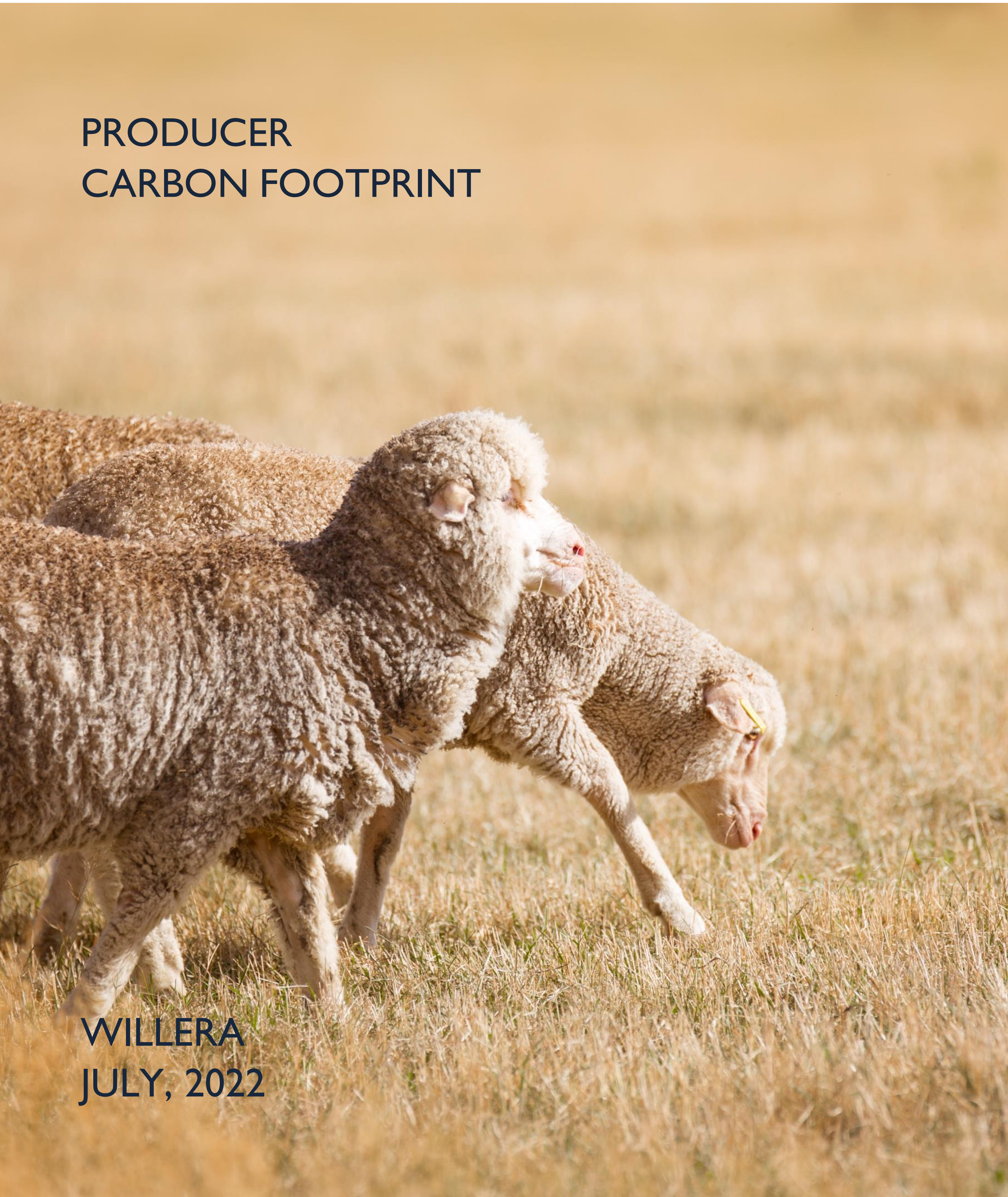
PRODUCER CARBON FOOTPRINT



WILLERA
JULY, 2022

WELCOME

Thank you for completing the Integrity Ag & Environment producer carbon footprint assessment. Environmental performance is becoming an important aspect of wool and sheep production and is vital to the livestock industry. It is essential that the public continues to support Australian wool and sheep production and reducing greenhouse gas (GHG) emissions is an effective way of maintaining this support.

