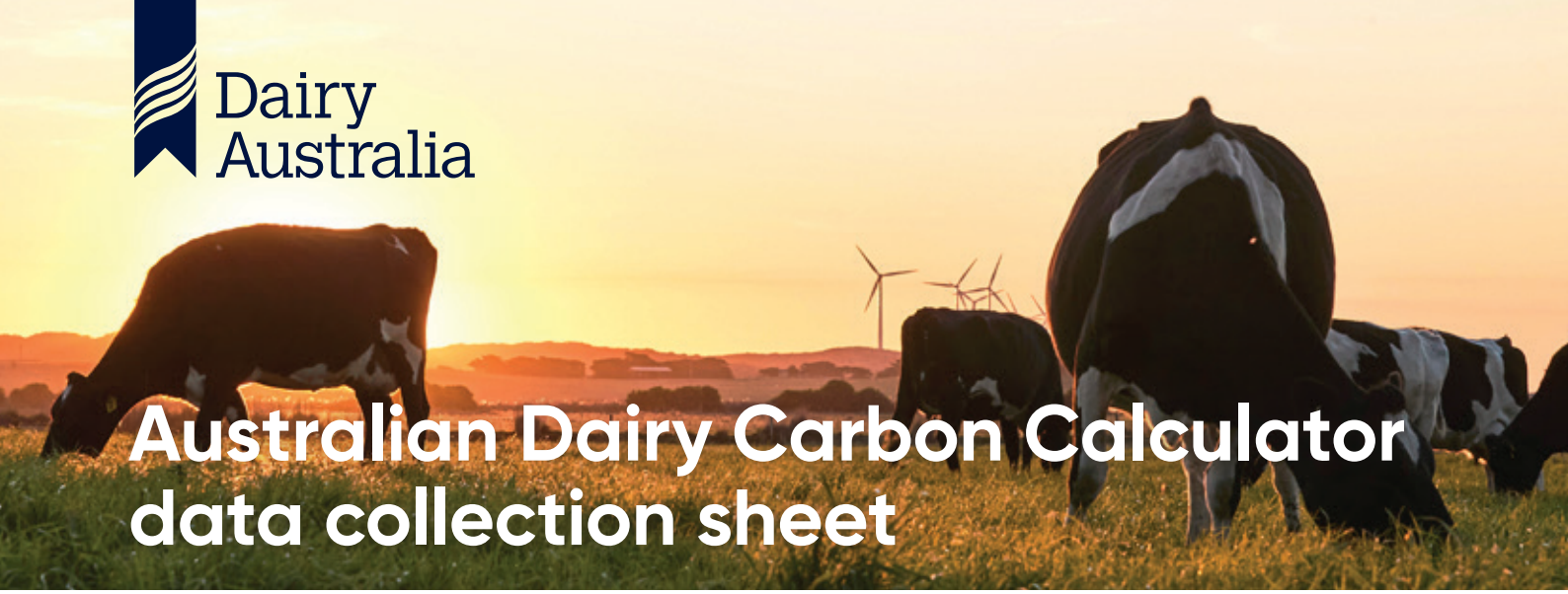
Dairy Australia



Australian Dairy Carbon Calculator data collection sheet

This datasheet outlines the information you need to complete the Australian Dairy Carbon Calculator (ADCC) and will help you gather it all in one place before you begin.

1. **Date data collected**	
2. **Owner or shareholder name/property name**	
3. **State and region**	

Note that milking cows is the number of cows milked for a minimum of two months over the assessment period, which may be greater than your average milking herd size. If you retain some or all of your non-replacement calves (heifers and bulls/steers) beyond post-weaning, these need to be recorded in the 'other stock <1 year age'. The last two columns are for calves up to ~10–12 weeks and around 100kg at weaning.

