Department of
Primary Industries and
Regional Development

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Calculating carbon

Calculate the carbon emissions from your farm business

Farming systems produce greenhouse gas (GHG) emissions, primarily in the form of methane (mostly caused by animal digestion and respiration) and nitrous oxide (mostly from fertilisers).

The Department of Primary Industries and Regional Development (DPIRD) recommend undertaking a basic carbon account to understand and explore options to reduce your emissions and consider which approaches will fit into your business plan. A baseline carbon account for your farm will give the total GHG emissions for the farm and the carbon intensity of your products such as wool, meat and grain.

Businesses can choose to set goals to reduce total farm emissions or choose to reduce emissions intensity of a specific product for a specific market.

Total farm emissions is expressed as tonnes per hectare of carbon dioxide equivalents: t/ha CO_2e-

Emissions intensity is measured as kilograms of carbon dioxide equivalents per kilogram of product: kg CO_2e-/kg product.

Focusing on reducing the emissions intensity of your products may not decrease your total farm emissions as you may choose to run or grow more product.

Typical emission sources on mixed farms in WA

(largest to smallest)

- Sheep & cattle (ruminants) methane emissions
- Crop nitrogen
- Flock or herd manure
- Fertilisers & herbicides
- Diesel
- Supplementary feed for livestock
- Electricity & other services like maintenance & repairs

Emissions are classified as Scope 1, 2 and 3

Scope 1:
All emissions on-farm from agricultural activity

Scope 2:
Emissions from the production of purchased electricity

Scope 3:
All emissions associated with producing inputs such as fertilisers, herbicides, veterinary services etc.

The accuracy of the baseline account is dependent on the quality and detail of the data collected, so accurate farm records are essential. Because livestock emission is likely to be a large proportion of a farm's emissions, it is vital that these are as complete as possible.

Doing the sums

Producers can choose to have a full carbon account completed for their businesses by an accredited consultant as part of a plan to register as carbon neutral or to acquire and sell Australian Carbon Credit Units (ACCUs).

There are also carbon calculators available online which give an approximation of emissions and run scenarios to model options to reduce the business' carbon footprint.

The series of Greenhouse Accounting Framework (GAF) tools (**piccc.org.au/resources/Tools**) are simple easy to use excel spreadsheet based tools, developed and maintained by Primary Industries Climate Challenge Centre (PICCC) at the University of Melbourne. GAF aligns with the Australian National Greenhouse Gas Inventory (NGGI) method. There are versions for most enterprises, however, mixed enterprises will need to combine their livestock and cropping calculations on to another spreadsheet to assess their emissions.

Calculations are for one production year only.

The data you will need:

1. Stock numbers on hand (numbers x days on farm per year)
2. Liveweight at slaughter or disposal x age
3. Weight of each class of animal
4. Amount of wool produced per animal per year
5. Purchased livestock and purchased animal feed
6. Yield of each crop with area and harvested weight
7. Amount of fertiliser and herbicide applied per crop and pasture
8. Diesel use per enterprise
9. Electricity and other energy sources.

This data allows the calculator to estimate enteric methane, nitrous oxide from manure, methane from manure, indirect nitrous oxide emissions arising from volatilised ammonia or nitrogen lost via leaching and run-off (direct and indirect nitrous oxide emissions from cropping).

For more information on how the National Clean Energy Regulator estimates emissions from these sources please see National Greenhouse Account Factors on **cleanenergyregulator.gov.au/**

Calculating carbon for Western Australian farms

The carbon accounts of four example farm enterprises in the WA agricultural region were calculated using GAF to assess the emissions from different farms.

The example farms were:

- **Eastern Wheatbelt:** 100% cropping enterprise
- **Eastern Wheatbelt:** mixed grain and sheep enterprise
- **Geraldton Medium Rainfall:** 100% cropping enterprise
- **Woolbelt:** mixed sheep and grain enterprise

The data for these examples was from the 2019 Planfarm Benchmarks, along with expertise and advice from local agronomists and other industry professionals.

For this fact sheet we used the:

- Cropping GHG Accounting Framework (G-GAF)
- Sheep & Beef GHG Accounting Framework (SB-GAF).

Summary of example farms

The composition of farm emissions can vary greatly between farms.

While the Woolbelt mixed farm was the smallest in hectares, it had the largest number of livestock in the system, and the livestock have largely contributed to the farms total emissions compared to the other farm examples.

The Eastern Wheatbelt (EW) 100% cropping farm had the lowest total emissions, as it was the farm with the lowest intensity of fertiliser and had no livestock (Figure 1).

The emission intensity remained similar between cropping systems however it was higher in the Geraldton (GE) 100% cropping example (Table 1).

