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Review

Critical environmental concerns in wine production: an integrative review



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ABSTRACT

Despite the wine industry's reputation as being environmentally safe, prior research has shown the cultivation of wine grapes and production of wine to be associated with a large number of environmental concerns. The present study utilised an integrative literature review to investigate key areas of environmental concern currently faced by organisations in the global wine industry. Concerns discussed include water use and quality, the generation and management of organic and inorganic waste streams, energy use and the production of greenhouse gas emissions, chemical use, land use issues and the impact on ecosystems. The review reveals current practice within wine organisations to be largely unexplored and inadequate. Practice is characterised by a lack of the quantitative environmental data required if the industry is to bring about lasting environmental improvement to operational processes, products, and towards economically and environmentally improved performance.

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1. Introduction

Recent years have seen mounting interest in research into environmental management in high profile 'dirty' industries (Handfield et al., 2005). Growing interest in carbon dioxide emissions reduction has recently broadened the number of industries which are seen to pollute and require better environmental management (Kauffmann and Tébar Less, 2010; Ratnatunga and Balachandran, 2009). Some industries portray a clean and green image yet their environmental implications remain under researched. Wine production, one of the world's oldest industries (Pretorius, 2000), is one industry for which environmental issues have gone largely unexplored (Barber et al., 2009; Marshall et al., 2005). While the industry is often promoted with idyllic images that depict sweeping green vistas (Delmas and Grant, 2010), the cultivation of wine grapes and production of wine are far from environmentally benign activities (Gabzdylva et al., 2009). Although subject to less political and media scrutiny when compared with other industries such as chemicals and mining, there remain many environmental issues with which wine producers have to contend (Ene et al., 2013; Marshall et al., 2005). The industry influences the physical environment within which it operates and at

the same time its future viability is inextricably linked to environmental impacts and conditions (Schaltegger and Burritt, 2000).¹ Given the economic and cultural significance attributed to wine production across many of the world's regions, it is vital that research be undertaken to understand and minimise the negative environmental impacts associated with the industry's activities. Such effort is crucial to ensuring the industry remains economically and environmentally sustainable, both now and in the future. In order to encourage further research and provide a foundation for understanding environmental management in the global wine industry, the present article will utilise an integrative literature review to investigate the key areas of environmental concern currently facing wine producing organisations.

The remainder of this paper is arranged as follows. Section 2 discusses the lack of extant academic efforts in the area of wine-related environmental management research. Section 3 discusses the methods used in this study. This is followed by Section 4 which offers a detailed integrative literature review concerning the key areas of environmental impact associated with wine production at the vineyard and processing levels. This section also incorporates a number of sub-sections in which areas of environmental concern

¹ While the production of wine undoubtedly impacts the physical environment paradoxically the environment in which the grapes are grown is also of utmost importance in determining the quality of the wine produced. It can be argued, therefore, wine producers have an inherent interest to engage with and promote sound environmental management principles.

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are individually addressed. Section 5 addresses the life-cycle issues associated with wine-related environmental management. Section 6 contains discussion, while Section 7 summarises and concludes the paper while also offering suggestions for future research based on the evidence presented in Sections 4 and 5.

2. The environmental impact of wine production – the need for an academic contribution

Despite being associated with a large number of environmental ills, the wine industry has traditionally been subject to a lesser amount of regulatory attention when compared to organisations operating in other manufacturing settings (Ene et al., 2013; Gabzdylova et al., 2009; Marshall et al., 2005). Russell and Battaglene (2007) suggest this situation may be testament to the fact wine has generally been considered an environmentally ‘safe’ product (also see Ruggieri et al., 2009). However, while past misconceptions may extend the industry a degree of protection from excessive regulation and public scrutiny, they also present a conundrum for industry participants when assessing the merits of environmental management; ignore the environmental consequences of their activities, or take action and risk drawing attention to the negative environmental impacts associated with industry undertakings (Warner, 2007). Notwithstanding the aforementioned discussion, evidence suggests regulators from around the world are becoming increasingly aware of the environmental implications of wine production and industry associations are responding through the development of proactive environmental initiatives that appear to be designed to support environmental self-regulation (Cordano et al., 2010; Pullman et al., 2010; Silverman et al., 2005).² Recent years have also seen proactive environmental efforts emanate from a limited number of individual organisations; however, it can be argued these efforts are the exception as opposed to the rule.

