British Council declared (2016), a hub "*has become a ubiquitous idea connoting a dynamic bringing together of diverse talents, disciplines and skills to intensify innovation*".[118] The Wine Lab project aims to create a hub that fosters dialogue between research, business and regional communities based on clustering and networking, and that facilitates policy debates through dialogue between regional centers and policy makers. In addition, it seeks to develop structured university-business cooperation in the field of wine, to pursue the co-creation of knowledge and innovation, and to increase lifelong learning opportunities. The project is funded within the Erasmus+ framework, through the funding program entitled *Cooperation for innovation and the exchange of good practices. Alliances - Partnerships between the world of work and education and training*

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[115] Giuliani, E., Morrison, A., Pietrobelli, C., Rabellotti, R. (2010). *Who are the researchers that are collaborating with industry? An analysis of the wine sectors in Chile, South Africa and Italy.* Research Policy, 39(6), 748-761.

[116] Wilson, T. (2012). *A review of business–university collaboration.*

[117] Dada, O., Fogg, H. (2014). *Organizational learning, entrepreneurial orientation, and the role of university engagement in SMEs.* International Small Business Journal 2016, Vol. 34(1) 86 –104.

[118] British council. (2016). *Creative Hubs: Understanding the New Economy.*

institutions. Twelve entities from Italy, Austria, Cyprus, Greece and Hungary form the hub, among them the University of Macerata in the Marche Region of Italy, research centres in the wine sector, wineries in disadvantaged areas, and business partners specializing in communication, entrepreneurship, evaluation and ICT solutions.[119]

Four major action areas promote the Wine Lab's objectives: learning and training, mobility and placement, wine hubs, and wine living labs. Learning and training materials are shared as open source educational materials and can be adapted to university curricula. Students can profit from mobility and placement opportunities in internships and traineeships to develop intrapreneurial and entrepreneurial mindsets. Wine hubs are learning communities/networks/active interest groups made up of stakeholders from the wine sector, such as producers, researchers, policy makers, tourism organizations, and cultural heritage organizations. Six hubs will be created in Austria, Greece, Hungary, and Italy. Wine living labs will be events organized in some of these countries to share knowledge through experiential learning; events include Taste and Create workshops, Winethons and Wine Weeks.

2.6. METHODOLOGY

2.6.1. DIAGNOSIS OF PROBLEMS

Despite their potential, SMEs have limited resources and face several obstacles to achieving their sustainability goals (Farias *et al.*, 2019)[120]. Knowledge and sustainability planning enable SMEs to integrate sustainability practices into their decision-making process and this should include a good understanding of customer and stakeholder opinions in support of sustainability (Loucks, Martens and Cho 2010). [121]

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[119] The Wine Lab. *https://thewinelab.eu/.* (Consulted on October 2019).

[120] Farias, L. M. S., Santos, L. C., Gohr, C. F., de Oliveira, L. C., da Silva Amorim, M. H. (2019). *Criteria and practices for lean and green performance assessment: Systematic review and conceptual framework.* Journal of Cleaner Production.

[121] Loucks, E.S., Martens, M.L., Cho, C.H. (2010). *Engaging small- and medium sized businesses in sustainability.* Sustainability Accounting, Management and Policy Journal, 1(2), 178-200.

According to the perspective set out in the study by Flores (2018), in order to find a balance for a holistic approach to sustainability, it is crucial to establish a dialogue between current and future needs and the expectations of stakeholders.[122]

Innovation in processes, products and services is important to address the challenge of sustainability (Hoogendoorn *et al.,* 2015)[123]. Most of SMEs lack the resources to eco-innovate, and to do so need to consider collaboration with stakeholders and promotion of knowledge transfer.[124] Several authors (Hall and Wagner, 2012[125]; Schaltegger and Wagner, 2011[126]; Tantalo and Priem, 2016[127]) explored the role of stakeholders in sustainable innovation and acknowledged their role in improving a company's sustainable performance. There are studies that explore the role of stakeholders in accelerating the SOI process in the agri-food sector (Ramos-Sandoval *et al*. 2019[128]; Wielinga *et al*., 2017[129]; Nolet 2016.[130]), but there is limited research related to their involvement in the

[122] Flores, S. S. (2018). *What is sustainability in the wine world? A cross-country analysis of wine sustainability frameworks.* Journal of cleaner production, 172, 2301-2312.

[123] Hoogendoorn, B., Guerra, D., van der Zwan, P. (2015). *What drives environmental practices of SMEs?*. Small Business Economics, 44, 759-781.

[124] Sáez-Martínez, F. J., Triguero, Á., González-Moreno, Á. (2019). *A review of Open-innovation and Eco-innovation strategies in SMEs.* Research on Open-innovation Strategies and Eco-innovation in Agro-food Industries, 9.

[125] Hall, J., Wagner, M. (2012). *The challenges and opportunities of sustainable development for entrepreneurship and small business.* Journal of Small Business & Entrepreneurship, 25(4), 409-416.

[126] Schaltegger, S., Wagner, M. (2011). *Sustainable entrepreneurship and sustainability innovation: categories and interactions.* Business strategy and the environment, 20(4), 222-237.

[127] Tantalo, C., Priem, R. L. (2016). *Value creation through stakeholder synergy*. Strategic Management Journal, 37(2), 314-329.

[128] Ramos-Sandoval, R., Álvarez-Coque, J. M. G., Mas-Verdú, F. (2019). *Innovative capabilities of users of agricultural R&D services.* Regional Science Policy & Practice.

[129] Wielinga, E., Koutsouris, A., Knierim, A., Guichaoua, A. (2017). *Generating space for innovations in agriculture: the AgriSpin project.*

[130] Nolet, S. V. (2016). *Accelerating sustainability-oriented innovations in agribusiness: a set of proposed best practices for corporations, investors, and entrepreneurs.* Doctoral dissertation, Massachusetts Institute of Technology.

wine sector (Hassen and Tremblay, 2016;[131] Pucci *et al*., 2018;[132]). Although some studies have addressed the issue of the relationship between universities and wineries for the transfer of knowledge (Gil and Carrillo, 2016; [133] Stewart, 2009 [134]; Guthey and Whiteman, 2009[135]), there is a lack of literature related to collaboration between wineries with universities. According to Lee (2000), the benefits of the relationship between academia and industry can be useful in solving technical problems, analysing results and facilitating the implementation of innovation.[136]

2.6.2. RESEARCH OBJECTIVES AND METHOD

The aim of this research was to understand how collaboration between wineries in disadvantaged areas and universities could encourage sustainability and innovation.

The potential benefit of the relationship between universities and SMEs is undervalued; businesses are failing to reap the positive values from university knowledge (Cosh and Hughes, 2010).[137] From the academic point of view, background research shows how challenging it is to find an effective tool for educating entrepreneurs (Higgins and Elliot,

[131] Hassen, T. B., Tremblay, D. G. (2016). *Innovation et territoire dans le secteur du vin au Québec.* Revue dEconomie Regionale Urbaine, (2), 325-354.

[132] Pucci, T., Casprini, E., Galati, A., Zanni, L. (2018). *The virtuous cycle of stakeholder engagement in developing a sustainability culture: Salcheto winery.* Journal of Business Research.

[133] Gil, A. J., Carrillo, F. J. (2016). *Knowledge transfer and the learning process in Spanish wineries.* Knowledge Management Research & Practice, 14(1), 60-68.

[134] Stewart, C. (2009). *The science of wine: Washington State University scientists and the development of the Washington wine industry, 1937–1992.* Doctoral Thesis, Washington State University.

[135] Guthey, G. T., Whiteman, G. (2009). *Social and ecological transitions: Winemaking in California.* Emergence: Complexity and Organization, 11(3), 37.

[136] Lee YS. (2000). *The Sustainability of University-Industry Research Collaboration: An Empirical Assessment.* J Tech Trans 2000, 25(2):111–133.

[137] Cosh, A., Hughes, A. (2010). *Never mind the quality feel the width: University–industry links and government financial support for innovation in small high-technology businesses in the UK and the USA.* The Journal of Technology Transfer, 35(1), 66-91.

2011)[138]. Learning for entrepreneurs is a social construction and it requires interaction (Cook and Brown, 1999).[139]

As part of the Wine Lab project, initial analyses were carried out to understand practical aspects of this relationship, and to adapt the project according to the local realities of the partners in an effective and efficient way. A review of the literature was conducted to identify the learning and training needs of small wine producers, as well as the opportunities and threats of the sector, especially considering the international context and negative effects on small producers. Starting from the information available, the work moved on to the empirical phase, which involved not only companies but also policy makers, experts in the field and students.

The analysis of wineries first identified the problems of the sector from their point of view, and also investigated whether the gap that the project wants to solve actually corresponded to the problems encountered by the players in the sector. Subsequently, we explored possible forms of cooperation with other stakeholders, with a focus on the university. Clearly, for the purposes of the project, it was important to understand whether the actors were willing to prepare for other collaborations beyond the business context. Finally, the study focused on the expectations of employers in the wine sector, in particular the mismatches between the skills employers need in new hires, and the abilities possessed by new graduates. We sought to ascertain whether the company believed that cooperation between university and enterprise could improve the performance of newly hired graduates, and if so, what kind of joint activities were deemed important for this purpose.

Thus, the Wine Lab research addressed the following questions: 1) how can the university contribute to the development of professional skills that satisfy business needs? 2) what skills have students already acquired through their studies? 3) what other skills to do they need to learn? (The Wine Lab Research Handbook)

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[138] Higgins, D., Elliot, C. (2011). *Learning to make sense: what works in entrepreneurial education?* Journal of European Industrial Training, Vol. 35(4), 345-367.

[139] Cook, S. D., Brown, J. S. (1999). *Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing.* Organization science, 10(4), 381-400.

For the purpose of this chapter, only the point of view of the wineries was analysed, and the first two parts of the interview were selected, as they were considered effective for the analysis of the problem.

First, the difficulties faced every day by wineries in disadvantaged areas were explored by conducting semi-structured interviews with representatives of 64 wineries in such areas in Italy, Austria, Hungary, and Greece, between August 2017 and January 2018.

Second, during the interviews, the representatives were asked whether they would be willing to collaborate with stakeholders such as universities, and what potential they might see in such a relationship.

The semi-structured interview method was selected to allow the respondents to express their views as fully as possible. Flexibility in the design and refinement of interview guides and in the actual conduct of interviews is probably the most important key to success (Yin, 1994).[140] According to Horton *et al.* (2004), this type of interview makes it possible to assess the veracity of the answer and to explore the opinion further, to understand the importance of the elements and their content.[141] It was considered effective for the research of Bregoli *et al*. (2016), who sought to analyse how wine tourism operators understand the concept of wine in order to determine how the definition can impact the extent to which stakeholders collaborate with each other and share knowledge.[142] Also in the study conducted by Wongprawmas and Spadoni (2018), this technique, in combination with focus groups, was effective for exploring stakeholders' perceptions about innovation, including perceived usefulness of innovation in the Italian wine chain.[143]

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[140] Yin, R.K. (1994), *Case Study Research: Design and Methods*, 2nd ed., Sage Publications, Thousand Oaks, CA.

