Evaluation of the life cycle of the wine production chain in Portugal: carbon and blue water footprint

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Abstract (300 word limit)

An increasing tendency in annual air temperature has been observed in Portugal, because of the global climate change. Climate change can affect the available water supply and may also increase evapotranspiration from crops and hence reducing the availability of water for irrigation. Carbon Footprint (CF) and Blue Water Footprint (BWF) are two of the most commonly used indicators for assessing the direct and indirect environmental impacts related to wine production. The aim of this work was to assess the carbon and water footprint of a bottle of wine produced in Portugal, throughout a cradle-to-gate the life cycle assessment (LCA) approach (ISO 14044). The input data were collected from a vineyard and a winery located in Santarém, Portugal. The functional unit selected for the study was a 0.75L bottle of wine. The LCA of the CF followed the CML 2001 methodology updated to the current data. The results showed values of 108L for the BWF, with more than 90% of the impact arising from groundwater withdrawal for vineyard irrigation. The high values related to irrigation in the vineyard can be explained by the climate of the region. This region has one of the lowest rainfall rates in the entire Portuguese territory and the distribution between the rainy years is extremely irregular. For the CF, the results showed values of 0.44 kg CO_2-eq. Production of glass bottles and production of electricity are the most impacting processes accounting for 67.5% and 12.5%, respectively. A good correlation (>97%) was found by comparing CF and BWF indicators, indicating a direct proportionality between the indicators for the processes involved in wine production. The result evidence that an intervention to minimize the impacts related to the BWF can also minimize the impacts of the CF. This study will provide additional support for strategic decisions in this sector.

Image

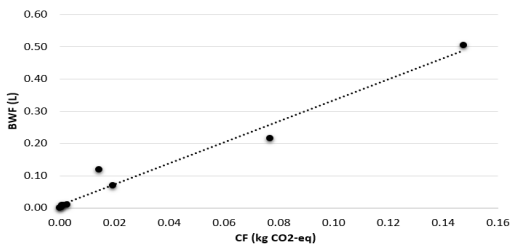


Figure 1: Correlation analysis for the wine bottle: CF vs BWF

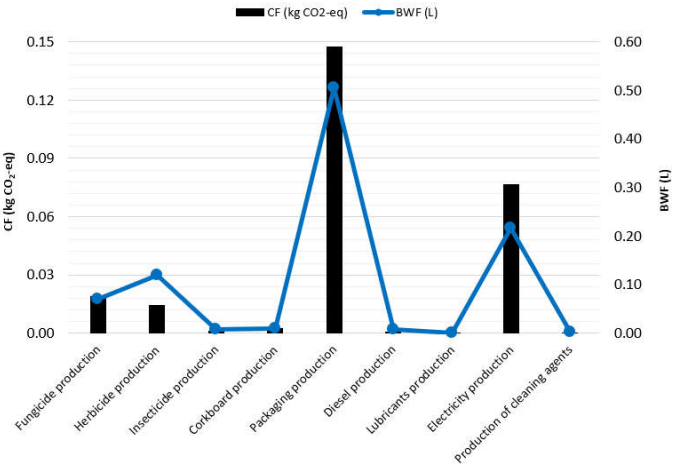


Figure 2: Contribution of processes related to the LCA of wine production.

Recent Publications (minimum 5)

1. Bonamente E, Scrucca F, Rinaldi S, Merico MC, Asdrubali F, Lamastra L (2016) Environmental impact of an Italian wine bottle: Carbon and water footprint assessment. Science of The Total Environment 560-561:274-283.
2. Civit B, Piastrellini R, Curadelli S, Arena, AP (2018) The water consumed in the production of grapes for vinification (Vitis vinifera): Mapping the blue and green water footprint. Ecological Indicators 85:236-243.
3. Fraga H, Santos J, Malheiro AC, Oliveira AA, Moutinho-Pereira J, Chaves MM (2016) Climatic suitability of Portuguese grapevine varieties and climate change adaptation. International Journal of Climatology 36:1-12.
4. Lovarelli D, Ingrao C, Fiala M, Bacenetti J (2018) Beyond the Water Footprint: A new framework proposal to assess freshwater environmental impact and consumption. Journal of Cleaner Production 172:4189-4199
5. Rinaldi S, Bonamente E, Scrucca F, Merico MC, Asdrubali F, Cotana F (2016) Water and Carbon Footprint of Wine: Methodology Review and Application to a Case Study. Sustainability 8:1-17.



Biography (150 word limit)

Pedro Henrique Presumido is an Environmental Engineer from the Federal Technological University of Parana (Brazil) and a Master's degree in Environmental Technology from the Polytechnic Institute of Braganca (Portugal). He is currently a researcher at the Center for Mountain Research (CIMO) and has experiences with Life Cycle Assessment and indicators of environmental footprints.

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