4. Livestock data

	Milking cows	**Replacement heifers** >1 yr age	**Replacement heifers** <1 yr age	**Mature bulls**	**Other stock < 1 yr age**	**Other stock >1 yr age**	**Calves sold soon after birth** 1–2 weeks	**Calves sold post-weaning** ~100kg
Number of animals								
Average liveweight kg								
Daily liveweight gain kg/day								
Number sold								
Average liveweight when sold kg								

5. Milk production data

Total herd milk production	**Units for milk production** Tick	**Average annual fat %**	**Average annual protein %**	**Average lactation length** days
	☐ Litres per annum ☐ kg milk solids per annum			

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6. Milker average diet intake and quality

A list of commonly fed forage and non-forage supplements and their corresponding dry matter digestibility (DMD) and crude protein (CP) percentage is included as an appendix to this datasheet.

This data is only used to estimate the milking cows average dry matter digestibility and crude protein % based on the intakes of all feeds and their corresponding DMD and CP%. The calculator will determine average daily intake, and thus methane production, using average diet DMD%, liveweight, milk production etc. Note if you only know the metabolisable energy content of a feed, add 1.037 to this ME value and then divide by 0.1604. For example, ME of grain might be 12.5 MJ/kg DM, so (12.5 + 1.037)/0.1604 = 84.4% dry matter digestibility.

	Intake DM/day	**DMD** %	**CP** %
Pastures			
Grain/concentrates			
Silage			
Hay			
By-products			
Other feeds			

7. All other stock diet DMD% and CP%
Can use the defaults 75% and 20%

Fertilisers

8. How do you wish to report fertiliser inputs? Tick

☐ Tonnes of element per annum ☐ kg of element per hectare, per annum

Note if you select the tonnes of element (i.e. N, P, K, S) per annum option, you do not have to enter in the area of pastures and crops fertilised.

We require the rate of element, not rate of fertiliser type. For example, urea is 46% N so 10t of urea is equivalent to 4.6t of N. We need to enter 4.6 into ADCC. A list of common fertiliser types and the percentage of elements in each is listed as an appendix in this data collection sheet.

If you select kg of element per hectare per annum, ADCC only allows one area of pastures and crops fertilised with P, K, S and lime/dolomite. So if you have 100kg P/ha across 45 hectares and 230kg K/ha across 30 hectares, you will need to work out a common area, possibly 30 hectares in this example, such that the P fertiliser rate is 100 kg P/ha x 45 ha/30 ha = 150kg P/ha for 30 hectares. In this example, you would enter 150 for the P rate and 230 for the K rate and 30ha for the area fertilised with P, K, S and lime. The ADCC calculator can assist you in working these numbers out if required.

	Nitrogen (N)	**Phosphorus** (P)	**Potassium** (K)	**Sulphur** (S)	**Lime/dolomite**
Rate of element tonnes or kg/ha					
Area of pastures fertilised ha					
Rate of element tonnes or kg/ha					
Area of crops fertilised ha					
Proportion of N fertiliser that is urea %					

9. Energy consumption

If you generate electricity on-farm through renewables and feed excess into the grid at times of the day/year, work out the net amount of electricity you take from the grid. For example, you produce 60,000kWh on farm, consume 40,000kWh of this and also purchase 100,000 kWh off the grid. Your net electricity from the grid would be 120,000kWh and all of this comes from the state grid. Enter 120,000kWh from state grid and 0% renewable and X% renewable where X depends on where you live:

- NSW/Qld/SA/Vic: 37% renewable
- Tas: 99% renewable
- WA: 15% renewable

These are indicative proportions of renewable (rather than non-renewable e.g. coal) electricity generation based on government reporting.

Electricity consumption kWh/annum	**Diesel/unleaded fuel consumption (litre/annum)** See the Appendices section if you use contractors for some/all paddock work	**Where does your electricity come from?** Select from list below	**Percentage of electricity guaranteed from renewables**
		☐ State grid ☐ 100% renewable	

10. Purchased supplements (tonnes of dry matter)

You may need to convert fresh weights into dry matter weights, e.g. grain is around 10% water, thus 90% dry. 10t of fresh weight grain would be 9t DM. See the Appendices section for typical dry matter % of commonly used forages and non-forages.