[141] Horton, J., Macve, R., Struyven, G. (2004). *Qualitative research: experiences in using semi-structured interviews. In The real life guide to accounting research (*pp. 339-357). Elsevier.

[142] Bregoli, I., Hingley, M., Del Chiappa, G., Sodano, V. (2016). *Challenges in Italian wine routes: managing stakeholder networks.* Qualitative Market Research: An International Journal, 19(2), 204-224.

[143] Wongprawmas, R., Spadoni, R. (2018). *Is innovation needed in the Old World wine market? The perception of Italian stakeholders.* British Food Journal, 120(6), 1315-1329.

The main objectives of this research were:

- To identify the needs of wineries located in disadvantaged areas;
- To define possible forms of cooperation between universities and wineries to foster innovation and sustainability.

For data analysis, the Grounded Theory Method (see Glaser and Strauss, 1967) was employed to help identify specific classifications based on the answers to each question.[144]

Once the data from the interviews was collected, the open coding phase began. This process consists in labelling texts by means of line-by-line coding, or in other words, giving a name to each sentence or period of text that has a specific meaning. This phase was followed by the focus coding phase (p.57) in which larger parts of the text were summarised in macro areas.

In this way, categories were created, and they helped to contextualise the problem (Charmaz, 2006).[145]

2.6.3. RESULTS

The answers to the first question *"What are the difficulties faced by small wineries in disadvantaged areas, particularly concerning the market?",* can be grouped into five categories.

The entrepreneurs indicated *bureaucracy* as the main issue, especially all the documents, certifications and inspections they must deal with. Some representatives of wineries said they struggled with the numerous, long, and tricky rules and procedures, in particular related to certifications, as the requirements are strict and the process expensive, especially for small businesses. They indicated the need to simplify all the procedures for doing projects and hiring seasonal labour. Some of those interviewed said there should be a specific kind of professional trained to deal with all the administrative issues. This outcome is in line with the results of the "Piatier" study conducted for the Commission of

[144] Glaser, B. G., Strauss, A. L. (1967). *The constant comparative method of qualitative analysis.* The discovery of grounded theory: Strategies for qualitative research, 101, 158.

[145] Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis.* Sage.

European Communities to identify the origin and impact of barriers to innovation, as the first two barriers they observed were related to general legislation, bureaucracy, norms and standards. (Hadjimanolis, 1999)[146]

Another problem is related to *lack of cooperation* between companies and stakeholders. Respondents said that the consortia do not create a real sense of cooperation between wineries, but rather are perceived only as political institutions. Moreover, there is no relationship among local businesses; stakeholders are not prepared to host tourists and consumers, so it is not possible to promote the products to the potential buyer. As previously observed, it is important to involve different actors in an area to understand its strengths and weaknesses, identify the opportunities to develop synergies, and define effective strategies for solving the challenges (see Cavicchi, Rinaldi and Corsi, 2013). In addition, as Sartori, Mottironi, Antonioli (2012) declared, to create a successful destination, branding is necessary to link the different actors of a certain area and reinforce the communication of a specific touristic message. This strategy can contribute to positive links among resources and products, like product export and sharing, and could increase the appeal to customers and tourists.[147]

Furthermore, the respondents expressed difficulties *in selling and promoting* wine in the national and international *marke*t: the main issues concerned the difficulty of keeping long-lasting relationships with clients, understanding what consumers want and proposing products to foreign customers in an organized way. As Francioni, Musso and Pagano (2012) affirmed, networking processes among companies is crucial for boosting and managing new markets, especially when SMEs are involved. In the internationalization process, small companies have to deal with barriers like lack of financial resources and dearth of knowledge about markets.[148]

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[146] Hadjimanolis, A. (1999). *Barriers to innovation for SMEs in a small less developed country (Cyprus).* Technovation, 19(9), 561-570.

[147] Sartori, A., Mottironi, C., Corigliano, M. A. (2012). *Tourist destination brand equity and internal stakeholders: An empirical research. J*ournal of vacation marketing, 18(4), 327-340.

[148] Musso, F., Pagano, A., Francioni, B. (2012*). Il ruolo dei consorzi nel settore agroalimentare per lo sviluppo dei mercati emergenti. In "Il sistema agroalimentare italiano di fronte alle sfide". Workshop del gruppo SIDEA" Marketing agroalimentare" (pp. 1-3).* Società Italiana di Economia Agraria (Sidea).

Then, the representatives of the wineries expressed difficulties with *sustainability* management. Infrastructures, adverse climate and soil conditions and problems related to internet connection are the everyday challenges of these wineries. In the words of one wine maker: "*Wineries, by definition, are located in the most difficult areas to reach. This objective reality, unfortunately, is worsened by poor quality roads and the lack of fast internet, and generates an "isolationist" attitude in farmers. The isolation of the land contributes to a kind of "absolutism of thought" and a weak ability to relate with others and to share and work in a team*". The local area is an essential part of the identity of a product (Ciasullo and Festa , 2012), but it can be a limiting factor when it lacks the required facilities for industrial activities.[149]

Furthermore, there is an issue related to social sustainability, a lack of trained and professional staff: companies stressed their difficulty finding employees able to work in cellars or in vineyards and who are willing to accept a short-term contract. It is necessary to invest in human resources, but the wineries lack the funding to do so.

Small wineries also have difficulty finding funds to implement *innovation.* They need more monetary support, through investments in the area and in the companies themselves. The sustainable development of a company can be an integral part of profitability when the winery strives to achieve an advantageous competitive position or when it brings about changes in the sector. To do this, it is necessary to link growth to the primary objectives of survival and profitability so that the executive team responsible for implementing the strategy can accurately assess whether growth generates a return over time that exceeds its costs.[150]

The following graphs show the frequency of the problems for each country.

[149] Ciasullo, M.V., Festa, G. (2012). *La reputazione del territorio nella comunicazione del vino, XXIV Sinergie Congress Proceedings*, Lecce, pp. 563-578

[150] Gilinsky Jr, A., Newton, S. K., Vega, R. F. (2016*). Sustainability in the global wine industry: Concepts and cases.* Agriculture and agricultural science procedia, 8, 37-49.

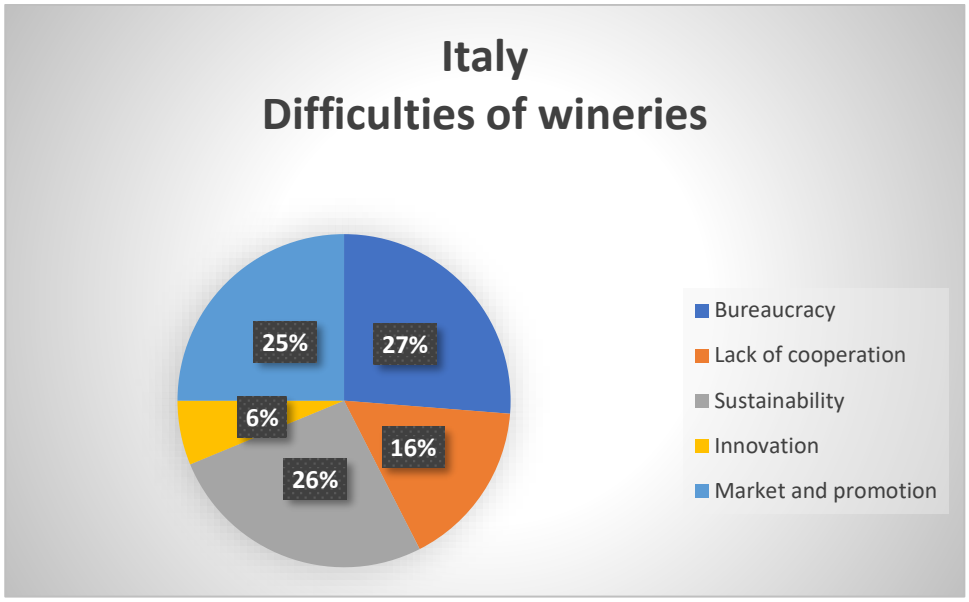

Figure 3 -Italy. Difficulties of wineries (source: data analysis).

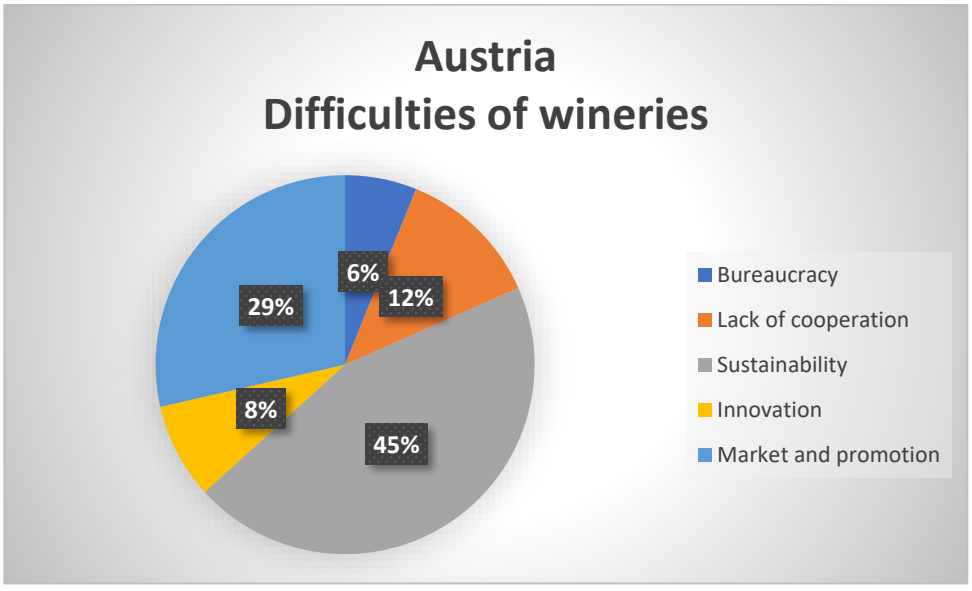

Figure 4- Austria. Difficulties of wineries (source: data analysis).

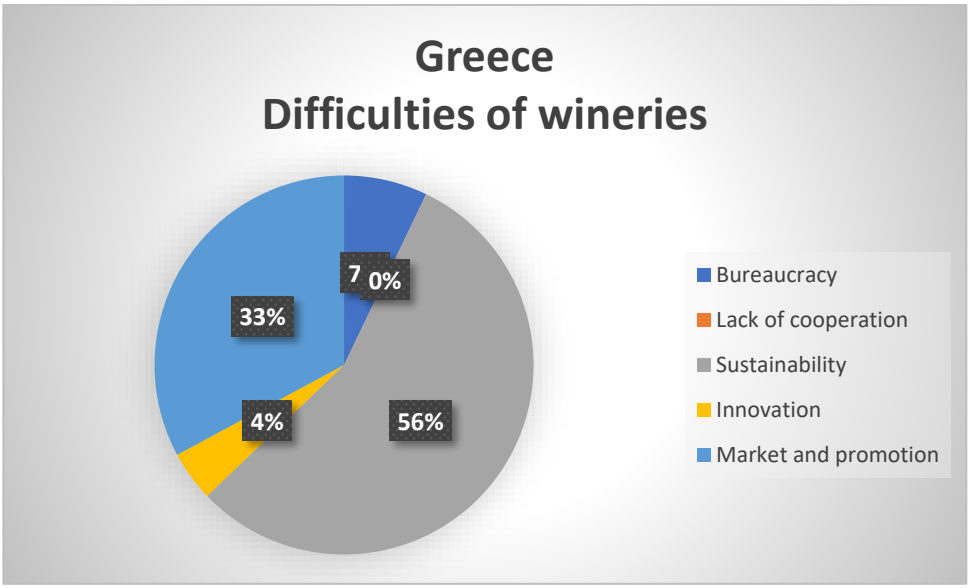

Figure 5-Greece. Difficulties of wineries (source: data analysis).

