



Final report

Carbon EDGE review and biodiversity additions

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Abstract

The project was undertaken to review and update MLA's Carbon EDGE training program, incorporating the latest research and development, global trends, policies, tools and information in the course material, including environmental markets and material relating to biodiversity. The update would ensure producers are getting the most contemporary material when attending a Carbon EDGE course.

A list of topics to scan for potential changes was developed in consultation with MLA. The scan was undertaken by reading through contemporary Australian literature, policy documents and legislation on these topics, including unpublished research provided by MLA, and through interviewing sustainability staff at MLA.

Producer perspectives on the course were also gathered by reviewing all feedback from previous Carbon EDGE courses.

Following the scan, recommendations were made on changes to the producer and deliverer manuals, the producer workbook and the course slides.

Changes were made after review, and the changes presented to accredited deliverers via two webinars. Further changes were made considering learnings from the participants of the webinars.

The Carbon EDGE materials are now updated with contemporary information.

The red meat industry can be confident in the relevance of current Carbon EDGE materials, which means this course will be able to keep producers abreast of the reasons they should know about Carbon, the science behind global warming, how to account for greenhouse gas emissions on their farms, the carbon and biodiversity markets in Australia and how to demonstrate their carbon position to stakeholders; and ways to reduce greenhouse gas emissions on farm and increase sequestration of carbon.

Executive summary

Background

The purpose of this work was to update MLA's Carbon EDGE course, and to include biodiversity content, where relevant and useful to red meat producers. This was necessary due to the rapid changes in policy, legislation and strategy around carbon, biodiversity and natural capital on farm, meaning the course materials would need significant updates.

The target audience for this work is primarily red meat producers, who attend Carbon EDGE to gain an understanding of all the aspects of greenhouse gas emissions and biodiversity as it relates to landowners and managers.

The updated materials will be used by deliverers when delivering Carbon EDGE courses across Australia.

Objectives

The objectives of this project were to:

- Conduct a review of the current Carbon EDGE deliverer manual, participant manual, slide deck, KASA, feedback forms, participant pre-work, deliverer support materials.
- Collate new research and information relating to greenhouse gases in agriculture and the red meat sector.
- Present recommendations on what should be included and / or updated in the Carbon EDGE material.
- Make updates to the materials as per the agreed changes, ensuring the content is fit for purpose.
- Scan recent policy, legislation, research, development and extension and market / environmental trends to identify what should be considered for inclusion in Carbon EDGE as it relates to biodiversity.
- Update existing Carbon EDGE materials with new biodiversity content as per the agreed changes, ensuring the content is fit for purpose.

These objectives were achieved.

Methodology

A list of topics to scan for potential changes was developed in consultation with MLA. The scan was undertaken by reading through contemporary Australian literature, policy documents and legislation on these topics, including unpublished research provided by MLA, and through interviewing sustainability staff at MLA. The topics scanned were:

- Carbon
- Sustainable pathways to CN30
- Soil carbon under time-controlled grazing
- Data platform for increasing soil carbon
- Integrated management systems for CN30
- Exploring methane inhibitors supplemented through water
- Evaluation of Bovaer in Australia
- Optimising Australian feedlot cattle performance and reducing emissions with low doses of 3-NOP
- Assessment of methane reduction efficiency of 3-NOP delivered to cattle through water

- Scan of projects in the “Methane Emissions Reduction in Livestock” program
- Scan of projects in “Climate Smart”
- AIA and other new GHG accounting calculators
- New and retiring ACCU methods
- Updates to legislative changes (methods and targets)

Biodiversity

- Definition of biodiversity for red meat producers
- Managing, monitoring and understanding biodiversity of farm / biodiversity toolkit / native cv pastures / threatened species definitions and frameworks for prioritisation
- Biodiversity indicators (terrestrial)
- Biodiversity credentials
- Biodiversity markets (State, Federal and International including offset schemes)
- Nature repair market and legislation
- LOOC-B / PLANR / Nature IQ / Regrowth benefits
- Satellite tools
- Eco-acoustics
- Silvopastoral / agro-forestry systems / landscape design (tree grass balance)
- Farming for the future and valuation of natural capital
- Regenerative agriculture
- Pollinator health and habitat.

Producer perspectives on the course were also gathered by reviewing all feedback from previous Carbon EDGE courses.

Following the scan, recommendations were made on changes to the producer and deliverer manuals, the producer workbook and the course slides.

Changes were made after review, and the changes presented to accredited deliverers via two webinars. Further changes were made considering learnings from the participants of the webinars.

