

## **Sustainable wine supply chain and entrepreneurship. The exploitation of by-products in a waste management process**

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### ***Abstract***

The sustainability issue has been acknowledged as a universal contemporary challenge within an entirely new, unprecedented and irreversible global economic, social, cultural and physical contemporary environment. Critical role plays the interdisciplinary Supply Chain Management (SCM) and its advance to sustainable SCM and more recently to green SCM.

The field of sustainability in the wine industry appears as a breeding ground for the development of multidisciplinary collaborations, as well as for the application of innovative practices in the framework of entrepreneurship, in both forward and reverse agrifood chains.

In such a context, this paper studies the exploitation of the opportunities derived from the wine production and waste management, within the totally new business, economic, social and physical environment. More specifically, it presents a start-up business plan conducted by Agricultural University in collaboration with the Harokopio University of Athens, Greece; it regards a wine waste management company in the island of Crete, Greece, highlighting the transformation of challenges to opportunities for innovation to more efficient use of by-products and wastes. It is noticed that this industry has shown historically exceptional innovative capability and flexibility, for climate privileged quality products in East Mediterranean region.

The conclusions and recommendations drawn in this study, provide useful insights and directions for future research that are expected to enrich the available knowhow in the wine industry which is particularly suitable for research on sustainability and in any way, must proceed to commitment for protecting the environment. The empirical case study in the island of Crete is expected to facilitate the attempts to transform the crisis to continuing sustainability performance of wine industry under contemporary world market conditions, along with potential broader managerial implications towards environmental protection and strengthening the social consensus through further future research.

**Keywords:** Sustainability, Sustainable Supply Chain, Wine Supply chain, Pomace, Polyphenols

## **1 INTRODUCTION**

The sustainability issue has been acknowledged as a universal contemporary “challenge” within an entirely new, unprecedented and irreversible global situation. Serious problems arise when going to the question how we can proceed in the transformation of the “sustainability challenge” to generic “sustainable opportunities”. This is firstly a matter of “sustainable knowledge management” (SKM) and diffusion, as the holistic Sustainable Supply Chain Management (SSCM) is founded on equal cooperation, partnerships and customers’ satisfaction for value creation.

Though research in the sustainability issue has invited increasing work by many academics and sustainability in the wine business has been fostered by growing interest of the wine industry itself and the active role of institutions (in governance, consulting and funding), there are still some gaps concerning wine supply chain and especially wine wastes management. As increasingly prominent business and scientific area, wine supply chain operations to both forward and reverse supply chain should be reconsidered in the light of sustainability, in holistic interactive methodology.

After having provided a brief description of sustainability issues with emphasis to the wine industry, the intention is to shift the emphasis toward more practical aspects of the topic. Thus, it aims at evaluating the possibilities of a start-up company that will exploit the wineries' waste for the production of polyphenols used in food and pharmaceutical industries.

After presenting a start-up business plan, in the island of Crete (traditionally developed winery area), this paper provides useful insights that can depict managerial implications and highlights the main challenges for further research.

## **2. LITERATURE REVIEW**

### **2.1 Sustainable Development and Environment protection**

It is common to connect the sustainability issue with the unprecedented changes that occurred throughout the post war period - indicatively mentioning particularly the 1970ies and 1980ies- with the two oil crises (1973 and 1979), the peaceful collapse of the “central planning system” in late 1980ies, the consequent globalization phenomenon, etc. These came in interchange though they are often attributed to increasing awareness about the “sustainability issue”, in connection with a general challenge of adjustment to a new economic, social, physical environment.

The abovementioned connection of the “sustainability” with the goal of adjustment to the new economic, social, physical environment, has been interpreted as presence of a missing link, as has been noticed in relation to the latest CCN program of the UN (Malindretos, 2016). In particular, the connection of the sustainability goals, starts with the need for overcoming the vagueness of its concept. The literature of the sustainability has connected its concept with the organizational change, which can be defined in various ways (Dixon and Fallon, 1989; MacGillivray and Doane, 2001; Dempsey et al., 2011; Castro and Charms, 2012; Giovannoni and Fabietty, 2014).