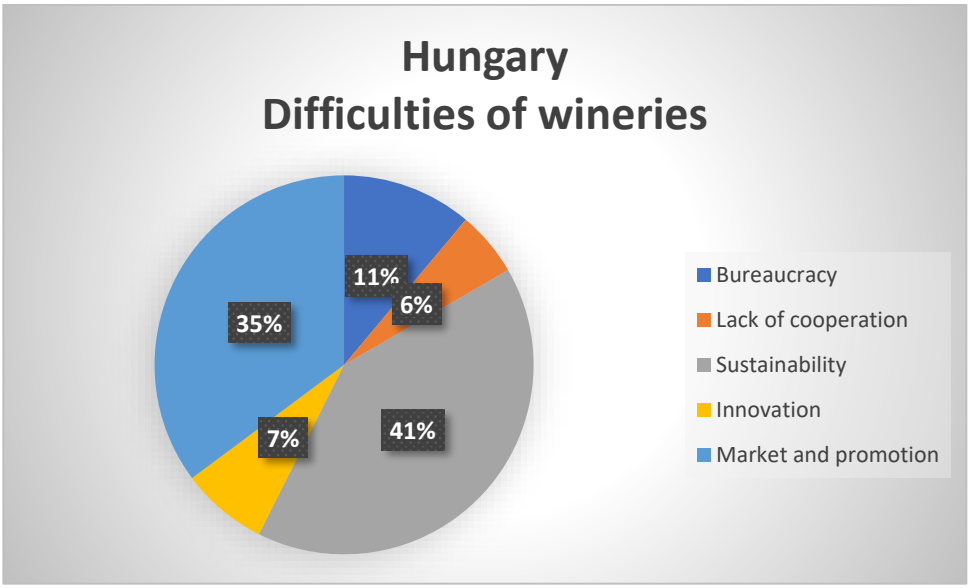

Figure 6- Hungary. Difficulties of wineries (source: data analysis).

Regarding possible forms of cooperation between universities and enterprises to foster innovation and sustainability, many of the respondents stressed the importance of cooperation and the positive potential for partnerships between universities, stakeholders

and wineries. Some of them have already had experience with high schools, universities and other stakeholders, and have seen the benefits of this collaboration: in their opinion, this situation helps to stimulate new ideas and innovation and to create new human resources. One of the winery representatives explained that they had a bad experience of working with a university but are willing to give this vision a "second chance". As mentioned above, cooperation between the different actors is also essential in terms of promoting a certain area. On the basis of this input from wineries, “committed” universities could train suitable graduates to meet the need for specialized staff, and engage in knowledge transfer (Dada and Fogg, 2014). When asked about the potential for cooperation with higher education institutions and research centers, the respondents' reaction was clearly positive. Internships, experiences of collaboration with local universities, and joint events are some of the activities that according to the respondents could facilitate the process of networking with knowledge institutions. They indicated their willingness to increase cooperation with universities and research centres, seeing student internships and traineeships as the most common form of cooperation, but also noting the value of technical research, for example, in product development. They put less emphasis on other potential supports, such as assistance for market access, or with specific problems.

Only a few companies failed to see the potential of collaboration. They had had negative experiences or did not believe that partnership could contribute to improving their situation.

The following graph depict the degree of potential for collaboration for each participating country, based on the interviews.

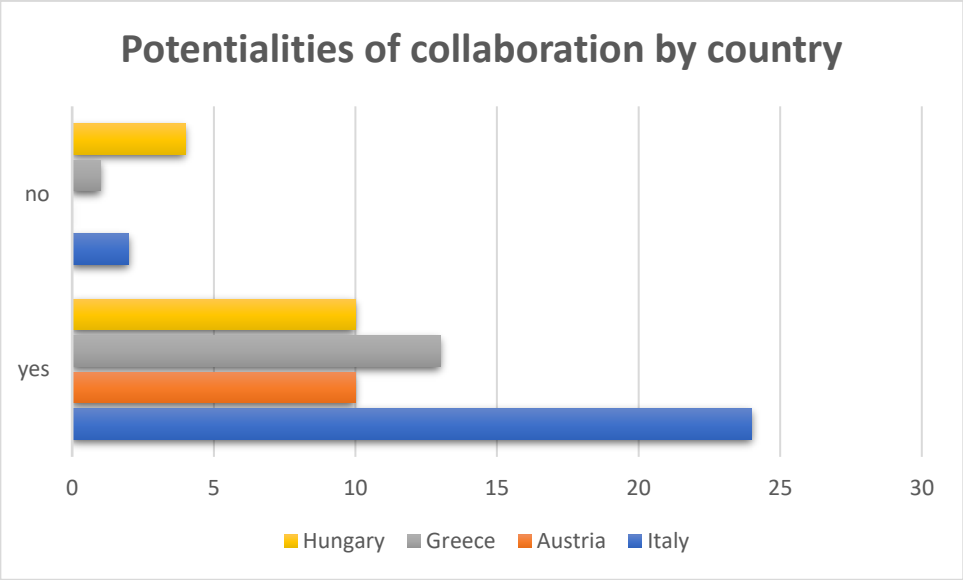

Figure 7- Potentialities of collaboration by country (source: data analysis).

2.7. CONCLUSIONS

The purpose of this research was to explore the potential for collaboration between universities and small wineries for the development of sustainability-oriented innovation. Small and medium-sized enterprises are a significant sector for the European economy, accounting for 52% of employment growth from 2008 to 2017 and 47% of the overall increase in value added generated by the non-financial business sector in this period. However, SMEs have difficulties in approaching sustainability in a chaotic environment of intense competition, liquidity problems, uncertainties and immaturity of business processes. In addition, SMEs suffer from skills shortages and high staff turnover. Innovation is seen as a key factor contributing to sustainability, and sustainable development is an urgent issue involving rapid action and significant change. Sustainability-oriented innovation could be a solution to the problem. In addition, several European programs for SMEs have innovation and sustainability as key elements (COSME, Horizon 2020, EIP). Stakeholder engagement is another aspect that would certainly help the development of sustainability-oriented innovation and is also included in European funding programs.

In this study, the relationship between universities and small and medium enterprises in the wine sector was analysed, highlighting how in this sector a relationship between enterprises and universities and research institutes can encourage the spread of innovation

(Giuliani *et al*., 2010). The university is seen as a generator of knowledge and accelerator of innovation and support for companies. These phenomena create a growing acceptance of the economic value of knowledge as a source of discontinuous innovation and competitive advantage.

In order to facilitate this exchange, The Wine Lab project was created; it aims to create the basis for a dialogue between research, business and regional communities based on clustering and networking. In addition, it aims to develop structured university-business cooperation in the field of wine and to pursue the co-creation of knowledge and innovation.

This project is the basis for the present research: in fact, in order to explore the potential for dialogue between universities and small and medium-sized wineries located in rural areas in Italy, Austria, Greece and Hungary, semi-structured interviews were conducted with representatives of wineries to understand the difficulties they face and ascertain whether they would be open to forming this relationship in order to promote innovation and sustainability in their wineries.

The most pressing difficulty for respondents was bureaucracy, followed by sustainable management (lack of staff and funds, the location of the winery, and the climate), marketing and promotion in the national and international markets, the dearth of interaction between companies and stakeholders in the area, and the need for innovation. According to the majority of respondents, collaboration between wineries and stakeholders would be important, providing excellent bases for creating relationships with universities and research institutes. We see the potential of this relationship, which can facilitate the exchange of knowledge and develop innovative and sustainable practices. Some of the respondents had already partnered with universities and developed projects with them to promote the area. They felt that students are the key elements for the creation of this network.

These results confirm the observations of Barth and Timm (2011) in their study of the role of students in the development of sustainability. In fact, in their role as research and teaching institutions, universities are recognized as fundamental to this process, as they

educate future policy makers to be more appreciative of sustainability and create new skills and knowledge that bring innovation to society.[151]

[151] Barth, M., Timm, J. (2011). *Higher education for sustainable development: Students' perspectives on an innovative approach to educational change.* Journal of Social Science, 7(1), 13-23.

CHAPTER 3 - HOW DO CERTIFICATIONS ON SUSTAINABILITY INFLUENCE CONSUMER CHOICE? AN EXPLORATORY RESEARCH WITH WINE EXPERTS

3.1 INTRODUCTION

The concept of sustainability has become very important in the agri-food sector in recent years, as demonstrated by Eurostat data (2019)[152]: in fact, in 2017 the total area dedicated to organic crops in the EU-28 was 12.6 million hectares, and is expected to grow in the coming years. Between 2012 and 2017, the total area fully converted or in the process of conversion to organic production increased by 25%.

This trend may have been in response to an increase in consumer interest in organic products. The amount European consumers spend on these products doubled between 2016 and 2017, rising to 47 euros per person, according to a report by Willer *et al*. (2019).[153] Buyers choose organic products because of their quality and value for good health, and their importance for the environment, according to Basha *et al*. (2015). The authors attributed this change in consumer behaviour to their growing awareness of environmental degradation and related problems.[154] Other reasons for buying organic products include social consciousness, but also the desire to have a unique lifestyle or to follow fashion trends (Rana and Paul, 2017).[155]

It is important to underline that certifications and labels give consumers a series of indications regarding not only the origin of the product but also the related production processes, which embrace environmental factors, ethical aspects, and safety, and are

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[152] Eurostat. (2019). *Organic farming statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php?oldid=420523#Total_organic_area*. (consulted on May 2019).

[153] Willer, H., Schaack, D., Lernoud, J. (2019). *Organic farming and market development in Europe and the European Union. In The World of Organic Agriculture. Statistics and Emerging Trends 2019 (pp. 217-254).* Research Institute of Organic Agriculture FiBL and IFOAM-Organics International.

[154] Basha, M. B., Mason, C., Shamsudin, M. F., Hussain, H. I., Salem, M. A. (2015). *Consumers attitude towards organic food.* Procedia Economics and Finance, 31, 444-452.

[155] Rana, J., Paul, J. (2017). *Consumer behaviour and purchase intention for organic food: A review and research agenda.* Journal of Retailing and Consumer Services, 38, 157-165.

associated with the concept of quality (Marino and Nobile, 2007).[156] Starting from this assumption, one can say that the label is the most powerful tool for producers to transmit information to the consumer (Banterle *et al*., 2013). [157]

There is strong attention to labelled organic wines, although consumer knowledge about these products is still growing (Troiano *et al*., 2016)[158], and studies investigating the positive perception of these wines from the sensory point of view are needed (Schaufele and Hamm, 2018).[159]

Given this gap, we investigated how organic certifications affect the hedonic perception of wine. The chapter is organized as follows: the first section briefly reviews the leading scientific contributions on sustainability in the wine sector and explores the importance of an eco-label in consumer choice. The second section presents the experimental part and outlines its methodology for data collection and analysis, while the third describes and discusses the main results.

