Australian Government



Department of Climate Change, Energy, the Environment and Water

Carbon Farming Outreach Program training package

Topic 3



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Carbon Farming Outreach Program training package

The Carbon Farming Outreach Program training package provides information to help farmers and land managers make decisions about reducing greenhouse gas (GHG) emissions and storing carbon.

The training package comprises 5 topics:



Watch these videos

In this video (4:38 minutes), presenters Gail Reynolds-Adamson and Matt Woods introduce the Carbon Farming Outreach Program, and the training package structure and content.

Video: <u>Welcome to the Carbon Farming Outreach Program</u> (youtube.com)



Transcript

GAIL REYNOLDS-ADAMSON: Hi, and welcome to Carbon Farming Outreach Training package.

Kaya Kepa Kurl Noongar Boodja. My name is Gail Reynolds-Adamson, and I'm a proud Noongar woman from Wudjari Country, on the eastern border of the Noongar nation in Kepa Kurl, also known as Esperance. 'Kepa' is water, 'Kurl' is boomerang, and its where the waters lie like a boomerang.

MATT WOODS: Hi, Gail, and welcome, everyone. I'm Matt Woods, an agricultural and science journalist.

Today, we're at my home, outside Bacchus Marsh, on the border of Wurundjeri, Woiwurrung, and Wathaurong Country of the Kulin Nation, and I pay my respects to Elders past, present, and future.

In the valley below me is the Bacchus Marsh agricultural district, where market gardeners and orchardists farm some of the deepest top soil in Australia.

I've been on hundreds of farms and spoken to thousands of farmers from one end of Australia to the other. And if there's one subject top of mind for every farmer, it's profitability.

And that's actually what this training package is about. Because, in most cases, good carbon farming practices will improve the profitability and health of your land. Whether you want to enter the carbon market or not, the truly great outcome with carbon farming is that it can be a win-win: good for your farm business, land, and the environment.

REYNOLDS-ADAMSON: Thanks, Matt. It's great to be part of this Carbon Farming Outreach Program training package, and to be able to share with farmers and land managers from all over Australia some of the who, what, when, where, and why, of carbon farming.

This includes evidence-based knowledge and practices both from Western and traditional Aboriginal Torres Strait Islander culture.

I'm the chairperson of Esperance Tjaltjraak Native Title Aboriginal Corporation in Western Australia. I'll be sharing more about the tree rejuvenation project we are running at Kardutjaanup to show you the many benefits, but also the risk requirements involved with this type of carbon farming.

WOODS: The aim of this package, through five short topics, is to give you the carbon farming essentials from expert practitioners, farmers, and land managers in all Ag (agriculture) sectors across Australia, like Gail, who've already embarked on carbon farming projects.

They'll share some tips and tricks with you, including why and how they did it, what technology and techniques they used, what worked, what didn't and who helped them along the way. We've also carefully researched and selected resources, materials, and tools that may benefit you and presented them by Ag (agriculture) sector and location for your convenience.

We know that you don't have loads of time to spend sitting in front of a computer. And that you need your learning to be relevant, targeted, accessible, and practical.

Each of the five topics should take you no more than one hour individually.

But we've also provided additional content and case studies if you want to find out more.

Short videos like this, as well as interviews and explainers, will allow you to access this package anywhere, anytime.

REYNOLDS-ADAMSON: The Carbon Farming Outreach Program training package won't make you an expert in carbon farming, but it will teach you the essential things you should know before embarking on carbon farming.

This includes benefits and risks, potential pathways to action, and the decision you will need to make, including whether or not to trade carbon credits, and some resources you can refer to for your location and type of practice. Importantly, we will help you to understand who you should talk to, what you should look out for when you are choosing advisors, and to ensure that you are getting quality, trusted, independent advice.

WOODS: Finally, each topic concludes with some relevant focusing questions, for you to consider in relation to your own circumstances.

Whether you're just learning about carbon farming for the first time and are exploring your options or had some experience and want to find out more, this package can help you. Think of it as like having a yarn with your neighbours over the fence about their carbon farming project.

In this video (4:03 minutes), Professor Richard Eckard discusses the need for carbon farming.

Video: Carbon Farming Outreach Program (youtube.com)



Transcript

PROFESSOR RICHARD ECKARD: For farmers and land managers to meet the goal of reduced emissions starting in 2030 through to 2050, they need to know what to do next, what steps to do next, and they need to know where the policy environment is coming from, who's asking them to be low emissions, what the targets are, and then what the options are for them to start responding.

Hi. I'm Richard Eckard, professor in the Faculty of Science at the University of Melbourne. I lead the Primary Industries Climate Challenges Centre, which researches the impact of climate change on agriculture and agriculture on climate.

What we're seeing is all the multinational supply chain companies that deal with agricultural produce have set targets, targets for reduced greenhouse gas emissions. And they average somewhere around 30 percent less emissions by 2030 and net zero by 2050. What we also know is about 70 percent of Australian agricultural produce is exported down these multinational supply chain targets. And so how does Australia perform on the global stage when those companies start buying globally to meet their target?

So it's really imperative that farmers and land managers get on board to know how do they gear their system to deliver the low emissions product that the supply chain will want to buy by 2030. What we're trying to do is just bring up the knowledge that carbon farming is a part of their future.

There is this trajectory towards lower emissions. So making them aware of the policy environment, of the supply chain constraints, of how they need a partnership with their supply chain, to achieve this. And then some awareness of what is their number, how do they get their number, and how do they move down the track towards improving that number. And what are the technologies they can bring to bear to reduce their number, their greenhouse gas footprint?

So these will be things to start with are just best practice. Best practice that we've known for the last 40 years. Things like nitrogen use efficiency, better crop yields, better soil testing, better growth rates in livestock, feeding animals better, bringing legumes into agriculture. These are all things we've known for a long time that improve efficiency, but also reduce the greenhouse gas footprint.