Whereas most people agree on the importance of “sustainable development”, its very nature and meaning is rarely discussed and analysed in an explicit way. As a result, the actual implementation of sustainability risks to be limited by the vagueness and ubiquity of its definition (Dixon and Fallon 1989). Also, while the concept of sustainability is broadly acknowledged as multi-dimensional, with its various dimensions brought to light different discourses over time and have often been treated separately (which has limited its actual implementation in real rhetoric). The literature review which addresses to the notion about the relevant dimensions of the sustainability (or sustainable development) is engaged with identifying key dimensions and intertwining the relations among them. In so doing the challenges and opportunities brought out by an integrated approach towards sustainability are also emphasized together with the role played by governance structures, business models, strategies and management, measurement and reporting systems in implementing “integrated sustainability” within organizations: in the prospect about sustainability can be a concise communication about how an organization’s strategy, governance, performance and prospects of synergic creation of value over the short, medium and long term (Giovannony and Fabietty, 2014 ).

The need to align governance systems to sustainability is also acknowledged at the company level (Newmark Craig M., 2009). In particular, there has been reported presence of managerial misconduct in certain corporations whose ways of doing business have been too profit-oriented and overly focused on the financial aspects of organisational performance (see Abdel-khalik 2002; Benston and Hartgraves 2002). Consequently, it has been broadly acknowledged that creating value only for shareholders is not enough (see, among others, Charreaux and Desbrie`res 2001; Coda 1988). Rather, value creation is an integrated process that is rooted around a broad perspective of governance, encompassing the interest of multiple stakeholders.

The knowledge of the supply chain encompasses a group of entities which have to share common goals, linked through processes such as procurement or logistics, to thereby providing goods or services, in response to the changes in economic, social and physical environment and climate change.

It refers to a supply chain interdisciplinary partnership to an integrated value creation network as conditional to sustainability (Vlachos and Malindretos, 2012). It refers to a historical change occurred during the 1970ies and 1980ies in the company management model; an associated new vision and advance of knowledge and research towards interdisciplinary and interfirm collective action; the raising opportunities of choices and trade-offs on cost/benefit criteria, by the innovation of the Logistics in the company's distribution functions and its extension throughout integrated supply chain of value creation network, and its further advanced to SSCM, accounting the social factors for further enhancing the sustainability performance, up to brainstorming re-engineering (Malindretos et al., 2002).

The association of sustainability with the micro-economics and the firm's goal for profits and efficiency maximization, incorporates innovative initiatives. Further is the planning and funding for their implementation. Because, in broad perspective, all systems and organizations face the challenge of implementing new practices at one time or another. Yet many of the innovations that are initially successful fail to become part of the habits and routines of the host organizations and communities.

Recognizing the need to promote the use of best practices to achieve better outcomes, many government agencies and community organizations devote significant resources to promoting research on evidence-based practices (EBPs), and quality-improvement programs: priorities, best practices and evidence-based interventions, in many systems and communities (Abrahamson, 2000; Ansoff, 1997; Appleby et al., 2003; Buchanan et al, 2003). Identifying the critical factors to the success of initial implementation efforts, cares policy makers and other stakeholders as increasingly concerned with the long-term impact of their investment. However, the review of the dissemination and implementation literature has shown near absence of studies focusing primarily on the sustainability of complex service innovations (Greenhalgh et al., 2004).

The United Nations Environment Programme (UNEP, 2010), in a first study of scientific assessment on the "Green Economy" and climate change impacts on consumption and production found that the most critical impacts are related to ecosystem health, human health and resource depletion; from a production perspective, it found that fossil-fuel combusting processes, agriculture and fisheries have the most important impacts.

It has been noticed, however, that the literature review has shown limited implementation performance and empirical research (Burgess et al., 2006). The performance issue has been seen to be enhanced by increasing use of integrated "Supply Chain Process Management" (SCPM), incorporating waste management processes.

In this respect, this paper addresses a very significant sustainability aspect in the wine supply chain, presenting an empirical study of a start-up company that will operate in the wine waste management business area.

## **2.2. Sustainability in the wine industry**

Research in the sustainability issue has invited increasing work by many academics. In the wine supply chain scientific filed, although there is some work done by researchers mainly concerning Life Cycle Analysis and Assessment (LCA) (Ardente et al., 2006; Notarnicola et al., 2003, etc.), there are not many references regarding wine supply chain and especially wine wastes management.

