

"THE IMPACT OF SUSTAINABLE DEVELOPMENT IN THE WINE INDUSTRY-CASE STUDY: THE THESSALY REGION"

Spyridon Fragkos

Phd Candidate of Panteion University of Athens

spirosfragos1@gmail.com

Abstract

The meaning of sustainable development and more specifically the principles of green development are tested in the field of wine production as a privileged field for its implementation. Though, there is a lot of confusion in the meaning of organic wine and of green wineries, there are efforts, both in local and international level, to be defined as "General Principles of organic vinification" in reference to organic viticulture, taking into account the wine production's effects on the environment and on climate changes. The aim of this paper is to propose the 'adapted supply chain model' for wineries and according to this model, to investigate the phases of vinification, through which the organic winemaking can be different from conventional vinification, as well to classify international practices of some green wineries. In addition, empirical elements were collected from the Greek region of Thessaly and they were investigated according to the new model so as to follow, more or less, the same international patterns. So, consumers can distinguish and enjoy a different organic product of high quality, which is produced in an eco-friendly way.

Keywords: *green growth, green wineries, adapted supply chain model for wineries, Thessaly wine region.*

A. Introduction.

The winery industry can fully correspond to the spirit of the declaration for the sustainable development and especially in green development's framework. The "classic" definition of sustainable development, also known as the Brundtland Report (1987) about 'Our Common Future', is: "the development that meets the needs of the present without compromising to the ability of the future generations to meet their own needs". Sustainable development is based on three dimensions: economical, social, and environmental. The key factor for the implementation of sustainable development is the climate change, which affects the environment and several production procedures (United Nations Headquarters, 2010). The greater difficulties are located in the social dimension of the sustainable development and in order to proceed its implementation, the framework of the Green development has been invented. As a result, green growth is a subset of sustainable development, narrower in scope, entailing an operational policy agenda that can help to achieve concrete, measurable progress in the interface of the economy and the environment. Green growth¹ is necessary because the present model development erodes natural capital and if it is left unchecked, this would mean increased water scarcity, greater pollution, climate change, unrecoverable biodiversity loss and worsening resource use (OECD, 2015).

¹ OECD: Declaration on Green Growth. Adopted at the Meeting of the Council at Ministerial Level on 25 June 2009. [C/MIN(2009)5/ADD1/FINAL].

The basic circuit of flow- inputs, process production, outputs, with its supplementary expansion of marketing as well as the natural environment- is an appropriate tool to examine the application of green growth in the sector of wine industry (Gunasekaran et al, 2004). The concept of sustainable production needs a holistic approach and it includes the entire life cycle of manufactured products, including consumer use and product end-of-life options, such as disposal, recycling and remanufacturing (Nasr et al, 2010). The climate change affects the environment and so, wine producers and vintners tend to think of environmentally friendly actions, because climate change acts counter productively for the quality of their wine as well as their earnings (Gemrich and Arnold, 2007).

Wine industry produces a commodity in an intrinsic sensory aspect of taste and aroma, and consumers expect wine to be healthy and produced in an environmentally sustainable way, and so companies can sell it in the modern marketplace successfully (Bisson et al, 2002). Wine is not a single, homogeneous product, but exists in various styles. Differences between wines are considered to relate to colour, variety, country of origin or winemaking. However, wines can be distinguished in two general types: on the basis of both the culture of their production and the culture of their consumption (Charters, 2006). In this paper, it is only investigated the culture of wine production in the concept of sustainability. Some first steps have been already made through the production of organic wine, which is produced of organic grapes; organic wine based on the quantity of sulfur it contains, as well as some conventional wineries which function through procedures which are friendly to the environment.

The Thessaly region is located in central Greece and this area has its own wine identity, because of the chemical composition of the soil, the climate of the area, the annual change of climate, the varieties cultivated and the cultivation techniques. Nowadays, Greek winemakers know modern technologies and with respect to the traditional art of vinification, produce quality wines, trying to protect the environment. The findings (which were collected by questionnaires all over the Thessaly region) show that green winemakers have focused on organic grapes mostly, considering them to be the most important factor for organic vinification, while according to supply chain model there are and other green activities in the production chain as well.

The purpose of this paper is to point up that the winery industry can follow the model of Green development. Using as a tool the “adapted supply chain model” for wineries, which I have processed below, all wineries can be classified by the produced result-the wine and by their operation phases as well. It is also under investigation which will be the benefits for the corporations, for the consumers, for the environment both now and in the future as well. In the end, it is recorded in this project what is the behaviour of the wineries in Thessaly, based on the suggested model.

B. Conceptual foundation.

The wine product.

Wine is a special commodity and its moderate consumption (250–300 ml/day – about one-third of a 750-ml bottle) has distinct health benefits, as it reduces the likelihood of type-2-diabetes, combats hypertension, and reduces the frequency of certain cancers and several other diseases. In contrast, an excessive ethanol consumption can cause cirrhosis of the liver and may increase the likelihood of hypertension and stroke. Moderate alcohol consumption yields a higher level of high-density lipoprotein cholesterol (HDL) which is protective against atherosclerosis and Coronary Artery Disease (CAD) (Jackson, 2008; Charters, 2006). As wine production has evolved from a cottage industry to global networks, the future of the wine industry is a blending of nutritional benefits and sound environmental practices with the human perception of quality (Bisson et al, 2002).