Australia is already 22 percent more rainfall variable than any other country in the world, and the historic management of the land took that into account. Now we're becoming aware of this in how we do carbon farming, that we have to actually change from strictly European farming systems to

systems that are more attuned to this high variability we're encountering. And so there's a lot to be learned from the Indigenous land management practices that we need to then incorporate into traditional farming, non Indigenous farming, so that it actually is a bit more in tune with the high variability we have in Australia.

Now the world needs to go net zero by 2050. What we haven't really reconciled is where does the big emission reduction take place? Obviously, it has to happen in the fossil fuel sector.

But we need to move towards, well, what can agriculture contribute to that inevitable net zero? And what can they contribute towards the 2030 goal? Now not every agricultural sector has the identical opportunity. We've got some intensive horticulture for example that have very low emissions and almost nothing to do to get to net zero apart from renewable energy. But you've got an extensive livestock sector where a lot of northern cattle stations, we don't even know how many cattle are there. So the challenges are vastly different, and this is what the program is trying to address is who has what options to move forward and what are those options.

Using this training package

This training package provides introductory information, and sources of further information and advice. References to third-party material, information or products or services do not represent endorsements. This training package does not provide detailed information that farmers and land managers may need when making decisions about carbon farming for their own particular circumstances. This training package is not a substitute for independent professional advice. Before making decisions about carbon farming, you may need to obtain more information and independent advice relevant to your particular circumstances.

Acknowledgement of Country

The Australian Government acknowledges the Traditional Owners and custodians of all the lands across Australia. We pay respect to all Aboriginal and Torres Strait Islanders, including elders, past and present. We also express our gratitude and appreciation for the ongoing stewardship of Country that Aboriginal and Torres Strait Islanders have practised for thousands of years. We understand that we all have much to learn from traditional ways of knowing, being and doing.

Statement of intent

This training package has been developed in consultation and collaboration with an Aboriginal and Torres Strait Islander reference group. We thank them for their generosity with time, expertise, and patience. We recognise Aboriginal and Torres Strait Islanders as rights holders and value the opportunity for Aboriginal and Torres Strait Islanders to engage with farmers and land managers in meaningful dialogue to weave traditional practices into carbon farming. Aboriginal and Torres Strait Islanders offer invaluable traditional ecological knowledge that complements the expertise of other farmers and land managers. Together, farmers, land managers and Aboriginal and Torres Strait Islanders are practising carbon farming methods that respect traditional insights and modern science. As co-innovators, we are exploring new pathways to reduce carbon footprints through joint carbon farming initiatives and preserving the land for future generations.

Aboriginal and Torres Strait Islander people should be aware that this website, the videos it contains and links to First Nations resources may contain images, voices and names of deceased persons.

Topic 3: Your greenhouse gas account

Time to complete this topic

About 60 minutes to read the information in this topic. Additional content includes videos, activities and links to other resources which may require extra time to complete.

In this topic:



3.1 Overview and learning outcomes

Overview

In this topic, you will learn about a greenhouse gas (GHG) account and how it quantifies and records your GHG emissions and carbon storage.

The topic starts by explaining GHG accounting and the reasons for doing it. It examines why a farmer or land manager should have a GHG account, including to quantify productivity improvements and other cobenefits of carbon farming. It also examines accounting for co-benefits and the uses of a GHG account.

Keeping a GHG account is about accurately estimating GHG emissions and carbon storage using a GHG calculator and recording these estimates. There are many calculators available. Some make quick, simple estimates that give a general understanding and allow users to run 'what if?' scenarios. Others are more complex and make more precise estimates needed, for example, to earn ACCUs. This topic explains 3 calculators, covering various sectors and levels of complexity and gives farmers and land managers hands-on experience using them. The 3 calculators are:

• the Meat and Livestock Australia (MLA) Quick Start Carbon Calculator, a simple calculator that estimates GHG emissions and carbon storage that only needs basic data

- the Greenhouse Accounting Framework (GAF) tools, a group of agriculture-specific tools produced by the Primary Industries Climate Challenges Centre and the University of Melbourne
- the Commonwealth Scientific and Industrial Research Organisation (CSIRO) LOOC-C (Landscape Options and Opportunities for Carbon abatement Calculator), which gives estimates and options for action linked to the ACCU Scheme.

Section 7 provides information on other calculators, including a table summarising them, to help in considering their suitability for a particular purpose.

Farmers and land managers often already have the data they need to use these calculators or are likely to be able to collect the data. For example, a farmer might have the data for farm input benchmarking or management or tax accounting.

Learning outcomes

After completing this topic, you will be able to:

- describe GHG accounts and the need for them
- identify 3 calculators and what data they need
- calculate GHG emissions and carbon storage for a property using a GHG calculator
- identify the largest sources of emissions and potential options to reduce emissions or store carbon.

Watch this video

In this video (2:10 minutes), presenters Gail Reynolds-Adamson and Matt Woods introduce Topic 3 and provide important context.

Video: Understanding emissions (youtube.com)



Transcript

GAIL REYNOLDS-ADAMSON: Welcome to topic three, where we look at understanding emissions in more detail, and in particular, how to accurately measure them.

MATT WOODS: Einstein supposedly once said, "Not everything that can be counted counts, and not everything that counts can be counted". Now he obviously wasn't talking about carbon farming because measuring emissions are what counts, and they can be counted.

The key is knowing how much emissions are going out and how much are being avoided or saved.

We call this carbon accounting.

REYNOLDS-ADAMSON: And carbon accounting is important when carbon farming. Whether you intend to sell carbon credits or not, being able to establish a baseline measure and report your emissions is vital for the Australian Carbon Credit Unit, ACCU, schemes.

But equally, for demonstrating to supply chains and to customers the fruits of your carbon farming endeavour. The key is knowing what to measure and how, and this is where this topic will help. Like most things agricultural, it's not always straightforward, and there's many different tools and techniques with various pros and cons.

Sometimes it can be hard to sort the wheat from the chaff.

WOODS: This topic will cover the on farm information needed to measure emissions. We'll look at various carbon calculators, how to choose the right ones for your sector, and the kinds of data they need.

