Final report

Carbon in Action Module Consultancy

Project code: L.SFP.1019

Prepared by: Stuart Smith
Pinion Advisory

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Abstract

The "Environmental Credentials for Australian Beef" project identified the need for a e-learning module that would allow producers to input their livestock numbers to calculate an estimate of net emissions. This would provide an easy entry point for producers to understand the concepts around livestock emissions as an entrée to using the MLA Carbon Calculator for more detailed emissions estimates.

A simple emissions calculator designed by Nicon Rural was used as the basis to develop a self-directed online calculator. "Lookup" tables that use localised Australian greenhouse gas emission data for cattle and sheep, and soil and tree sequestration data, were added to the calculator to expand its coverage to most livestock farms.

The expanded calculator, now named "Quick Start Carbon Calculator" was then transformed to an online platform by Cognizant software developers and embedded into a scripted online learning module. The industry now has an online module and interactive tool where producers can do a quick calculation of their emissions estimate without the time and expense required to conduct a detailed estimate. This lowers the barriers to entry to producers who would otherwise find engaging in greenhouse gas and carbon balance estimation as too difficult or expensive.

Executive summary

Background

The "Quick Start" carbon calculator was developed to give producers a relatively quick approximation of their carbon balance as an entry point to further learning and action regarding carbon neutrality.

The resultant on-line learning module will be included in MLAs learning platform, the 'Toolbox' with the existing three greenhouse gas modules.

The "Quick Start" carbon calculator module can be used by producers as self-paced learning, however, may also be used in group learning contexts (e.g. Carbon EDGE courses) or at field days or conferences. It may also be used in educational settings such as universities or schools.

Objectives

- Develop a tool to calculate a carbon balance in a livestock enterprise
- Develop a self-directed online learning platform
- Pilot and refine both the tool and the learning platform.

These were achieved and the tool and learning platform can be found at
https://elearning.mla.com.au/lessons/quick-balance-carbon-calculator/.

Methodology

An excel based carbon balance calculator developed by Nicon Rural was used as a starting point.
Lookup tables were developed and added to the original calculator as back-end data that covered livestock emissions, soil, pasture production and tree sequestration for different areas of Australia.
An online calculator was then developed that used the spreadsheet and back-end data that could be easily used by producers.
A script was developed around the calculator as part of an online learning module.
The calculator and script were uploaded to MLA's 'Toolbox', piloted by producers and further refined before release in late 2023.

Results/key findings

The online module, including the calculator, was developed and piloted by producers. It received good feedback from the pilot producers, who were at various stages of their own learning about carbon neutrality and how it might apply to their own enterprises.

Several changes were made due to the piloting, some technical, and others about how information is arranged.

The resultant calculator is not reflective of every scenario and location, however, it will be acceptable for those who require a rapid approximation of where their business is regarding carbon balance. The calculator could also be used in an educational context to deliver key concepts to students.

Benefits to industry

The industry now has a rapid calculation tool and online module that will give producers an approximate idea of their carbon balance without having to invest the time and money to conduct a more accurate assessment and estimate. This lowers a barrier to entry to producers who would otherwise find engaging in greenhouse gas and carbon balance estimation too difficult or expensive.

Future research and recommendations

Back-end data for this Quick Start carbon calculator has been limited by what can be gathered from the literature, and various researchers working in this field. The data spread over the country, although quite comprehensive, will necessarily be improved with time as more data comes to hand through research work.

It is recommended that this calculator is updated regularly as new data comes to hand.

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1. Background

1.1 Developing a 'quick' carbon balance calculator for producers

The "Development of carbon management e-learning modules" project was an MLA Donor Company funded project by the Greenham group.

The objective of this project was to increase producer knowledge of greenhouse gas emissions, how they relate to livestock production systems and how producers can improve their carbon balance.

This project allowed the development of three carbon e-learning modules that are now in MLA's e-learning platform, the 'Toolbox'.

The following e-learning modules were developed and are being used by industry:

1. Carbon 101
2. Measuring your emissions (using MLA Carbon Calculator)
3. Carbon sense.

It was identified by the "Environmental Credentials for Australian Beef" project that an additional module was necessary to enable producers to input their livestock numbers into a calculator to get an approximate estimate for emissions. To do this would require 'back end' data for livestock emissions for different zones of Australia, along with estimates of soil and tree sequestration for these zones.

A "quick" calculator is a low bar entry point for producers to get an approximate estimate of emissions before progression to the use of detailed emissions calculators such as the "MLA Carbon Calculator". The main target audience is those producers who would like an estimate of their carbon balance but are not at the stage to complete the detailed work to compile data and/or spend money on consultants to get a more accurate estimate of their carbon balance.