3.2. SUSTAINABILITY IN THE WINE INDUSTRY

Sustainability is becoming an important aspect in the wine industry, as shown by the increasing attention paid by academia, institutions and associations (Santini, Cavicchi and Casini, 2013).[160] In fact, Wine Monitor Nomisma (2016) indicated that in the period 2004-2014, organic viticulture increased by +259% in Europe and +261% in the world, according to data released by FIBL. Europe represents 84% of the world's organic area, of which 7.8% is planted with organic vines. In the EU, Spain has the highest organic

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[156] Marino, D., Nobile, S. (2007*). Tra il dire e il fare. Atteggiamenti e comportamenti alimentari degli italiani attraverso l'indagine empirica. In "E. Battaglini (Ed.), Il gusto riflessivo. Verso una sociologia della produzione e del consumo alimentare, 219–267".* Rome: Bonanno Editore.

[157] Banterle, A., Cavaliere, A., Ricci, E.C. (2013). *Food labelled information: An empirical analysis of consumer preferences.* International Journal on Food System Dynamics, 3(2), 156-170.

[158] Troiano, S., Marangon, F., Tempesta, T., Vecchiato, D. (2016). *Organic vs local claims: substitutes or complements for wine consumers? A marketing analysis with a discrete choice experiment.* New Med. 15 (2), 14e21.

[159] Schaufele, I., Hamm, U. (2018). *Organic wine purchase behaviour in Germany: exploring the attitude-behaviour-gap with data from a household panel.* Food Qual. Prefer. 63, 1e11

[160] Santini, C., Cavicchi, A., Casini, L. (2013). *Sustainability in the wine industry: key questions and research trend.* Agricultural and Food Economic. 1(1), 9.

vineyard area (84,381 hectares), followed by Italy (72,361 hectares) and France (66,211 hectares).[161]

According to a factsheet on sustainable wine in Europe published by the UK Ministry of Foreign Affairs (2016), in Europe, sustainable wine is more associated with organic winemaking practices by consumers. This market is still considered as a niche, but it will have great potentialities to develop in the coming years.[162] Apart from environmental reasons (Berns *et al*., 2009)[163], there are several drivers that encourage wineries to become organic; one of them is to differentiate their product from those of competitors (Gilinsky *et al*., 2016, Castellini *et al*., 2014) by producing and advertising it as environmentally friendly.[164] Furthermore, the results of the study of Schäufele and Hamm (2017) suggested that producing and marketing wine with sustainability characteristics can be a promising strategy for quality differentiation, particularly for wines that are both local and organic. In addition, wineries will make a profit if they develop well-structured marketing, aimed at increasing consumer knowledge of sustainable wine production, thus creating preferences and influencing purchase behaviour.[165]

If we focus on the consumer perspective, different issues emerge in the concept of sustainability, which could mistakenly be misunderstood as merely a matter of organic or biodynamic production. In fact, there is no standard definition of sustainability in the wine industry (Szolnoki, 2013), and biodynamic or organic practices are confused with sustainable farming. Also, Forbes *et al*. (2009), underlined that consumers had confused ideas about sustainability.

Nonetheless, in a study by Szolnoki (2013), it emerged that winemakers agreed on the fact that consumers, even if they are confused about the concept of sustainability, could

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[161] Wine Monitor Nomisma. (2016). *Vinitalybio: in due anni sono raddoppiati in Italia i consumatori di vini bio.*

[162] CBI – UK Ministry of Foreign Affair. (2016). *CBI Product Factsheet: Sustainable wine in Europe.*

[163] Berns, M., Townend, A., Khayat, Z., Balagopal, B., Reeves, M., Hopkins, M.S., Krushwitz, N. (2009). *Sustainability and competitive advantage*. Sloan Management Review, 51(1), 19-26.

[164] Gilinsky Jr, A., Newton, S. K., Vega, R. F. (2016). *Sustainability in the global wine industry: Concepts and cases.* Agriculture and agricultural science procedia, 8, 37-49.

[165] Schäufele, I., Hamm, U. (2017). *Consumers' perceptions, preferences and willingness-to-pay for wine with sustainability characteristics: A review.* Journal of Cleaner production, 147, 379-394.

be positively influenced by sustainable products.[166] In their study of consumer understanding of sustainability of Italian wines, Borra *et al.* (2014) explored how consumers perceive the *greener* wine by asking them to define the concept of sustainable and organic wine. They found that Italian consumers do not seem to have real knowledge about organic or sustainable viticulture and winemaking, but even so, sustainable wine has great appeal.[167] Indeed, customers like to know that the wineries implement green and clean practices to protect the environment[168], and according to recent studies (Forbes *et al*., 2009, Pagliarini, Laureati and Gaeta, 2013), sustainable wines are perceived as quality products for which consumers are willing to pay more.[169]

Pomarici and Vecchio (2014) investigated the interest of Italian millennials in sustainable products and found that 53% were willing to buy sustainable food products and 75% to purchase sustainable wines.[170] As shown in the study by Wiedmann *et al*. (2014), consumers tend to prefer organic products over conventional ones; results of a blind test showed that adding information about the process by which the wine was produced led consumers to increase their interest in organic wine.[171] Similarly, Forbes *et al*. (2009), who investigated consumer attitudes to sustainable wine in the New Zealand marketplace, found that over 75% of respondents declared they would prefer to drink wines that had been produced using environmentally sustainable practices and 72% would purchase an

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[166] Szolnoki, G. (2013). *A cross-national comparison of sustainability in the wine industry*. Journal of Cleaner Production, 53, 243-251.

[167] Borra, D., Viberti, A., Massaglia, S., Dal Vecchio, A. (2014). *Sustainability of Italian wines: Knowledge, understanding, and interest of consumers. In BIO Web of Conferences (Vol. 3, p. 03003).* EDP Sciences.

[168] Castellini, A., Mauracher, C., Procidano, I., Sacchi, G. (2014). *Italian market of organic wine: a survey on production system characteristics and marketing strategies.* Wine Economics and Policy, 3(2), 71-80.

[169]Pagliarini, E., Laureati, M., Gaeta, D. (2013). *Sensory descriptors, hedonic perception and consumer's attitudes to Sangiovese red wine deriving from organically and conventionally grown grapes*. Frontiers in psychology, 4, 896.

[170] Pomarici, E., Vecchio, R. (2014). *Millennial generation attitudes to sustainable wine: An exploratory study on Italian consumers.* Journal of Cleaner Production, 66, 537–545.

[171] Wiedmann, K., P., Hennigs, N., Henrik Behrens, S., Klarmann, C. (2014). *Tasting green: an experimental design for investigating consumer perception of organic wine.* British Food Journal, 116(2), 197-211.

environmentally sustainable wine over one of similar price and quality which had been produced using conventional vinicultural practices.

Potential buyers also indicated the importance of labelling in their sustainable wine choices; in fact, almost 93% of them wished to see some form of labelling to inform them about wines that have been produced using environmentally sustainable practices. [172]

3.3. THE WORLD OF SUSTAINABLE CERTIFICATIONS

Certification is a guarantee for the buyer that winemaking is performed following specific guidelines different from those for conventional wines (Dans *et al*., 2019). Organic and sustainable producers seek certification to differentiate their product from those of their competitors, feeling that consumers will prefer wines that are the result of organic or ecologically friendly agriculture. Thus certifications are seen as a way to promote and empower a positive perception of the product. Research carried out by Sogari *et al*. (2015) demonstrated that consumers perceived sustainable certifications as a guarantee of high-quality wines. On the other hand, some argue that the value of labelling a wine as sustainable exists only if consumers believe that sustainable practices of viticulture truly contribute to the good of environment.[173]

Consumers are presented with a plethora of symbols and logos for organic and/or sustainable products, and not knowing their meaning, cannot compare the characteristics of the products.[174] In particular, consumers find it difficult to compare organic and non-organic wines on the basis of the symbols or logos (Ginon *et al*. 2014, Dans *et al.*, 2019)[175]. Indeed, as shown in *fig.8* comparing the most important certification logos, each symbol has a specific meaning, and the characteristics differ.

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[172] Forbes, S. L., Cohen, D. A., Cullen, R., Wratten, S. D., Fountain, J. (2009). *Consumer attitudes regarding environmentally sustainable wine: an exploratory study of the New Zealand marketplace.* Journal of Cleaner Production, 17(13), 1195-1199.

[173] Sogari, G., Corbo, C., Macconi, M., Menozzi, D., Mora, C. (2015). *Consumer attitude towards sustainable-labelled wine: An exploratory approach.* International Journal of Wine Business Research, 27(4), 312-328.

[174] D'Amico, M., Di Vita, G., Monaco, L. (2016). *Exploring Environmental Consciousness and Consumer Preferences for Organic Wines without Sulfites.* Journal of Cleaner Production 120: 64–71.

[175] Dans, E. P., González, P. A., Vázquez, A. M. (2019). *Taste and Knowledge: the Social Construction of Quality in the Organic Wine Market.* Human Ecology, 47(1), 135-143.

Country	Chile	Argentina	USA	Europe	Australia	NZ	SA
Maximum use of SO2 during vinification	Red: 75mg/l White: 100mg/L	Red: 70mg/L White: 80 mg/L *Until 100mg/L for wine to keep for ageing*	The use of SO2 is forbidden	Red: 100mg/L White: 150mg/L	Red: 100mg/L White: 100mg/L	Red: 100 mg/L White: 150mg/L	Red: 90mg/L White: 100mg/L
% of organic vineyard *(data from 2015-2016)*	3% of Chilean vineyard	2% of Argentinian vineyard	4.1% of American vineyard	8,5% of European vineyard	No data to show	7% of New Zealand vineyard	2% of South African vineyard
Local organic or sustainable label	No specific label for organic wine Sustainable label:						No specific label for organic wine Sustainable label:

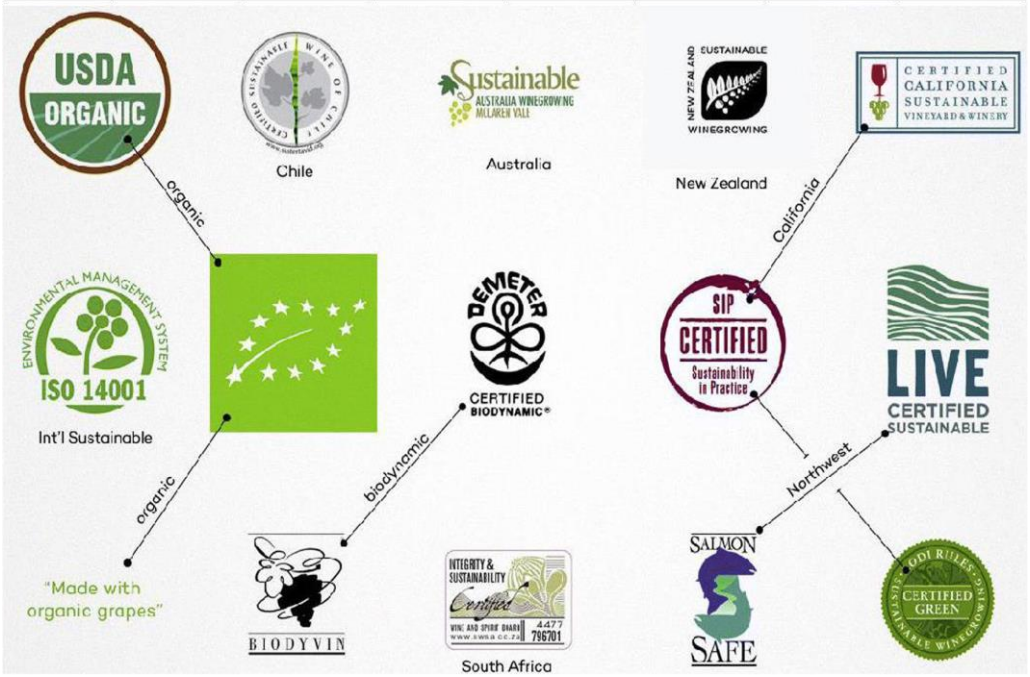

Figure 8- Most important sustainable logos and different restrictions. (Source: http://winefolly.com/tutorial/beyond-organic-certified-sustainable-wine/).

