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Future Drought Fund

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CARBON FOOTPRINT & FEASIBILITY EXTENSTION PROJECT: A CASE STUDY

Prepared for Ag Excellence Alliance

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Morella Vineyards

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National Landcare Program

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Morella Vineyards

In the Clare Valley (SA), located close to the town of Watervale, you will find Morella Vineyards, a 4th generation family farm. The farm consists of 37 hectares of vines, 239 hectares for grazing and 143 hectares of cropping land.

This region is associated with warm to hot summers and cool to cold winters, with an annual rainfall of approximately 600mm. It has a wide variety of soil types that contribute to the variability and flavour of the region's wines.

Goals for Sustainability

- To be a carbon neutral farming enterprise within the next decade.
- To increase the level of biodiversity in and around their vineyards.
- To increase soil health and soil carbon levels in their vineyard.

Morella Vineyards has not previously undertaken a carbon footprint assessment, so their first step was to understand their enterprise's greenhouse gas (GHG) emissions and carbon sequestration in tree plantings.

Carbon Footprint

A carbon footprint allows producers to calculate their current GHG emissions and helps them understand the main drivers of emissions. Carbon accounting is completed through modelled calculations based on farm inputs, to estimate emissions and carbon storage. Emissions are defined into three scopes: Scope 1: (direct GHG emissions from an enterprise), Scope 2: (GHG emissions from purchased electricity), and Scope 3: (emissions associated with purchased inputs and transport). A carbon footprint examines the combined impact of total emissions produced across a property, and is also commonly reported as 'emissions intensity', which is the emissions per unit of product (e.g. kg of CO_2-e per tonne of product). This is a measure to contextualise efficiency of production with GHG emissions.

"The carbon accounting process provided our business with a high-level estimation of our carbon footprint"

Ben Castine

Under vine native insectary plants at Morella Vineyards

Farm details

Region overview					
State		**Region**		**Electricity source**	
South Australia		Mid North		State Grid	
Native vegetation, soil and climate					
Species/type of tree		**Soil type**	**Annual rainfall (mm)**	**Area of trees (ha)**	**Age of trees (yrs)**
Environmental Plantings, plantings as part of the EcoVineyards projects		Alkaline Calcareous soils	600	8	15
Crop data					
Average vine age (yrs)	**Vines per ha**	**Area sown (ha)**	**Area with midrow cover crop (ha)**	**Irrigation (ML/ha)**	**Crop yield (t/ha)**
19.5	1747	37.4		0.56	7.13
Purchased inputs					
N fertiliser (t N)	**N manure/ compost (t N)**	**Lime (t)**	**Herbicide/pesticide (L)**		**Other fertiliser (t)**
0.71	0	0	1007		0
Electricity					
Electricity (kWh)			**Irrigation electricity (kWh)**		
			1103		
Fuel and gas					
Irrigation pump fuel/diesel usage (L)	**General diesel usage (L)**	**Crop diesel use (L)**	**Petrol (L)**	**LPG usage (L)**	
1960	8398	5879	5210	30	

Emissions Summary

The emissions intensity of the grapes produced over one year at Morella Vineyards was found to be in the mid-low range compared to other assessments completed internally. This was mainly due to efficient production for this year, with a high crop yield in comparison to other assessments. Vehicle fuel usage was the largest contributor to emissions.