REYNOLDS-ADAMSON: Again, you will hear from experts and see relevant case studies and be prompted to respond to the focus questions in preparation for discussions with the experts to guide your decisions.

And one more thing before you go.

Whilst we can and must measure emissions and other co-benefits such as biodiversity, there are some that, whilst they count, simply cannot be counted.

3.2 Greenhouse gas accounting and accounts

About greenhouse gas accounts

A farmer or land manager uses a GHG account to record GHG emissions and carbon stored. They or their advisers keep the account. It is an 'account' only in the sense that it records:

- 'debits' (scope 1, 2 and 3 emissions)
- 'credits' (carbon stored)
- the resulting balance.

The opening balance of an account is GHG emissions minus carbon stored, estimated for a defined period. The opening balance helps in understanding your emissions sources. It provides a starting point or a baseline against which you can measure the progress of carbon farming activities to reduce emissions and store carbon.

The emissions boundary covered by your footprint may be all the sources of emissions and increase in carbon storage on your land, or it may also include your supply chain. The boundary should be defined in line with your purpose for determining your footprint and any associated requirements you may need to meet.

There are different ways to construct a GHG account, and the approach you use depends on the purpose of preparing the account. It might be a simple account with limited, approximate data to, for example, track livestock emissions over time. Or the account might conform to a standard (such as a <u>Climate Active</u> <u>Standard</u>), to support a farmer's claims about the emissions intensity of their products (such as wool, meat and grain). Depending on the purpose of an account, it may record insetting and offsets in addition to emissions and carbon stored.

The government is developing <u>voluntary GHG estimation and reporting 'standards' (VEERS)</u> for agriculture, fisheries and forestry industries. The 'standards' aim to improve the quality and consistency of accounting methods and tools.

'Carbon' vs 'greenhouse gas'

The commonly used term 'carbon accounting' generally refers to accounting for all GHGs, not just carbon dioxide and stored carbon.

3.3 Accounting approaches

Greenhouse gas accounts

Keeping a GHG account means quantifying GHG emissions and carbon stored. A farmer or land manager keeping an account solely for their own purposes can choose any suitable approach. However, if they keep an account to participate in a program (such as the ACCU Scheme), they will need to use the program's specified approach for their calculations. These approaches may differ from whole-offarm calculators such as GAF calculators. Program-specific approaches can include:



- the applicable scheme's eligibility requirements
- the emissions sources and carbon stores to be included
- the monitoring and measurement tools and methods (such as for remote sensing and soil sampling and analysis)
- the calculator and tools to estimate quantities of GHGs emitted and carbon stored; calculators are custom-made software, or spreadsheets, usually in Microsoft® Excel®
- the frequency of estimates, to track changes over time
- reporting and verification standards.

The two main Australian Government initiatives with requirements for estimating or calculating GHG emissions and/or carbon stored are:

- the ACCU Scheme, administered by the Clean Energy Regulator, the statutory body that administers initiatives legislated by the Australian Government for measuring, managing, reducing and offsetting Australia's GHG emissions
- the Australian Government's Climate Active program, administered by DCCEEW, which encourages business decarbonisation by certifying voluntary climate action.

Accounting for co-benefits

Topic 2 examined the co-benefits of carbon farming for a farmer or land manager, the environment and the community. Accounting for co-benefits is in its infancy, but it is maturing as governments and an environmentally conscious public want to know the cultural, environmental and social impacts of farming and land management. Examples of accounting for co-benefits include:

- the Queensland Government's Land Restoration Fund, which requires projects to follow a specified carbon storage method and deliver at least one environmental co-benefit, with the option of including social and/or First Nations peoples' co-benefits, as explained in its <u>LRF Cobenefits Standard</u> (PDF 2.1 MB)
- the Western Australian Government's Carbon Farming and Land Restoration Program's <u>Co-benefits Standard 2022-2023</u> (PDF 1 MB), which outlines eligible co-benefits with examples, data and guidance about monitoring and reporting and a <u>CF-LRP Co-benefits Portal</u>, a digital mapping tool for applicants to identify co-benefits
- the <u>Aboriginal Carbon Foundation's</u> Core Benefits Verification Framework for the Environmental, Social and Cultural Values of Aboriginal Carbon Farming for determining values for benefits in First Nations carbon market projects.

Uses of a GHG account

A GHG account can help a farmer or land manager to:

- baseline their GHG emissions and changes in carbon storage, to help in identifying emissions reduction and carbon storage options and to set benchmarks for monitoring their emissions profile over time
- track and report on emissions reductions and carbon storage in an ACCU Scheme project if the GHG accounting is done in line with the specified method for the project
- achieve and maintain Climate Active certification for voluntary climate action
- provide evidence (when prepared within a suitable framework) to consumers, retailers, lowerinterest sustainability loan providers and others who are interested in the carbon footprint of your product or business
- quantify productivity improvements and other carbon farming co-benefits
- use the data generated to work with regional natural resource management (NRM) organisations to reduce GHG emissions and store carbon at the landscape scale.

If selling produce internationally, farmers may need GHG accounts to demonstrate their emissions management credentials.

3.4 Calculators

Next, we look at 3 calculators covering various sectors, levels of complexity and purposes to give you hands-on calculator experience. Some initiatives (such as the ACCU Scheme) specify requirements for estimating GHG emissions and carbon storage, which include using specific calculators. The results of these calculators may not suit your particular purposes: no calculator suits all uses and all initiatives.

Watch this video

In this video (1:57 minutes), Matt Woods and Professor Richard Eckard of the University of Melbourne discuss what a carbon calculator is and what it does.

Video: Carbon calculators (youtube.com)



Transcript

MATT WOODS: Hello. I'm Matt Woods, and I'm here with Professor Richard Eckard. Richard has been working for over twenty years on addressing the impacts of a changing climate on agriculture.

Can you briefly describe what a carbon calculator is?

PROFESSOR RICHARD ECKARD: So a carbon calculator is just -- in our case, we've got the greenhouse accounting framework calculator. So we've got one called the sheep and beef calculator, another one called the feedlot calculator; a dairy calculator.