It is important to highlight that which each certification is different, they are also linked to each other. Thus, organic logos describe wine products made with organically grown grapes and no synthetic ingredients. *Biodynamic* logos indicate that the product is not only organic but also was made in conformity to the holistic approaches for environmental health advanced in Steiner's principles, applied to vineyards. Finally, *sustainabl*e logos indicate proper waste reduction practices in winemaking and ensure that all ingredients

and resources have been used in a conscious manner, in order to ensure availability for future generations (Mariani and Vastola, 2015).[176]

Differences are found in the area of application of certification when it comes to organic wines: in fact, the American label *USDA Organic* certifies that wines were produced with grapes from organic farming and that any additives are of organic origin. In addition, they contain no GMOs or sulphur.[177] There are only 26,837 companies in the US certified with this logo[178], because producers do not want to sacrifice the addition of sulphur, which serves to preserve the wine longer[179]. Europe has different parameters and standards for organic wines, which will be discussed in more detail in the next section.

Among the various organic indications, there is "*wine made with organic grapes*". Like *USDA Organic*, this logo means that there are only organic additives and no GMOs, but products with this logo can contain up to 100 ppm of sulphites.[180]

Certifications of *sustainable* wines indicate efficient water and energy use in the vineyard and cellar, and take into consideration the areas of production and their particular aspects.[181]

At the international level, the Environmental Management System (ISO 14001 / ISO 14004) serves to identify and reduce environmental waste through a series of regulations to guide companies in managing their business. The ISO continuously updates and revises the sustainability guidelines, and compliance is an excellent international reference for sustainability.[182]

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[176] Mariani, A., Vastola, A. (2015). *Sustainable winegrowing: Current perspectives.* Int. J. Wine Res, 7, 37-48.

[177] USDA. *https://www.usda.gov/topics/organic*. (Consulted on September 2019).

[178] USDA. (2019). *Count of United States Certified Organic Operations by State or Territory.* Organic Integrity Database.

[179] Winefolly. (2014). *The Bottom Line on Sulfites in Wine. https://winefolly.com/tutorial/sulfites-in-wine/.* (Consulted on September 2019).

[180] Organic Wine Club. (2017). *What are organic wines? A guide on organic wine its benefits. https://organicwineclub.co.uk/blogs/news/what-are-organic-wines-a-guide-on-organic-and-better-wines.* (Consulted on September 2019).

[181] Pomarici, E., Vecchio, R. (2019). *Will sustainability shape the future wine market.* Wine Economics and Policy, 8(1), 1-4.

[182] ISO. *https://www.iso.org/about-us.html.* (Consulted on September 2019).

In the U.S., California leads the field in sustainability certifications, with three important providers. First, the California Association of Winegrape Growers (CAWG) certification covers the areas of environmental soundness, economic viability and social equality, and entails self-evaluation of over a hundred criteria for water use, energy use, greenhouse gas emissions, and nitrogen use, to be assigned a score from 1–4. In order to obtain full CCSW certification, a third party is required to verify the assessments.[183] The CAWG, together with the Wine Institute, produced a practical self-assessment manual for winemakers in 2002.

Second, there is the Sustainability in Practice (SIP certified) logo indicates that producers meet the three Es of sustainability: *economic profitability, environmental management and social equity*, measured with a points system. The vineyard and winery must be 75% eligible for each point and must create a sustainability plan that includes documentation, reporting and examples of how that vineyard/vineyard complies with SIP certification. Wines must contain 85% SIP certified wine to be labelled SIP, and each year the winery is evaluated by a third party.[184]

Third, the Certified Green logo of The Lodi Rules Sustainable Winegrowing Program evaluates six macro areas -- business, human resources, ecosystem, soil, water and pest management -- through 101 measurable criteria. One of the unique features of Certified Green logo is a pesticide assessment system that evaluates a vineyard's pesticide use in terms of effects ranging from farmworker health to wildlife risks. Cellars and vineyards must also meet one of the three CCSW sustainability areas.[185]

In Oregon, Washington and Idaho, wineries wishing to certify that they meet sustainable standards turn to the LIVE Certificate (Low Input Viticulture and Oenology). Each year, their efforts to improve sustainability, including vineyard planning and planting, are evaluated, and their adherence to standards for fertilisation, crop biodiversity, irrigation and winemaking are assessed.[186]

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[183] California Sustainable Growing. *https://www.sustainablewinegrowing.org/.* (Consulted on September 2019).

[184] SIP Certified. *https://www.sipcertified.org.* (Consulted on September 2019).

[185] Lodi Rules Sustainable Winegrowing Program. *https://www.lodirules.org/.* (Consulted on September 2019).

[186] Live. *https://livecertified.org/standards.* (Consulted on September 2019).

For this same area, as well as for California and British Columbia, there is also the Salmon-Safe project, in which sustainable wine producers implement long-term soil conservation techniques such as the creation of natural vegetation pads between farmland and waterways on farms.[187]

Sustainability certification for New Zealand vineyards and wineries through the Sustainable Winegrowing New Zealand programme entails an audit every three years to evaluate factors such as crop biodiversity, soil, water and air standards, energy use, use of chemicals, vineyard and cellar waste, social impact and sustainable business practices. The programme also identifies other environmental certification schemes, including ISO 14001, organic and biodynamic wine production.[188]

In Chile, companies that want to be classified as sustainable must have an environmental management system, comply with current national legislation, regardless of the level of complexity of their operations, and demonstrate their conformity in the three areas of the production process, namely, the vineyard, processing and the company. Companies are classified as Green Areas if they meet sustainability criteria regarding the soil, Red Areas if their winery, bottling plant or other wine production facilities meet standards of sustainability, and Orange Area if the company, including land, offices and facilities, meet these standards. There is a conformity standard and a checklist of the requirements and scores for each area. The checklist items are reference items, not formal requirements of the certification process, and other means can be used to meet the requirements of the standard. Wineries and vineyards are reviewed every two years and receive scores for their compliance to standards: they must meet or exceed the reference standards for that year.[189]

Argentina has had a sustainability protocol since 2013, launched by the Bodegas de Argentina Institute and based on the results of a four-year study by Catena Wine. It follows the model of the Certified California Sustainable Vineyard and Winery (CCSW) system, modified to take into consideration Argentina's unique climate and growth conditions.[190]

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[187] Salmon Safe. *https://salmonsafe.org/.* (Consulted on September 2019).

[188] New Zealand Wine. *https://www.nzwine.com/en/sustainability/swnz/.* (Consulted on September 2019).

[189] Vinos de Chile. *http://www.sustentavid.org/en/.* (Consulted on September 2019).

[190] Bodegas de Argentina. *https://www.bodegasdeargentina.org/.* (Consulted on September 2019).

In South Africa, the Integrity Sustainability certification, established in 2010, indicates that producers respect the health and safety of their workers, combat pests with natural predators, reduce their use of chemicals, pesticides, and water, and employ appropriate wastewater treatment systems. Farms and wineries are inspected every three years and, if they meet the minimum requirements, can use this logo on their wines.[191]

Members of Sustainable Winegrowing Australia, which is managed by the Australian Wine Research Institute, can "choose to be independently certified by undergoing a triennial, third-party audit against the Australian Wine Industry Standards of Sustainable Practice (AWISSP) for viticulture and wineries. The AWISSP have been developed and updated over the past ten years by incorporating feedback from wine-grape growers and wineries, and in consultation with trainers, auditors and technical experts."[192]

The next two sub-sections will explore in detail the two certifications that will be the subject of the empirical part of this work.

3.3.1. EUROPEAN CERTIFICATION FOR ORGANIC WINE

Organic farming regulations cover all agricultural products, including aquaculture and yeast, and define their production and final processing stages. They exclude products from fishing and hunting wild animals but include the collection of wild plants when certain natural habitat conditions are met, while specific rules exist for wine and aquaculture.[193]

The primary legislation governing organic farming in the European Union was produced between 2008 and 2018. EU regulation 889/2008[194] provided rules governing organic

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[191] Sustainable Wine South Africa (SWSA). *https://www.wosa.co.za/swsa/en/Overview/.* (consulted on September 2019)

[192] The Australian Wine Research Institute (AWRI). *https://www.awri.com.au/industry_support/sustainable-winegrowing-australia/membership*/. (Consulted on September 2019).

[193] European Commission. (2015). *Organic production and products.* https://ec.europa.eu/info/food-farming-fisheries/farming/organic-farming/organic-production-and-products_en. (consulted on February 2019).

[194] Reg. n. 889/2008. *Laying down detailed rules for the implementation of Reg. n. 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control.* Brussels.

production, labelling and control; it was followed by EU regulation 2018/848[195], also on organic production and labelling of organic products. Regulations specifically concerning organic aquaculture animal and seaweed production were covered in EU Regulation 710/2009[196], while those on organic wine were established in EU Regulation 203/2012.[197] Every EU country appoints an authority responsible for ensuring compliance with EU rules on organic products; this is generally the responsibility of the Department of Agriculture or of Public Health. The Commission requires the member states to provide regular reports to ensure that the necessary controls are in place.

Once a year, EU countries report to the European Commission on the results of the controls carried out on organic operators and the measures taken in case of non-compliance.

Figure 9 - the EU Organic logo.

Farmers, processors or traders who want to apply for organic certification will have to undergo checks by the authorities, which will determine whether the raw materials, production processes and finished product comply with organic regulations. If the outcome is positive, they will receive a certificate confirming their compliance with EU requirements.[198] After the inspections, the EU confers the organic logo (*figure 9*) which will be placed on the label of the product together with a code number of the inspection body and the place of origin of the

[195] Reg. n. 848/2018 *of the European Parliament and of the Council on organic production and labelling of organic products and repealing Reg. n. 834/2007.* Brussels.

[196] Reg. n. 710/2009 *amending Reg. n. 889/2008 laying down detailed rules for the implementation Reg. n. 834/2007, as regards laying down detailed rules on organic aquaculture animal and seaweed production.* Brussels.