Emissions summary (excluding vine sequestration): Total & net emissions

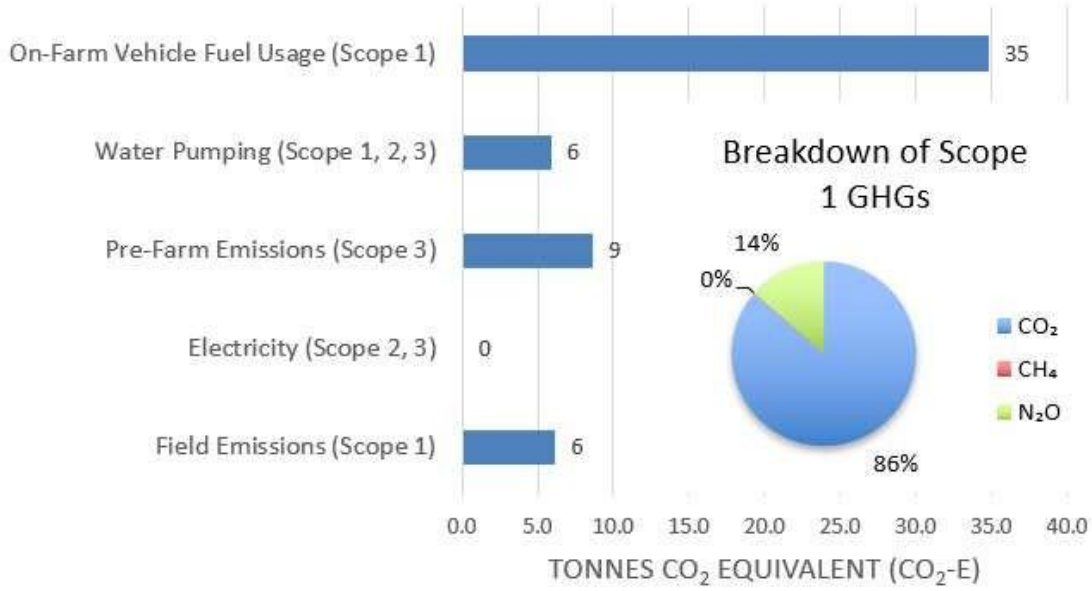
	Tonnes CO_2 equivalent (CO_2-e)
Subtotal: Scope 1 emissions	46
Subtotal: Scope 2 emissions	1
Subtotal: Scope 3 emissions	9
Total Emissions	**56**
Carbon sequestration (native vegetation) (estimate only)	-29
Net Emissions	**27**

Emissions summary (excluding vine sequestration): EI and Group comparisons

Emissions Intensity (EI) Category	EI (Scopes 1,2,3)	EI (Net Farm)	Group EI Range*	Estimated error range for EI:
Grapes (kg CO_2e/t yield)	189.6	91.4	19-842	± 20% to ± 40%

** The 'group' was 10 Clare Valley and Barossa Valley producers assessed in this program*


Twiggy daisy-bush, Olearia ramulosa and various other native insectary plants



A hotspot analysis of Scope 1, 2 & 3 emissions for grape production

Carbon Storage

Existing native vegetation plantings in areas around the orchard were identified as contributing to carbon sequestration. Accounting for carbon in grape vines is also important as they are long-lived storages for carbon, although it is more relevant in early years of vineyard establishment. There are no formal carbon methodologies in Australia that show how to quantify carbon in grape vines and some accreditation systems don't include this as a carbon sequestration source. At Morella Vineyards, carbon sequestration was estimated in grape vines at up to 82 tonnes CO_2-e per year, which would be enough to make the farm "carbon negative" if counted – i.e. the farm draws 55 tonnes CO_2-e more carbon from the atmosphere than is emitted each year.

Opportunities to reduce net emissions

The following management activities have the potential to reduce net GHG emissions:

- Improved on-farm vehicle and machinery fuel efficiency (e.g. reduction in unnecessary use and passes)
- Optimisation of fertiliser application (e.g. reducing reliance on DAP application, possibly using legumes in the inter-rows, avoiding nitrogen application in wet conditions)
- Installation of a solar system to power irrigation pumping and replace existing diesel pumps

Morella Vineyards will be looking at options to reduce the number of tractor passes in the management of their crops, to reduce their overall emissions. In the mid-term, Ben is now looking to upgrade the under-vine sprayer from a single to a double row (halving tractor run time), and to reduce spraying significantly by using under-vine straw mulching for weed suppression. In addition, he is also interested in the electrification of farm vehicles and tractors, and charging with on-site solar power generation, in the longer term.

Ben's experience

Ben found that developing the carbon account was insightful as it provided him with an understanding of GHG emissions and significant emission sources for his property, and to understand where his property currently sits in comparison to other vineyards. His key takeaway was understanding the large impact of on-farm fuel usage on the total emissions of a vineyard, which presents reduction opportunities through cultural practice change and implementation of more fuel-efficient or electric vehicles.

"The Integrity Ag & AgEx workshop provided our business with a high-level estimation of our carbon footprint, together with an increased understanding of emissions, carbon sequestration and carbon markets. This has helped guide management decisions around the most effective way to reduce GHG emissions."

Ben Castine

NOTE: Cover photo credit: Dr Mary Retallack, EcoVineyards - Jess, Ben and Rose with native insectary species planted along the vineyard headland in the background.