METHODS

This report provides you with an estimate of the carbon footprint of wool and sheep meat production for FY 21 (1 July 2020 to 30 June 2021). The assessment has excluded emissions from cropping. The estimate is 'cradle to farm gate' (includes the carbon impacts of the product from the moment it's produced up to the farm gate). It includes GHG emissions sources on-farm (Scope 1, e.g. livestock emissions), as well as emissions from pre-farm sources (Scope 2 & 3, e.g. from purchased inputs). The unit of measurement is kilograms of greenhouse gases (converted to CO_2-equivalent amounts) per kilogram of greasy wool and corrected sheep meat. (Note: live weight sold was corrected when flocks were expanding or contracting, to remove the influence of flock fluctuations).

The methods used are the Integrity Ag & Environment's verified carbon footprint system (VCFS) which is published in Wiedemann *et al.* (2015) and is compliant with the International Organisation for Standardisation Carbon Footprint of Products (ISO 14067). The methods used are compliant with and align with the publications that are used for reporting in the Australian sheep sustainability framework. Therefore, the results in this report may be compared to results from the sheep sustainability framework.

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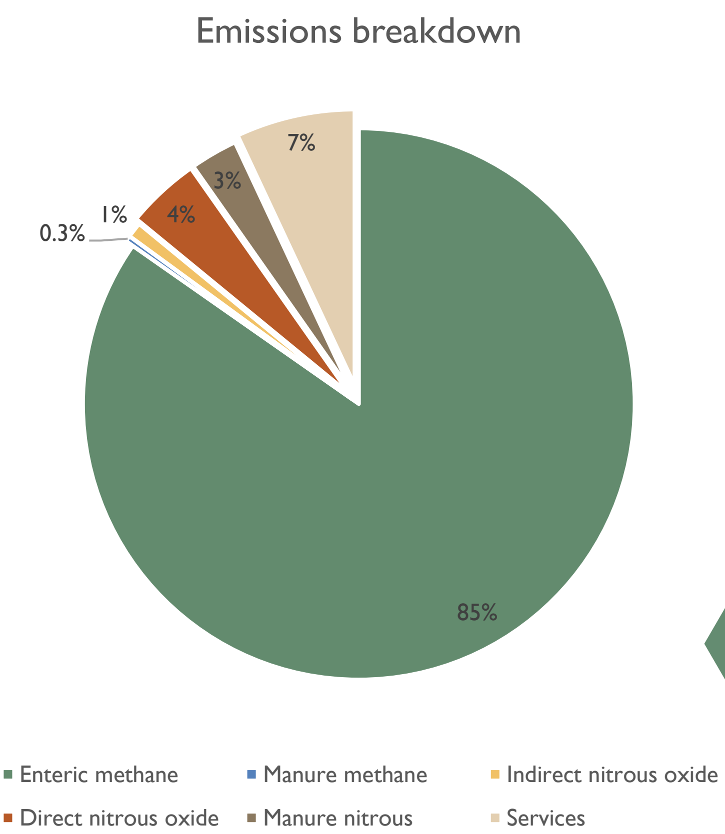
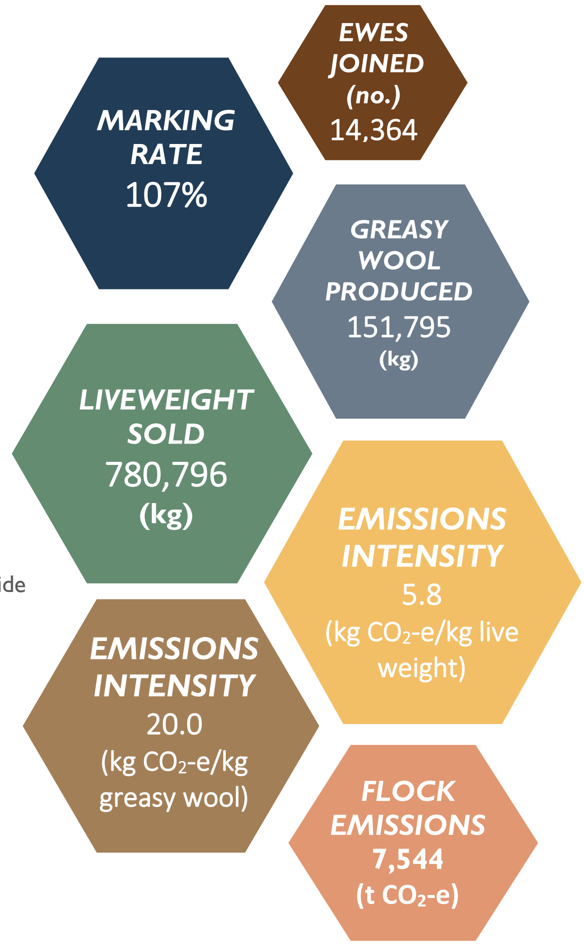
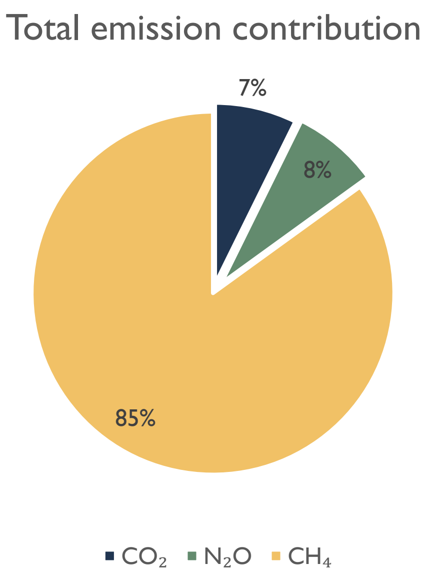
RESULTS