The resulting module that has been developed can be used for producers to complete self-paced learning, or can be used as an educational tool in workshops, field days etc where time is limited.

2. Objectives

The objectives of this project, as set out in the project agreement were:

2.1 Develop a tool to calculate a carbon balance in a livestock enterprise

The Carbon in Action e-learning module used a simple excel-based calculator developed by Cam Nicholson (Nicon Rural) and developed it further for on-line use. "Lookup tables" containing data for various geographic zones in Australia expanded the scope of this calculator.

2.2 Develop a self-directed online learning platform

The Pinion Advisory project team liaised closely with Cognizant, who undertook the web development component of the project and the overall approach and timeframes for the project. Pinion Advisory also liaised with Nicon Rural as the subject matter expert. MLA provided the web platform for the online learning and uploaded all the scripting.

2.3 Pilot and refine the tool and the learning platform

Producers were contacted and volunteers were engaged with to pilot the program. Feedback from this process was used to further refine the on-line learning module that has been developed.

The online module can now be accessed at [Quick Start Carbon Calculator - The Toolbox - MLA eLearning](#).

3. Methodology

3.1 Development of "Lookup" tables

Data for livestock, soil and vegetation was obtained from several sources: subject matter experts (Cam Nicholson, Richard Eckard), other carbon accounting tools (e.g. SB-GAF) and the scientific literature. As much as possible, data specific to production regions of Australia was added for every field in the calculator.

3.2 Develop script for e-learning platform

A scripting framework was developed by Pinion Advisory around the parameters of the calculator. This was used to produce a draft script for the online module to have the same look and feel of the other online modules in the MLA 'Toolbox'. This script, after internal review, was supplied to MLA who uploaded it on their e-learning site. After review and editing, this script was then finalised for online beta-testing. Results from the beta testing were then used to modify the final script.

3.3 Review online tool, pilot with producers, collate producer feedback and review

Once the module and online calculator had been installed into MLAs website, it was reviewed internally at Pinion, which resulted in several changes that were quickly actioned by MLA and Cognizant.

Several producers were contacted via telephone and email in September to request their assistance in piloting the tool. Some of these producers had reviewed modules in the past, or expressed interest in reviewing the eLearning modules. Others were contacted by Pinion Staff. Twenty-three producers were contacted and nine responded favourably. These producers were then emailed the web address and password to log into the module. Feedback was obtained via three online meetings with guided exploration of the module and calculator page by page. One producer could not attend these meetings and sent feedback via a video recording.

Feedback was collated into a table, with corresponding recommendations for each item of feedback. A meeting was then held with Cognizant and MLA to review the feedback and to assist in refinements to address feedback.

4. Results

4.1 Development of "Lookup" tables

The following table (T1) shows the information that is required for the input fields of the calculator, and also describes which of these fields is auto-populated with the use of "lookup" tables.

Table 1: Information required for input fields and description of "Lookup" tables.

Information	"Lookup" table data description
Total area (hectares)	N/A, manual entry
State	Table included in "Lookup - soil" All States (including the Northern Territory, excluding ACT) are represented
Zone	Table included in "Lookup - soil" Every state is subdivided into zones: Tasmania: 4 Western Australia: 14 NSW: 7 Queensland: 10 South Australia: 8 Victoria: 13 Northern Territory: 4
Rainfall (average annual)	Table included in "Lookup - vegetation" This auto-populates based on zone but includes the option for the user to overwrite with more representative data.
Area under pasture (hectares)	N/A, manual entry
Dominant soil type	Table included in "Lookup - soil" This is based on texture and has 7 options.
Dominant pasture species	Table included in "Lookup - soils" Options are given depending on zone, but all up there are up to 18 different pasture classifications for each zone, each with its own associated pasture growth rate.
Soil depth	N/A, (set at standard 30 cm).
Area under trees (ha)	N/A, manual entry
Tree species	Table included in "Lookup table – vegetation" There are 10 options for tree communities, each with their associated carbon sequestration (in tonnes of CO_2 equivalent per hectare per year) averaged over a 30 year period from planting.

Once this information is entered into the calculator, it automatically calculates a distribution of the different livestock classes, which can be manipulated by the user so it better fits the distribution of animals on their farm. The calculator then uses "lookup" tables with livestock emission data (kilograms CO2-e per head of livestock per day) that match the State that the farm is in, to make an estimate of farm emissions.

For Western Australia, distinction is made between Pilbara, Kimberley and (remainder of) Western Australia because of the size of this State.