Results/key findings

The Carbon EDGE course was updated with the latest Australian relevant research, particularly in areas of emissions reduction on farm, with reference to genetics, husbandry, pasture species and supplements.

A new section was added at the front of the course to bring together all the possible reasons that red-meat producers should know about carbon and biodiversity and how it relates to their farm. This section has pulled together previous information on international treaties, Australia’s commitments and the goals of the red meat industry. It also incorporates material on drivers for emissions reduction in the supply chain that filter down to red meat producers.

Material has been added on accounting for natural capital and biodiversity on farm, biodiversity and nature repair markets and the co-benefits of on-farm sequestration from vegetation to natural capital and biodiversity.

The overall length of the course has not been changed, but there have been some adjustments made to the flow of topics to make this more logical.

Benefits to industry

The industry now has a revised Carbon EDGE course that incorporates all the latest Australian relevant research, policy and legislation surrounding carbon on farm. It also has extra material on natural capital and biodiversity that has logical connection to carbon on farm.

Future research and recommendations

Because of the fast-moving nature of the topics in this project, it is recommended that reviews of Carbon EDGE are conducted regularly (every two years).

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1. Background

1.1 Carbon EDGE review

This project was to review and update Meat and Livestock Australia's (MLA) Carbon EDGE training program, incorporating the latest research and development, global trends, policies, tools and information in the course material, including emerging environmental markets as material relating to biodiversity.

The reason that this was necessary was the rapidly changing environment around greenhouse gas emissions, climate change and related policy, especially as it relates to the red meat sector. There are research projects within Australia continually updating knowledge of the science and practice of greenhouse gases and climate change in relation to livestock. Also, Meat & Livestock Australia has a new strategic plan and has made some policy shifts around emissions targets. There are also rapidly developing tools and policies emerging around on-farm natural capital and biodiversity that relate to greenhouse gas (GHG) emissions on farm, and it was deemed necessary that participants should be informed of these links.

The main target audience for this work are red meat producers who are upskilling in their knowledge of greenhouse gas emissions science, policy, emissions reduction on farm and sequestration. The result of this review is an updated Carbon EDGE course that will be streamlined and relevant to educate red meat producers not only on Carbon and GHG but also introduces them to natural capital and biodiversity.

2. Objectives

The objectives of this project were to:

- Conduct a review of the current Carbon EDGE deliverer manual, participant manual, slide deck, KASA, feedback forms, participant pre-work, deliverer support materials.
- Collate new research and information relating to greenhouse gases in agriculture and the red meat sector.
- Present recommendations on what should be included and / or updated in the Carbon EDGE material.
- Make updates to the materials as per the agreed changes, ensuring the content is fit for purpose.
- Scan recent policy, legislation, research, development and extension and market / environmental trends to identify what should be considered for inclusion in Carbon EDGE as it relates to biodiversity.
- Update existing Carbon EDGE materials with new biodiversity content as per the agreed changes, ensuring the content is fit for purpose.

These objectives were achieved.

3. Methodology

3.1 Topic scan

There was agreement at the inception of the project to scan several topics relating to current research and development, technology and policy relating to GHG and Carbon and biodiversity for

new information that might precipitate change in the current Carbon EDGE course content. These topics can be found in Table 1.

Table 1 - Topics for review

Carbon EDGE review	Biodiversity content inclusion
Sustainable pathways to CN30	Definition of biodiversity for red meat producers
Soil carbon under time-controlled grazing	Managing, monitoring and understanding biodiversity on farm/Biodiversity Toolkit/Native cv improved pastures/threatened species definitions and frameworks for prioritisation
Data platform for increasing soil carbon	Biodiversity indicators (terrestrial)
Integrated management systems for CN30	Biodiversity credentials
Exploring methane inhibitors supplemented through water	Biodiversity markets (State, Federal and International including offset schemes)
Evaluation of Bovaer in Australian long fed Wagyu cattle	Nature repair market and legislation
Optimising Australian feedlot cattle performance and reducing emissions with low doses of 3-NOP	LOOC-B / PLANR / Nature IQ/ Regrowth Benefits
Assessment of methane reduction efficacy of 3-NOP delivered to cattle through water	Satellite Tools
Scan of projects in the Methane Emissions Reduction in Livestock Program	Eco-acoustics
Scan of projects in Climate Smart	Silvopastoral / agro-forestry systems / landscape design (Tree grass balance)
AIA and other new GHG accounting calculators	Farming for the Future and valuation of natural capital
New and retiring ACCU methods	Regenerative agriculture
Updates to legislative changes (methods and targets)	Pollinator health and habitat

Furthermore, the following methods were used to complete the scan of the above topics:

The MLA Group Manager - Sustainability and Project Manager R & D were interviewed and provided project information. The MLA Project Manager – Sustainability Credentials and MLA Project Manager – Genetics, contributed material via email.