To read the full report please visit: **agric.wa.gov.au/carbon-calculators-example-farms**

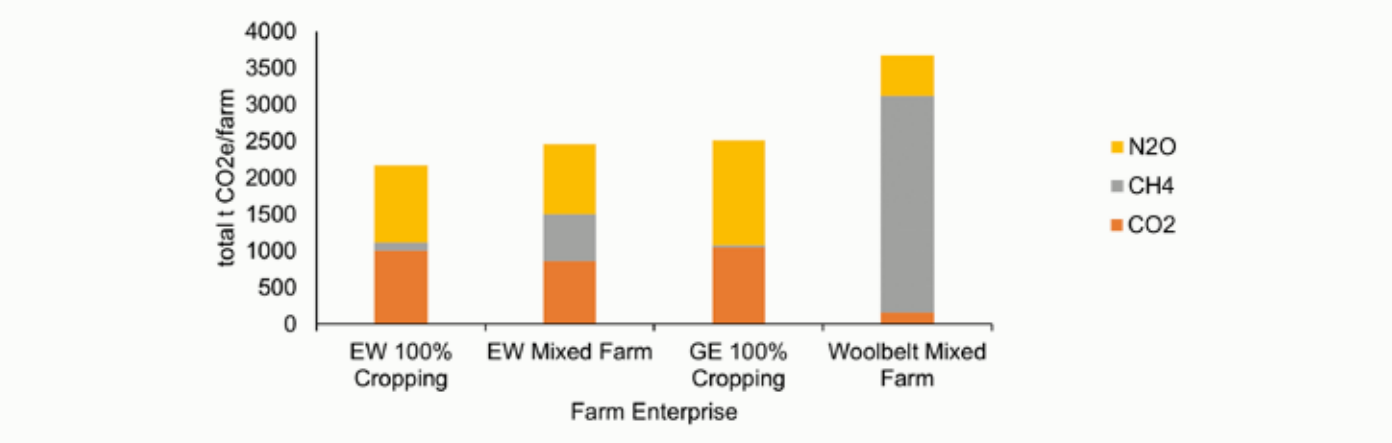


Figure 1 *Comparison of the four different farming systems emission breakdowns*

	Wheat	Barley	Pulses	Oilseeds	Sheep Meat	Sheep Wool
	t CO_2-e/t crop				kg CO_2-e/kg LW	kg CO_2-e/kg greasy
EW 100% cropping	0.29	0.31	0.24	0.70		
EW mixed farm	0.29	0.31	0.24	0.70	8.10	29.40
GE 100% cropping	0.36	0.41	0.26	0.88		
Woolbelt mixed farm	0.29	0.31			7.63	28.54

Table 1 *Emission intensities across four different farming systems*

Options for reducing emissions

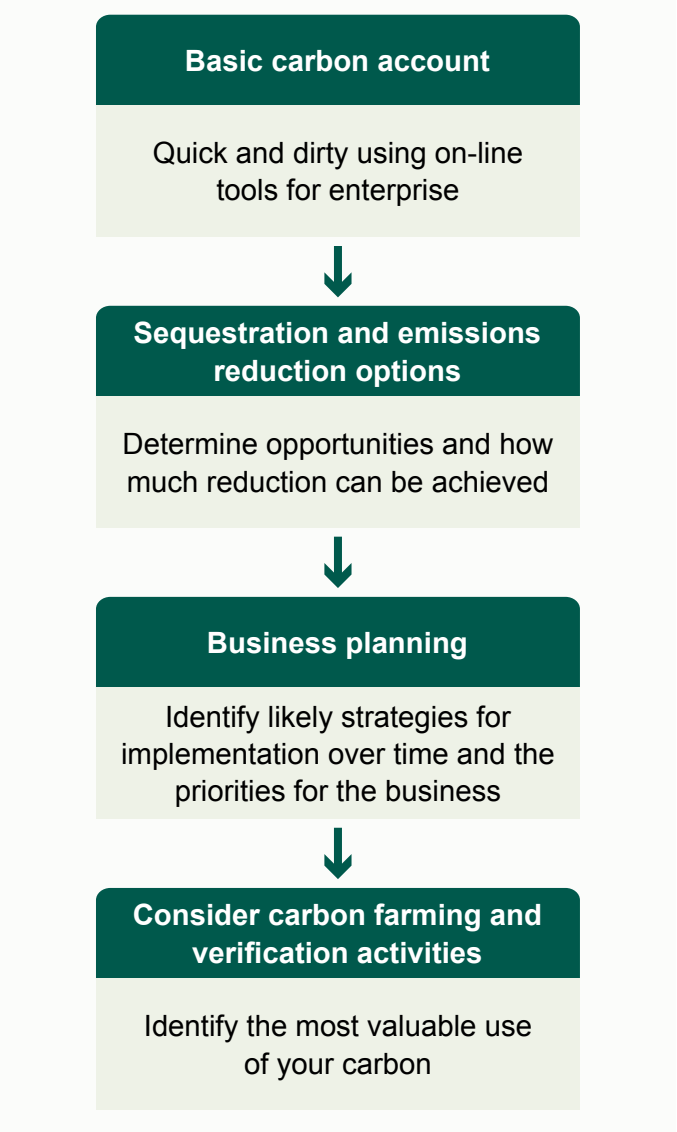
There are different options to reduce or sequester carbon emissions or to mitigate them completely. These include, but are not limited to:

To sequester carbon:

- tree planting and encouraging remnant vegetation regrowth
- incorporating organic matter by green and brown manuring or apply biosolids or biochar.

To reduce emissions:

- shift to renewable and alternative energy sources
- reduce inputs (using legume phases, variable rate technology)
- improve livestock efficiencies by changing feed regimes, feed efficiencies or utilising fodder shrubs, such as saltbush or other browsing shrubs
- use improved genetics for sheep to produce less methane
- feed animals supplements that will mitigate methane mitigation, for example aspargopsis or possibly brassicas
- prevent soil erosion by wind and water, and general improvement of soil characteristics (claying and liming).



More information

agric.wa.gov.au/climate-change/greenhouse-gas-emissions-wa-agriculture

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Important disclaimer

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