Pasture/cereal hay	Pasture silage	Grains/concentrates	Lucerne/legume hay	Cereal/maize silage	By-products

Carbon sequestered in trees

See the Appendices section at the end of the datasheet for a listing of soil types and tree species for each region. ADCC only has the space for one tree entry so if you have multiple plantings at different ages, you will need to determine the average age of all.

11. How are you estimating carbon in trees? Tick ☐ No estimate of carbon (i.e. no trees) ☐ Based on data entered here ☐ Based on data from another tool

Region	**Tree species**	**Soil type**	**Area of trees** ha	**Average age of trees** whole number of years	**Carbon sequestered** t CO_2e/ ha.annum) – only relevant if using other tools e.g. FullCAM, LOOC-C (Env. plantings

Manure management

For most farms where the milkers spend 2–4 hours per day off paddock (i.e. to/from the dairy, at the dairy, on a feedpad etc.), the state-based factors will generally reflect how your farm's manure is managed. If this is the case, select 'default state-based factors' and fractions from the drop-down list in ADCC. You have completed data collection and so can start entering this data into ADCC.

However, if the milking herd spend a larger proportion of time away from the paddocks grazing, such as for partial/total mixed ration farms, you might consider entering farm-specific data to determine GHG emissions from urine and dung deposition. If this is the case, select 'user-defined factors' and fractions, fill in the following questions to populate ADCC, making sure you also select 'user-based factors' and fractions in ADCC to override the default values.

If all other stock also spends a proportion of time off-paddock (i.e. mostly only relevant for fully-housed TMR farms, not because you have them yarded occasionally for treatment, weighing, pre-testing etc.), you will also need to answer questions about how the manure from these animals is handled. However, if these animals are outdoors year-round, leave the questions for these blank so the default 100% of manure deposited onto paddocks remains activated.

Milking herd

12. **Average number of hours per day and days per annum spent at the dairy and yards where manure is hosed/flushed**

13. **Percentage of waste that is flushed and drains directly to a paddock without any solids separation**

14. **Percentage of waste that is flushed and spread daily from a sump/dispersal system**

ADCC assumes that the remaining percentage is flushed and enters a pond/lagoon system. So, if the answer to the last two questions is 0% (i.e. neither directly drains to paddock or sump/dispersal system and spread daily), ADCC assumes 100% is flushed to a pond/lagoon system.

15. **Do you pre-treat the waste prior to being spread daily/enters a pond/lagoon?** ☐ Yes ☐ No
    i.e. a solids trap, weeping wall, mechanical separation

16. **Average number of hours per day and days per annum spend on a feedpad/loafing area/housed**

17. **Select how the milking herd's feedpad waste is mostly handled**
    only one option can be selected

    - ☐ Flushed and drains directly to a paddock
    - ☐ Flushed and spread daily from a sump/dispersal system
    - ☐ Flushed to a pond/lagoon system
    - ☐ Scraped and stockpiled before spread onto paddocks at a later date

All other stock (listed as Heifers in ADCC as the primary stock that may spend significant time off paddock)

Only complete this if all other stock spend a significant amount of time off paddock i.e. TMR farm.

18. **Average number of hours per day and days per annum spent in yards or housed where the waste is deposited**

19. **Select how this other stock waste is mostly handled** only one option can be selected although it can be different to the milking herd's feedpad waste

    - ☐ Flushed and drains directly to a paddock
    - ☐ Flushed and spread daily from a sump/dispersal system
    - ☐ Flushed to a pond/lagoon system
    - ☐ Scraped and stockpiled before spread onto paddocks at a later date

Appendices

Commonly fed non-forage and forage supplements

If you only know the fresh (wet) weight of a feed, multiply this by the average dry matter to convert to dry weight (DM).