INPUTS & FLOCK PERFORMANCE







The first pie chart above provides a summary of the emission results from your sheep enterprise broken down by source, detailing the contribution of emissions sources from the flock and farm services. The second pie chart provides a summary of the contribution to total emissions from each of the major gases.

WHAT WOULD A REDUCTION IN YOUR GHG EMISSIONS LOOK LIKE?

To put your carbon footprint in perspective, your Scope 1 flock emissions were compared to Scope 1 light vehicle emissions from the National Greenhouse Account (2017) factors on petrol emissions and Australian Bureau of Statistics (2019) data on motor vehicle use.

A 5% reduction in Scope 1 emissions would save

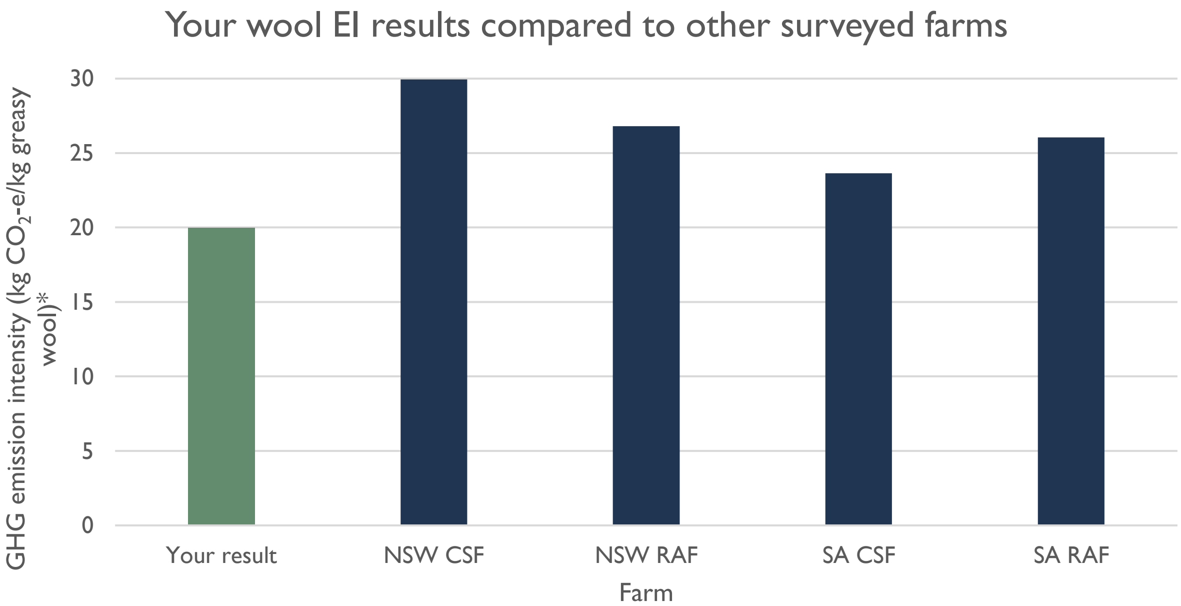
348 tonnes

of CO_2-e emissions per year.

This would be equivalent to taking 105 light vehicles off the road for a year.

YOUR RESULTS IN CONTEXT