Green development could be applied in wine industry, in the concept of appropriate environmental sustainability programs that include: production, transformation, warehousing, and packaging of products. Twenty years ago, a number of ways of implementing sustainability in the wine industry were developed based on voluntary environmental and social standards and certifications, and also, many different sustainable winegrowing programs were developed through collaborative efforts driven by national institutions and associations in wine-producing countries (Pomarici et al, 2015). Sustainable vitiviniculture is defined by the OIV as a “Global strategy on the scale of the grape production and processing systems, incorporating at the same time the economic sustainability of structures and territories, producing quality products, considering requirements of precision in sustainable viticulture, risks to the environment, products’ safety and consumer’ health and valuing of heritage, historical, cultural, ecological and landscape aspects”. The guide covers all the activities in this area, in the spirit of sustainability (OIV, 2008). Green growth tries to be an answer to the contradiction between economic development and environment. The General Assembly decides to develop the general principles of an international greenhouse gas, accounting a protocol for the vine and wine sector adaptable to each country’s situation and proposes to publish the General principles of the OIV GHG Accounting Protocol. Life cycle of vitivinicultural product consists of the following phases: grape production, wine processing, distribution and retail and end-life-phase (covering disposal and recycling) (OIV, 2011).

The supply-chain framework (product life cycle).

The supply chain is a sufficient tool of management to describe the production process. This tool could be used in green product making, and also, in wine making and gives the opportunity to analyze each stage of the life-cycle of each product.

When companies become more vertically integrated, they use supply chains to reduce all different sources of uncertainties and in addition, they can study alternative models about products and process, especially when a new product is being introduced in today's global marketplace (Lee and Billington, 1993). Although, there is no explicit description of supply chain management or its activities, it can be defined as "a virtual organization composed of several independent entities with the common target on an efficiently and effectively managing of all its entities and operations, including the integration of purchasing, the demand of management, a new product design and development and manufacturing planning and control". This definition may be used to describe all the value-adding activities from the raw materials extractor to the end users, including recycling, waste management and environment pollution (Tan, 2001). But, sustainable supply chain management (SSCM) can be defined “as the strategic, transparent integration and achievement of an organization’s social, environmental, and economic goals in the systemic coordination of key interorganizational business processes for improving the long-term economic performance of the individual company and its supply chains”. This framework thus provides an initial integration and extension of firm activities, and can further enhance the organization’s long-term viability (Carter and Rogers, 2008). Having a clear vision and objectives for the companies’ sustainable supply chain programme, this will provide direction for each company's strategy and in identifying areas for continuing improvement. If there are particular “hot spots” in supply chain, then these can be removed, in favor to the environment (UN, 2010). However, there is a lack of empirical analysis and case studies on performance metrics and specific measurements in a supply chain environment. Research and practitioner-driven initiatives are needed in the area of SCM performance measurement (Gunasekarana et al, 2004).

Green business is a holistic approach and can be defined as “those businesses that, across the whole economy, have made efforts to introduce low-carbon, efficient resources, and/or re-manufactured products, processes, services and business models, which allow them to operate

and deliver in a significantly more sustainable way than their closest competitors”. And, according to ‘Supply Chain Tool’, there are five key steps in each business product life cycle: inputs, process, outputs, environment externalities and marketing. Based on the five steps of the business life cycle, Figure -1 shows the two criteria for each step so as to adopt the green business practices. In the basis of green business typology and applying the necessary subjective judgment around some of the criteria that are identified in Figure-1, business could be categorized into 3 types in relation to greening their functions: (C1): Firms whose activity is to produce environmental goods and services. (C2): Firms which have taken active and identifiable steps to change their products and/or process so as to take a substantiality agenda into account and (C3): All other firms which have taken some steps to improve the process’ efficiency or change their brand’ image. Although a significant amount of work is required to establish this above workable set of criteria, this framework is comparative and covers the entire range of activities of the company or sector (Titley, 2008:2-7).

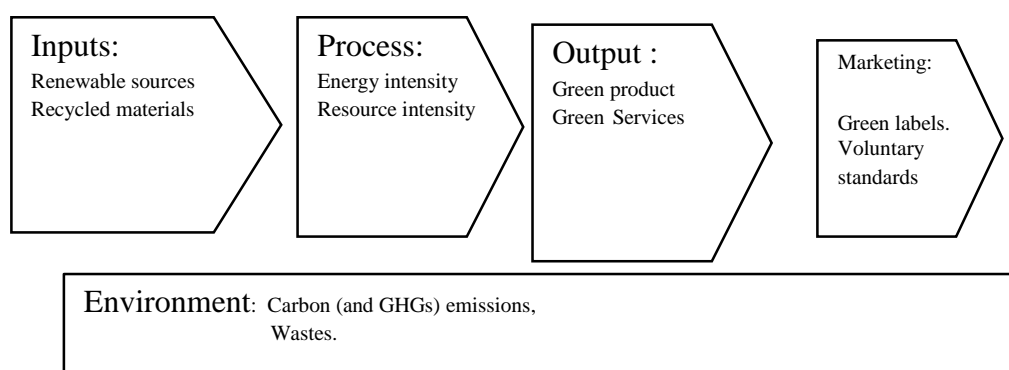


Figure: (1). Loop of manufacturing green system (Brian Titley, 2008).