The field of sustainability in the wine industry appears as a breeding ground for the development of academics and university collaborations (Santini and Cavicchi, 2011): the paper proposed by Lee (2000) provides a general framework that can be used for describing the benefits arising from the relationship between academics and industry. In general, it can be said that the industry, by cooperating with research institutions, can be helped in solving technical problems, can have an easier access to useful findings and can be facilitated in the innovation implementing process. There is no surprise about the fact that the industry is supporting research in some countries: it is the case of the Wine and Food Institute in California cofounded by Robert Mondavi Winery, the Anheuser-Busch Foundation and Ronald and Diane Miller of Silverado Vineyards to conduct research on wine and food ([www.winespectator.com](http://www.winespectator.com)). Generally speaking, we can say, by observing some cases, such as the Washington State Wine Industry, that University research has fostered the development of the wine industry. Ohmart (2008), when observing the diffusion of sustainable practices among grape growers, suggests that it depends on two factors: the rigorous science and its effective delivery to grape growers, two issues that might explain any existing difference in terms of penetration and diffusion of sustainable practices in viticulture. Also Guthey and Whiteman (2009) when analysing the history of winemaking in California, state that funded university research has contributed to shape Californian

wine production thanks to the useful inputs provided for developing winemaking practices and understanding human environment relationships.

As far as the differences among wineries concern, some scholars have proposed a model that would help to classify wineries' orientation in terms of sustainability; the model proposed by Casini et al. (2010) provides four different possible profiles of wineries. The so called "devoted" wineries are those that show a strong orientation towards sustainability that is emphasised by wineries when they communicate with customers so that company's image can be associated to a green orientation; those companies must invest on customers and employees training and education programs in sustainability and need to ensure an alignment between corporate vision and managerial vision. Another category of wineries, the so called "unexploiters", stands half the way between devoted and another category called "laggards" that are those wineries who would never adopt sustainable practices: unexploiters usually decide to adopt sustainable practices, but do not communicate and share with other people (clients, first of all) their decision. Such a behaviour limits the benefits that might be gained through a sustainable orientation. At the opposite of unexploiters stand opportunists: those are wineries that don't have a particular interest in sustainability, but tend to heavily communicate the few sustainable practices introduced.

Internal as well as external drivers are critical towards the sustainability goal (Santini and Cavicchi, 2011). Thus, internal drivers are the ethical motives inspiring top management and entrepreneurs as well as strategic intentions based on the recognition of an advantage that might arise from sustainability. External drivers, instead, take place in the firm's external environment and concern pressures coming from institutions, customers, communities, associations, environmental groups, activists, regulators and competitors.

An orientation towards establishing networks among local players is a key factor of success. In some specific contests, such as California, it emerged that agro-ecological partnership became the leading vehicle for extending sustainable agricultural practices (Swezey and Broome, 2000; Dlott, 2004); it has also been recognised the proactive role that those partnerships had in spreading a green orientation among wineries (Broome and Warner, 2008).

New Zealand is investing in environmental issues: "The New Zealand wine industry aims to be the first in the world to be 100% sustainable. The Sustainable Winegrowers New Zealand (SWNZ) program introduced in 1995 is a framework of industry standards set up to achieve this by vintage 2012." (<http://www.newzealand.com>). Besides initiatives promoted by associations and institutions it should be reminded the efforts paid by single companies for promoting practices that would reduce, if adopted, gas emission and wastes. The case of the Wine Group in the US show that big companies invest to environmental issues: the Wine Group has launched in 2008 a website ([www.betterwinesbetterworld.com](http://www.betterwinesbetterworld.com)) for documenting how Bag in Box can help in reducing emissions and wastes (<http://www.winebusiness.com>).

The development of specific programs for sustainable winegrowing has fostered the adoption of "ground to bottle" practices for producing grapes and wine (Broome and Warner, 2008). Institutions and regulators have played a key role in enhancing wineries interest towards sustainability by funding specific practices adoption and by educating through a sustainable orientation (Swinbank, 2009).

It has been demonstrated that competitors' orientation towards sustainability can promote a mechanism of adoption that affects other companies in the competitive environment: Murphy (2000) describe the introduction of the flange-type bottle with a C-cap on the market by Mondavi, that has been subsequently adopted by other wineries in the market who, conscious or unconscious, have embraced the same principles that have inspired Mondavi before the product launch.

Consumers' involvement in sustainability is also reshaping wineries' interest toward this issue, as it has been perfectly described by Bisson et al. (2002): "As consumers become more aware of the vulnerability of our global environment, the demand for sound agricultural production practices is increasing. In the future, the perception of the producer as a conscientious environmental steward will be an important influence on the consumer's purchasing decision. This is due in part to the fact that the typical wine consumer is well educated and affluent." The pressures coming from consumers have created a market for wines that have been realized taking into account environmental issues, such as organic or biodynamic wines (Forbes, et al. 2009): in particular, in some countries, as the UK, organic wine moved from a niche to a mainstream position (Sharpley, 2000).