The graph below compares the GHG emissions of wool produced on your farm to other regional average farms (RAF) and case study farms (CSF) previously surveyed across Australia (Wiedemann et al., 2016, updated for AR5 values), showing results better than average.



* excludes emissions and/or sequestration from soil and vegetation

The table below provides the key parameters from your farm compared to the CSF's and RAF's shown above. A higher lamb marking rate, higher live weight and greasy wool per breeding ewe are the key factors driving a lower emission intensity than the NSW and SA CSF and RAF's.

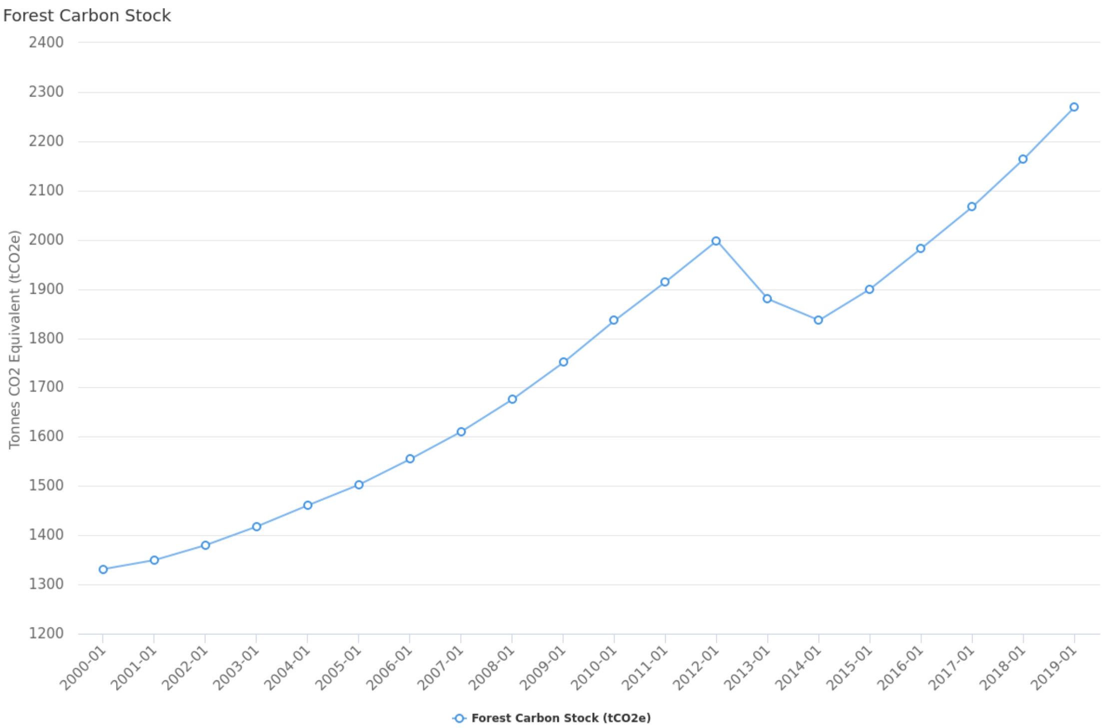
Key Parameter	Your farm	NSW CSF	NSW RAF	SA CSF	SA RAF
Lamb marking rate (%)	107%	86%	85%	90%	69%
Breeding ewe mortality rate (%)	2%	2%	4%	4%	8%
Wool sold per breeding ewe (kg greasy/head)	11	6	8	10	10
Live weight sold per breeding ewe (kg live weight/head)	54	36	34	46	32