As alluded to in the previous paragraph, to date efforts to improve the environmental performance of wine organisations have been largely driven from within the industry itself (Cordano et al., 2010). While such action would appear to be a step in the right direction, it has been argued the effectiveness of current programs is largely unconfirmed and subject to debate (Hughes et al., 2005; Silverman et al., 2005). While industry associations appear to be maintaining a focus on industry-wide environmental improvement, a lack of information on specific areas of environmental concern is creating a large amount of confusion for individuals working at the coalface. Improving knowledge within the aforementioned area is an undertaking with which academic research has great potential to assist.

The last ten years have seen a burgeoning effort given to investigating environmental management within wine organisations; however, it can be argued this body of research remains disjointed and underdeveloped. Hitherto academic outputs have ranged from a limited number of generic studies that explore environmental management within and across different regions (e.g. Gabzdylova et al., 2009; Marshall et al., 2010), to other studies that offer scientific evidence in support of innovations designed to address specific areas of environmental concern (e.g. the land filter technique for wastewater treatment proposed by Christen et al.

(2010)). However, within this literature a holistic summary of the environmental problems facing wine producers is yet to be offered and a number of these issues remain poorly understood. By providing a summary of wine-related environmental concerns it is hoped the current paper will afford a foundation for other academics, thereby encouraging further engagement with wine-specific environmental research which is required if effective industry-wide environmental solutions are to be realised. Hence, this paper will utilise an integrative literature review in an attempt to address the following question: (RQ1) *What are the key areas of environmental concern currently facing the global wine industry?* The next section will discuss the method used to answer this question.

3. Research method

In order to understand the environmental concerns currently facing the global wine industry, an integrative literature review was conducted. An integrative literature review requires the author to present and summarise “the current state of knowledge on a topic” (Neuman, 2006, p. 112) and to provide a synthesis, in this case leading to identification of a “research agenda that flows logically from the critical analysis of the literature” (Torraco, 2005, p. 363). Literature for inclusion in the review is gleaned from the following databases: Science Direct, EBSCO, Emerald Management Plus, JSTOR, ProQuest, SpringerLink, Taylor and Francis and Wiley Interscience. Keywords employed in initial database searches included: “environmental management”, “environmental impact”, and “environmental concern”. These items were combined in various forms with the following wine-specific search terms: “wine industry”, “viticulture”, “wine production”, “winegrape growing” and “oenology”. Database search tools were set to order references based on relevance to these search terms.

Articles in which the wine industry was the specific research concern were read in full with individual areas of environmental concern documented and tabulated against relevant references. This process continued until a saturation point was reached at which no new information or additional insight was forthcoming. The literature was then critically analysed in line with each of the key areas identified using the method outlined above. The process described facilitated a clearer understanding of the environmental concerns currently facing the global wine industry. This understanding incorporated not only new insights, but also areas in which knowledge is deficient.

However, while every effort has been made to ensure the following review provides a balanced and unbiased description of the current situation, it also comes with a caveat. Although desirable to include a cross-section of evidence from a variety of wine regions, limited academic publications across a number of areas meant this was not always possible and, where necessary, academic literature has been supplemented with government and industry-based reports, as well as commissioned and non-commissioned studies conducted by independent research bodies. In addition, while the extant literature contains many examples of research projects concerned with technological and scientific advances that may be able to improve specific areas of environmental concern within the global wine industry, such studies are not elaborated further here. The main reason is, as noted by Devesa-Rey et al. (2011, p. 2333), that wine organisations often encounter difficulty in transferring scientific research findings into actual practice. It would appear that what seems feasible within a laboratory or controlled environment, and in the presence of experienced researchers, will often encounter difficulties in the face of the commercial realities of contemporary business. This is by no means to discount or discourage wine-related scientific and technological research, and indeed further study investigating the diffusion of

² Examples of such initiatives include the Entwine Australia program, Sustainable Winegrowing New Zealand, the Code of Sustainable Winegrowing Practices in the USA, the Integrated Production of Wine Scheme in South Africa, and other more generic programs such as ISO 14001 which are popular across the Old World wine regions of Europe (Knowles and Hill, 2001; Marshall et al., 2010; Warner, 2007; Winemakers' Federation of Australia, 2012).

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