Another view and estimate of sustainable production is the three laws of sustainable product development: (1) Minimize material and energy resources needed to satisfy product function and consumer demand. (2) Maximize usage of expended resources and (3) Minimize or eliminate the adverse impacts of waste and emissions (Nasr and Thurston, 2006). However, it should be stressed that, when the modern industrial supply chains often extend around the world, their environmental impacts should not merely be shifted across international boundaries through mechanisms such as outsourcing (OECD, 2012).

The ‘Adapted supply chain model’ for green wine industry.

Despite the wine industry manufactures product-wine of grapes, its survival depends on climate conditions for high quality wines and implementation of 'sustainable' strategy in the wine industry, which contributes to the protection of the environment. With the help of figure (1) a respective chain (figure. 2) can be formed for the industrial sector of the wine and respectively help us characterize a winery as a 'green' winery, according to the criteria and gravity rates that will have been defined into each stage of the chain operation. The wine production phase carried out by the winery starts with grape transportation, proceeds with winemaking processes and ends when the wine is ready to be packaged or sold as loose wine directly at the winery. So, a winery can be green when it satisfies a part of the greening procedure in each stage of the product life cycle. Of course, a benchmarking goal can be defined in every function (figure.2). In the past, the use of only organic grapes was adequate, but now more and more green functions are required to be classified as a green winery: from the kind of energy that is used, the kind of fermentation, the quality of wine that is produced, up to the

ways of marketing and management of wastes for environmental protection. The more green functions a winery uses throughout its operation, the more it is characterized as a green one.

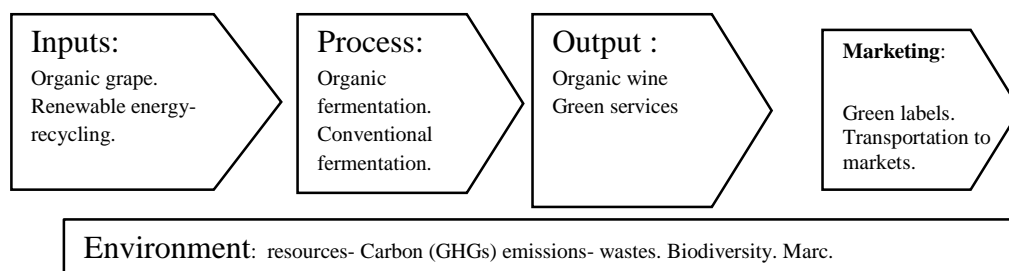


Figure (2): The ‘Adapted supply chain model’ for green wine industry.

According to figure (2) in the stage of inputs, the use of organic grapes, the use of renewable energy and the use of recycling materials are the basic characteristics of green winery. During the production process (second stage) there can be applied two fermentation methods: organic fermentation using traditional technologies or conventional fermentation using new technology with bio-yeast. Also, the use of sulfite is important to determine wine as organic. In the third phase, called output, wine conservation procedures are applied in oak barrels or bottling or again fermentation in high quality wines. By nowadays, by-products and wastes have been created, which are illustrated in the box called 'environment'. In the fourth phase of marketing, the green standards could be recyclable packaging materials, green labels which certify the wine quality, the amount of money spent on advertising and the gas emissions for the wine transport in all selling points. The box in figure (2), called 'environment', closes the above circuit and all the important environmental friendly services can be found there, such as waste management, marc, that protect or not the biodiversity of the region and create a tourist attraction.

With the distinction of the organic wine production in phases as shown in figure-2, one parameter-variable, such as gas emissions or wastes, can be estimated. So, an example of measurement of included emissions in the vine and wine sector could be: a) Fuel and energy used (even from not owned machinery) in vineyard operations (e.g. harvesting, vineyard treatments). b) Fuel and energy used (even from not owned machinery) in winemaking and processing (e.g. bottling). c) Fuel and energy used in the product transport. d) energy for waste disposal. Emissions related to business travels and the consumption phase are not included in the Production Product as they are not directly linked to the wine or grape life cycle, due to their negligible impacts (OIV, 2011, protocol). There is an emerging research interest about 'sustainability' on the wine industry and researchers can foster the adoption of sustainable practices among wineries at different levels, promote validity elements about public health with clean environment and create sustainability awareness between industry and consumers (Santini et al, 2013). The certification of environmentally friendly practices by a third party and the labeling of the eco-certification on the product provide specific benefits to the producers, such as improved reputation in the industry or increased product quality, which can lead to a price premium (Delmas and Grant, 2010).

According to figure (2), countries, regions and wineries could be characterized as 'green' in wine production, if they satisfy some of the green functions of the 'adapted green supply chain' model. Three categories could be formed: organic wines from organic grapes, organic wines on the base of sulfite content, and wines that are produced through environmental friendly practices.