VEGETATION CARBON SEQUESTRATION

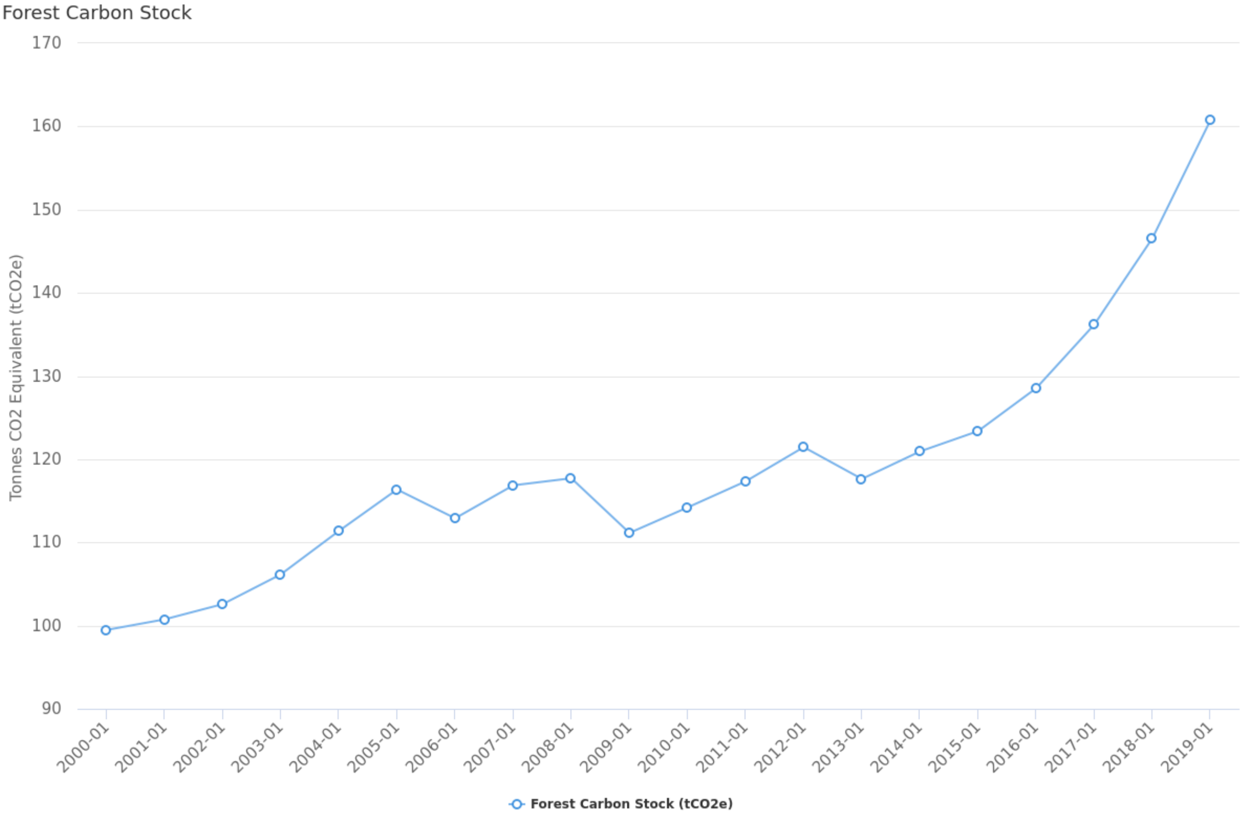
MyFarmKey Results – Forest Carbon

The results presented from the MyFarmKey assessment are for carbon in living trees in forest and consists of the following components: aboveground biomass – biomass of the aboveground parts of living trees and belowground biomass – biomass of the roots of living trees. It should be noted that these carbon estimates do not include changes in carbon across areas smaller than 0.2 ha and with less than 20% tree cover. As noted in the MyFarmKey report, the carbon estimates have not been verified for the individual farm and may include errors inherent to the vegetation mapping data used. Note: positive values indicate vegetation carbon sequestration.