### **3. RESEARCH METHODOLOGY**

This paper presents a study conducted by the collaboration of two Universities: the Agricultural University of Athens (Postgraduate Program of Entrepreneurship and Consulting in the Agricultural sector) and the Harokopio University of Athens, Greece. The basic goal is to foster "innovative opportunities" and sustainability performance through "shared mobilization" of all available physical

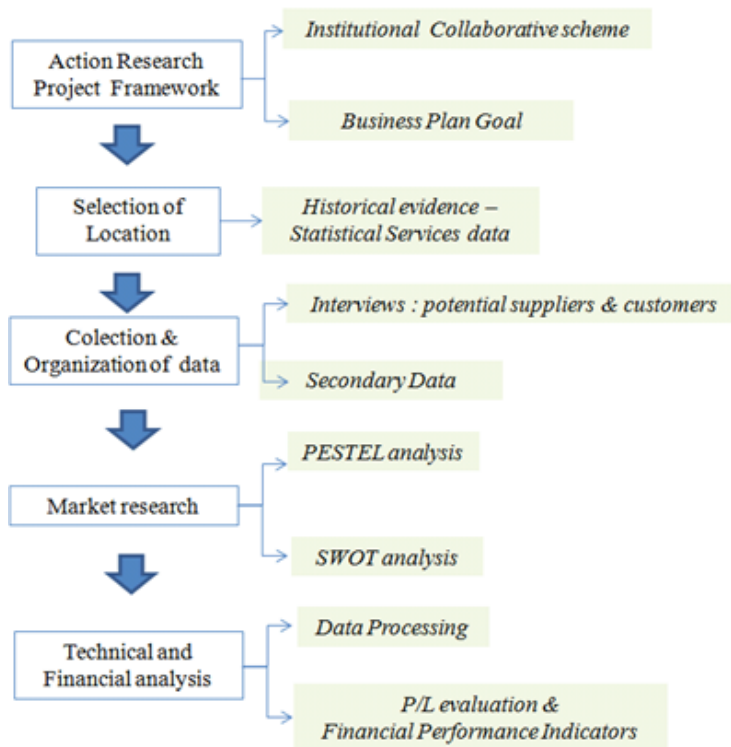
and human /social resources in the wine and viticulture industry, within the broad challenge of an ever changing business, economic, social and physical environment. More specifically, it concerns the foundation of a start-up company in the island of Crete, Greece, that operates in the wine waste management field.

Entrepreneurship differs from one geographic location to another due to variations in environmental conditions and, in particular, economic, political/legal, and social conditions. Another factor that impacts entrepreneurship is knowhow level in relation to the nature and attributes of operations/products/services to be managed based on all time experience acquired. In this respect the choice of location/area, namely the island of Crete and more specifically Kissamos province is not accidental, as it is recognized as place of most famous quality of “marouva krasi” (meaning old superior taste wine). The thematic of this paper underlies historical evidence that the wine has been known around five thousand years of systematic cultivation in Crete (Velivasaki, 2016). It is moreover noticeable in historical perspective, that the wine quality product in East Mediterranean region is privileged in well recognized benchmarking from ancient era 5 thousand years BC. In addition, the same industry has shown exceptional (if not without antecedent) innovative capability and flexibility.

The necessary data and critical information were mainly collected from managers of wineries and pharmaceutical/food companies, that represent suppliers and customers of the start-up company respectively. From the (potential) suppliers point of view interviews were conducted with the managers of the ten biggest wineries in Kissamos area. It is noticeable that most of the biggest wineries’ managers (seven out of ten), characterised their companies as “unexploiters” (medium-level sustainable orientation) with the potential to become “devoted” companies by adopting significant sustainable practices in the future. These seven wineries were selected as the potential suppliers of the start-up company. On the opposite edge of the start-up company’s value chain, namely the potential customers, the anticipated price of the start-up company by products was identified based on interviews conducted with five pharmaceutical and four food companies. Secondary data provided the necessary technical information for the design and development of the start-up company infrastructure, set up and operational costs.

Holding in mind the lot of yet unsettled issues, presented as imperfections, myths, conflicts, implies the critical usefulness of the SWOT method in the empirical research that focuses on sustainability performance. SWOT alongside PESTEL analysis was used as a basis for the analysis of business and environmental factors, for identifying competitive advantage by matching strengths to opportunities and converting weaknesses or threats into strengths or opportunities.