A two-day workshop was held with the project team, and the MLA Sustainability Adoption Project Manager was held on the 14-15 April 2025.

Project summaries supplied by the MLA Sustainability team included:

- E.SUB.0010 Beef Industry Trends Analysis – 2020 (Wiedemann, et al., 2023)
- P.PSH.2104 Time-controlled grazing for soil C sequestration and improved ecosystem services (Rowlings, et al., 2024)
- P.PSH.1333 Delivering integrated management system (IMS) options for CN30 (Eckard, et al., 2024)
- P.PSH.2127 CSP – Steak n’ wood: demonstrating livestock productivity and environmental service benefits of trees on farm in northern systems (Milestone report #7) (Pachas, et al., 2024)

- Soil carbon sequestration under the tropical perennial legume *Desmanthus* in northern Australian grasslands (unpublished) (Rowlings, et al., 2025)
- Sustainable pathways producer case study: Jigsaw Farms, Hamilton VIC (Meat & Livestock Australia, 2025)
- B.CCH.2124 Red meat greenhouse gas emissions update 2021 (Mayberry, 2024)
- Evaluation of methane prediction equations for Australian feedlot cattle fed barley and wheat-based diets (Animal Production Science) (Almeida, et al., 2025)
- B.FLT.5015 Reducing emissions of backgrounded cattle – combining Bovaer 10 with supplementation to reduce methane and increase productivity (Meale, et al., 2024)
- The essential oil blend Agolin Ruminant L reduces methane production in vitro and in vivo when included in the drinking water of cattle (Batley, et al., 2024)
- Fact sheet: can grazing management improve soil carbon? (McDonald, 2023)
- Fact sheet: Natural capital to support farm profitability (Mendham, 2025)
- Fact sheet: Reducing vulnerability to drought. Producer case study: the Whip family. (Peralta, et al., 2025)
- Fact sheet: Juggling profit, climate, emissions and biodiversity – the livestock farmer’s conundrum (Court, et al., 2025)
- Fact sheet: Exploring options to reduce greenhouse gas emissions when grazing Australia’s rangelands (Liedloff, et al., 2025)
- Fact sheet: Ecosystem services markets for Australian farms: improving resilience and profitability of farm enterprises (Mendham & Harrison, 2025)
- Fact sheet: sustainable pathways to reducing GHG emissions: sheep and wool production. Producer case study: the Foster family (Harrison, et al., 2025)
- Sustainable pathways producer case study: Ararat, Victoria (MLA (b), 2025)

Other research literature was also sought out to support the topic scan through online database search.

3.2 Feedback from past Carbon EDGE participants

Producer feedback from all the previous non-pilot Carbon EDGE courses that had been run over the past two years was reviewed. This material was collated by the EDGE coordinator. Feedback was from Toowoomba (22 participants), Longford (11 participants), Charters Towers (19 participants), Emerald (20 participants) and Oatlands (9 participants).

3.3 Summary report for review

A summary report was submitted to MLA identifying priority information to be included in Carbon EDGE review and Biodiversity inclusions. This included an outline of the scan made for current research and development, extension and market / environmental trends from the MLA Sustainability team, and recommendations for changes to be made to Carbon EDGE, including inclusion of biodiversity content. This report was included as part of the Milestone 1 report.

3.4 Perform updates to Carbon EDGE and incorporate biodiversity content

The Carbon EDGE participant manual, Carbon EDGE deliver manual and Carbon EDGE slide deck were updated according to the recommendations from the summary report.

3.5 Online webinars to update current deliverers

Two online webinars were conducted to update current deliverers with the changes made to the course. Webinars were conducted on 29-30 July online. South Coast NRM was invited to attend the webinars to allow their project team to incorporate changes into the developing Carbon PGS package.

4. Results

4.1 Topic scan

Table 2 shows the topics that were scanned, and the decisions made for their inclusion or otherwise in the Carbon EDGE materials.