	Dry matter %			Dry matter digestibility %			Crude protein %		
	Average		Range	Average		Range	Average		Range
Non-forage supplements									
Barley grain	88.7	81.2	97.0	79.5	55.6	87.3	10.8	6.3	19.0
Brewer's grain	28.2	13.9	60.6	69.8	53.7	90.5	21.6	9.8	28.8
Canola meal	90.5	87.4	93.5	78.2	63.4	99.0	37.5	27.4	42.1
Carrot pulp	10.0	8.0	15.5	82.1	56.9	91.8	9.8	6.5	15.3
Citrus pulp	14.3	10.6	17.3	83.4	62.1	93.7	8.6	6.0	11.9
Cottonseed meal	89.8	87.5	95.3	71.8	62.1	82.1	43.5	39.5	48.0
Grape marc	55.1	19.6	93.9	40.7	14.9	78.2	12.1	5.4	17.2
Lupin seed	91.6	86.1	95.5	81.5	72.4	96.3	32.0	21.3	43.2
Maize grain	84.2	60.3	96.4	89.2	79.5	96.3	10.0	7.3	21.9
Molasses				66.6			4.0	3.0	5.0
Oats	91.1	80.0	93.3	66.6	38.1	91.8	9.0	4.0	15.4
Rice bran	90.4	89.9	90.8	89.9	60.1	97.6	15.5	12.9	19.6
Sorghum grain	89.6	86.2	94.4	86.0	80.8	93.1	10.6	9.6	13.2
Soyabean meal	85.4	11.9	93.7	96.3	86.0	99.0	43.5	29.3	53.7
Sunflower meal	90.8	86.4	92.0	64.0	54.3	90.5	34.1	20.4	39.1
Tomato pulp	27.3	16.6	30.2	49.8	26.5	60.1	19.4	5.0	22.6
Triticale grain	89.4	80.3	96.9	84.0	75.0	87.3	11.4	6.6	18.8
Turnip tops	29.1	8.5	87.7	86.6	69.2	93.7	15.9	7.2	29.6
Turnip bulbs	23.7	4.7	87.4	89.9	75.6	95.7	14.8	4.6	26.7
Wheat grain	89.4	80.2	92.9	84.7	67.9	91.2	12.9	7.4	22.7
Wheat bran	34.0	15.1	89.6	77.6	70.5	85.3	17.9	8.4	29.8
Whey	7.5	2.1	27.4	87.9	79.5	91.2	30.1	18.6	40.3
Forage supplements									
Barley silage	39.0	20.9	64.3	58.8	35.6	74.3	10.7	5.5	22.9
Barley hay	87.0	66.1	93.7	56.9	27.2	72.4	8.2	1.2	14.6
Barley straw	89.3	73.4	93.6	42.0	14.2	55.0	2.8	0.2	28.8
Clover silage generic	41.9	20.9	79.5	62.1	52.4	68.5	19.3	12.4	27.2
Clover hay generic	86.6	61.3	93.2	57.5	40.1	72.4	17.6	6.3	26.1
Grass silage	43.2	17.1	89.3	60.1	31.0	77.6	13.2	5.1	26.6
Grass hay	86.3	51.9	94.0	51.7	31.7	67.9	8.0	0.7	17.7
Legume/grass silage (legume dominant)	42.1	13.7	68.3	60.8	38.1	73.7	16.0	7.3	28.6
Legume/grass silage (grass dominant)	86.4	45.2	95.9	56.9	33.6	73.7	14.5	4.1	25.4
Lucerne silage	49.5	15.8	87.7	60.8	31.0	70.5	20.0	5.3	32.1
Lucerne hay	87.8	36.0	96.1	60.1	34.3	73.1	18.9	5.7	29.7
Lucerne straw	86.1	68.2	93.4	36.9	27.8	44.0	8.9	5.9	14.1
Maize silage	30.9	9.2	84.5	68.5	32.3	84.0	7.7	3.4	17.1