**Figure 1: Methodological approach of paper's study**



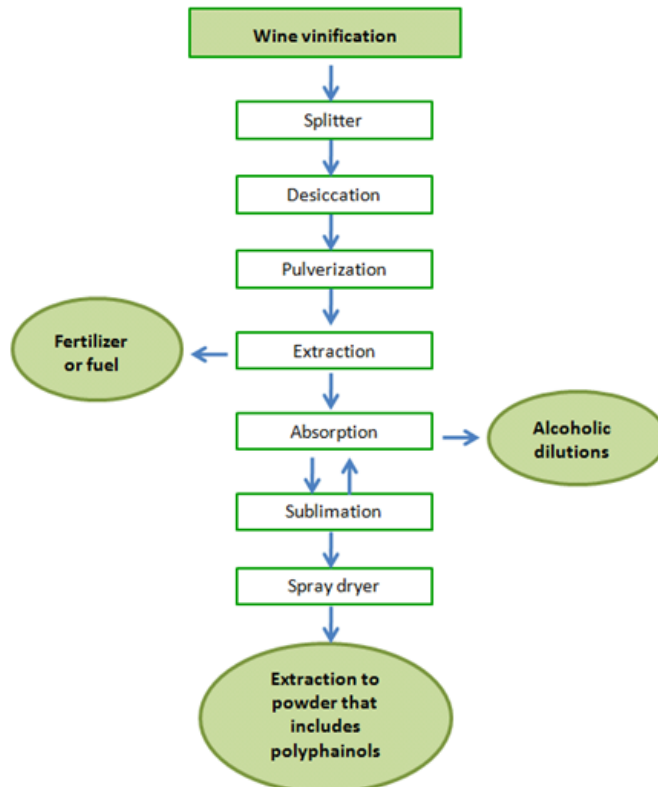
The operational design and technical details of this project were based on the institutional research knowhow and are briefly presented in this paper. Special attention was given to the financial analysis of the study for determining whether project is profitable and its future prospects. Thus, profit & loss statement summarized the revenues and expenses to be generated by the company over the entire reporting period along with the use of certain financial performance indicators, commonly used to business plans.

#### 4 WINE WASTE MANAGEMENT START-UP COMPANY

##### 4.1 General information about the start-up company

The company is going to be established in Kissamos area, in Chania prefecture (map 1), west Crete. Its main activity will be the elaboration of wineries' by-products and more specifically of pomace for the production of polyphenols (fig.2).

Figure 2: Process of pomace elaboration for the production of polyphenols



In Greece 85,000 tn of pomace are produced annually from the wineries that elaborate 665.000 tn of grapes. The greatest proportion of pomace is used for animals' feed and a small part for the production of raki (local drink). It is more broadly noticed that the wine and viniculture are identified by deeper roots in bonds in Greece, as assimilated in the religion, culture, civilization, inspirations, arts, philosophy, way of life, technological and economic progress. Historically, it goes further back than the Homeric epics. In effect, it has been maintained in broader perspective, that wine has been "a core element of the first European civilization". Crete is an island that has been traditionally engaged with vinicultural farming and wine production. Particularly, the history of wine in the island of Grete - based on numerous historical sources- is dating back to the era of the Minoan Civilization (c.3000 years BC). It was intermixed with the Olymbian Gods -Cronos, Zeus, battle between the Olympians and the Titans- the God Dionyssus, the second of the Olymbian Gods was the God of the grape harvest, he born in the "Ideon Andron" of the island of Crete, and became symbol of wine taste quality and further economic and political power.

The privileged vineyards' in the history of wine in Crete and broader in Greece and the Eastern Mediterranean may not be irrelevant to the survival of this industry alongside the half of the 20th millennium by Othoman occupation, in view of that the "Koranion" prohibits strictly the wine use. More specifically, as the vineyard farmers (mostly SMEs) achieved to survive through innovative transformation and commercial exploitation of created by-products of wine (e.g. tsipouro, raki, oyzaki,