Organic wine from organic grapes

This kind of wine has some extra advantages. The soil, in which organic methods of cultivation are applied, as it is known, needs years to be upgraded to an upper level of quality. Organic varieties do provide greater levels of vitamin C, iron, magnesium and phosphorus. They also tend to provide greater levels of antioxidant phytochemicals (anthocyanins, flavonoids and carotenoids). Regarding LDL- oxidation prevention, it appears that red wine is more potent than white wine and organic varieties provide no extra benefit. Organic fruits and vegetables appear to have the potential to diminish the mutagenic action of toxic compounds and inhibit the proliferation of certain cancer cell lines. In addition, organic food has fewer insecticide residues than conventional food (Crinnion, 2010). In Chile, though grapes are organic, there are two distinct classifications of organic wine depending on the production technique used. Organic Wine is subject to a completely organic production process, while the second type of organic wine which was made of organic grapes, uses organic grapes in a conventional winemaking process. Organic consumers are usually better educated than consumers of non-organic food and they buy organic products because they care for the environment and they are keen to support organic farmers for organic food as healthy and safe (JARA-ROJAS et al, 2013).

Organic wine and sulfites.

One of the important criteria for organic wine is its content in sulfite, that prevents microbial contamination. The use of sulfur dioxide persists in several stages of wine-making and in all domestic and foreign wines and beers as a preservative additive today. However, it may cause severe allergic reactions in susceptible individuals, especially asthmatics (Papaioannou and Pfeiffer, 1983). Until 2012, there was no EU legislation on organic wine and this year the Commission published the implementing rules for organic wine. The most complicated issue in drafting this legislation was sulfite reduction. According to the new rules, the maximum sulfite content is set at 100 mg per liter for red wine ,versus 150 mg/l for conventional, and 150mg/l for white/rosé, versus 200 mg/l for conventional, with a 30mg/l differential where the residual sugar content is more than 2g per liter. The regulation states that for organic wine, exported from the United States to the EU, the U.S. authorities have agreed to apply and certify compliance with the rules for organic wine in the EU Regulation (USDA, 2014; INFOAM, 2013). In Spain, 41 cellars are producing some wine with low or no added sulphites. The most recent approach is to control oxidation from the beginning of the grapes' processing through low temperature, dry ice, quick initiation of alcoholic and malic acid fermentation, cold stabilization, filtering and bottling, and as a result, microbial contamination can be avoided (INFOAM, 2013).

Wineries with environmental friendly practices- The climate change.

In the past decades, the policy about the environmental harm caused by industrial production was to disperse pollution in less harmful ways and the meaning was concentrated in the phrase: "the solution to pollution is dilution". But in 1989, the United Nations Environment Programme (UNEP) introduced a new Cleaner Production Programme with a new concept and philosophy: "anticipate and prevent", through an integrated environmental strategy. The major factor distinguishing the new policy from previous policies is the fact that attention shifts towards the earlier stages of the industrial process, e.g. the source of pollution, and investigates all aspects of the production process and organization, in areas in which environmental harm can be reduced or eliminated (OECD, 2009:24-25). By stimulating innovation, strict environmental regulations can actually enhance competitiveness and the companies have numerous avenues for technological improvement. Moreover, environmental

regulations may also reduce product cost by showing how to eliminate costly materials, reduce unnecessary packaging or simplify designs (Porter & Linde, 1995). As far as climate change is concerned, which is affected by manufacturing activities by the emissions of CO₂, the first significant political decision was taken by 154 nations in 1992 (UN) and the Kyoto Protocol, was adopted in 1997 and entered into force in 2005. The recently Paris Agreement (2015) marks a major step forward beyond the Kyoto Protocol with a more ambitious reduction target of 1.5°C. This agreement could signal the beginning of the end of the fossil fuel era with aggressive development of the renewable energy sources, which would promote sustainable development, climate stabilization, and a major improvement in global health (Codur et al, 2016).

So, one of the oldest wineries in California (dating back to 1893) uses modern methods to energy saving. The electricity for the winery comes from its solar panel installation accounting for 70% and the upcoming projects include additional lighting and refrigeration control upgrades. Another sustainable production initiative was the way of managing the winery's wastewater ponds from a double- containment- ammonia-activated system to one that uses pellets to induce microbial activity that processes the waste. So, the economic cost was reduced to 80% and of course, the environmental impact was more significant, because "instead of having trucks full of ammonia arriving at the winery, we get little boxes filled with pellets" (CSWA, 2013). Both the average growing-season climate and temperature extremes, such as very hot days, can affect vine and fruit development. Generally, fruit's prices are substantially higher than in even moderately cooler regions. For example, Cabernet Sauvignon from the Fresno district was sold for about \$260/ton in 2006, compared to fruit from the Napa district, which was sold for over \$4,100/ton. This 15-fold difference in price was accompanied with just a 2.7°C (5°F) cooler average annual temperature. Another option to face climate change is to shift the location of plantings, for example, to cooler regions further north, but this presents obvious problems to small growers with limited holdings — and long traditions — in a specific region. Genetic solutions about the new varieties of wine grapes have not developed in the last 50 years (Nicholas & Field, 2008). New Zealand tries to maintain the benefits of the nation's clean, green image, without GMO, because the educated and affluent consumers in Europe and the Far East increasingly want 'safe' food (Sustainability Council of New Zealand, 2003). In South Africa, a program developed from 1998 for sustainable winegrowing is called IPW [Integrated Production of Wine]and it follows a clearly tourist oriented approach using its responsibility for biodiversity and therefore ,the protection of the local flora and fauna as a tourist attraction (Gemmrich and Arnold, 2007). Due to the fact that Greece is one of the world's warmer wine regions, researches were convinced about the effect of regional climate change in viticultural areas with increases in temperature that affect mainly maturing and the quality of the grapes of greek indigenous varieties that were examined. Areas with late ripening varieties were shown to be less sensitive to climate changes (Koufos et al, 2013).