	Dry matter %			Dry matter digestibility %			Crude protein %		
	Average		Range	Average		Range	Average		Range
Forage supplements continued									
Oaten silage	40.9	18.1	82.2	56.2	38.1	72.4	9.8	3.8	19.4
Oaten hay	88.9	40.2	96.4	54.3	29.1	73.1	6.9	1.1	16.3
Oaten straw	89.4	80.2	93.8	40.1	27.8	64.7	2.8	0.1	11.9
Pasture silage	43.1	10.9	87.6	60.8	14.2	76.3	14.1	3.2	27.3
Pasture hay	86.2	48.6	95.5	54.3	34.3	72.4	10.8	1.7	30.0
Rice straw	85.2	52.2	93.5	43.3	34.3	57.5	4.0	1.9	5.0
Subclover silage	37.1	20.6	59.9	61.4	33.6	67.9	18.8	12.6	26.9
Subclover hay	86.8	71.7	93.9	56.9	42.0	68.5	17.2	7.7	25.7
Triticale silage	42.9	20.1	71.0	58.8	45.9	72.4	10.8	4.0	24.0
Triticale hay	86.6	54.3	93.9	55.6	31.0	69.2	7.3	1.3	16.2
Triticale straw	89.8	62.7	95.7	40.1	26.5	58.2	2.8	0.7	6.7
Wheat silage	44.9	27.5	69.1	56.9	29.7	69.2	10.0	6.5	16.0
Wheat hay	87.9	46.8	95.1	56.2	31.7	71.1	8.2	0.1	17.4

Common fertilisers and their composition

Primary element(s)	Brand	Composition (%)			
		N	P	K	S
N	Urea	46.0	0.0	0.0	0.0
N & P	Di-ammonium phosphate	18.0	20.0	0.0	1.6
	Mono-ammonium phosphate	10.0	21.4	0.0	1.5
P	Single Superphosphate	0.0	9.0	0.0	11.0
	Double Superphosphate	0.0	16.2	0.0	4.1
	Triple Superphosphate	0.0	20.0	0.0	0.8
	Pastursul	0.0	18.0	0.0	9.7
	Pasture Builder	0.0	14.0	0.0	0.0
	Hi-Fert 0:20:0	0.0	20.0	0.0	1.5
K	Potassium chloride	0.0	0.0	50.0	0.0
	Muriate of Potash	0.0	0.0	50.0	0.0
P & K	Pasture Gold 3:1	0.0	8.9	17.5	11.0
	Pasture Gold 4:1	0.0	9.8	14.5	12.2
P & S	Pasture Gold	0.0	14.3	0.0	17.1
	Gold Phos 10	0.0	18.0	0.0	10.0
	Gold Phos 20	0.0	16.0	0.0	20.0
	Pasture Phos	0.0	13.0	0.0	7.0
K & S	Super Potash 1 & 1	0.0	4.4	25.0	5.5
	Super Potash 2 & 1	0.0	5.9	16.6	7.3
	Super Potash 3 & 1	0.0	6.6	12.7	8.2
	Super Potash 4 & 1	0.0	7.0	10.0	8.8
	Super Potash 5 & 1	0.0	7.3	8.3	9.2
Blends of all elements	Dynamic Lifter	3.5	2.4	1.6	1.0
	Pasture Booster	24.0	4.0	13.0	5.0
	Poultry litter*	2.6	1.8	1.0	0.6

*Poultry litter can vary widely depending on many factors. If your farm is applying poultry litter, we suggest you ask the supplier if they have any records of what the percentage of elements were.

Fuel consumption with contractors

When estimating the amount of fuel (diesel) consumed, you also need to consider any activities that contractors undertake on the farm, especially where they supply the fuel. Approximate consumption figures for some common activities are:

- Fertilising/chemical spraying/rolling/hay raking/tethering/light harrows – 3 litres per ha
- Direct drilling/sowing/mowing/silage wrapping/power harrows – 9 litres per ha
- Discing – 12 litres per ha
- Baling silage and hay/harvesting (e.g. maize silage) – 16 litres per ha
- Ploughing/tillage – 18 to 22 litres per ha (dependent on soil conditions)

For example

You are using a contractor for harvesting silage. The steps in this process were mowing, tethering, raking, baling and wrapping. This process would require approximately 40 litres per hectare (i.e. 9 litres/ha for mowing, 3 litres/ha each for tethering and raking, 16 litres/ha for baling and 9 litres/ha for wrapping). This needs to be included in the fuel consumption figures in ADCC as it is a component of the farm's management and fuel consumption.