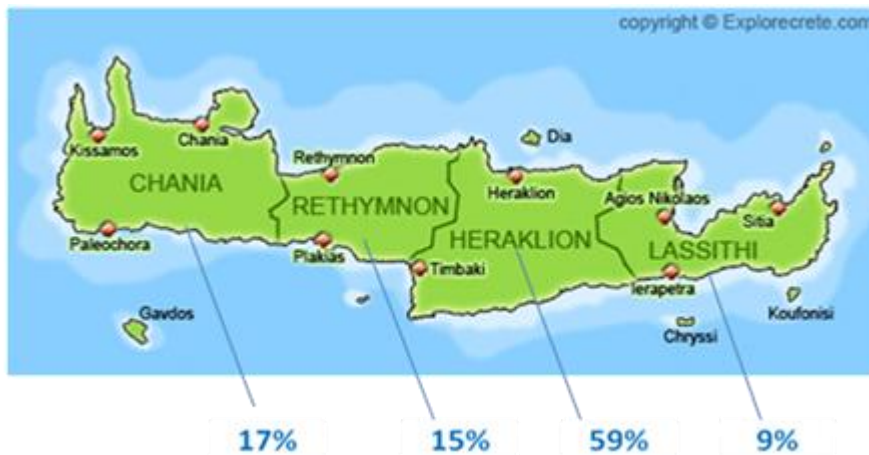
etc.) and to promote them secretly in the market place, within extraordinary difficulties of that time. It has also to be added that Greek wines are often distinguished in foreign exhibitions, gaining prizes and distinctions, and promising wine exports promotions, though they face various miss barriers administrative procedures, introversion, etc. (Papalexiou, 2009; Artopoulos et al., 2010), besides recent increase in VAT rate to 24% (June 2016).

According to Hellenic Statistical Services data (2010) vinicultural areas has doubled from 1999 to 2009 (from 100,000sq meters to more than 200,000 sq meters correspondingly), with Heraclion prefecture representing the highest proportion between the four prefectures of Crete (Map1).

The management team will have the responsibility of the production, research and development, sales and promotion, while logistics and financial issues will be outsourced to local partners.

In the past few years, interest in the polyphenols has risen considerably, particularly the ones that derive from red and white grape varieties (Kammerer et. Al, 2004). Many polyphenolic extracts, for example from grape skin and grape seeds are sold as ingredients in functional foods, dietary supplements and cosmetics without any legal health claims. Many herbal teas contain soluble polyphenols, and their efficacy is often attributed to astringent substances (Haslam et. al, 1989).

**Map 1: Proportion of vinicultural farms in Cretan prefectures**

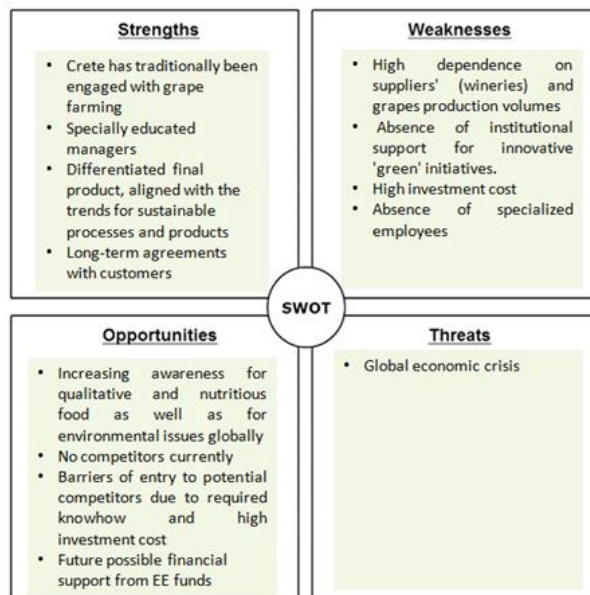


Therefore, future company's suppliers in this case study will be 7 wineries from Chania prefecture, while potential customers will be enterprises from the food and cosmetics industry, as well as pharmacies.

#### 4.2 Market research and SWOT analysis

Table 1 reveal, among others, the challenges from such an initiative. Major challenge relies on the acknowledged value of the final product to people's health, together with the increasing awareness for environmental issues in the ever changing marketplace.

**Figure 3: SWOT analysis**



### 4.3 Financial evaluation

The main cost factors (infrastructure and operational costs) are outlined in Tables 1 and 2.

