The Australian
Red Meat Industry's

Carbon Neutral by 2030 Roadmap

CN 30

Facilitate

RMAC

Advocate

AMIC Australian Meat Industry Council

ALEC AUSTRALIAN LIVESTOCK EXPORTERS COUNCIL

ALFA AUSTRALIAN LOT FEEDERS' ASSOCIATION

CATTLE COUNCIL OF AUSTRALIA

GICA Goat Industry Council of Australia

SHEEP PRODUCERS AUSTRALIA

Deliver

AMPC AUSTRALIAN MEAT PROCESSOR CORPORATION

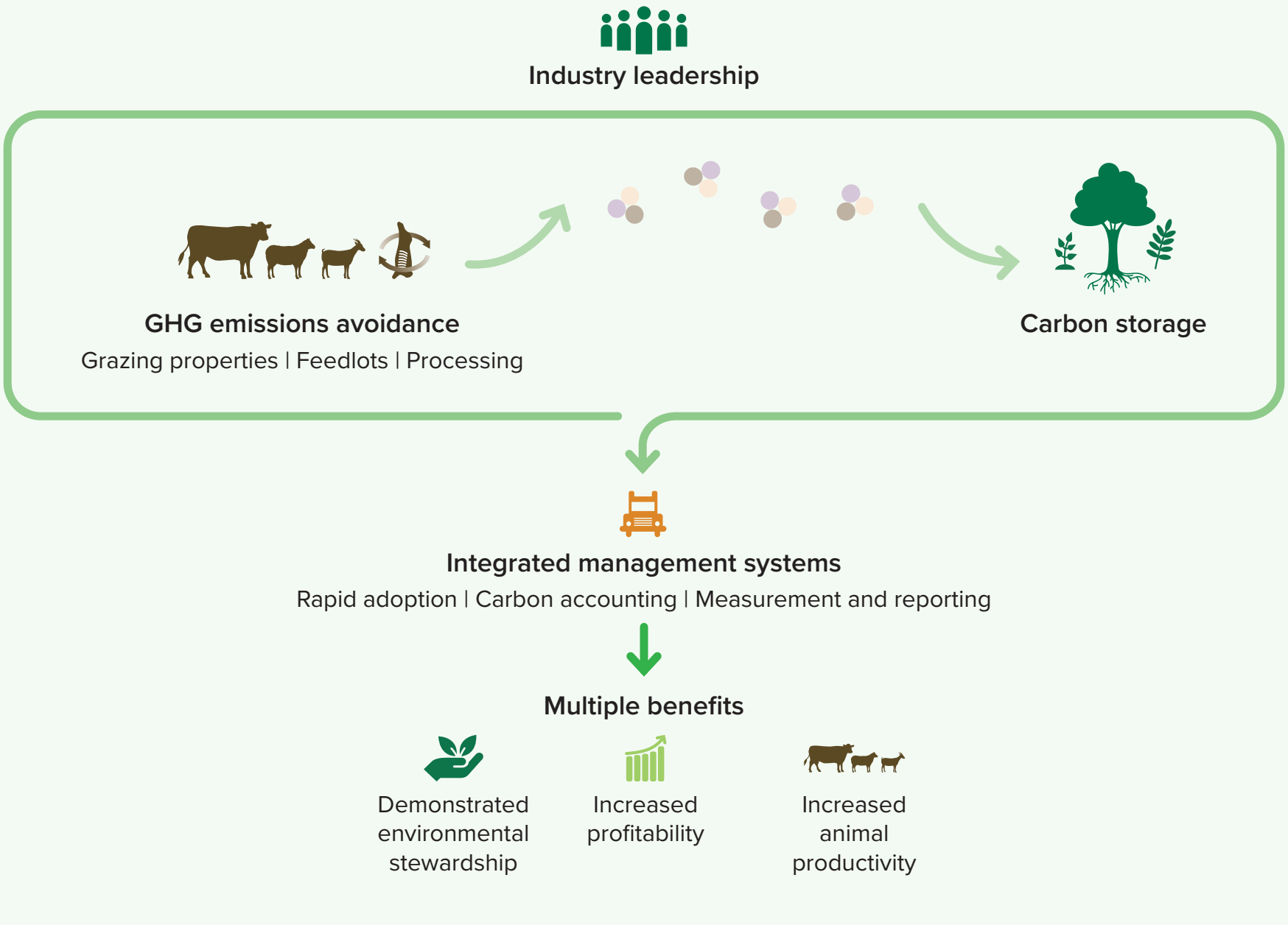
LIVECORP THE AUSTRALIAN LIVESTOCK EXPORT CORPORATION

mla MEAT & LIVESTOCK AUSTRALIA

ABN 39 081 678 364

Published November 2020

Contents


Industry leadership
GHG emissions avoidance
Grazing properties | Feedlots | Processing
Carbon storage
Integrated management systems
Rapid adoption | Carbon accounting | Measurement and reporting
Multiple benefits
Demonstrated environmental stewardship
Increased profitability
Increased animal productivity

Foreword

The Australian red meat and livestock industry has created an opportunity to turn today's challenges into tomorrow's opportunities through its Carbon Neutral by 2030 (CN30) Initiative. The CN30 target, alongside investment in technologies and practices that demonstrate the industry is proactively addressing emissions, reinforces the industry's reputation as a global leader in sustainable food production. This is a key point of difference for Australian red meat in a competitive global protein market.

Research undertaken by a consortium of organisations led by Australia's national science research agency, Commonwealth Scientific and Industrial Research Organisation (CSIRO), has shown it is possible for the Australian red meat and livestock industry to achieve CN30 while maintaining animal numbers, through continued efforts to avoid greenhouse gas emissions and store carbon in vegetation and soils.

The industry's aspiration to achieve CN30 is in the context of doubling the value of red meat sales as the trusted source of the highest quality protein, under the Red Meat Advisory Council's *Red Meat 2030* strategy.

The Australian red meat industry has already made big inroads towards CN30. Net greenhouse gas emissions have fallen 57% since 2005, representing by far the greatest reduction by any sector of Australia's economy. However, continued progress is vital.

