



Comparative life cycle assessment in the wine sector: biodynamic vs. conventional viticulture activities in NW Spain



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ABSTRACT

Viticulture is currently experiencing a gradual shift to more sustainable production practices. Many producers see in this shift an opportunity to increase their sales, especially in a context which is greatly influenced by the reduction in wine sales due to the world economic crisis. Hence, both organic and biodynamic viticulture have begun to be applied in many vineyards as alternative attractive agricultural techniques. Nevertheless, it remains unclear which are the exact environmental benefits (or drawbacks) of applying these techniques for numerous environmental impacts, such as climate change or toxicity. Therefore, the main goal of this study is to perform an environmental evaluation using Life Cycle Assessment (LCA) for three different viticulture techniques within a single appellation (*Ribeiro*, NW Spain): biodynamic cultivation sites, conventional vineyards and an intermediate biodynamic-conventional wine-growing plantation (i.e. biodynamic site lacking certification). Moreover, two methodological improvements in the field of wine LCA studies are suggested and developed in terms of land use impact categories and labour inclusion in life-cycle thinking. Results demonstrate that biodynamic production implies the lowest environmental burdens, and the highest environmental impacts were linked to conventional agricultural practices. The main reasons for this strong decrease in environmental impacts for the biodynamic site is related to an 80% decrease in diesel inputs, due to a lower application of plant protection products and fertilisers, and the introduction of manual work rather than mechanised activities in the vineyards. Nevertheless, a series of preliminary assessments suggest that the impacts linked to land use and human labour, two under-analysed issues in wine LCA, may show different trends to those obtained for the other environmental dimensions, adding complexity to the integrated interpretation of the results.

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1. Introduction

Historically the production of wine has concentrated in Europe. However, the so called “New World” wines have experienced a strong development in recent decades in countries such as United States, Argentina, Chile, Australia or South Africa. Ever since year 2000, the surface dedicated to viticulture has decreased on a worldwide level, while the production of wine has remained constant (OIV, 2012). Nowadays, Europe still represents roughly 60% of the global surface area used for wine-growing. More specifically, Spain is the country with the highest surface area destined for

grape production, representing 18.3% of the world’s vineyards (OIV, 2012). However, in terms of wine production, Spain is the third world producer, after France and Italy, with 33 million hectolitres in 2011 (OIV, 2012). Galicia (NW Spain) only represents 1% of the Spanish vineyard surface (INE, 2012). However, the five appellations in this region, *Monterrei*, *Rías Baixas*, *Ribeira Sacra*, *Ribeiro* and *Valdeorras*, have acquired international recognition for their quality (Decanter, 2012).

Currently, viticulture is experiencing a gradual shift to more sustainable production patterns (Gabzdylóva et al., 2009). In fact, many producers see in this shift an opportunity to increase their sales, especially in a context which is greatly influenced by the reduction in wine sales due to the world economic crisis (OIV, 2011). Therefore, many producers have initiated or have already accomplished the conversion towards field operations that improve the environmental profile of wine production. Hence, both organic

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