**Table 1: Cost of infrastructure**

Cost of infrastructure and start-up (€)	
Site 7000 sq. meters *	103,190
Site configuration **	10,168
Building 1000 sq. meters ***	244,555
Equipment	1,300,948
Start-up cost	1,000
Unexpected costs (15% of total infrastructure)	248,980
<b>Total</b>	<b>1,908,840</b>

\* value of 1000 sq. meters: 14,741 €

\*\* value of site configuration per 1,000 sq. meters: 1,453 €

\*\*\* construction cost of buildings per 100m<sup>2</sup>: 24,455

**Table 2: Fixed and variable costs**

Fixed Costs (€)		
Services and consumables (WWW site, insurance, consumables, certification, etc.)		5,430
Administration cost		127,789
<b>Total</b>		<b>133,219</b>
Variable costs (€)		
Raw materials	2,500,000kg*0.015€/kg	262,500
Cost of picking raw materials	2,500,000kg*0.008€/kg	140,000
Labour (21 employees)	5€/h /60 days	50,400
Maintenance	1% of equipment value	13,001
Dissolver cost	150,000kg*0.1€/kg	105,000
Water	12,000m <sup>3</sup> /winery*0.3/kg	25,200
Electricity	2,280,482kwh/winery*0.041€/kwh	654,602
<b>total</b>		<b>1,250,703</b>

The above tables result to the total annual operational costs as follows:

**Table 3: Total operational costs**

Total operational costs (€)	
Fixed	133,219
Variable	1,250,703
Unexpected costs (5% of operational costs)	69,196
Equipment depreciation (10% of equipment cost)	130,095
<b>TOTAL OPERATIONAL COSTS</b>	<b>1,583,313</b>

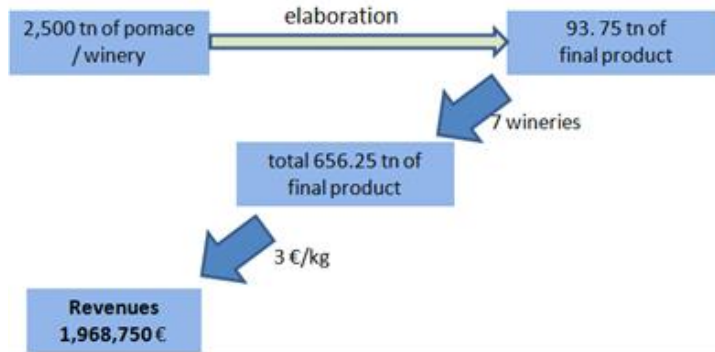
### Potential revenues

Taking into account that the overall output of each winery (“supplies” of the start-up company) is 2,500 tn of pomace annually, the total available volume of pomace from the 7 wineries will be 17,500 tn.



The elaboration of the pomace in the company's production line will come up with 656.25 tn of polyphenols. According to current market information sources the price is about 3€ per kg, so therefore the total forecasted income is 1,968,750 € (figure 4).

**Figure 4: Forecasted revenues derived from the 7 wineries supplies**



Provided that after the third and fourth years of operations the price will increase about 0,1€ /kg and that the company's throughput will remain stable, company's income within 5 years after its establishment will be over 2 million €.

**Table 4: Five years revenues' estimation**

5 years Revenues					
Year	1	2	3	4	5
Output (tn)	656.25	656.25	656.25	656.25	656.25
Price (€/kg)	3	3	3.10	3.20	3.20
<b>Total revenues (€)</b>	<b>1,968,750</b>	<b>1,968,750</b>	<b>2,034,375</b>	<b>2,100,000</b>	<b>2,100,000</b>

In retrospect, we come up with the overall financial results, presented in table 5.

**Table 5: Financial results**

Financial Results (€)	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	4 <sup>th</sup> year	5 <sup>th</sup> year
Revenues	1,968,750	1,968,750	2,034,375	2,100,000	2,100,000
Operational costs	1,453,118	1,453,118	1,453,118	1,453,118	1,453,118
Gross Profit	515,632	515,632	581,257	646,882	646,882
Depreciation	130,095	130,095	130,095	130,095	130,095
Profit before taxes	385,537	385,537	451,162	516,787	516,787
taxes 26%	100,240	100,240	117,302	134,365	134,365
<b>Net profit</b>	<b>285,297</b>	<b>285,297</b>	<b>333,860</b>	<b>382,422</b>	<b>382,422</b>

In addition, major financial indexes suggest that investment is financially sustainable, as derived from table 6.

**Table 6: Financial Indexes**

Index	Result
ROI	12.97%
NPV	331,891
IRR	23%

## 5 MAIN REMARKS AND CONCLUSIONS

Naturally, entrepreneurship is fostered by entrepreneurial behavior, or behavior that fosters growth through innovative ideas, products, services, markets, and technologies (Stevenson & Jarillo, 1990). Entrepreneurial activity is more likely to thrive when appropriate infrastructure is in place to enhance competition and problem-solving activities between a country's entrepreneurs (Busenitz et al, 2000). In addition, knowhow and experience facilitate innovation and effective exploitation of all available resources.