The CN30 Roadmap describes what a carbon neutral Australian red meat industry means, why industry has set the target, the work areas industry will focus on between now and 2030, and how the industry can execute those work areas. The CN30 Roadmap is for the people that live, work and own red meat businesses, and those within our community who consume our product and benefit from our industry. It will be our industry's people, customers and consumers who will empower industry to achieve CN30 while remaining the trusted supplier of the highest quality protein.

MLA is investing in technologies to support industry's transition to a carbon neutral position. Some technologies and practices being adopted include improved animal genetics and husbandry practices to reduce emissions intensity (per unit of meat produced). Other options require further research and development to validate their environmental and economic benefits for industry and its stakeholders.

Our industry is striving to be a world leader in sustainable red meat production, delivering high value, high quality products to Australia and the world. Our customers, consumers and the community increasingly want to see environmental stewardship credentials from our industry. We must meet this growing demand and be rewarded for doing so. We will leave no stone unturned in the search for opportunities for industry to transition to a carbon neutral position by 2030.

Sincerely,

Jason Strong

Executive summary

Carbon Neutral by 2030 (CN30) is an ambitious target for the Australian red meat and livestock industry to achieve net zero greenhouse gas (GHG) emissions by 2030. This means that, by 2030, the industry aims to make no net release of GHG emissions into the atmosphere.

Carbon neutrality will be achieved through reductions in emissions from grazing management, lot feeding and processing, in addition to increases in carbon storage in soils and vegetation.

The Australian Red Meat Industry's Carbon Neutral by 2030 Roadmap (CN30 Roadmap) describes the technologies and practices required for industry to thrive in a carbon neutral future. The CN30 Roadmap is built with industry's key national and global stakeholders in mind, including:

- industry (producers, feedlots, processors and retailers)
- customers, consumers and communities
- governments
- partners (such as other agricultural research and development corporations, research organisations and private sector solution providers).

The CN30 Roadmap provides industry stakeholders the opportunity to understand and use relevant information to inform current and future decision making and action. However, not all parts of the CN30 Roadmap will be relevant to all stakeholders.