And it's a simple spreadsheet.

It has all complex calculations behind the scenes that you can go and look at if you want to. There's nothing hidden there. But the data input page is one page where you just put in your animal numbers, how much fertiliser you've used, how much lime you used, and what energy you used, and what you bought onto the farm.

WOODS: Right.

ECKARD: And it breaks it down to a simple number at the end that says "this is how much methane is produced". "This is how much nitrous oxide is produced". "This is how much carbon dioxide you're losing".

And "this is how much total emissions your farm produces and emissions per unit product it produces".

At the end, those are the numbers that matter. And over time, that's what the supply chain will look at and say, what is your emissions intensity? How much methane are you producing?

And those are the numbers that matter.

WOODS: Terrific. Thank you very much Richard. I appreciate your time.

MLA Quick Start Carbon Calculator

We start by looking at a simple, straightforward calculator that requires basic data inputs and allows users to understand GHG emissions sources and carbon storage.

The MLA (Meat and Livestock Australia) <u>Quick Start Carbon</u> <u>Calculator</u> is a quick, easy way for farmers to estimate their GHG emissions and carbon storage through on-farm tree growth. The calculator also estimates how much pasture growth and tree planting you will need to balance out emissions.

The calculator needs minimal data to estimate on-farm emissions, although the better the data, the more accurate the result.



The calculator gives farmers and land managers just starting their calculation journey a quick assessment of their GHG emissions and carbon storage. It also gives a taste of what the MLA's more comprehensive calculator (the <u>MLA Carbon Calculator</u>) and other sector-specific calculators can provide.

The calculator is based on the Greenhouse Accounting Framework tools developed by the University of Melbourne, which this topic examines later.

Watch this video

In this video (4:59 minutes), Matt Woods and Professor Richard Eckard of the University of Melbourne discuss the basics of the MLA Carbon Calculator and its main functions, providing information to help you decide whether this calculator suits you. Section 6 has an activity to use a simplified version of this calculator.

Video: Measuring emissions (youtube.com)

Transcript

MATT WOODS: Hello. I'm Matt Woods, and I'm here with Professor Richard Eckard.

Richard's been working for over 20 years on addressing the impacts of a changing climate on agriculture.

WOODS: If that farmer wanted to monitor and measure their emissions, how would they start?

Where would they start to work out actually how much emissions they're producing?

PROFESSOR RICHARD ECKARD: So, there is some thought out there that farmers might need to measure emissions. That'll never happen. It is too complex; it is too complicated from a science point of view to get accurate profiles on methane from animals in a farm setting - so that's impractical.

However, the research we've done says that 20.7 times dry matter intake is a fairly reliable number. And we're starting to quantify all the mitigation strategies against that. So if you feed oils to your cows at seven percent, that 20.7 becomes 16. We know that. If you feed seaweed, it might become five.

So we know how to adjust calculations to accommodate it. The biggest uncertainty in knowing what your number is on a livestock farm is knowing how many animals you've got. That's actually far bigger than the methane conversion that we use.

WOODS: You'd think most farmers know their animal numbers, wouldn't you?

ECKARD: It is surprising, we do case studies across farms right from the Northern Territory right down to Tasmania, and getting animal numbers right is the biggest struggle we have in doing an accurate carbon audit on farms. Even though they have a stock book - because there's no such thing as static number of animals on a farm. A dairy farm will milk different number of animals every day of the year.

A beef system, a prime lamb system, lambs are being born, lambs are dying. So actually knowing exactly how many animals you've got on any one day, and locking that into a calculator is actually quite difficult.

Even some of the best farmers, we have to go back to them two or three times to say "did you mean culling before or after the weaning rate you quoted?"

Because it doesn't reconcile and you realise that; we had one case of a Queensland farmer that the numbers didn't add up when we said, you know, what was your weaning rate? What was your reproductive rate? How many animals are you producing? And it turns out that there were a thousand animals down the back of the farm that they lost for a couple of years. It gives you some perspective on some of the bigger properties in Australia where you can lose a thousand animals for a period of time. Not ultimately, but you can miss them in a muster that isn't perfect.

WOODS: So farmers won't be required to actually measure their emissions, but it's useful for them to start maybe calculating their emissions and carbon calculators is something that you've got a real history in, and were a first mover in. How do they work and what are the sort of inputs that farmers might need to put into them?

ECKARD: Correct. So at the moment, we've got fairly simple spreadsheet calculators. They are being coded up into online tools like Meat and Livestock Australia have a identical version of our sheep and beef calculator now online, and it will give you the same answer. We've made sure that the various calculators are not giving different answers.

The biggest input is animal numbers.

So if you're a sheep or beef producer somewhere in Australia, getting the animal numbers right into the calculator on a seasonal basis is probably the biggest input.

If you know your animal numbers, you can pretty much complete the calculator in ten minutes. We've tried to keep it as simple as possible. So that if you know the data that needs to go in, you can put it in in about ten minutes. The other inputs you need to know is fertiliser used. So if you're a dairy farmer, you might be using nitrogen fertiliser, you need to know how much you put on. Most dairy farmers know that.

And the other inputs is electricity and diesel consumption on the farm, and we just put that on an annual time step basis.

So emphasising again, they're simple spreadsheets, they have a single page of data input, and, we try to keep it down to about ten minutes to get in and out if you've got all the data required.

Greenhouse Accounting Framework sector-specific tools

The second calculator is actually a group of more comprehensive tools. The <u>Greenhouse Accounting</u> <u>Frameworks (GAF) for Australian Primary Industries</u> tools are for various agriculture and land management sectors. These tools, in the form of Microsoft® Excel® spreadsheets, allow users to predict the sources and amounts of GHGs emitted from a farm and a product at the farm gate.

There are industry-specific tools for dairy, sheep and beef, cropping, feedlot, sugar, cotton, horticulture, pork, buffalo, deer, goat, poultry and rice. The tools are designed to be easy to download and use, although you need to be familiar with Microsoft® Excel®.

