

Greenhouse Gas Inventory for Lowlands Wines

Robert Holdaway, July 2021

This document summarises the methods employed in the calculation of a net greenhouse gas inventory for Lowlands Wines for 2020. Company activities include emissions associated with viticulture, winemaking, bottling and distribution, as well as offsets through afforestation activities including production forestry and native forest regeneration.

Emissions calculations

Data from the 2020 calendar year were used to estimate annual emissions (expressed in units of Mg CO₂e) for all company related activities. The emission assessment followed methods recommended for the New Zealand wine industry (Greenhaigh et al. 2008). Where data were lacking, industry averages, or generic (often high) emissions factors were used.

Emissions were allocated using the following boundaries. Grape sale emissions stop when grapes are delivered to the receiving winery. Bulk wine emissions stop when wine is delivered to the receiving winery. Bottled wine emissions stop when the wine produced in 2020 is in the hands of a customer. Elements included in the emissions calculations and their values for 2020 are given in Table 1.

Following the recommendations in Greenhaigh et al. (2008), included in the assessment are all emissions that are integral to the production of the product. This included distribution to a foreign destination port or domestic retailer, and embodied GHG associated with consumable inputs to the vineyard and wine production process. Contract activities are also included. Emissions from capital goods, soil, human energy inputs, consumer emissions, outlets and transport of employees to and from place of work are excluded. Emissions sources that are likely to be <1% of total emissions were also excluded (Greenhaigh et al. 2008).

Direct electricity and liquid fuel emissions include electricity for all uses (lights, pumps, equipment) and fuel for all uses (tractors, truck, utes, for spraying, mowing, harvest etc.). Total vineyard emissions per ha were 991.34 kg CO₂e /ha, significantly lower than a recent industry estimate of 3000 kg CO₂e / ha (Andrews 2020). No specific data for winery emissions were available so a standard industry value of 0.313 kg CO₂e / litre wine (Greenhaigh et al. 2008) was used. Packaging and distribution calculations used emissions factors given in Greenhaigh et al. (2008), and came to a total of 0.531 kg / bottle.

Emissions intensity (per bottle of own-label wine produced) were estimated based on average yield of 16t/ha, and a grape to wine conversion rate of 0.75. This value was 0.828 kg CO₂e / bottle. This is lower than the 1.243 kg CO₂e / bottle estimate from Greenhaigh et al. (2008), mainly due to the use of lightweight packaging and lower per-bottle vineyard emissions.

Table 1: Emissions calculations for Lowlands Wines for 2020

Emission Source	Emissions estimate	Units
Vineyard		
Liquid fuel (diesel, petrol, LPG)	648.85	kg CO ₂ e / ha
Electricity	56.16	kg CO ₂ e / ha
Sprays	204.03	kg CO ₂ e / ha
Fertiliser	82.30	kg CO ₂ e / ha
All vineyard emissions	991.34	kg CO₂e / ha
Winery		
All winemaking activities	0.313	kg CO₂e / litre wine
Packaging and distribution		
Bottles	0.225	kg CO ₂ e / 750ml bottle
All other packaging	0.086	kg CO ₂ e / 750ml bottle
Distribution	0.220	kg CO ₂ e / 750ml bottle
All packaging / distribution emissions	0.531	kg CO₂e / 750ml bottle

Carbon sink calculations

Only sinks from conversion of currently owned land to forest were included in these calculations. Other potential sinks such as increases in vineyard soil carbon through regenerative soil management practices, or any potential future investment in forestry were not included.

Carbon sinks for planted (production) forests were calculated using the averaging method recently employed by the New Zealand Government (Ministry for Primary Industries 2021). This method accrues carbon for the first rotation of the forest up to the long term average carbon stock achieved over multiple rotations. This recognises that on average, production forests store significantly more carbon than non-forested land.

All forests planted post-1989 were included in our sink calculations, regardless of any specific policy and accounting time periods, or whether the land was registered in the New Zealand Emissions Trading Scheme or not.

Default carbon lookup tables for Nelson-Marlborough were used up till year 17 when average carbon value of 290 Mg CO₂e was achieved (Ministry for Primary Industries 2021). This average value is based on a 28 year rotation of *P. radiata* with replanting completed within 2 years after harvest. Details of the forest blocks, area, and year of planting are given in Table 2.

These forests generated a net carbon sink of 106,911 Mg CO₂e in the years 1990-2020, and is forecast to provide additional carbon sink of 99,105 Mg CO₂e in the years 2021-2040.