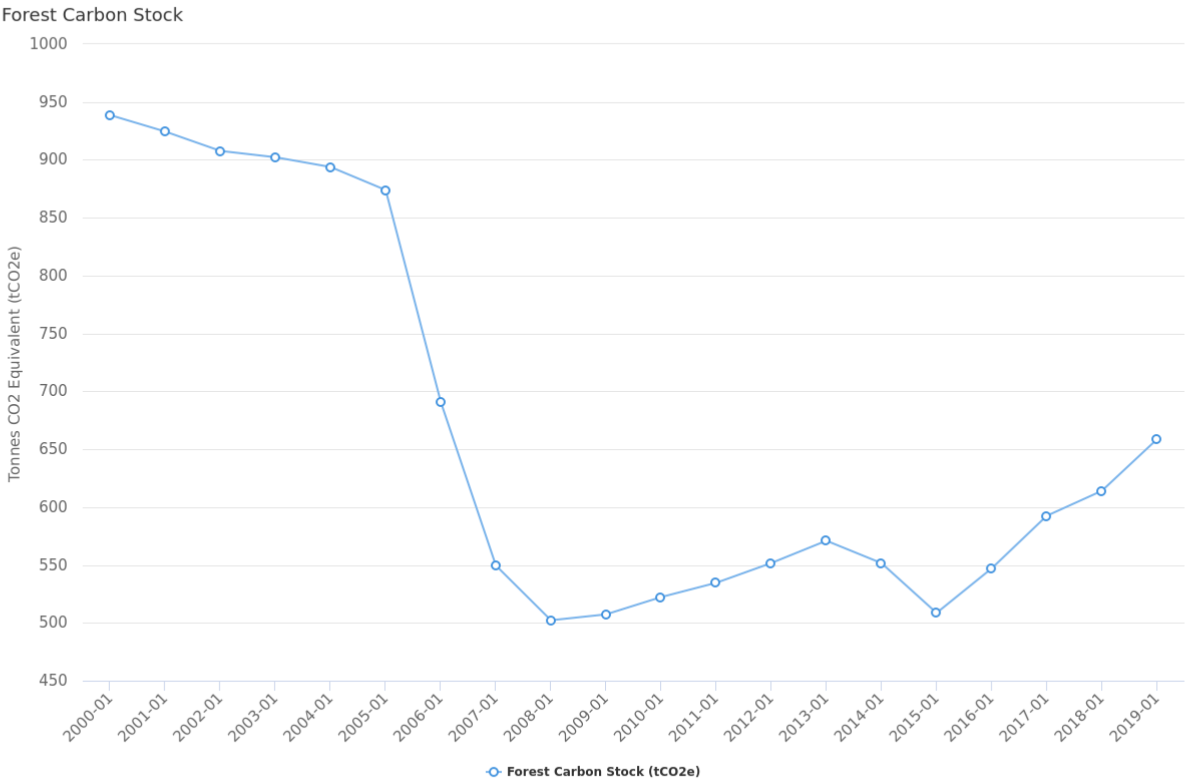
Forest Carbon – Sangus Creek



Forest Carbon - Rochaven



Forest Carbon – Wargam



The MyFarmKey assessment shows a continuing improvement in forest carbon stocks on the Sangus Creek and Rochaven, as well as on Wargum since 2008. The latest year assessed was 2019, and therefore this year was used in the following analysis. The reductions observed in forest carbon stock may be due to climatic conditions or forest loss change during this time.

It should be noted that this satellite vegetation assessment results are not suitable for valuing or creating carbon credits under any scheme. Rather, the results provide an indication of the potential forest carbon stock changes based on data from the Australian Government and global data. As well as this, existing established native vegetation is not currently eligible to be counted towards formal carbon neutral certification through Climate Active, however this may change in future.