[197] Reg. n. 203/2012 *amending Reg. n.889/2008 laying down detailed rules for the implementation of Reg. n. 834/2007, as regards detailed rules on organic wine.* Brussels.

[198] European Commission. *Organic Farming at glance. https://ec.europa.eu/info/food-farming-fisheries/farming/organic-farming/organics-glance_en.* (consulted on February 2019).

agricultural raw materials in the product. The logo allows farmers to market their products in the EU area and allows consumers to recognise an organic product.[199]

3.3.2. BIODYNAMIC WINES: DEMETER CERTIFICATION

Biodynamic producers approach sustainability with a focus on maintaining soil health and sowing in harmony with lunar cycles. The pioneer of biodynamic agriculture was Rudolf Steiner, who in 1924 began to promote the biodynamic approach to agriculture; his phenomenological scientific paradigms were in contrast to the "reductionism" prevalent from the 1900s to the present day.

This method involves a system of cultivation at the most natural, conceiving the farm as a closed-loop agricultural body until it evolves into a real agricultural individuality with techniques and natural substances from inside. Biodynamic preparations, attention to the rhythms of nature and the relationships and processes among the living beings involved are the basis of this type of cultivation. The proposed agricultural model contrasts with specialised and single-crop agriculture and it views the concept of sustainability as a social and economic model for the development of healthy agriculture and food for human beings.[200]

Figure 10 – Demeter biodynamic logo

The Demeter Certification in biodynamic wine production can be obtained if producers meet rigorous standards, and must be renewed annually. The standards are articulated in a 2008 publication with procedural guidelines for producing biodynamic wine.[201] The first step is to demonstrate organic farming according to current regulations. In addition, principles of quality in sensory terms, digestibility and good taste must govern the stages for processing the grapes and products derived from them. Only indigenous yeast, pied

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[199] European Commission. *The organic logo. https://ec.europa.eu/info/food-farming-fisheries/farming/organic-farming.* (consulted on February 2019).

[200] National Geographic Italia. (2016). *L'agricoltura biodinamica funziona davvero?. http://www.nationalgeographic.it/food/2016/09/21/news/l_agricoltura_biodinamica_funziona_davvero_-3241474/.* (Consulted on September 2019)

[201] Castellini, A., Mauracher, C., Troiano, S. (2017). *An overview of the biodynamic wine sector.* International Journal of Wine Research, 9(1), 1-11.

de cuvee (Demeter or organic), Demeter or organic yeast or commercial yeast without GMOs, is allowed, while use of sulphur dioxide must be kept to a minimum. Finally, processes with high energy consumption or strong environmental impact, as well as chemical methods, must be avoided at all stages of production.[202]

3.4. THE IMPORTANCE OF ECO-LABELS IN CONSUMER CHOICE.

As mentioned previously, consumers are becoming more aware of the importance of environmentally friendly production, and are willing to pay for organic wines. However, how do they recognise that a wine has been produced using sustainable practices?

Wine labels are crucial to communicating all the characteristics of a wine (grape variety, region, country).[203] Müller *et al.* (2010) looked at how labels influence consumer choice. According to Goodman (2009), one of the most important factors that consumers consider when they choose a wine is the attractiveness of the label.[204] Labels with ecological logos are perceived as high quality and increase the willingness to pay for it, while conventional labels are mostly associated with inexpensive wines (Orth and Malkewits, 2008).[205]

While consumer wine choice is usually led by origin, grape variety and price, an organic label is viewed as an indicator of quality, and consumers seem to be willing to pay more for the product (Willer, Lernoud, Huber and Sahota, 2018).[206] This idea was supported by Zepeda and Deal (2009) in their investigation of consumer behaviour regarding the organic label and local food: they observed that consumers with greater knowledge about organic farming practices may be more likely to purchase organic food [207] As shown by Forbes *et al.* (2009), "*green*" wines are positively perceived by consumers, who are

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[202] Demeter International e.V. (2008). *Demeter International wine standards: version June 2008.*

[203] Mueller, S., Lockshin, L., Saltman, Y., Blanford, J. (2010). *Message on a bottle: The relative influence of wine back label information on wine choice*. Food Quality and Preference, 21(1), 22-32.

[204] Goodman, S. (2009). *An international comparison of retail consumer wine choice*. International Journal of Wine Business Research, 21(1), 41-49.

[205] Orth, U. R., Malkewitz, K. (2008). *Holistic package design and consumer brand impressions.* Journal of marketing, 72(3), 64-81.

[206] Willer, H., Lernoud, J., Huber, B., Sahota, A. (2018). *The world of organic agriculture. http//www.orgprints.org*. (consulted on November 2018).

[207] Zepeda, L., Deal, D. (2009). *Organic and local food consumer behaviour: Alphabet theory*. International Journal of Consumer Studies, 33(6), 697-705.

willing to pay more for a wine produced by using environmentally sustainable practices and which are labelled as such. [208]

In addition to a well-designed label with text stating that the product is organic, a clearly placed certification logo from one of the accredited certifying agents for organic or biodynamic viticulture can signal the quality of the wine.[209] In fact, as Ginon *et al*. (2014) asserted, the inclusion of logos and symbols informs consumers and encourages them to choose to buy the environmentally sustainable product.[210]

In a study examining the impact of labels with three indications (different integrated/sustainable, organic and biodynamic), Bazoche *et al.* (2015) found that when logos were shown, the biodynamic wine was chosen significantly more often than others.[211]

3.5. METHODOLOGY

3.5.1. PROBLEM DIAGNOSIS

Research related to consumer preferences and sensory analysis has indicated that extrinsic product cues, such as packaging and branding, influence how consumers evaluate food products (Deliza and MacFie, 1996).[212] Many studies have examined how consumer perception of a wine may be influenced by a label indicating it was produced in a

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[208] Forbes, S. L., Cohen, D. A., Cullen, R., Wratten, S. D., Fountain, J. (2009). *Consumer attitudes regarding environmentally sustainable wine: an exploratory study of the New Zealand marketplace*. Journal of cleaner production, 17(13), 1195-1199.

[209] Kwong, L. M. (2011). *Eco-labels as a signal of quality.* Journal of Wine Economics, 6(2), 179-192.

[210] Ginon, E., Ares, G., dos Santos Laboissière, L. H. E., Brouard, J., Issanchou, S., Deliza, R. (2014). *Logos indicating environmental sustainability in wine production: An exploratory study on how do Burgundy wine consumers perceive them.* Food research international, 62, 837-845.

[211] Bazoche, P., Issanchou, S., Brouard, J., Maratray, J., Ginon, E. (2015). *Evaluating consumers' sustainable choice of wine: A virtual shop experiment* (No. 202735). European Association of Agricultural Economists.

[212] Deliza, R., MacFie, H. J. H. (1996). The generation of sensory expectation by external cues and its effect on sensory perception and hedonic ratings: A review. Journal of Sensory Studies, 11(2), 103–128.

sustainable way (Sogari *et al*., 2015,[213] Delmas and Lessem, 2017[214], Sogari, Mora and Menozzi, 2016[215]). In this context, some have explored the relationship between a sustainable label and evaluation of the hedonic properties of the wine. Apaolaza *et al*. (2017)[216] studied the halo effect on the sensory and hedonic experience of wine, finding that the presence of certifications on the label significantly influences the sensory dimension of a wine. According to Gassler *et al*. (2019)[217], subjects who knew that a wine gave significantly more importance to the influence of taste perceptions in their willingness-to-pay for the wine. It also emerged that in the evaluation phase, organically labelled wines may be preferred to conventional wines. In the study carried out by Wiedmann *et al.* (2014)[218] it was shown that during the tasting session, after the blind phase, the explanation of the biological characteristics of the wine and the subsequent tasting influenced the opinion of respondents.

Italy is one of the largest producers of organic wine in Europe, with 83,000 hectares cultivated. It is also the nation with the highest percentage of organic vineyards out of total vineyards, at 11.9%, followed by Austria with 11.7% and Spain with 10.2%. Even so, little research on Italian organic wines is available in the literature.

Italian consumers are strong supporters of sustainable wines. According to a FederBio report (2018), in 2016, purchases of organic wine in Italy reached 11.5 million euros in large-scale distribution, up 51% compared to 2015. Among the varieties, red organic wine

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[213] Sogari, G., Corbo, C., Macconi, M., Menozzi, D., Mora, C. (2015). *Consumer attitude towards sustainable-labelled wine: an exploratory approach*. International Journal of Wine Business Research, 27(4), 312-328.

[214] Delmas, M. A., Lessem, N. (2017). *Eco-premium or eco-penalty? Eco-labels and quality in the organic wine market.* Business & Society, 56(2), 318-356.

[215] Sogari, G., Mora, C., Menozzi, D. (2016). *Sustainable wine labelling: a framework for definition and consumers' perception*. Agriculture and agricultural science procedia, 8, 58-64.

[216] Apaolaza, V., Hartmann, P., Echebarria, C., Barrutia, J. M. (2017). *Organic label's halo effect on sensory and hedonic experience of wine: A pilot study.* Journal of sensory studies, 32(1), e12243.

[217] Gassler, B., Fronzeck, C., Spiller, A. (2019). *Tasting organic: the influence of taste and quality perception on the willingness to pay for organic wine.* International Journal of Wine Business Research.

[218] Wiedmann, K. P., Hennigs, N., Henrik Behrens, S., Klarmann, C. (2014). *Tasting green: an experimental design for investigating consumer perception of organic wine.* British Food Journal, 116(2), 197-211.

is preferred by Italian consumers (57% of sales of organic wines were for red ones, + 42% compared to 2015), although there is also growth in the consumption of organic white wines (+93%) and sparkling wines (+59%). [219]

3.5.2. RESEARCH OBJECTIVES

The aim of this research was to discover how an organic label influences the hedonic evaluation of Italian wine, from the point of view of experts in the field. Eleven master's degree students of *Wine Export Management* of the University of Camerino (Italy) were recruited for study: all participants have medium to high awareness and high involvement in wine tasting.

According to the definition provided by the American Society of Testing Materials (ASTM, 2005; see Lesschaeve, 2007), a wine expert is a person with extensive experience in the field of wine, who performs perceptual assessments to measure the effects on the quality of varieties of raw materials, processes and storage. Experts in the wine sector are focused on quality assurance, the detection of defects and the development of new products.[220]

The choice of this target group was motivated by the fact that according the study conducted by Zucco *et al*. (2011) with four groups of wine drinkers (untrained, second and third level trainee sommeliers, and professional sommeliers) in a descriptive analysis of wine in a sensory analysis, professionals were found to be more capable in the semantic description of the product and more aware in the analysis of descriptors.[221] Thanks to their trained memory, professionals can identify analytical (segmentation) and holistic (categorisation of wine) aspects involved in the evaluation of wine quality (Tempere *et al*. 2019). [222] Standard consumers, according to research conducted by Pagliarini *et al.*

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[219] FederBio (2018). *Vinitaly 2018: il trionfo del vino biologico italiano.*

[220] Lesschaeve, I. (2007). *Sensory evaluation of wine and commercial realities: Review of current practices and perspectives.* American Journal of Enology and Viticulture, 58(2), 252-258.