Each tool has:

- a *Data summary* tab, which itemises and totals scope 1, 2 and 3 GHG emissions in CO₂-e as well as carbon stored to estimate net farm emissions
- data input tabs, in which the user inputs crop, vegetation, livestock or other data as relevant tabs for each of the emissions line items, showing the assumptions, formulas and values used for the item.

The data summary tab shows GHG emissions and storage items at a glance and in chart form. The example in the <u>Australian Dairy Carbon Calculator</u> shows that methane emissions from enteric fermentation make up almost two-thirds of scope 1 emissions. Fertiliser on-farm and manure make up about one-quarter and pre-farm emissions one-tenth.

The data input tab requires data that many farmers would have at hand for farm input benchmarking, or management or tax accounting purposes, or that is reasonably easy to collect. For example, the sheep and beef tool needs sheep class numbers, live weight by class and live weight gain by class, broken down by season.

The tabs for each GHG emissions line item have detailed analyses useful to farmers, land managers and their advisers. The Primary Industries Climate Challenges Centre and the University of Melbourne developed these tools as part of their Farm Greenhouse Accounting Framework, which is designed to align with the <u>Australian National Greenhouse Accounts</u>, a series of comprehensive reports and databases that estimate and account for Australia's GHG emissions from 1990 onwards.

AIA Environmental Accounting Platform (EAP)

The Environmental Accounting Platform (EAP) developed by Agricultural Innovation Australia (AIA) is a free, standardised tool for calculating GHG emissions across 15 commodities. Built with investment from 10 rural Research and Development Corporations, it enables producers and mixed farming businesses to calculate their emissions at a commodity and whole of enterprise level, establish operational baselines, and scenario-plan to support decisions aimed at reducing emissions.

The EAP is supported by a Technical Advisory Panel comprising Australia's leading experts in GHG accounting, emissions reduction, lifecycle assessment, and climate science. It is consistently updated to ensure alignment with the latest versions of the Greenhouse Accounting Framework (GAF) tools.

LOOC-C

Unlike the MLA Quick Start Carbon Calculator and GAF tools, the CSIRO's <u>LOOC-C</u> (Landscape Options and Opportunities for Carbon abatement Calculator) isn't used to calculate a farm's GHG emissions and carbon storage. Instead, it allows a quick assessment of emissions reductions or carbon storage that could be achieved by conducting some types of ACCU Scheme projects.

LOOC-C lets you select a land area on a map and assess the suitability of the listed ACCU Scheme methods for the land. It provides indicative estimates of the number of ACCUs that could be generated for the selected area.

LOOC-C can also help people who may not intend to run an ACCU Scheme project because it indicates the carbon storage potential of management activities at a selected location and the co-benefits of these activities.

3.5 Meeting calculation requirements

As we have seen, there are basic calculators and other calculators that meet a specific baselining or reporting requirement (such as for an ACCU Scheme method). The basic calculators are informative and widely used but only produce general results. Also, they lack quality control over data input and may not align with the <u>Australian National Greenhouse Accounts</u> or be eligible for use under programs such as Climate Active. The government has committed to developing <u>voluntary GHG estimation and reporting</u> <u>'standards' (VEERS)</u>. However, none of this might matter if you only use the results to get a general understanding of your emissions profile.

Initiatives such as the ACCU Scheme specify detailed requirements for estimating GHG emissions. The requirements may include making calculations using a model or data derived from field sampling or a combination of these approaches.

If a farmer or land manager considering participating in the ACCU Scheme decides they can't produce a calculation that meets the scheme requirements, they would commonly engage an adviser. Advisers include carbon service providers. Topic 4 provides more information.

Any adviser would need to have the necessary experience and knowledge in GHG accounting or environmental auditing aligned with relevant standards, which could include:

- the Australian National Greenhouse Accounts methodologies
- Climate Active carbon accounting and technical requirements for certification
- international value chain reporting requirements, including pre-farm to farm gate life cycle assessment framework, consistent with <u>ISO 14040:2006(en) Environmental management —</u> <u>Life cycle assessment — Principles and framework</u>.

Changes in carbon storage in vegetation and soils over time can be calculated using data from physical sampling of trees and soil. Samples must be collected and analysed using robust processes to obtain accurate estimates. For example, soil sampling locations may need to be selected randomly to avoid bias and samples collected to a specified depth. Samples may need to be analysed in a laboratory using analytical methods and soil sensing techniques. While this approach can produce accurate estimates, it requires specialist skills and may be expensive. Simulation models can estimate carbon storage in vegetation and trees without the need to collect and analyse field samples.

Third-party verification of data and calculations can help ensure benchmarking and reporting requirements are met and that claims about reduced GHG emissions and carbon storage are well-supported.

The University of Melbourne's <u>Guidelines for conducting a carbon audit on farm and farm products</u> (PDF 171 KB) provide more details on this topic.

ACCU Scheme methods

Farmers and land managers planning to run an ACCU Scheme project must calculate their GHG emissions and carbon storage using a legislated method. Topic 5 examines ACCU Scheme methods.

The <u>Full Carbon Accounting Model</u> (FullCAM) is used to produce abatement estimates for several ACCU Scheme vegetation management methods. It is also used to estimate net emissions from the land sector for Australia's National Greenhouse Accounts.

Each ACCU Scheme method specifies how to calculate GHG emissions. Some methods have their own calculator, such as:

- the Blue Carbon Accounting Model (BlueCAM)
- the Savanna Burning Abatement Tool (SavBAT).

3.6 Activities

Activity: Respond to the following questions

Consider how this topic might apply to your land management or farming practice.

Consider the following questions and make notes about ways to calculate GHG emissions and carbon storage that might suit your purpose.

The following points will help you have informed discussions with advisers.

- 1. Working through the following activities, which calculators are most appropriate for you?
- 2. Who might you speak to for further advice about calculating your GHG emissions?