Table 2 - Topics scanned and recommendations for their contribution to Carbon EDGE

Topic	Comment	How incorporated into Carbon EDGE
Sustainable pathways to CN30	This project is run by the Uni of Tasmania and is multi-faceted. Each facet is dealt with below.	(Harrison, et al., 2022)
Sustainable pathways to CN30 – social, environmental and economic impacts of reducing emissions	The original Carbon EDGE material had information on the social, environmental and economic impact of GHG emission reduction interventions. This impact information has been removed as it confused some participants, but information on interventions remains. The original material remains in the deliverer manual for reference.	Slides 127-155 Producer manual: Pages 63 - 67 Deliverer manual: Pages 71-75 (Harrison, et al., 2021)
Sustainable pathways to CN30 – Soils and grazing	The soils component of this project shows that grazing systems have little impact on soil carbon. Sequestration of soil carbon is only likely when soils are already degraded below equilibrium levels. This is already covered in the soil carbon sequestration content.	Slide 193 Producer manual: pp 64-65 Deliverer manual: pp 109-117 (McDonald, 2023)
Sustainable pathways to CN30 – Natural capital accounting	Natural capital accounting has been included in at the end of Module 2, as it fits with GHG accounting.	Slides 78-80 Producer manual p26 Deliverer manual p42 (Mendham, 2025)
Sustainable pathways to CN30 – 13 Case studies across Australia	Case studies had several outcomes, including the complexity of trade-offs between emissions reductions and gross margins, the co-benefits of	Slides 176-180. Producer manual pp 57-58

Topic	Comment	How incorporated into Carbon EDGE
	vegetation plantings and the time delay for biodiversity improvements from vegetation planting.	Deliverer manual p106 (Court, et al., 2025)
Sustainable pathways to CN30 – Options for rangelands	Difficulty in application of feed additives from a practical feeding and cost sense. Best options to manage herd composition and animal production. Some pasture options like Leucaena.	Slides 146-148 Producer manual pp 33,37 and 39 Deliverer manual pp 85-87 (Liedloff, et al., 2025)
Sustainable pathways to CN30 – Ecosystem services markets	GHG accounting and carbon markets are already part of the course. Extra material has been added on natural capital accounting and biodiversity markets.	Slides 78-82; 111-113 Producer manual pp 26 Deliverer manual p63 (Mendham & Harrison, 2025)
Soil carbon under time-controlled grazing	There are possible benefits from time-controlled grazing to soil carbon levels, but the results are not conclusive although it looks positive for soil carbon and biodiversity.	Slides: 136-137 Producer manual: pp70,81 Deliverer manual: p 114 (Dowhower, et al., 2020) (Ma, et al., 2021) (Rowlings, et al., 2024) (Voglmeier, et al., 2020)
Data platform for increasing soil carbon in Australian agricultural systems	Agrimix and QUT are performing this project, where they are developing easier and cheaper ways to measure soil carbon using flux towers and modelling. Only relevant to measurement of ACCU schemes or large-scale soil measurement of carbon at this stage, less important for producers. Recommend not included for producers but a note inserted in the deliverer manual.	Slides: N/A Producer manual: N/A Deliverer manual: N/A Reference: N/A
Integrated management systems for CN30	Incorporate findings from the project on 3-NOP, tropical legumes, temperate legumes and oils.	Slides: 144-145, 152 Producer manual: Page 39, 41 Deliverer manual: Pages 82-85 (Eckard, et al., 2024)
Exploring methane inhibitors supplemented through water	Research continuing but not practical. Nitrate feeding has been removed as an ACCU method. Mention as a	Slides: 154 Producer manual: Page 42

Topic	Comment	How incorporated into Carbon EDGE
	possible carrier of supplements but do not recommend in emissions reduction module.	Deliverer manual: Page 86-87 Reference: Pers comm, Group Manager Sustainability - MLA
Evaluation of Bovaer in Australian long fed Wagyu cattle	Research continuing, not economic for grass fed cattle at present. Mention but do not recommend in emissions reduction module.	Slides: 151-154, Producer manual: Page 42 Deliverer manual: Pages 85-86 (Almeida, et al., 2023) (Honan, et al., 2022; Almeida, et al., 2025) (Meale, et al., 2024)
Optimising Australian feedlot cattle performance and reducing emissions with low doses of 3-NOP	Still being trialled in feedlot production. Still uneconomic but mention in the reducing emissions section as something that is being developed for the co-benefit of productivity gains as well.	Slides: 152-154 Producer manual: Pages 42 Deliverer manual: Pages 85-86 (Almeida, et al., 2023) (Almeida, et al., 2025) (Honan, et al., 2022) (Meale, et al., 2024) Pers.comm Group Manager Sustainability - MLA
Assessment of methane reduction efficacy of 3-NOP delivered to cattle through water	Water delivery is being trialled, still not economic but hopeful that productivity gains will be a co-benefit.	Slides: 154 Producer manual: p42 Deliverer manual: p86 Conversation with Group Manager Sustainability - MLA
Scan of projects in the methane emissions reduction in livestock program	Breeding values, additives, oils, tropical legumes, delivery systems for supplements are all being researched. Mention these in the emissions reduction section but separate practical and “do now” methods to reduce methane from research and under development methods.	Slides: 127-155 Producer manual: Pages 33 – 44 have been modified Deliverer manual: Pages 84 - 86 (DCCEEW (e), 2025)

