



## Economic-environmental impact analysis of alternative systems for red wine ageing in re-used barrels

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### ABSTRACT

When wood comes into contact with wine, organoleptic properties valued in oenology are generated, which are lost over time and barrels use, so alternative processes are currently used into old barrels as adding wood chips, sticks and staves for keep those properties; however, the environmental and economic impact of the use of these alternatives is not known. This article presents a life cycle assessment (LCA) and economic analysis for those common alternative process used for keep organoleptic properties, but using barrels additives from *Quercus alba* and *Quercus petraea* wood. The ISO 14040 standard is employed for the LCA in Simapro® software, making use of the CML-IA baseline V3.04/EU25 methodology and for the economic analysis the production cost is used. The results indicate that aggregating wood chips to recover the organoleptic properties on wine is the alternative that generates less environmental impact and the least expensive, while the highest environmental impact and cost are produced when using wood slaves. On the other hand, additives from *Quercus alba* wood are less expensive and present low environmental impact in relation to those from *Quercus petraea*.

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### 1. Introduction

The food industry is currently using several techniques for improve their production process and resource management (Nabavi-Pelesaraei et al., 2016) and currently is necessary to modelling the and measure the input as row material and energy, and outputs as products and waste (Nabavi-Pelesaraei et al., 2014; Qasemi-Kordkheili and Nabavi-Pelesaraei, 2014).

An important food industry is winery production, where there are several processes to be optimized and researches always are looking to improve it and propose alternatives to traditional

production process. For example, Oxidative vinification in oak barrels has great advantages, since its wood, when in direct contact with the wine, will give it some aromas and phenolic compounds, with the consequent modification of the aromatic and gustatory characteristics (Del Alamo-Sanza and Nevares, 2014; Ribéreau-Gayon, 1999; Zamora, 2003). This process in oak barrels provides the product with aroma, taste, color, and body; therefore, the product is called ageing wine, and represents an increase in added value and quality (González-Arenzana et al., 2019).

This type of ageing wines has become a standard among the main producing countries of top-quality wines, but their use involves high economic costs due to:

- Difficulty of access to oak wood due mainly to the shortage.
- Investment in barrels and high cost.
- Limited life of barrels (5–7 years).
- Losses due to absorption and losses due to evaporation of the wood from a new barrel.
- Maintenance, cleaning and use of barrels (cost).

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