Thessaly is a Greek region and contains mostly four special wine zones, from where some empirical data were collected. One of them, called "Tyrnavos" is orientated mostly to the production of table wines and "Moschato Ambourgou" dominates. In the second region of Karditsa, two native wine varieties of them, called "mauro messienikola" and "leuki poikilia Mpatiki", are cultivated and therefore, red and white wines are produced. The third region is near the Pagasitikos gulf and its vineyards are located in "Nea Aghialos", where the main special variety, which is called "Roditis",is produced, but other varieties exist as well, such as "Sykiotis" and "Sabatiano". The fourth region vineyards of "Rapsani" are located near the highest Greek mountain, Olympos and the indigenous varieties in "Rapsani" are "Krasato", "Stavroto" and "Xinomavro" (Kourakou-Dragona, 1987). Local factors as terrain, micro-climate, atmospheric humidity and sunshine during the ripening period of grapes are some of the most important factors that give special characteristics to Thessaly wines.

C. Method.

I conducted a research with questionnaires about wineries in Thessaly region, during the period April 2014- September 2014. The goal of the research (in the frame of my phd thesis) was to investigate the Thessaly wine industry in relation to green development. The sample was 24 questionnaires of total 54 wineries from the lists of the Chambers. For the kind of grapes that are used and also, about which must be the Greek answer to the global competition, I carried out the cross-section-data analysis ,whereas for the variables : production amount, using capital, employees number, cost of raw materials, cost of energy, amount for R&D, exports and also whether wineries use renewable energy or how they manipulate their wastes and if they participate in networking, I used the average- cross- section- data analysis throughout six years (from 2008 to 2013) in order to have a better image of the industry, because the owners of wineries were afraid to give me the data easily. The active and highly effective interference of my University to the questionnaire’s protocol was of great help to the data’ collection. The data were divided into two groups: the conventional and the organic wineries. The SPSS package (version 16) was used to elaborate the data. At the same time, a qualitative research was conducted without a structured questionnaire, to complete the image of each winery.

D. Findings/results.

Qualitative findings/results. a). From my research with unstructured questionnaire, in Thessaly wine region all wineries owners stressed the negative impact of the increase in the price of fossil fuels and the necessity of exports because domestic market is restricted after GDP decrease. Greater pressure appeared in organic wine, because of higher prices of organic wine in comparison to conventional, and especially the small organic producers have reached the limits of survival, because of small subsidy and bureaucracy.

b). Difficulties were faced in my effort to collect accurate data about the amount of production, the cost of production, the money for R&D, and accurate data about exports. After my insistence and the intervention of my University, the owners-directors agreed to give data - approximately and as a result, not so accurately - because they were afraid of the competition. The same situation is verified from the PRC Group’s research (2009) in Greece.

c). Organic winemakers feel that their contribution to the organic production is the wine production of organic grapes (which is produced in majority from owners-Diagram.5) and that organic waste is used as fertilizer on farms. And, according to the Figure 2 (winery green system) there are only two actions relevant to the green winemaking.

Quantitative findings/results. a). Total production seems to have a slow reduction from 2008 to 2013 (Diagram 1) due to the limitation of creating new vineyards. The percentage of conventional production is 74.7% in total production, while organic production is 25.3 % (Table A). This percentage shows that the organic sector is growing slowly.

Diagram 1: Total production.

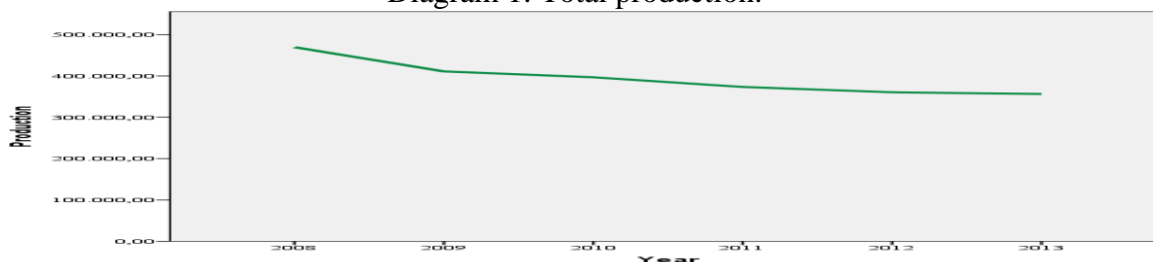


Table A. Wine production in Thessaly region.