Topic	Comment	How incorporated into Carbon EDGE
Scan of projects in Climate Smart	There are two streams in DAFFs Climate Smart. These are “capacity building” and “partnerships and innovations”. Several projects deal with capacity building of farmers, communities and aboriginal groups across Australia, with a narrow focus on local regions. Partnerships and Innovation projects are also regionally based in the main and cover many topics. Recommendation is that deliverers become familiar with projects in their area that may overlap with Carbon EDGE content.	Slides: N/A Producer manual: N/A Deliverer manual: N/A (DCCEEW (a), 2025)
AIA and other new GHG accounting calculators	These will be mentioned in the GHG Accounting section, with some commentary around the pros and cons of each calculator.	Slides: 69 Producer manual: pp 13-16 Deliverer manual: Page 36 (AIA, 2025) (Ruminati, 2025)
New and retiring ACCU methods	Will be discussed in the module “Carbon Credits and demonstrating your carbon position”. especially new methods like the integrated method or retiring methods like Human Induced Regeneration.	Slide: 99 Producer manual: p24 Deliverer manual: p56 (Australian Government Clean Energy Regulator (a), 2025) (Australian Government Clean Energy Regulator (b), 2025)
Updates to legislative changes (methods and targets).	New methods will be mentioned in the module “Carbon Credits and demonstrating your carbon position” and the <i>Nature Repair Act</i> and the commencement of the biodiversity market with the first new method in March 2025 also mentioned.	Slides: 99, 111 Producer manual: p24 Deliverer manual: p57 (DCCEEW (b), 2025)

Topic	Comment	How incorporated into Carbon EDGE
Definition of biodiversity for red meat producers	Introduced in Natural Capital Accounting (slides 78-92). Followed by Nature Repair Markets (slides 111-113)	Slides: 78-82; 111-113 Producer manual: p18, 26 Deliverer manual: pp 42,63 (Accounting for Nature, 2025)
Managing, monitoring and understanding biodiversity on farm	Slide 80 has a list of ways to assess biodiversity and ecological condition on farm. Slide 82 has tools for desktop assessment of biodiversity on farm.	Slides 80, 82. Producer manual: p18 Deliverer manual: p42 (CSIRO, 2024) (CSIRO, 2025) (DCCEEW (c), 2025) (DCCEEW (d), 2025) (MLA (a), 2025) (Queensland Government, 2025)
Biodiversity Toolkit	MLAs biodiversity toolkit is suggested as a way of ground-truthing environmental assets and biodiversity on farm in Slide 80.	Slide 80 Producer manual: p18 Deliverer manual: TBA (MLA (a), 2025)
Native cv improved pastures	Pasture species and their GHG reduction potential are dealt with in slides 138 – 148. These are mostly introduced pastures, but native pastures are introduced on slide 148.	Slides: 138-148 Producer manual: pp 38-39 Deliverer manual: p84 (Durmic, et al., 2022) (Taylor, et al., 2016) (McSweeney & Tomkins, 2015) (Harrison, et al., 2015) (Stifkens, et al., 2022)
Threatened species definitions and frameworks for prioritisation	Protected matters search tool is introduced in Slide 82 – for desktop analysis of potential for threatened species on farm	Slide 82 Producer manual: p16 Deliverer manual: p42 (DCCEEW (d), 2025)