[221] Zucco, G., Carassai, A., Baroni, M. R., Stevenson, R. J. (2011). *Labeling, identification, and recognition of wine-relevant odorants in expert sommeliers, intermediates, and untrained wine drinkers.* Perception 40, 598–607.

[222] Tempere, S., De Revel, G., Sicard, G. (2019). *Impact of learning and training on wine expertise: A review.* Current Opinion in Food Science.

(2013) on the hedonic evaluation of Sangiovese by professionals and consumers, are not able to discriminate between organic and conventional wines from a hedonistic point of view due to the lack of formal training in sensory evaluation.[223]

For this experimental phase, Montepulciano d'Abruzzo (wine from Abruzzo region made with Montepulciano grapes) was chosen because it is one of the top three best-selling denominations in Italy (UVI, 2018).[224] Moreover, according to data published in Nomisma's Wine Monitor (2017), the consumer of organic wine buys mainly in the large-scale retail channel (33%); this is also the case for Montepulciano d'Abruzzo, among the best-selling wines in this channel, in 2016, 15% of sales of organic wine were for Montepulciano d'Abruzzo).[225]

3.5.3. RESEARCH PROTOCOL

A focus group and three experimental sessions involving blind and informed tasting were used in this research to assess how the hedonic evaluation of wine changes depending on the presence of organic certification.

The combination of a focus group with tasting session enables better understanding of consumer perceptions. In fact, the study conducted by Pettigrew and Charters (2008)[226] demonstrated that tastings in a focus group have the potential to generate additional and insightful data that can increase our appreciation of the complexities involved in consumption experiences. They can reveal the uncertainty affecting how consumers evaluate product and explicate the multiple evaluation pathways that food and beverage consumers may use. Charters *et al.* (2011) adopted this methodology to investigate and compare the engagement of Generation Y consumers with champagne and sparkling wine

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[223] Pagliarini, E., Laureati, M., Gaeta, D. (2013*). Sensory descriptors, hedonic perception and consumer's attitudes to Sangiovese red wine deriving from organically and conventionally grown grapes.* Frontiers in psychology, 4, 896.

[224] Unione Italiana Vini. (2018). *Gdo Italia, mercato del vino stabile ma in evoluzione per tipologia e formato.*

[225] Wine Monitor Nomisma (edited by), Silvia Zucconi. (2017). *Numeri e tendenze vino bio. Gran Bretagna, Germania, Italia: numeri e tendenze del vino biologico sul mercato Europa.*

[226] Pettigrew, S., Charters, S. (2008). *Tasting as a projective technique*. Qualitative Market Research: An International Journal, 11(3), 331-343.

in Anglophone countries.[227] This technique was also used in the research conducted by Cavicchi *et al*. (2014) to understand how the negative role of prejudice affects market strategies, comparing American and Italian wines.[228]

Therefore, a focus group was organised in which members were asked their opinion of sustainable wines, their expectations of them, the advantages and disadvantages of sustainable wines, and their assessment of the market for these wines. This qualitative approach was a compromise between the strengths of participant observation and individual interviewing (Morgan, 1997)[229]. According to Stewart and Shamdasani (1990), focus groups allow "*the researcher to obtain deeper levels of meaning, make important connections and identify subtle nuances in expression and meaning*".[230]

After the focus group, participants were invited to take part in the experimental sessions (the expectation test) to evaluate their sensory and hedonic expectations of three Montepulciano d'Abruzzo wines, one conventional, one with an EU organic logo and one with a Demeter biodynamic logo, similar in terms of cost and vintage. Participants were asked to express their opinion of each wine by marking a 9-point hedonic scale in which 1=Dislike extremely and 9=Like extremely. This "liking scale" is the most widely used to measure acceptability of a specific product.[231]

The first session was a blind test, with sensory information only: the participants were only informed that the wines were produced in the Abruzzo Region, and were asked to taste and evaluate them using the 9-point scale. The second session was the non-sensory expected phase: the participants were allowed to look at the information available in wine

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[227] Charters, S., Velikova, N., Ritchie, C., Fountain, J., Thach, L., Dodd, T. H., Fish, N., Herbst, F., Terblanche, N. (2011). *Generation Y and sparkling wines: a cross-cultural perspective*. International Journal of Wine Business Research, 23(2), 161-175.

[228] Cavicchi, A., Santini, C., Bailetti, L. (2014). *Mind the "academician-practitioner" gap: an experience-based model in the food and beverage sector*. Qualitative Market Research: An International Journal, 17(4), 319-335.

[229] Morgan, D.L. (1997). *Focus Groups as Qualitative Research*. Sage Publications: Newbury Park, CA, USA.

[230] Stewart, D.W., Shamdasani, P.N. (1990). *Focus Groups: Theory and Practice*. Sage Publications: Newbury Park, CA, USA.

[231] Lim, J. (2011). *Hedonic scaling: A review of methods and theory.* Food quality and preference, 22(8), 733-747.

labels and were asked to articulate their expectations of the wine, without tasting them. The third session was a labelled test, combining non-sensory and sensory input: participants could read the wine labels and were asked to taste and evaluate the wines using the 9-point scale.

The rationale for these tests is described by several authors. Schifferstein (2001)[232] indicated that these tests make it possible to elicit sensory preferences and thus understand in-depth how organic information can influence consumers' sensory evaluation. Cardello (1994)[233] reported that the expectation test method allows evaluation of sensory and hedonistic expectations through comparison of the results obtained from a blind test, where consumers have only the product information at their disposal and a test where subjects have full information. Müller and Szolnoki (2010) applied the expectation test in the wine sector, and found it useful for assessing the relative impact of different extrinsic attributes on informed hedonistic taste and the intention to purchase for the wine, separating the relative effect of different attributes and also taking into account the differences between consumers in their reactivity to different product characteristics.[234]

Data were analysed using one-way ANOVA analysis of variance for between-group differences of values, to understand whether the evaluations of the participants were affected when they could see from the label that the wine was sustainable. This information was compared with the one collected during the discussion phase preceding to and following the testing phase. The ANOVA results were studied together with the input from the focus group and from the expectation phase when participants could look at the labels but did not taste the wines.

The main objectives of the experimental research were to:

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[232] Schifferstein, H. N. (2001). Effects of product beliefs on product perception and liking. In Food, people and society (pp. 73-96). Springer, Berlin, Heidelberg.

[233] Cardello, A. V.(1994). Consumer expectations and their role in food acceptance, in MacFie, H. G. H., Thomson D. M. H., Measurement of food preferences, Springer US, pp. 253-297.

[234] Müller, S., Szolnoki, G. (2010). The relative influence of packaging, labelling, branding and sensory attributes on liking and purchase intent: Consumers differ in their responsiveness. Food quality and preference, 21(7), 774-783.

- understand how the information available to the consumer can influence the hedonic perception of wine, and
- measure how much the taster's evaluation of the hedonic characteristics of a wine changes when the taster sees the organic logo on the label.

3.6. RESULTS

3.6.1. EXPERIENTIAL PHASE

In order to fully understand the participants' perception of sustainable wine, a focus group discussion was organised at the beginning of the meeting, using the framework of Sogari *et al*. (2013). Participants were asked open-ended questions to stimulate discussion about their interest in sustainable wine products, their perceptions and opinions about them, and whether they perceived differences with conventional ones.[235]

The discussion began with questions about sustainable wine. Some points about history and socioeconomics were brought up. (1) (*"preserving the territory and protecting it, sustainable is the whole chain that includes people, land and economy of the product"* or *"sustainability from an economic and social point of view. A positive impact not only on the entire production chain but also on the territory, society and culture"*). Observations about the environment came up as well (2) ("*attention and sensitivity to environmental impact, against pollution", "environmental impact"* or *"green by making*"). Participants also mentioned the ethical aspects (3) ("*wine that respects the environment and the consumer, the company works ethically by respecting consumers and employees. There is greater attention to the conditions of the staff."* or *"It is useful because the workers who have worked to achieve that goal are well paid*").

The participants seemed to agree that the most significant aspect of sustainable wines was the environmental one, while also noting the importance of the subjective factor of consumers and their values.

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[235] Sogari, G., Mora, C., Menozzi, D. (2013). *Consumers' perception of organic wine. A case study of German and Italian young consumers. In "Wine and tourism. A value-added partnership for promoting regional economic cycles". Proceedings of the 3rd Symposium of the Workgroup Wine and Tourism of the German Society of Tourism Research (DGT).* EURAC book (Vol. 62, pp. 101-112).

The discussion then moved to the hedonic perception of wine. Participants were asked whether they think there is a difference between conventional and sustainable wines. Many of the respondents said they personally did not note sensory differences when they tasted these wines, but thought that non-expert consumers expect there to be differences. Finally, participants were asked whether they think non-expert consumers expect organic wines to taste better than conventional wines. The participants replied that expert consumers are aware that there are no sensorial differences between the former and the latter, but thought that other consumers, seeing the organic or sustainable logo on the label, expect the wine to have better sensorial quality than conventional ones.

3.6.2. FINDINGS

After the focus group and the tasting sessions, the results were presented and discussed with the participants. They were shown a graph (*figure 11*) illustrating the trend of their hedonic evaluations of the wines. Their differences of opinion about the three wines expressed during the three phases of the expectation test were pointed out.

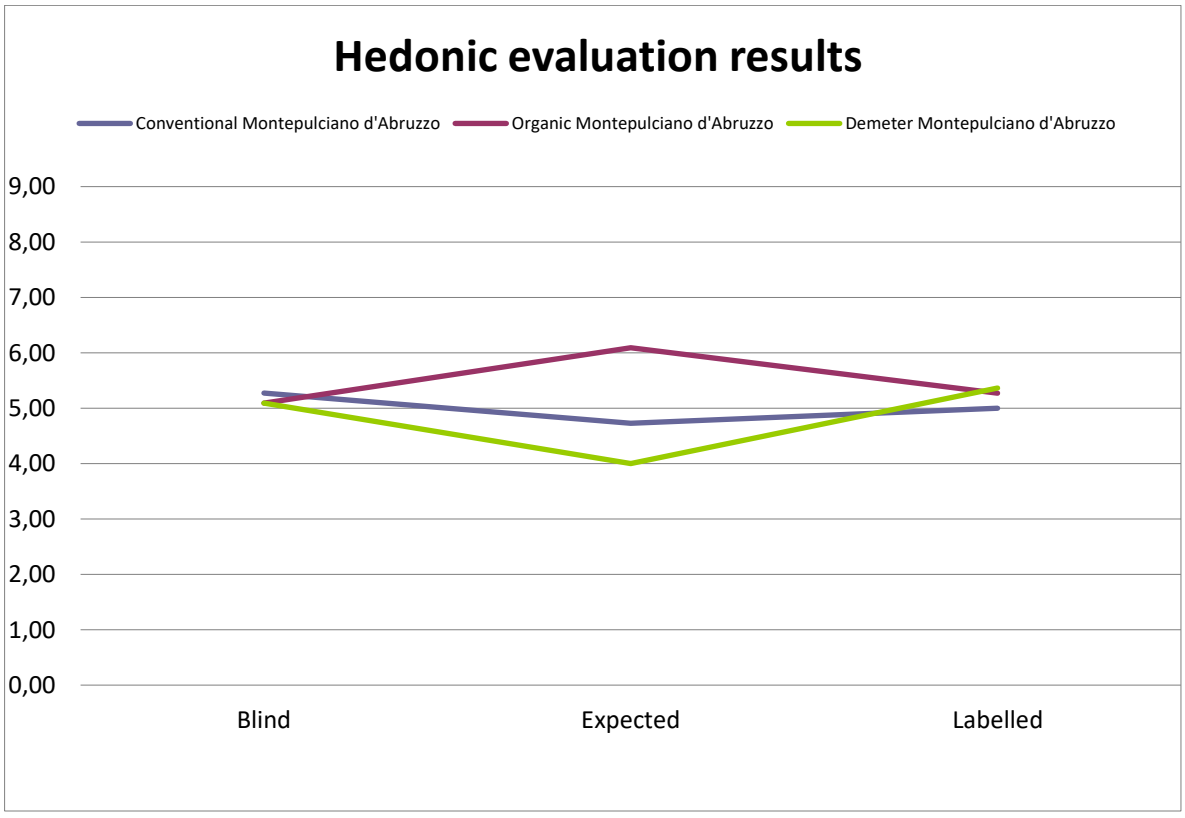

Figure 11- Hedonic evaluation of expectation test (source: data analysis)

In the blind and labelled phases, participants scored the three types of Montepulciano d'Abruzzo similarly, while in the expectation phase, they indicated preference for the organic wine over the conventional and the Demeter ones.