For producers, lot feeders, processors and retailers, the CN30 Roadmap provides information on how to connect the individual actions of their operations to wider industry actions and how to reduce net emissions whilst remaining productive and profitable.

For customers, consumers and communities, the CN30 Roadmap demonstrates how the red meat industry plans to remain productive and profitable in a low carbon economy. It also shows how industry will tackle the climate challenges that lie ahead, and how customer, consumer and community support will be critical to achieving CN30.

For government, the CN30 Roadmap provides information on potential emissions avoidance and carbon storage opportunities, areas requiring future investment and how a supportive policy framework is required to drive technology adoption and practice change. It also describes how the industry will track and report progress towards carbon neutrality.

For partners, the CN30 Roadmap describes collaboration opportunities to support industry's transition to a carbon neutral position.

The CN30 Roadmap enables stakeholders to navigate a series of complex economic, social and environmental issues influencing almost all aspects of the red meat value chain, from animal genetics through to meat processing and consumer marketing. There are four key areas of work, representing the most important issues in pursuit of the CN30 target:

1. Emissions avoidance
2. Carbon storage
3. Integrated management systems
4. Leadership building.

The technologies in each work area have been selected based on their potential impact and are based on current knowledge and understanding of science, policy and market conditions. The work areas will require annual review as knowledge and priorities evolve, and progress is made towards the CN30 target.

Collaboration throughout the value chain – with Government, the research community and other interested stakeholders – will be critical. These collaborations will bring to life the technologies and market development activities required to enable industry to transition to a profitable, socially responsible, carbon neutral position by 2030.

How to get involved

The CN30 Roadmap outlines the vision and describes the journey ahead for industry. It's time for industry to 'roll up its sleeves, dig in and pave the way' for a prosperous, carbon neutral Australian red meat industry. While designing the CN30 Roadmap, many partnership and project ideas were identified. MLA will take a lead role in working with people from all backgrounds in the search for opportunities for industry transition to a carbon neutral future.

The CN30 Roadmap outlines the road ahead as we know it, however ongoing review and engagement with industry stakeholders will be required on the way to 2030.

To keep across the latest news and opportunities to get involved, sign up for our newsletter by contacting CN30@mla.com.au and check out our website (mla.com.au/CN30).

Why has industry launched the CN30 initiative?

Industry has launched the CN30 initiative to capitalise on growing government and community interest in solutions to greenhouse gas-induced climate change. CN30 provides consumers, customers and the community with a world-leading offering to reduce net emissions from the red meat industry and be the trusted source of the highest quality protein.

What will the CN30 initiative deliver?

Achieving CN30 will deliver multiple benefits to the industry, the environment, livestock, customers, consumers and the community.

- **Benefits for industry:**
  - increased productivity and reduced net GHG emissions through adoption of novel technologies and practices on-farm, in feedlots and for processing facilities
  - improved drought resilience through adoption of technologies and practices that boost soil health and improve soil moisture utilisation
  - increased value capture from low carbon or carbon neutral red meat products
- **Benefits for the environment:**
  - a reduction in net greenhouse gas emissions from the red meat industry, alongside enhanced biodiversity and stewardship of natural resources
- **Benefits for livestock:**
  - improved animal health and wellbeing through improved availability of nutritious feeds and access to shade and shelter
- **Benefits for consumers:**
  - knowledge that Australian red meat production and consumption is environmentally responsible
- **Benefits for communities and government:**
  - knowledge that the red meat industry is making a substantial contribution to Australia's international commitments on climate change.