Activity: MLA Quick Start Carbon Calculator

The purpose of this activity is not to yield results that can be actioned on a property but to introduce you to a calculator, the type of data required and how to use the MLA Quick Start Carbon Calculator to get a result. The MLA calculators are intended for livestock production enterprises (see section 7 for a summary of calculators). Note that the steps in the calculator may change over time, so check the current version before using it.

- 1. Read the <u>How to work through the calculator</u> page, which explains the calculator's methods and assumptions for livestock, vegetation and scope 2 and 3 emissions.
- 2. Open the MLA <u>Carbon in action</u> webpage, which explains the MLA e-learning module that walks you through how to use the calculator.
- 3. Complete the <u>Introductory survey</u>.
- 4. Move on to <u>Background</u>, the key point being that the only data required is the total property area (in hectares), areas of pasture and trees and the number of livestock.
- 5. Move on to the <u>Calculator</u>, where the user enters data about their property. Use the following example data if you don't want to use the calculator for your property.

Data	Value
Property area	4,000ha
Location	South Australia
Zone	Mount Gambier
Beef cattle herd size	0 head
Sheep flock size	2,000 head
Area under pasture	3,900ha
Dominant pasture species	Aust Phalaris, clover, annuals
Dominant soil type	Clay
Area under trees	100ha
Dominant tree type	Mixed species

Activity: Greenhouse Accounting Framework Tools

Again, the purpose of this activity is not to yield results that can be actioned on a farm but to introduce you to these calculators, the type of data required and how to use the calculator to get a result.

- 1. Open the GAF for Australian Primary Industries <u>Tools</u>. Click on the version of the framework relevant to you, which will download the spreadsheet to your computer, which you must then open.
- 2. Click on the data input tab and enter the data relevant to your farm profile.
- 3. Click on the data summary tab and work through the top 2 or 3 GHG emissions items, which is where there may be the greatest potential to reduce GHG emissions. Are you surprised by their size or that they are the main items?

Activity: LOOC-C calculator

The purpose of this activity is not to yield results that can be actioned on a farm but to introduce you to the idea of a calculator, the type of data required and how to use the calculator to get a result.

- 1. Open <u>LOOC-C</u>. Choose your area on the map using the Area tool and select all relevant options on this page.
- On the next page, explore the available methods, which will be addressed in greater detail in Topic
 Select a method of interest and explore the results. Note that while these are ACCU Scheme methods, the practices within the methods can be used for carbon farming activities other than an ACCU scheme project.
- 3. In particular, explore the Farm Co-benefits tab and discuss the findings.
- 4. Click on the Save as PDF line at the foot of the Available methods page to summarise the results.

3.7 Other resources

Calculators

While there are many other calculators, some of which are below, the logic of the original GAF tools (developed by the Primary Industries Climate Challenges Centre and the University of Melbourne) sits under many of them. All the calculators below are free to use unless otherwise indicated. This is not a comprehensive list of available calculators.

Australian Dairy Carbon Calculator

The <u>Australian Dairy Carbon Calculator</u> was developed by the Tasmanian Institute of Agriculture and Dairy Australia. The calculator is a spreadsheet to provide an understanding of GHG emissions under current management practices and to explore potential management practices to reduce on-farm GHG emissions. These practices include the management of herds, feed and soil, and reducing energy use and switching to renewables.

Australian Wine Carbon Calculator

The <u>Australian Wine Carbon Calculator</u> was developed by the Australian Wine Research Institute. It is a spreadsheet for estimating scope 1 and 2 emissions of vineyards and wineries. It also provides information on calculating scope 3 emissions, but it does not include them in calculations. The institute provides advice about <u>carbon accounting</u> (PDF 520 KB) in viticulture and <u>additional links</u> to information about vineyard soil health, soil analysis, salinity and management practices to improve soil structure and grapevine nutrition.

DairyBase

<u>DairyBase</u>, developed by Dairy Australia, helps dairy farmers and advisers measure and compare farm business performance over time. Dairy farmers already using DairyBase can estimate their GHG emissions using pre-populated data from their DairyBase farm dataset. The calculator is only accessible to registered users. The website has guides to using DairyBase.

MLA Carbon Calculator

The <u>MLA Carbon Calculator</u> enables farmers to calculate total enterprise GHG emissions and emissions intensity for beef, sheep, goat, wool, feedlot and crops. The MLA has digitised the <u>Sheep and Beef</u> <u>Greenhouse Accounting Framework (SB-GAF)</u> (XLSX 2.6 MB) and the <u>Grains Accounting Framework (G-GAF)</u> (XLSX 2.5 MB). MLA provides a <u>Carbon accounting technical manual</u> (PDF 1.8 MB) and a <u>video</u> about how to use the calculator.

Platform for Land and Nature Repair

The Australian Government's <u>Platform for Land and Nature Repair</u> (PLANR) provides a calculator enabling users to estimate their GHG emissions and the condition of the natural assets on their land. They can then compare the results to other areas in their region.

Ruminati

The <u>Ruminati</u> calculator is managed by a group of industry experts and has BASE and PRIME versions that help estimate a farm's GHG emissions and carbon storage. Ruminati PRIME, an enhanced, purchasable version, allows for modelling of GHG abatement options, creating emissions reduction plans and sharing emissions-related information with other organisations in their supply chain. The website provides access to a <u>video</u> about how to use the calculator.

Carbon calculator summary

The following information summarises the applicability and requirements of the carbon calculators discussed in this topic, to help farmers and land managers consider calculators that may meet their particular needs and circumstances. Notes below the summary provide more details.