In order to ascertain whether the differences between the type of wine and the phase of the test were significant, a contrast test was carried out. The H statistic of Kruskall Wallis method was chosen as the most suitable, given the characteristics of the sample and the distribution of the data.

Table 3 shows the contrast between the conventional wine (variable 1) and the phases of the test. Given the level of significance (α=0,768), a confidence level of 99%, the null hypothesis of equality of means in the distribution of the groups was accepted. In other words, there were no differences in the ratings of this wine as a function of the phase in which the test was carried out.

Test statistics[a,b]

	One
Kruskal-Wallis H	,527
df	2
Asymp. Sig.	,768

a. Kruskal-Wallis Test

b. Grouping Variable: Test

Table 3- Kruskal- Wallis H test for conventional wine (source: data analysis)

Table 4 shows the contrast between the organic wine (variable 2) and the phases of the test. The level of significance was lower than the previous one (α =0,161), indicating that the null hypothesis of equality of means in the distribution of the groups was accepted with a level of confidence lower than the previous one (95%).

Test statistics[a,b]

	Two
Kruskal-Wallis H	3,647
df	2
Asymp. Sig.	,161

a. Kruskal-Wallis Test

b. Grouping Variable: Test

Table 4- Kruskal- Wallis H test for organic wine (source: data analysis)

Finally, Table 5 shows the contrast between the Demeter-certified wine (variable 3) and the phases of the test. Also, in this case, the difference was low (α =0,140) but it was still possible to validate the null hypothesis of equality of means in the distribution of groups with a confidence level of 95%.

Test statistics[a,b]

	Three
Kruskal-Wallis H	3,927
df	2
Asymp. Sig.	,140

a. Kruskal-Wallis Test

b. Grouping Variable: Test

Table 5- Kruskal - Wallis H test for Demeter wine (source: data analysis)

This low margin of difference could be explained by the fact that the tasters were experts in the wine sector, so the sensory aspect was more significant than it would be for a normal

consumer. Therefore, in the judgment of the participants, the sensory component was more important than any value attributed to an organic or sustainable logo.

One month after the test, participants were emailed to ask about their experience. Specifically, they were asked a) what they learned about certifications and b) what the most important element of this experience was for them.

In the responses to the first question, respondents indicated that they learned that sustainable labels are a means of communication between the producer and the consumer, conveying a set of practices of environmental care as well as social and economic values. A label with a green leaf or biodynamic logo certainly has more appeal than that of a conventional wine, because it conveys a message of attention to the theme of sustainability.

However, respondents noted that in some cases these logos could be counterproductive. In contrast to the opinions expressed during the focus group phase, in their responses some participants indicated that some consumers perceive wines produced with sustainable practices to be less tasty than conventional ones, and thus the logo can make a negative difference in the sales phase.

Nonetheless, the respondents recognised that sustainable labels are an important pillar of the national and global agri-food system. They are the future, and therefore their promotion and purchase must be encouraged.

Responses to the second question indicated that the most important element of the experience was seeing how the label affects the perception of the product, and by extension, how this can influence consumer choices in buying wine. Participants observed that a label is an important marketing tool for the promotion of wine.

It was emphasized that a connection needs to be created between the appearance of the bottle, the message that the producer want to send to the consumer and the product.

They also became aware of how trends can influence the market: if there is no real knowledge of the meaning of logos and the consumers are not experts in the sector, they often will choose what is currently most trendy in the market.

3.7. CONCLUSION

This chapter has addressed the issue of organic certifications and how they affect the hedonic evaluation of wine.

Sustainability is an increasingly important issue in the wine sector, and it is also reflected in production volume and consumer attention in choosing certified wines. However, customers are not always aware of what it means to buy a sustainable wine, often associating it exclusively as organic or biodynamic production. Even so, winemakers agree that consumers prefer wines of this category.

To understand how much EU organic certification influences the hedonic perception of wine, a focus group and an expectation test were organised with eleven students from the Master in Wine Export Management at the University of Camerino (Italy). In the focus group discussion, it emerged that sustainability can be viewed in terms of history, socioeconomics, environmental aspects, and ethical considerations.

Some participants asserted that in the choice between conventional and sustainable wine, the background experience of the consumer makes the difference: those who are committed to buying sustainable products expect better quality. However, the participants indicated that they personally found no sensory differences between conventional, organic and sustainable wines.

In conclusion, it was found that organic wines are perceived as better and healthier than conventional wine, so there is a potential higher willingness to buy.

In the subsequent experimental sessions, participants were presented with three Montepulciano d'Abruzzo wines (one conventional wine, one with an EU organic logo and one with Demeter biodynamic logo). There was a session with a blind taste test, a session for expressing expectations of the three labelled wines, and a session in which participants tasted the labelled wines. In each session, they scored the wines on a 9-point hedonic scale. Finally, the results were presented to the participants to show them the differences of opinion on the three wines during the three phases of the experimental part. Analysis of the 9-point hedonic scale scores that participants assigned to the wines indicated that the perception between the various labels underwent a small margin of variation. This result could be explained by the fact that the participants were experts in the field, so the sensory aspect was more important than the presence or absence of certifications on the label.

A month later, participants were contacted and asked to express an opinion about what they learned about certifications and what the most important element of the experience was. It emerged that they learned more about the communicative role of certifications and that it is very important to create a connection between the appearance of the bottle and the product.

CONCLUSIONS

The aim of this applied research was to understand sustainability in the wine sector by approaching the points of view of winemakers and expert consumers.

As explained in the first chapter, global and European policies in favour of a sustainable approach are considered to be of primary importance: the United Nations Agenda 2030 provides the guideline that influences and will influence all global policies in order to achieve economic, political and social sustainability.

These objectives have also influenced the European agri-food sector, leading to the implementation of programmes that promote these practices, through specific funds to encourage communities to work together to achieve this objective. In fact, many of them promote collaboration between different actors of a geographic area to foster innovation and sustainability.

Thus, the second chapter explores the possibilities and potentialities of the relationship between universities and small and medium-sized wineries to encourage sustainability-oriented innovation. The literature presents several examples of possibilities for collaboration between these two actors, but does not specifically investigate what their point of views are. Starting from The Wine Lab project, which aims to facilitate innovation in the wine sector, interviews were conducted with small winemakers located in disadvantaged areas of Europe, to understand their daily challenges and ascertain whether they see potential in the relationship between universities and businesses.

In response to the first question, interviewees indicated that one of the foremost problems they face in their everyday activities is bureaucracy, especially that involved in obtaining certifications and presenting documents. Some winery representatives expressed difficulties dealing with rules and procedures felt to be too long and complex. They also pointed to a lack of collaboration between companies and stakeholders, indicating that Consortia do not create links between wineries, and are perceived merely as political institutions. Moreover, there is practically no relationship with local businesses, which are not ready to welcome tourists and do not facilitate a promotion of the area. Wineries face sustainability challenges such as the lack of specialized staff, adverse weather conditions, the difficulties of their isolated and hard-to-reach locations, and a dearth in investments and financing. In particular, they have problems working in their area

because of inadequate infrastructure, adverse climatic and soil conditions and problems with internet access. In addition, there is a lack of qualified professionals able to work in the cellar or in the vineyard and willing to accept short-term contracts. Wineries should invest in human resources but lack the funds to do so. Finally, they underlined their difficulty in innovating because of a lack of monetary support, through investments in the area and in the companies themselves; they struggle to manage promotion of their products, to access new markets, to maintain long-lasting relationships with clients, to understand what consumers want and to propose products to foreign customers in an organized way.

As far as collaboration is concerned, most of the respondents see some potential in building stronger relationships with universities: some of them already have benefited from collaborations in their areas.

Starting from the need of wineries to make their way into the market and to promote their products and sustainability, the third chapter focuses on consumers, trying to understand their perception of sustainability.

Buyer recognize that wines have been produced using sustainable practices by reading the certifications on the label. There are many studies in the literature that investigate the role of certifications in consumer choices about which wine to buy and how much they are willing to spend for it, underlining how sustainability has become a real strategy for the marketplace, and brings tangible results.

The last part of this research explores how certifications influence the hedonic perception of wine.

Working with a sample of expert consumers, who are more sensitive to the sensory aspects of wine, an expectation test was used to analyse this aspect. A focus group discussion explored the participants' perceptions about sustainability, and their comments seemed to fall into categories related to history, economics and the environment, and ethics. They said that there are no sensory differences between sustainable and conventional wines, but felt that inexperienced consumers value the former over the latter, in the mistaken idea that sustainable wines taste better, but also in the expectation that they are healthier and that their production methods are better for the planet.

Finally, the discussion turned to whether consumers give weight to these considerations when buying wine: the participants felt that consumers display greater propensity to buy organic products for the reasons just stated.

In the experimental part of the study, participants assigned equivalent scores to three Montepulciano d'Abruzzo wines (a conventional one, a certified organic one, and a Demeter one) during the first and third sessions, namely, the blind tasting session and the labelled tasting session, but gave somewhat higher scores during the second session (expected), in which they were asked to evaluate the wines on the basis of the labels, but without tasting them.

This small variance could be explained by the fact that the tasters are experts in the wine sector, so the sensory aspect is more significant for them than it would be for an untrained consumer. Therefore, beyond the value attributed to a certain logo, the sensory component was predominant over the informative one.

The multidisciplinary character of this thesis has made possible a useful overview that better represents the real context of applied research.

For further studies, it would be interesting to analyse the difficulties of small wineries and the potential of the relationship between stakeholders in other European countries, comparing problems and possibilities of each nation, considering different cultures and economic and political conditions. Moreover, expanding the sample of expert consumers to encompass tasters from other nations might provide further insights into the phenomenon.

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