Sangus Creek forest carbon sequestration (t CO_2-e) in 2019	**-106**
Roachaven forest carbon sequestration (t CO_2-e) in 2019	**-14**
Wargam forest carbon sequestration (t CO_2-e) in 2019	**-45**
Total forest carbon sequestration (t CO_2-e) in 2019	**-165**
% of flock carbon footprint	**2%**

Tree Planting Sequestration Assessment

An assessment has been completed to estimate the carbon sequestered from tree plantings. Below is a summary of the tree planting information provided and the estimated annual carbon sequestration from these plantings. From examination of the MyFarmKey satellite imagery it was assumed that 30% of the carbon storage from the tree plantings on Sangus Creek and 40% on Rochaven were also included under the MyFarmKey assessment, and therefore the sequestration from these trees have not been added to the total vegetation sequestration (as this would be double counting). No tree plantings were recorded for Wargum as the large majority of trees fall under the properties Biodiversity Trust area which is included under the MyFarmKey assessment.

Tree Planting – Sangus Creek

Species	Age (years)	Area (ha)
Mixed species (Environmental Plantings)	1 to 5	9
Mixed species (Environmental Plantings)	6 to 10	61
Mixed species (Environmental Plantings)	11 to 20	161
Mixed species (Environmental Plantings)	21 to 30	3
Mixed species (Environmental Plantings)	31+	33
Total		**267**
Sangus Creek sequestration (t CO_2-e)		**-246**

Tree Planting – Rochaven

Species	Age (years)	Area (ha)
Mixed species (Environmental Plantings)	1 to 5	0
Mixed species (Environmental Plantings)	6 to 10	0
Mixed species (Environmental Plantings)	11 to 20	0
Mixed species (Environmental Plantings)	21 to 30	0
Mixed species (Environmental Plantings)	31+	56
Total		**56**
Rochaven sequestration (t CO_2-e)		**-226**

Total Willera sequestration (t CO_2-e)	**-472**
% of flock carbon footprint	**6%**

The carbon sequestration estimated from forest carbon and tree plantings was compared to over 200 livestock producers in southern Australia through a project initiated by Landcare Australia. This study found that the average emissions reduction due to carbon sequestration from native forests and plantings was 25%, with 70% and 31% of this sequestration coming from native vegetation and tree plantings, respectively. Therefore, on Willera there may be opportunities to increase the number of tree plantings.

SOIL CARBON SEQUESTRATION

Soil organic carbon (SOC) can be a source or a sink of greenhouse gas emissions depending on land use and management practices. In Australian soils, there is a clear relationship between SOC, water availability, mean annual temperature and soil texture (Wynn et al. 2006). Soil carbon sequestration is also highly influenced by rainfall. Soil organic carbon stocks is the amount of carbon stored in the soil at a given point in time. Soil organic carbon change provides an indication of the carbon loss or carbon sequestration between two points in time.

Historic soil test data with repeated measured on the same paddock over time was not available. Therefore, the change in soil carbon over time was unable to be determined.

Sangus Creek soil organic carbon concentration (SOC %)

Paddock	Hectares	Sample Depth (cm)	2019 SOC (%)	2021 SOC (%)
Weir Paddock		10	2.4	no data
Weir Paddock	34	40	1.5	no data
Weir Paddock		70	0.6	no data
L Shaped East		10	2.3	no data
L Shaped East	20	40	1.0	no data
L Shaped East		70	0.6	no data
Nardoo Irrigation	42	10	2.5	no data
Addlem 3	44	10	no data	2.2
Aunty Leils River	87	10	no data	2.5
Grandpas West	20	10	no data	2.2
Jakes Peppercorns	31	10	no data	1.3
Keith's No 9	33	10	no data	3.0
Keith's No 11	37	10	no data	1.5

Sangus Creek mean soil organic carbon concentration (SOC %)

Paddock	2019	2021
All paddocks (0-10cm)	2.4	2.2

Sangus Creek mean soil organic carbon stock (t C/ha/yr)

Paddock	Hectares	Sample Depth (cm)	2019	2021
Weir Paddock		10	31	-
Weir Paddock	34	40	78	-
Weir Paddock		70	55	-
L Shaped East		10	30	-
L Shaped East	20	40	52	-
L Shaped East		70	55	-
Nardoo Irrigation	42	10	33	-
Addlem 3	44	10	-	29
Aunty Leils River	87	10	-	33
Grandpas West	20	10	-	29
Jakes Peppercorns	31	10	-	17
Keith's No 9	33	10	-	39
Keith's No 11	37	10	-	20