Topic	Comment	How incorporated into Carbon EDGE
Biodiversity indicators (terrestrial) and biodiversity condition	Biodiversity indicators are introduced in Slide 78, under natural capital accounting. More detail is then given in slide 79-92 with some guidance on assessing natural capital and biodiversity through desktop analysis and on the ground.	Slides: 78-92 Producer manual: p16 Deliverer manual: p42 (Accounting for Nature, 2025) (CSIRO, 2024) (CSIRO, 2025) (DCCEEW (c), 2025) (DCCEEW (d), 2025) (Kelley, 2025) (Mill, 2015) (MLA (a), 2025) (Peisley, 2017) (Queensland Government, 2025) (Roseo, et al., 2024) (Savory Institute, 2025)
Biodiversity markets (State, Federal and International including offset schemes)	Included in updates to legislative changes in the “Carbon Credits and demonstrating your carbon position” section	Slides: 114-116 Producer manual: p26 Deliverer manual: p63 (DCCEEW (b), 2025)
Nature repair market and legislation	Included in updates to legislative changes in the “Carbon Credits and demonstrating your carbon position” section	Slides: 111-113 Producer manual: p26 Deliverer manual: p63 (DCCEEW (b), 2025)
LOOC-B / PLANR / Nature IQ / Regrowth benefits	These tools are all summarised on Slide 82 as a way to do a desktop analysis of biodiversity or natural capital condition on farm.	Slide 82 Producer manual: p26 Deliverer manual: p42 Reference: (CSIRO, 2024) (CSIRO, 2025) (DCCEEW (c), 2025) (DCCEEW (d), 2025) (MLA (a), 2025) (Queensland Government, 2025)
Satellite tools	Ag TRACE being developed to enhance European market access by	Slides: N/A Producer manual: N/A

Topic	Comment	How incorporated into Carbon EDGE
	monitoring land clearing by satellite. Not recommended for inclusion	Deliverer manual: N/A
Eco-acoustics	This is a way of measuring biodiversity and was used in the QUT time-controlled grazing research. Not practical for producers, not included.	Slides: N/A Producer manual: N/A Deliverer manual: N/A
Silvopastoral / agro-forestry systems / landscape design (tree grass balance)	New information has been included on the co-benefits of vegetation on farm in slides 176-184. Steak n' Wood project has been included as a case study on slides 185-187.	Slides: 176-187 Producer manual: pp 57-58 Deliverer manual: p109 (Kelley, 2025) (Mill, 2015) (Peisley, 2017) (Pachas, et al., 2024) (Roseo, et al., 2024)
Farming for the Future and valuation of natural capital	Not recommended for inclusion at this stage due to the preliminary nature of the results from this project.	Slides: N/A Producer manual: N/A Deliverer manual: N/A
Regenerative agriculture	Not recommended for inclusion.	Slides: N/A Producer manual: N/A Deliverer manual: N/A
Pollinator health and habitat.	Slide 183 has been included describing the ecosystem services from pollinators.	Slides: 183 Producer manual: p58 Deliverer manual: p107 (Devkota, et al., 2024) (Klein, et al., 2007)

4.2 Feedback from past Carbon EDGE participants

There was positive feedback from participants about most of the course.

For improvement, there was a theme to make clearer the “why” of the course, or the drivers for participation by the producer community. In response, the drivers for participation have been moved to the start of the course in Session 1, “Drivers to lower emissions – why are we here?”. This section, from Slides 10-27 now covers global trends, the Paris agreement and Australia’s commitments and interventions through the Safeguard Mechanism and the Australian Carbon Credit Unit Scheme and more recently the introduction of climate related financial disclosures from

businesses of a certain size. The section continues with an explanation of the red meat industry's current response, and responses from domestic and international supply chains to lower greenhouse gas emissions, driven by shareholders and consumers. There was extra content in the slides for this section that was not originally in the producer manual. This has now been included in the introductory section of the producer manual.

Another strong theme from past participants was to streamline the GHG101 section so there was minimal overlap with the pre-work. This section has been streamlined without losing too much content for those participants who may not complete the pre-work modules.

Participants also gave feedback that it was important that their manual followed the course content closely, so they could follow along during the course. The slides, producer manual and deliverer manual have been aligned so that this is covered.

Participants wrote that they would like to have enough time to reflect on delivered content so that the learnings could be captured. Reflection time has been included after each section so that producers can adjust their goals and action plans, especially during the on farm emissions reduction section, where a reflection time has been added after each type of intervention to reduce on-farm emissions.

There was also feedback that regional delivery should be prioritised where possible, and content tailored to local conditions. The content has slides where adaptation to local content is encouraged. Also, materials that combined both tropical, temperate or rangeland examples have been separated so deliverers can easily hide irrelevant content.

4.3 Summary report for review

A summary report with recommendations for course changes was produced as Milestone 1 report. This included recommendations for structural and content changes.

4.4 Perform updates to Carbon EDGE and incorporate biodiversity content

Updates have been made to the slide deck, producer manual, deliverer manual and slide deck as outlined in **Table 2**.

4.5 Online webinars to update current deliverers

Two online webinars were conducted to update current deliverers on changes to the course on 29-30 July 2025. Structural changes and changes to the content of the course were delivered as part of these webinars. An outline of the structure of the webinars is contained in Appendix 1. As a result of these webinars there was some feedback from deliverers about the content which led to minor changes in the materials.