Carbon Farming Outreach Program training package

Calculator	Sector or land use	Type of estimate or analysis	Data required	Relevant carbon farming categories	Accessibility	General description
<u>Australian</u> <u>Dairy Carbon</u> <u>Calculator</u> (Dairy Australia)	Dairy	GHG emissions Abatement estimates	Property information Livestock Cropping Vegetation Waste management Consumables usage	Soil Livestock Vegetation Other – renewable energy and manure management	Microsoft® Excel® spreadsheet Downloadable for offline use Free No account required	Used to estimate GHG emissions, impacts of management activities on emissions and carbon storage in trees and explore different management actions. Based on <u>Dairy GHG Accounting</u> <u>Framework (D-GAF)</u> .
Australian Wine Carbon Calculator (Australian Wine Research Institute)	Viticulture Winemaking	GHG emissions	Cropping Waste management Consumables usage	Soil Other – renewable energy and energy- efficient irrigation systems	Microsoft® Excel® spreadsheet Downloadable for offline use Free No account required	Used to estimate GHG emissions from vineyards and wineries and impacts of management activities on GHG emissions.
Blue Carbon Accounting Model (BlueCAM) (Australian Government)	Blue carbon	ACCU Scheme Abatement estimates	Property information Cropping Vegetation Consumables usage External – tidal ranges	Blue carbon	Microsoft® Excel® spreadsheet Downloadable for offline use Free No account required	Used to estimate abatement for projects under the ACCU Scheme Tidal Restoration of Blue Carbon Ecosystems method.
<u>DairyBase</u> (<u>Dairy</u> Australia)	Dairy	GHG emissions Abatement estimates	Property information Livestock Cropping Vegetation Waste management Consumables usage	Soil Livestock Vegetation Other – renewable energy and manure management	Online only Internet required Free Account required	Used to estimate GHG emissions, impacts of management activities on emissions and carbon storage in trees and explores different management actions. Based on <u>D-GAF</u> .

Carbon Farming Outreach Program training package

Calculator	Sector or land use	Type of estimate or analysis	Data required	Relevant carbon farming categories	Accessibility	General description
Environmental Accounting Platform (Agricultural Innovation Australia)	Beef (Feedlot) Beef (Pasture) Buffalo Deer Goats Poultry (Broiler) Poultry (Layer) Pork Sheep Cotton Cropping (Grains) Horticulture Rice Sugar Wild Sea Fishery	GHG emissions	Property information Livestock Cropping Vegetation Fisheries Waste management Consumables usage	Soil Livestock Vegetation Other – renewable energy and manure management Savanna fire management	Online Internet required Free Account required	Calculator used to estimate GHG emissions at a commodity or whole of enterprise level, impacts of management activities on emissions and carbon storage in trees
<u>Full Carbon</u> <u>Accounting</u> <u>Model (FullCAM)</u> (<u>Australian</u> <u>Government)</u>	Forestry Cropping Grazing Non- agricultural land use	GHG emissions ACCU Scheme Abatement estimates	Property information Cropping Vegetation	Soil Vegetation	Online and downloadable Internet required Free No account required	Used to estimate GHG emissions, impacts of management activities on emissions and carbon storage in soil and vegetation. Also used to estimate abatement for some vegetation and soil carbon methods under the ACCU Scheme.

Carbon Farming Outreach Program training package

Calculator	Sector or land use	Type of estimate or analysis	Data required	Relevant carbon farming categories	Accessibility	General description
Greenhouse Accounting Frameworks (GAF) for Australian Primary Industries Tools (The University of Melbourne)	Beef (feedlot) Beef (grazing) Buffalo Dairy Deer Goats Poultry Pork Sheep Cotton Cropping Horticulture Rice Sugar	GHG emissions Abatement estimates	Property information Livestock Cropping Vegetation Waste management Consumables usage	Soil Livestock Vegetation Other – renewable energy and manure management Savanna fire management	Microsoft® Excel® spreadsheets Downloadable for offline use Free No account required	Individual sector-specific calculators used to estimate GHG emissions, impacts of management activities on emissions and carbon storage in trees.
Landscape Options and Opportunities for Carbon abatement Calculator (LOOC-C) (CSIRO)	Agricultural or non- agricultural land use	Abatement estimates	Property information Cropping Vegetation Consumables usage	Soil Livestock Vegetation	Online only Internet required Free No account required	Used to produce indicative estimates of potential abatement under some ACCU Scheme methods, for a specified land area and time period.

Carbon Farming Outreach Program training package

Calculator	Sector or land use	Type of estimate or analysis	Data required	Relevant carbon farming categories	Accessibility	General description
<u>MLA Carbon</u> <u>Calculator</u> (<u>Meat and</u> <u>Livestock</u> <u>Australia)</u>	Beef (feedlot) Beef (grazing) Goats Sheep Cropping	GHG emissions Abatement estimates	Property information Livestock Cropping Vegetation Consumables usage	Soil Livestock Vegetation Other – renewable energy Savanna fire management	Online only Internet required Free Account optional	Used to estimate GHG emissions, impacts of management activities on emissions and carbon storage in trees and explore different farm management actions. Built on <u>Sheep and Beef</u> <u>Greenhouse Accounting Framework (SB- GAF) and Grains Accounting Framework</u> (<u>G-GAF</u>). Emissions estimates include consumables usage and feedlots which are not included in the MLA Quick Start calculator (explained below).
MLA Quick Start Carbon Calculator (Meat and Livestock Australia)	Beef Sheep Cropping	GHG emissions Abatement estimates	Property information Livestock Cropping Vegetation	Soil Livestock Vegetation	Online only Internet required Free Account optional	Used to estimate GHG emissions, impacts of management activities on emissions and carbon storage in trees.
<u>Platform for</u> <u>Land and</u> <u>Nature Repair</u> (<u>PLANR)</u> (<u>Australian</u> <u>Government)</u>	Beef Sheep Dairy Pork Poultry Cropping Forestry Horticulture Non- agricultural land use	GHG emissions Abatement estimates Biodiversity	Property information Livestock Cropping Vegetation Consumables usage	Soil Vegetation	Online only Internet required Free Account optional	Used to estimate GHG emissions, impacts of management activities on emissions and carbon storage in trees. PLANR also estimates biodiversity condition and can support planning of vegetation projects under the ACCU Scheme.