Sangus Creek mean soil organic carbon stock (SOC t C/ha/yr)

Paddock	2019	2021
All paddocks (0-10cm)	31	29

As a basis for estimating potential carbon sequestration rates at Sangus Creek, soil carbon levels for the region were reviewed for the site. Information gained from the Victorian Department of Environment, Land, Water and Planning (DELWP) provides modelled soil organic carbon concentration (%) of 0.7% - 1.2% (0 - 30cm) for the area (DELWP 2016). Soil organic carbon concentrations at Sangus Creek are higher than the modelled estimates for the region. However, there is uncertainty in these regional results as there are limited data points for this area. It is important to note that soil carbon concentrations generally decrease down the soil profile.

Wargum mean soil organic carbon <u>concentration</u> (SOC %) at 0 – 10cm depth

Paddock	Hectares	2011
East Wheat	200	1.1
West	200	1.8
Mean SOC concentration (%)	**400**	**1.5**

Wagum mean soil organic carbon <u>stock</u> (t C/ha/yr) at 0 – 10 cm depth

Paddock	Hectares	2011
East Wheat	200	14
West	200	24
Mean SOC stock (t C/ha/yr)	**400**	**19**

As a basis for estimating potential carbon sequestration rates at Wargum, soil carbon levels for the region were reviewed for the site. Information gained from the Soil Profile Attribute Data Environment (SPADE) provides modelled soil organic carbon concentration (%) of 0.5 – 1.0% (0 - 30cm) and soil organic carbon stocks (t C/ha) of 25– 40 t C/ha (0 – 30 cm) for the area (NSW Department of Planning Industry and Environment 2020). Soil organic carbon concentrations at Wargum are higher than the modelled estimates for the region. It is important to consider that soil carbon concentrations generally decrease down the soil profile. Hence, if sampled to a depth of 0 – 30 cm (which is the minimum sampling depth for an ERF soil carbon project) the SOC % would likely be diluted and less than the values reported in the first table.

To determine the soil organic carbon change over time, repeated measurements on the same paddocks would be required. It is important to note that these soil carbon sequestration values are not suitable for developing a carbon market project or carbon neutral product.

WHAT IS YOUR NET CARBON POSITION?

Including carbon sequestration from vegetation carbon stock changes enables you to understand your 'net' carbon footprint – your carbon footprint counting both emissions, and carbon storage in vegetation and soil. This is completed by deducting the annualised vegetation carbon sequestration from the total reported emissions and revising the net emissions and net emissions intensity values. For your property, the following net emissions profile was determined:

Note. Negative values indicate carbon sequestration. Positive values indicate carbon emissions.

Net emissions summary	(t CO_2-e)
Flock emissions (excluding cropping)	7,544
Carbon sequestration (tree plantings)	-265**
Carbon sequestration (forest)	-124**
Carbon sequestration (soil)*	0
Net emissions	**7,156**

Net emissions intensity (kg CO_2-e/kg live weight)	**5.5**
Net emissions intensity (kg CO_2-e/kg greasy wool)	**18.9**

** Soil carbon stock was not included in the net emissions summary or the carbon footprint repeated measurements on the same paddocks would be required to determine the soil organic carbon change and measures need to be in place to ensure its permanence (ISO 14067).*

*** A 25% discount has been applied to the vegetation carbon estimates to account for discounts applied to ERF projects assuming a 25-year permanence period. This includes a 'risk of reversal buffer' that reduces the total sequestration able to be claimed to account for uncertainty and risks in the permanence of stored carbon.*

GHG REDUCTION OPPORTUNITIES & IMPLICATIONS

- Opportunities exist to improve flock performance by increasing marking rates and increasing lamb output.
- Further improvement in growth rates would contribute to a more efficient flock and may be an option to reduce emission intensity
- Soil and vegetation carbon sequestration opportunities may reduce your net carbon emissions, while providing additional benefits to biodiversity, soil health, soil erosion and salinity, and livestock shelter.
- Strategies that aim to increase and maintain ground cover and return more above and below-ground biomass to the soil are likely to increase soil carbon. This includes deep-rooted perennial pastures, improvements to soil fertility, rotational grazing management and reduced tillage.

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