Emissions are sourced from "Lookup - Livestock" tables for each month of the year for the following stock classes:

Cattle	Sheep
Bull calves <12mo, weaned and unweaned	Rams
Bulls >1yo	Wethers
Steer calves <12mo, weaned and unweaned	Maiden ewes (intended for breeding)
Steers >1yo	Breeding ewes
Heifer calves <12mo, weaned and unweaned	Other ewes
Cows 1 to 2yo	Lambs & hoggets
Cows >2yo	

The calculator estimates possible soil sequestration of carbon. To do this, it uses information sourced from "Lookup - soil", and includes assumptions for soil bulk density, roots to shoot ratio and annual pasture growth. The soil bulk density is based on selected soil texture from what the producer selects in the farm information section.

Roots to shoots ratio and total amount of pasture growth in kilograms of dry matter per hectare per year are based on the dominant pasture species selected from "Lookup - soil".

4.2 Develop Script for e-learning platform

The script was developed as a basic explanation of carbon balance estimations, and commentary around the calculator and what is necessary to successfully use it, and its limitations.

Some of the script was uploaded as straight text, other as "hover" boxes, like question marks that reveal further information when the mouse "hovers" above them. Fig. 1 (below) shows the introduction page for the online learning module (https://elearning.mla.com.au/lessons/introduction-39/).

Figure 1: Introduction page for the online learning module.

Fig. 2 shows an example of a hover box, which in this case has appeared by hovering the mouse over the section of the website for the entry of the number of hectares (ha) for the property.

Figure 2: Example of a hover box.

4.3 Review online tool, pilot with producers, collate producer feedback and review

Following is a summary of the feedback from the piloting with producers.

General Feedback

There were some technical issues with the on-line module and calculator, such as font colour, problems with auto-scrolling and drop-down lists, and loss of data in the calculator. These issues were all dealt with and fixed by Cognizant.

Some thought the tool was simple to use, and should be kept that way. Others wanted more detail that probably could only be provided in more complex calculators. This showed that there were distinct differences in target audiences.

The module script

Most thought the script was easy to read. One person thought that some of the background information on "sources", "sinks" and "insetting" should have been more proximal to the results page, to assist in interpretation. The information on the results page was adjusted appropriately.

The Quick Start Calculator

Property Information

There was an issue selecting zones with some users – the zones were not broad enough to cover all production areas or the rainfall that was pre-populated for a zone was not quite right and therefore some users felt there could be errors. The calculator has now been changed so the users can input their own rainfall data.

One particular user had four farms over two states, and wanted to be able to calculate emissions on an enterprise basis instead of farm-by-farm, which was difficult to achieve in the way this tool was set up. A new script was added that recommended that users do the calculations for one farm at a time if they are geographically dispersed.

Livestock inventory

Some were happy with the auto-calculation of a herd composition using a single number of livestock, others were concerned about the details, but eventually were able to enter the numbers in using the sliders for the graphs. Some realised that the fine details would probably not change the results very much. The sliders to adjust stock numbers were kept unaltered.

Vegetation and Soils

Some producers found it difficult to come up with a figure for total hectares of trees, given they did not know how to define this number, with some land with low tree density and some with higher density. Some producers were concerned that if age of trees were not considered, the wrong figures would be calculated. More scripting was added about the age and density of trees to give some guidance to users for these questions.

For pastures, those with extensive and multiple properties found it difficult to select a dominant species. It was decided to make no changes for this simple tool, and guide users with complex situations toward the MLA Carbon Calculator.

For soil, one of the producers could not find an exact match from the drop down list, but chose a similar soil type. It was decided to keep the number of soil types as is for simplicity.

Results

Some thought the results were simple and easy to understand. Others were keen to learn more about their results, and how they compared to others. Some producers wanted more explanation of the results, including the concept of insetting. Some producers wanted to be able to record their results in some fashion, e.g. printing, emailing to self, or downloading. Some more text has been added to the results page to help producers understand their results.

5. Conclusion

5.1   Key findings

- A simple on-line emissions calculator for livestock farms has been developed.
- The target audience are producers who are not at the stage where they want to perform complex and accurate emission calculations, rather, it is aimed at those who would like an approximate estimation before considering their next actions toward a better carbon balance.
- Back end empirical data for emissions / sequestration across Australia will improve and more research comes to hand, and would be useful to improve the calculator that has been developed.

5.2   Benefits to industry

The industry now has an online module where producers can do a quick calculation of their net emissions without having to invest the time and money to do a detailed estimate. This caters for those producers who would otherwise not engage in calculating their carbon balance due to the time and expense involved, and provides a bridge to more intense investigation and on-property action.

The calculator may also be used in an educational setting for potential new entrants into the meat and livestock industry.

6. Future research and recommendations

It is recommended that a process of review is put into place to regularly update the information on which the "quick start" carbon calculator is based, to improve the resolution of data so it covers more specific areas of Australia, and therefore its accuracy can be improved with time.

There is a possibility to make the back-end data source "open" but this needs further investigation.