Carbon Farming Outreach Program training package

Calculator	Sector or land use	Type of estimate or analysis	Data required	Relevant carbon farming categories	Accessibility	General description
<u>Ruminati</u> (<u>Ruminati)</u>	Beef (feedlot) Beef (grazing) Sheep Cropping	GHG emissions Abatement estimates	Property Information Livestock Cropping Vegetation Consumables usage	Soil Livestock Vegetation Other – renewable energy	Online only Internet required Free and paid options Account required	BASE (free) and PRIME (paid) versions are used to estimate GHG emissions, impacts of management activities on emissions and carbon storage in trees. <u>Based on</u> <u>GAF tools</u> . Ruminati PRIME can estimate emissions from feedlots and can be used to explore different management actions.
<u>SavBAT</u> (<u>Australian</u> <u>Government)</u>	Agricultural or non- agricultural land use	Abatement estimates	Property information Vegetation External – vegetation map of project region	Savanna fire management	Online only Internet required Free No account required	Used to estimate abatement for projects under the ACCU Scheme Savanna Fire Management methods.

The presentation of material in this summary table does not imply the expression of any opinion, and the mention of specific companies or calculators does not imply that these have been endorsed or recommended by DCCEEW. Every effort has been made to ensure the information on calculators is accurate and linked to the most recent version of the calculator at the time of publication.

Supporting information

Calculator: calculator name and responsible organisation. Some products include functions other than calculations; all are referred to as calculators for simplicity. A carbon calculator can be custom-made software or a spreadsheet (usually in Microsoft® Excel®) that can be used to conduct activities including estimating quantities of GHGs emitted and providing abatement estimates.

Sector or land use: agricultural and non-agricultural sectors or land uses that a calculator relates to.

Type of estimate or analysis: types of estimates or analyses the calculators can be used for.

- GHG emissions: calculator can be used to estimate GHG emissions, which may include scope 1, 2 and 3 emissions, and could be for an operation (e.g. a farm or winery), a land area, or an activity.
- ACCU Scheme: calculator is specified in an ACCU Scheme method for estimating abatement from projects conducted under the method.
- Abatement estimates: calculator can be used to estimate abatement (emissions avoided or reduced or carbon stored) from activities. May provide for forecasts of abatement and/or estimates of abatement already achieved.
- Biodiversity: tool can be used to examine biodiversity condition.

Data required: types of input data that may be required.

- Property information: may include area boundary, property name and size, location/region, annual rainfall, workforce, ownership status and distribution of land use activities on property. The calculator may include a geospatial tool to define an area boundary.
- Livestock: may include livestock numbers, seasonal liveweights, animal sexes, liveweight gain, crude protein, dry matter digestibility, livestock purchase and sale inventory, milk production and supplementary feed use (e.g. hay, grain, cotton seed).
- Cropping: may include crop varieties grown, area sown, average/yearly pasture and crop yields, soil properties (e.g. soil organic carbon), fertiliser usage and herbicide and pesticide usage.
- Vegetation: may include species of trees, soil type, area of trees, age of trees, vegetation management actions, and fire management.
- Waste management: may include solid waste (e.g. packaging), wastewater and organic waste (e.g. manure and vines). May also include how waste is managed (e.g. how much solid waste is recyclable or how much manure is drained to the paddock).
- Consumables usage: may include water usage (e.g. irrigation types, water sources), fuel consumption (e.g. petrol, diesel, natural gas, liquified petroleum gas, biodiesel), vehicle types and farm transport data, and electricity usage (e.g. how much energy used has been purchased or generated) and winemaking products (e.g. CO₂ and synthetic refrigerant).
- External data: refers to specific information required by a calculator which is obtained from an external source.

Relevant carbon farming categories: guidance on relevant carbon farming groups/activities, as identified in Topic 2.

Accessibility: refers to the how the calculator can be accessed and used. This includes:

- format of calculator: Microsoft® Excel® spreadsheet or online platform
- online or offline use: downloadable for offline use; or online only, and internet required
- user fees and accounts: free and no account required; free and account required; free and account optional (calculator can be used without account but account needed to save calculations); free and paid options (users are required to pay a fee to access the full content of the calculator).

General description: outlines the main features of each calculator. For consistency, descriptions have been based on whether:

- the calculator estimates GHG emissions and/or carbon storage
- the calculator explores the effect of different management practices on GHG emissions and explores management actions
- the calculator is based on a GAF calculator
- the calculator is used in an ACCU Scheme method.

The calculators may have more functions than those described. Users of the summary table are encouraged to click on the link for each calculator to explore all available functions, and any recent or upcoming updates to the calculator.

Other materials

Understanding carbon co-benefits (Indigenous Carbon Industry Network)

<u>Chapter 10. Understanding Co-Benefits</u> (PDF 844 KB) from the downloads page of the <u>Indigenous Carbon</u> <u>Industry Network</u> provides information about co-benefits from carbon farming practices for First Nations farmers and land managers.

Evaluation of potential indicators for the co-benefits of carbon farming (New South Wales Department of Primary Industries and Regional Development)

<u>Potential indicators for the co-benefits of carbon farming</u> (PDF 2 MB) is a report from a workshop hosted in 2019 on indicators relating to the potential co-benefits of carbon farming by the New South Wales Department of Primary Industries and Regional Development in collaboration with the University of New South Wales and the University of Technology Sydney.

Life Cycle Assessments (AgriFutures)

<u>Life Cycle Assessments: A Useful Tool for Australian Agriculture</u> (PDF 864 KB) is a booklet by the entity formerly known as the Rural Industries Research and Development Corporation, now called AgriFutures, that explains the main aspects of assessments, including the methodology for conducting one. It also provides several case studies of life cycle assessments.

What is a life cycle assessment? (Australian Pork Limited)

<u>Life Cycle Assessment</u> (PDF 4 MB) is a fact sheet produced by Australian Pork, explains life-cycle assessment, its difference from a carbon footprint and the different scopes of emissions included in a life cycle assessment.

Calculating net emissions and reduction strategies for a broadacre farm (Grains Research and Development Corporation)

<u>Carbon Neutral Grain Farming by 2050 – an example in calculating net emissions for a broadacre farm and</u> <u>strategies to reduce net emissions</u> is a Grains Research and Development Corporation report that looks at example GHG accounts from Western Australian cropping enterprises.