Carbon in trees

Note that for the majority of regions, there is no difference in carbon sequestration between the two soil types. Similarly, the drop-down list in ADCC will occasionally have two options for Radiata Pines (low or high input), although the carbon sequestration potential is frequently the same. If the species on your farm is not listed, select the next most relevant. Environmental plantings are native species endemic to your region so select this if no options match what you have on farm. Alternatively, use other tools such as FullCAM to access data for your region.
If you access carbon sequestration data from other sources, make sure you are recording t CO_2e/ha. You can convert C to CO_2e by multiplying by 3.67, e.g. 4 t C/ha = 14.68 t CO_2e/ha.

State	Region	Soil types	Tree species options
Victoria	East Gippsland	• Red earths • Yellow duplex	• Mixed species environmental plantings • Tasmanian Blue Gum • Shining Gum • Radiata Pine
	South & West Gippsland	• Non-cracking clays • Gradational soils	• Mixed species environmental plantings • Tasmanian Blue Gum • Shining Gum • Mountain Ash • Radiata Pine
	South-west	• Cracking clays • Red duplex	• Mixed species environmental plantings • Sugar Gum • Tasmanian Blue Gum • Shining Gum • Radiata Pine
	North-east (e.g. Wangaratta, Benalla)	• Grey cracking clays • Red duplex	• Mixed species environmental plantings • Sugar Gum • Tasmanian Blue Gum • Shining Gum • Radiata Pine
	Northern (e.g. Cobden, Shepparton, Echuca)		
	Mallee (e.g. Kerang)	• Calcarosols • Yellow duplex	• Mixed species environmental plantings • Sugar Gum • Tasmanian Blue Gum • Shining Gum • Radiata Pine
New South Wales	Northern coastal	• Duplex • Clays and red loams	• Mixed species environmental plantings • Spotted Gum • Dunn's White Gum • Flooded Gum • Slash Pine • Loblolly Pine
	Southern coastal	• Clays • Loams	• Mixed species environmental plantings • Sugar Gum • Tasmanian Blue Gum • Red Ironbark • Radiata Pine
	Central Inland & Riverina		

State	Region	Soil types	Tree species options
Tasmania	North-east	• Loams • All other soils	• Mixed species environmental plantings • Tasmanian Blue Gum • Shining Gum • Radiata Pine
	Central North and Midlands		
	Southern and Derwent Valley		
	North-west		
South Australia	South-east	• Duplex soils • Cracking clays	• Mixed species environmental plantings • Tasmanian Blue Gum • Radiata Pine
	Murray River		
Western Australia	South-west	• Loams & clays • Sandy duplexes	• Mixed species environmental plantings • Tasmanian Blue Gum • Sydney Blue Gum • Maritime Pine • Radiata Pine
Queensland	Northern	• Clays • Duplexes	• Mixed species environmental plantings • Hoop Pine • Lemon-scented Gum • Western White Gum • Blackbutt • Pinus hybrids
	Southern		

FURTHER INFORMATION

Dairy Australia supports dairy farmers looking to better manage their carbon footprint by understanding on-farm emissions and then working out which options offer practical and profitable ways to reduce emissions.

To access the Australian Dairy Carbon Calculator, visit **dairyaustralia.com.au/climateandenvironment**

Dairy Australia Limited ABN 60 105 227 987
E enquiries@dairyaustralia.com.au
T +61 3 9694 3777
F +61 3 9694 3701
dairyaustralia.com.au

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