2008-2013	Total production wine	Conventional wine	Organic wine
Thessaly region	57175344,00 lit	42732584,00 lit	14442760,00 lit
Percent	100 %	74,7 %	25,3 %

b). It is confirmed and in the area of Thessaly that the wine industry has a high degree of concentration, as in Greek wine industry (PRC Group, 2009). There are few but big wineries which use a large amount of capital, some medium companies and a lot of small companies, both conventional and organic wineries (Diagrams 2 & 3). More specifically, the Diagram 2 shows the difference between large conventional wine companies (they use from 2 million euro to 4 million euro) and medium-small companies that use a maximum of half a million euro. The same picture is about the organic wine companies as well.

Diagram 2. Capital that conventional wineries companies have used.

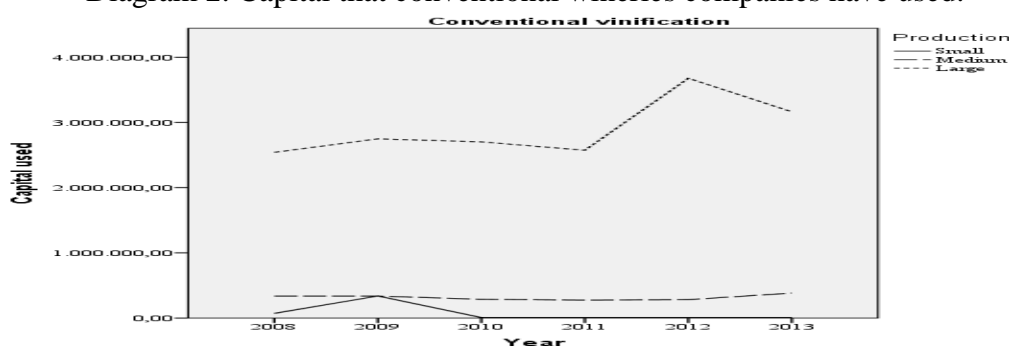
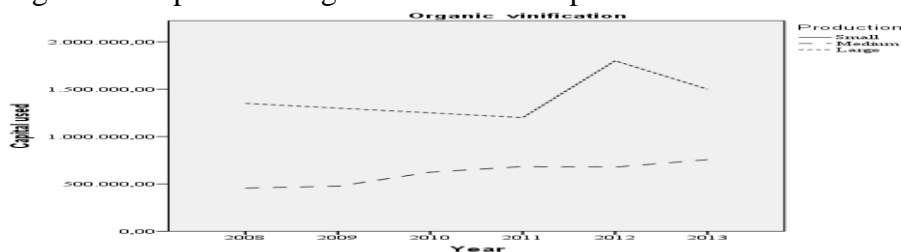
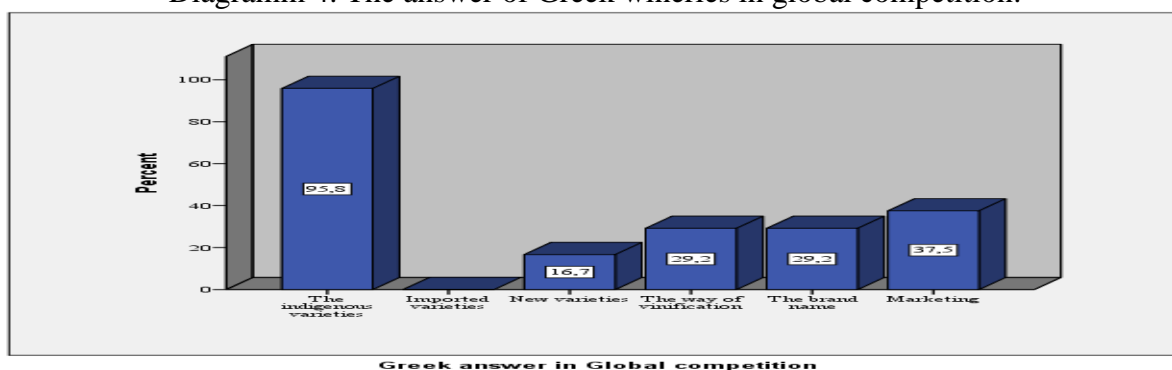


Diagram 3. Capital that organic wineries companies have used.



