Carbon footprint of Australian wine

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Why measure carbon?
Carbon emissions, or more generally greenhouse gases, contribute to global warming, which has been described as “the greatest challenge of our time” (Gilis 2013). The world is transitioning to a low carbon economy and this is playing out in many of Australia’s key export markets in the form of product-based sustainability criteria. The AWRI assists vineyards and wineries to measure their carbon emissions through the Entwine Australia program, which is helping members to drive process efficiencies and manage environmental impacts while also working to improve market access.

Life cycle assessment?
This poster presents a life cycle assessment (LCA) model of Australian wine production and sales. LCA looks at the environmental impacts at all stages of the wine’s life cycle, from the extraction of raw materials like oil and sand, to energy and glass production, grape growing, winemaking, waste treatment, overseas shipping and recycling of packaging material. The model includes wine sold in all major formats: cask and glass domestically, and bottled and bulk for export wines.

Export: bulk vs bottle
Bulk wine leaving the winery is far less emissions-intensive than bottled wine, but only because the bottle hasn’t been made yet. The packaging still needs to be produced in the destination market. This shifts the glass production emissions outside of Australia, but given global warming is a global problem, may not provide any benefit.

There are, however, benefits in transport efficiencies provided by not shipping the glass mass. Whether these benefits outweigh bottle emissions depends on whether glass production in the destination market is more or less carbon-intensive than it is in Australia, and by how much. This generally comes down to the recycled content of the glass production (~30% in Australia) and the local electricity mix (relatively high fossil fuel use in Australia).

Packaging format
Glass bottles are the single biggest emission source for wine packaged in glass. The emissions are strongly tied to glass weight, which has led to a considerable shift towards lightweight bottles in recent years. The current technical limit is approximately 330 g for 750 ml still wine bottles. This saves 15% of the total carbon footprint compared to standard 500 g bottles, including savings on transport emissions. Conversely, a premium 750 g bottle can increase the carbon footprint by 20%.

Cask packaging is much less energy-intensive than glass production. Wine packaged in casks is approximately 40% lower in emissions compared to standard glass bottles, and there is very little difference between different cask sizes, on a per litre basis.

Where does the data come from?
The model is based on data collected from Entwine Australia. The program covers 25% of the vineyard area in Australia and 43% of the winery crush, which is a significant sample size. The grape growing stage was modelled using regional averages, scaled to match the amounts harvested in each zone, while the winery stage was modelled based on winery size categories to capture economies of scale.

Reference