Table 2 Details of the production *P. radiata* forest blocks

Year Planted	Area (ha)
1992	49.0
1993	261.1
1995	43.5
2000	15.0
2020	87.8
2021	254.0

Natural forest carbon sinks for post-1989 natural forest within the Mt Impey Conservation Estate were also included in the sink calculations. A total of 785 ha of this property is being managed by Lowlands Wines as regenerating post-1989 natural forest. Sinks were calculated from the date the property was purchased (2020) onwards based on property specific lookup tables provided by the NZ Government (Ministry for Primary Industries 2021). This area has an average carbon sink of 4223 Mg CO₂e per year over the 2021-2040 period. Carbon sequestered by the 1000 ha of older (pre-1990) regenerating natural forest that is also part of the Mt Impey Conservation Estate was not included in the calculations.

Net carbon position

The net carbon position for Lowlands Wines was calculated by subtracting cumulative net emissions for cumulative net sinks for the period 1990-2040.

Annual emissions for 2020 were scaled by area under production (vineyard emissions per ha), litres wine produced (winery emissions per litre produced), and bottles sold (packaging and distribution emissions per bottle sold) to give estimates of emissions from 1990-2019 and forecast emissions from 2021 to 2040.

Carbon lookup tables based on field measurement data (Ministry for Primary Industries 2021) were used to estimate/forecast forest sink changes from 1990-2040.

Results are shown in Figure 2. Even allowing for substantial error in the carbon emission calculations, it is very clear from Figure 2 that the company is significantly carbon positive overall, and is forecast to be a net sink of 269,000 Mg CO₂e over the 1990 to 2040 period. The forecast rise in emissions from 2020-2040 is due to forecast growth in the bottled wine sales, and is not due to an increase in emissions intensity per bottle produced.

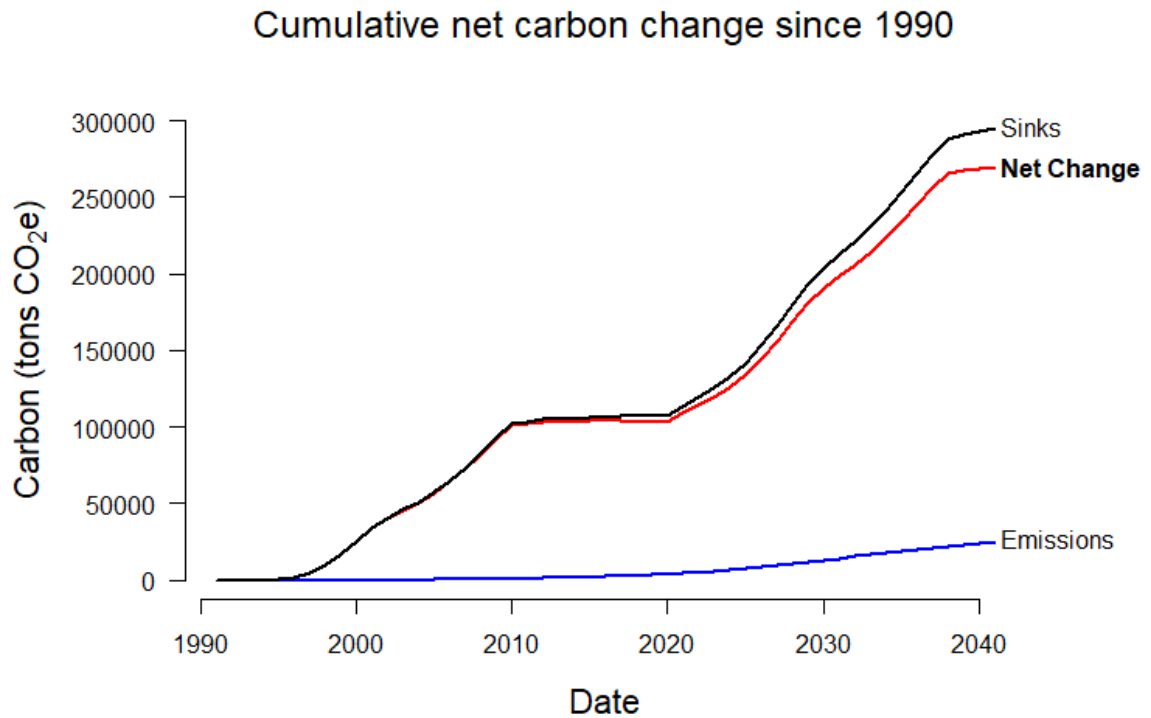


Figure 2. Cumulative total carbon emissions, sinks, and net position for Lowlands Wines for the period 1990 to 2040.

References

Greenhaigh S, Mithraratne N, Sinclair, R, Smith S, McConachy E, Barber A. (2008) GHG product accounting guidelines for the wine industry. MAF Technical Paper No: 2011/16

Andrews, J. (2020) Assessment of land use greenhouse gas (GHG) emissions of the wine sector in New Zealand. Toitu Envirocare report for the NZ Wine Industry.

Ministry for Primary Industries (2021) <https://www.mpi.govt.nz/forestry/forestry-in-the-emissions-trading-scheme/>