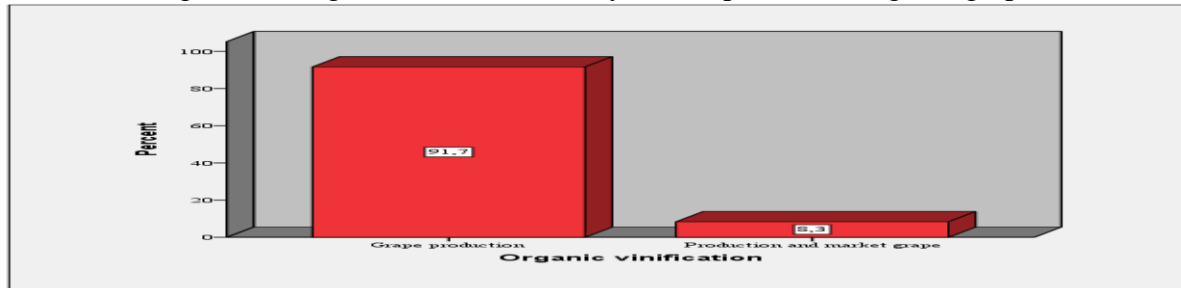
c). Greek winemakers believe that the Greek answer to global competition is: indigenous varieties with a percent 95.8 %, marketing 37.5 %, brand name and method of winemaking with a percent 29.2 % and new varieties with 16.7% (Diagram, 4). This shows: the locality against globalization.

Diagramm 4. The answer of Greek wineries in global competition.



d). *Organic vinification* comes mostly from organic grapes, 91,7 % of them are cultivated from wineries, while the 8,3 % of organic grapes are bought from other organic grape producers (Diagram 5). There are not many organic grape producers because of the high cost production and the low subsidy of organic products.

Diagram 5: Organic vinification, only 8,3 % purchased organic grapes.



e). *Energy*. The cost's curve of energy of fossil fuel has the same increasing evolution both for conventional and organic wineries. However, there is a steady but small use of renewable energy sources in organic wineries, and in conventional wineries it seems to have a little increase in 2012 (because of state subsidies this year and of the increased prices of fossil fuels the same year) (Diagram 6: a, b, c, d).

Diagram (6.a). Cost of fossil fuel energy in conventional wineries.

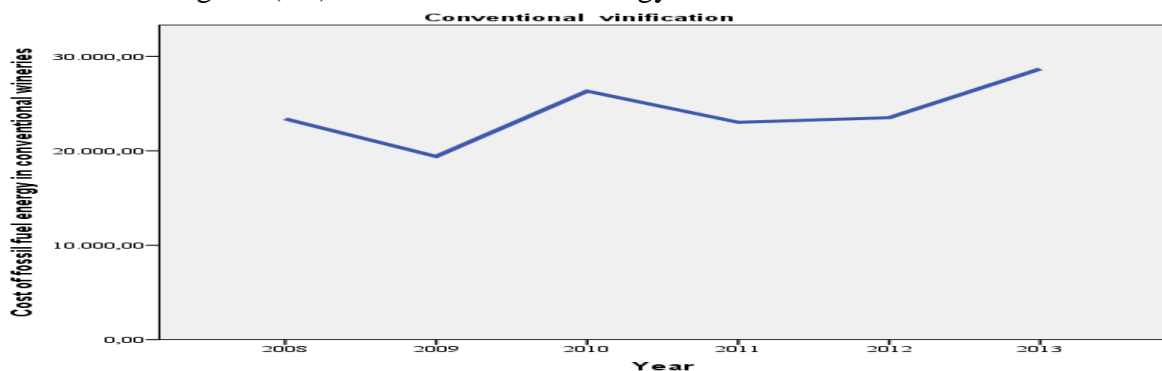


Diagram (6.b). Cost of fossil fuel energy in organic wineries.

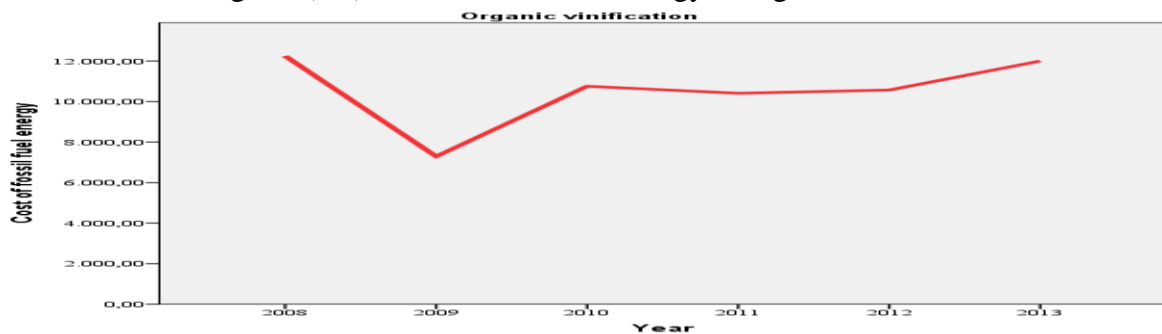


Diagram (6.c). Cost of renewable source energy in conventional wineries.