5. Conclusion

5.1 Key findings

The key findings from this project are:

- Research, development, extension and policy regarding greenhouse gas emissions and natural capital on farm are in a state of rapid development in Australia.

- The red meat industry is taking an active approach to address climate change and natural capital conservation considering international, national and industry drivers.
- Carbon EDGE has been updated to remain contemporary to changes in greenhouse gas accounting for farms and introduces the new concept of natural capital accounting and biodiversity.
- Developments in carbon and nature repair / biodiversity markets, and ways for producers to demonstrate their carbon position have been included in the course.
- Current research relating to lowering emissions on farm, through husbandry, genetics, pasture and feed management, feed supplements and alternative feed has been included.
- The co-benefits of vegetation on farm (for example trees) for carbon sequestration as well as a provider of ecosystem services like shelter and pollination have been added.

5.2 Benefits to industry

The industry now has an updated Carbon EDGE course that has been amended by:

- Addition and consolidation of the drivers for producers to be involved in the Carbon and Greenhouse aspects of running a red meat enterprise
- Addition of content relating to natural capital accounting, natural capital and biodiversity markets and the co-benefits of vegetation on farm, apart from carbon sequestration
- Updating of developments in carbon markets and demonstrating on-farm carbon position to stakeholders
- Streamlining and updating of the ways to reduce emissions on farm, including separation of tropical, rangelands and temperate interventions for easy adaptation by deliverers.

The course remains a comprehensive introduction to carbon and its implications for red meat producers and is unique in the flow through the course to assist producers develop a relevant action plan for their own farms. This is becoming increasingly important as stakeholders in the red meat industry, such as customers, importers, exporters, financial institutions, supply chain businesses and processors have increasing pressures to manage GHG emissions and natural capital management which flows through to producers.

6. Future research and recommendations

Because of the fast-moving nature of this topic, it is recommended that course content is reviewed comprehensively every two years and also reviewed in part upon the release of research reports, policy or legislation in Australia that may affect the content.

At present there are no recommendations to change the length or overall content of the course, even though there are suggestions in the producer feedback that the course might be streamlined to one day face-to-face with pre-work being completed online. This could be trialled in the future and an assessment made of the effect of this on producer participation and their perceived value.

As the course is heavy on content, it is recommended that different delivery modes and styles are trialled as the course is rolled out to improve the effectiveness of learning, and that any insights from this is fed back into the course design.

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8. Appendix

8.1 Summary of changes for deliverers given at online webinars

REVIEW OF CARBON EDGE

Structural changes

Day 1

Current structure	Associated activities	New Proposed structure	Associated activities
Introduction to C-EDGE	Expectations Matching game Intro KASA	Introduction to C-EDGE	Expectations Matching game Intro KASA
Goal Setting Part 1	1a and 1b in the workbook	Supply chain considerations 1 and 2 including “why”	
GHG101 Pre-work refresh	Scope activity KASA	GHG101 Reinforce the basics	Scope activity KASA
Supply chain considerations Part 1		Goal setting part 1	1a and 1b in the workbook
Luncheon		Luncheon	
Greenhouse Gas Accounting	Own carbon account Activity 2 in Workbook Emissions intensity picture cards KASA	Greenhouse Gas Accounting	Own carbon account. Activity 2 in Workbook. PLANR demo Emissions intensity picture cards. KASA
Afternoon tea		Afternoon tea	
Goal setting part 2	Review and refine goals	Goal setting part 2	Review and refine goals
Carbon Credits and Carbon Neutrality	KASA Day 1 reflections Revisit parking lot	Carbon Credits and Demonstrating Your Carbon Position	
		Biodiversity / Environmental markets	KASA Day 1 Reflections Revisit parking lot
End of Day 1			

Day 2

Current structure	Associated Activities	New proposed structure	Associated activities
		Reflect on day 1, parking lot addressed	
Supply chain considerations Part 2		On farm emissions reduction	Activity 3 in workbook listing interventions KASA Shortlisting opportunities to reduce emissions
On-farm emissions	Activity 3 in workbook listing interventions KASA Shortlisting opportunities to reduce emissions	Morning tea	
Morning tea		On-farm sequestration Part A Trees	Activity 4 in workbook listing woody areas of vegetation on farm. Worked through example with farm map. Activity 4a Estimate sequestration potential on-farm with LOOC-C.
On-farm sequestration Part A Trees	Activity 4 in workbook listing woody areas of vegetation on farm. Activity 4a Estimate sequestration potential on-farm with LOOC-C.	Environmental co-benefits from revegetation (including biodiversity)	Activity 4 in workbook (expanded) to include co-benefits from revegetation