According to the literature, a tight relationship between academics and industry can provide significant benefits to the wine industry and improve its overall orientation towards sustainability. Moreover, it can promote entrepreneurship through supporting innovative initiatives, like the wine waste management case study presented in this paper. This empirical study has been carried out in the prefecture of Kissamos in the island of Crete, characterized by warm East Mediterranean climate and, in addition, for the famous best quality tasteful wine products.

This paper's study is a collaborative outcome of the industry (wineries, food and pharmaceutical companies) with two institutions, specialized in agricultural sector (Agricultural University of Athens) and sustainable supply chains (Harokopio University of Athens), aiming at investigating the innovative challenges derived from wine by-products and wastes management. This is in line with the emergence of the New Management Model "revolution", has underlined the importance of four partnerships (4Ps) [permanent, public, private partnership] and four collective value creation conditions (4Ss) [system-structure-strategy-synergies] (Porter and Keamer, 2011). It is noticeable though that research doesn't show to keep the path of such diffusion and it is much more intensive in some countries rather than others, although sustainability issues are affecting the wine industry all over the world.

The development of synergic schemes between would contribute in identifying, evaluating and applying sustainable solutions to both forward and reverse wine supply chain. For instance, in the island of Crete an agricultural cluster can be established, encompassing all stakeholders, such as local Universities, grape farmers, wineries, retailers as well as food and pharmaceutical companies. In this direction, "devoted" and "unexploiters" are the categories of wineries (Casini et al., 2010) that can show the way towards sustainability. In any way, all managers, must realise, including these that are not inspired by ethical issues, the important advantages of such an orientation in terms of marketing benefits, corporate image positive feedbacks or cost savings (Isaak, 2002).

The wine industry is particularly suitable for research on the sustainability issue. The positive financial results presented in the previous paragraph confirm the significant challenges founded on the exploitation of wine waste, in the framework of closed loop supply chains, contributing to "two-tear" genuine holistic SC in the advance of Supply Chain Management to Green Supply Chain Management, which have attracted attention of both academia and practitioners in recent years (Meade et al., 2006; Guide and Wassenhof, 2008; Guide Akçalı and Cetinkaya, 2011; Govindan et al., 2015). At any event, strengthening the integrated supply chain is seen as key to unlocking a sustainable future (Carbon Trust and BSR, 2017), as the literature review has shown, that there has been so far not sufficient implementation performance (Burgess et al., 2006). The persisting performance issue of the sustainability is also confirming non-sufficient commitment to past calls for integrated "Supply Chain Process Management" (SCPM) (Becker, 1997), and dynamic, feed-back R&D sharing process, driving to BPR (Hammer & Champy, 1993; Malindretos et al., 2002).

The solid knowledge driven re-thinking is very helpful, especially for performing use of missed wastes in the wine supply chain, along with stepping up processing redirection, for enhancing the company sustainability performance. Besides, energy and resources, covering the consumption of energy and resources in the wine supply chain and the wine supply chain's conduct to reduce the consumption of energy and resources, is one of the critical sustainability aspects that should be effectively managed (Abbing, 2010). Thus, the findings of the above mentioned case study reveal the great opportunities derived from the application of sustainable practices in the reverse wine supply chain, in the framework of effective Resources Based Management (RBM).

It has greater applicability globally, providing some key cost elements and the evaluation results from the operation of a company that manages wineries by-products. In addition, this paper provides some useful insights that could be helpful for future research in the field of wine by-products management. An analytical business plan is necessary to explore the details of operating such a company, including Logistics and the flows of raw materials to the production line and its output to the customers. Moreover, in view of that sustainability goal encompasses the social pillar, apart from the financial and environmental ones, the positive impact of such initiatives in the local society must be also taken into account, since new job opportunities arise, both directly ('in-house' operations) and indirectly (outsourced activities from partners, like Logistics providers).

Universities and local authorities must promote the diffusion of knowledge and sustainability awareness to all wine value chain partners. Research has a social responsibility in the development of a sustainable orientation in the wine business.

The conclusions and recommendations drawn in the present study are expected to enlighten the opportunities in wine reverse supply chain and the exploitation of all available knowhow towards wine industry sustainable development.

Due to the social implications that sustainability as a research issue has, researchers who are working in this field have social responsibility too; through their work, they can foster the adoption of sustainable practices at different levels of the wine industry, contributing indirectly to the growth of the overall welfare of people living in a certain area.

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