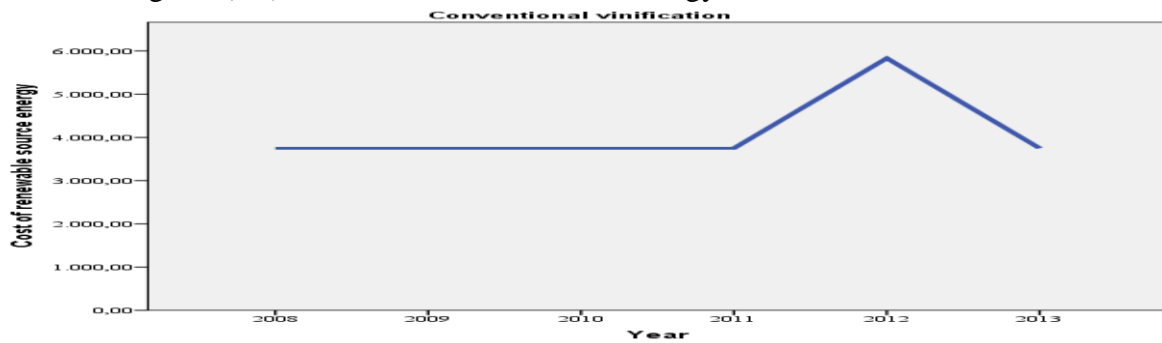
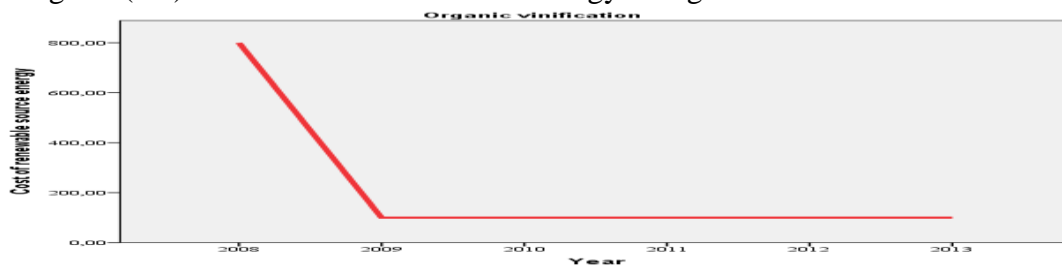


Diagram (6.d). Cost of renewable source energy in organic wineries.



f). *Waste management.* In the question, about the reclaim of the waste 80 % percent of the respondents answered yes, both in conventional and organic wineries. (Diagram 7: a, b). This is a second important criterion of sustainability in Thessaly region wineries.

Diagram (7.a). Reclaim of wastes in conventional wineries.

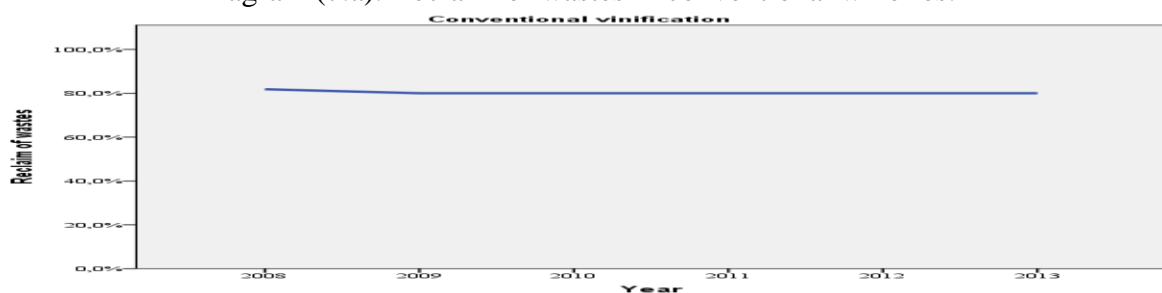


Diagram (7.b). Reclaim of wastes in organic wineries.



Opportunities and threats. Thus, my own research confirmed that organic wine is mainly based upon organic grapes, while there are other functions according to *adapted supply chain for wineries* (figure, 2) that help in sustainability such as: recycling materials, the low use of sulfite, the reduction emission gas for wine transport to the selling points, the protection of biodiversity of the region and the creation of tourist attractions. There is a small but growing trend in renewable energy use because of subsidy and also, sufficient waste management. However, the very small organic wineries face survival problems due to increased costs and low- sales price of their products and maybe experienced producers in rare varieties of wine will be lost.

Conclusion

In the basis of the concept of Sustainable Development and specifically in the concept of Green Development, there was found that the principles of sustainability can be applied in wine industry for the benefit of companies, consumers, environment and of climate change. The increases in temperature can mainly affect the maturing and the quality of grapes. Winemaking can be described through the “adapted supply chain model” for wineries and in each of these stages of the chain, some green criteria can be applied, so that wineries can be classified as green wineries with contribution to sustainability (Figure, 2). However, the criteria of sulfite content, that was defined by OIV in 2012 are strong, as well as the perception that organic wine should be produced from organic grapes. Some best practices of wineries in global level that confirm sustainability practices are: in the California region some wineries have developed new methods to save energy or apply renewable energy sources; others have replaced chemical ways for wastes through mechanical methods; few wineries in Spain have applied new methods of fermentation through refrigeration control of must; and in the New Zealand region, winemakers have decided not to use GMO, according to customers' wish.

In Greece, high quality wines have been produced since the ancient years. From the empirical elements of my research in Thessaly wine region, the same perception has been recorded about the definition of organic venification, namely, using only organic grapes. There is also, a limited use of renewable energy, but sufficient management of wastes. High concentration in the degree of the wine industry's sector is observed in Thessaly region, and Greek winemakers believe that the Greek answer to global competition is the indigenous varieties.

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