Current structure	Associated Activities	New proposed structure	Associated activities
On farm sequestration Part B Soils	Activity 4b estimating carbon stocks and sequestration potential using LOOC-C. Shortlisting opportunities for sequestration KASA	On farm sequestration Part B Soils	Activity 4b estimating carbon stocks and sequestration potential using LOOC-C. Shortlisting opportunities for sequestration KASA
Luncheon		Luncheon	
Workbook review	Activity 5 Reviewing everything, what is there to do now, do next or do later Pitch activity	Workbook review	Activity 5 Reviewing everything, what is there to do now, do next or do later Pitch activity
Afternoon tea		Afternoon tea	
Wrap up	Revisit expectations Revisit parking lot Feedback sheets	Wrap up	Revisit expectations Revisit parking lot Feedback sheets
End of day 2			

Changes to content

Introduction

- Housekeeping has moved forward for risk management (Slide 3)
- Added context of the other EDGE workshops (Slide 5)
- Instead of straight into goal setting after the introduction, now go straight into the “Drivers to lower emissions – Why are we here” which replaces the two “supply chain consideration” sessions (Slides 11-27)
- Other inclusions in the introduction are the Australian and Red Meat Industry responses to global warming and international commitments.
- The producer manual will now have this content included in the introduction.

Greenhouse gas (GHG) 101 – Reinforce the basics

- Slides for atmospheric gas levels over time have been added (slides 31-33)
- Changes to global warming potential over time has been added (slide 35)
- Temperature anomaly for Australia has been added (slide 36)
- There has been an expansion of the scope discussion, with inclusions of the cases of agistment and contractors (slides 39-42)
- New videos were sought, but were difficult to find. The old videos have been retained.
- Carbon Cycle rapid review has been added (slides 47-48) as a quiz activity
- ACCU Scheme and other policy drivers has been removed and added to the introduction
- Pathway to CN30 has been removed and alternative commentary added to the introduction concerning the red meat industry’s current response to global warming and GHG emission reduction.

Goal setting Part 1

- Now comes after GHG 101.

Greenhouse gas accounting

- Context slide added (slide 63)
- Extra example of emissions factors (slide 67)
- AIA and Ruminati calculators introduced (slide 70)
- “What now” slide added (slide 76)
- Major change: addition of natural capital accounting (slides 79-82)
- If time, activity for LOOC-B or PLANR has been included (slide 82)
- Wool has been removed from the emissions intensity exercise as it was being compared to food but no other textiles (slides 85-86)

Goal setting Part 2

Carbon Credits and demonstrating your carbon position

- There is a language shift away from carbon neutral as a standalone goal, other points on the spectrum can be achieved
- Methods relevant to red meat producers have been updated (slide 99)

- Some streamlining with the carbon neutral section (slides 105-110), mainly removal of duplication
- Major change: addition of nature repair market and conservation covenants (slides 111-113)

End of day 1

Day 2

- Major change: instead of starting with supply chain considerations part 2, now start with “On Farm Emissions Reduction”

On-farm emission reduction

- Separated out husbandry from genetics. Husbandry now slides 127-130.
- Simplified the tables. No longer have economic, environmental and social columns
- Genetics slides 131-134, including EBV and ASBV updates on slide 132
- Jon Wright case study added as a genetic case study
- Grazing land management, feed types and diet, time controlled grazing has been added (Slides 136-137)
- Pasture species to reduce methane production has been simplified, separated into temperate vs tropical so irrelevant slides can be hidden and confusion reduced (slides 138-148)
- Slides on feed additives have been simplified but explanation included on their mode of action (slides 151-152)
- Alternative feedstuffs has been separated from feed additives (slide 153)
- Slide on “musts” for feed additives added (slide 154)
- Vaccination and early life programming have been re-described as “blue sky” interventions, to emphasise they are research rather than practical solutions at this time
- In fertilisers, a slide has been added to explain the difference between volatilization and denitrification (slide 158)

On-farm sequestration

- The word “trees” has been largely substituted with “vegetation”.
- Slides 176-183 have been added which detail the co-benefits from vegetation
- The Steak n’ wood project has also been added as a case study (slides 185-187)
- Some extra information has been added on soil structure and texture (191-192)
- A better slide has been included on land management and soil carbon (193)
- Lifespan of soil organic matter forms has been added (slide 196)
- Desmanthus has been added as a tropical case study (slide 201)