MLA resources and support

10 tips to get your business CN30 ready

What you can do today:

1. Arm yourself with the right knowledge. Identify your emissions sources, know what carbon storage options are available and document these in your carbon account. Visit: **mla.com.au/news-and-events/industry-news/creating-a-carbon-account-for-your-business**
2. Consider herd or flock management practices and genetic technologies to improve livestock diet, breeding efficiency or structure to reduce methane emissions per kilogram of live weight produced. Visit: **mla.com.au/globalassets/mla-corporate/blocks/research-and-development/erf-fact-sheet_beef-cattle-herd-management.pdf** and **mla.com.au/research-and-development/search-rd-reports/final-report-details/environment-on-farm/genetic-technologies-to-reduce-methane-emissions-from-australian-beef-cattle/3032**
3. Consider energy efficiency and/or renewable energy options to reduce energy use and generate renewable energy. Find out more about how to weigh up the best options for your business at: **mla.com.au/news-and-events/industry-news/energy-decisions-made-easy**
4. Identify shade and shelter options on your property. Integrate trees and shrubs into grazing management for improved carbon storage, animal health and welfare, and biodiversity benefits. Your local Landcare group can assist you with selecting the right tree and vegetation species for your region. Visit: **mla.com.au/research-and-development/Grazing-pasture-management/native-pasture/tree-grass-balance**
5. Consider the potential for savanna fire management methods to avoid emissions and improve carbon storage. Visit: **mla.com.au/globalassets/mla-corporate/blocks/research-and-development/erf-fact-sheet_savanna-burning_final.pdf**
6. Monitor and record active dung beetle populations and keep an eye out for new species as they are released. Visit: **mla.com.au/research-and-development/Environment-sustainability/dung-beetles/** and **mla.com.au/news-and-events/industry-news/new-dung-beetles-rolling-through**

Within three years:

7. Plan for delivery and distribution of new feeds and supplements that reduce methane emissions from livestock and improve animal growth rates. This will enable more production for the same or less methane emissions. Visit: **mla.com.au/research-and-development/Environment-sustainability/national-livestock-methane-program**
8. Establish deep-rooted pastures and legumes to improve soil carbon levels, soil health and lift animal productivity. Visit: **mla.com.au/news-and-events/industry-news/are-my-pastures-stuffed**

In the longer term:

9. Consider what mix of pastures, legumes and trees is most suitable to maintain livestock productivity in future weather and climate scenarios. Visit: **mla.com.au/research-and-development/business-management/enterprise-and-property-planning**
10. Look at collaborative supply chain arrangements to mitigate financial, environmental and market risks, as well as the impact on business inputs and outputs. Visit: **mla.com.au/about-mla/what-we-do/mla-donor-company**

What does carbon neutral mean?

Under the Australian red meat industry's CN30 initiative, carbon neutral means net zero GHG emissions on an annual basis.

This means that the amount of GHGs released to the atmosphere by industry is equivalent or less than the amount of additional carbon stored in soils or vegetation in grazing lands in a given reporting year. The sources and sinks of emissions under the CN30 initiative are illustrated in Figure 1.

The three most relevant GHGs from the Australian red meat industry are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Each of these gases has a different global warming potential (GWP) based on the ability of the gas to trap heat in the atmosphere and the length of time the gas persists in the atmosphere.

To simplify accounting of the various GHGs, a standardised measurement unit known as 1 tonne of CO_2 equivalent (CO_2-e) is used across the different gases. This underpins the generation of carbon credits, where each credit constitutes 1 tonne of CO_2-e GHG emissions. The GHG accounting convention most widely used globally, including by the Australian Government from 2021-22 onwards, is:

- 1 tonne of CH_4 released into the atmosphere has the equivalent warming potential of 28 tonnes of CO_2 released into the atmosphere.
- 1 tonne of N_2O released into the atmosphere has the equivalent warming potential of 265 tonnes of CO_2 released into the atmosphere.

Emission sources from the Australian red meat industry include cattle, sheep and goats (enteric methane, methane and nitrous oxide from waste management), fertiliser use in production of livestock feed (nitrous oxide emissions from fertiliser use in some pasture and crop production), land management practices (deforestation, savanna burning), waste management in meat processing and energy use (including transport), together with other relevant minor processes. Land management practices (revegetation, avoided deforestation) also represent a carbon sink, or store.

Dairy animals are excluded, and emissions from sheep production are attributed to meat and wool based on a protein mass allocation method. Emissions from live export animals are not included after leaving Australia. The scope boundary for the CN30 initiative is shown in yellow in Figure 2.

Australia's national herd and flock in 2030

According to CSIRO, it is possible to achieve CN30 without reducing herd numbers below the rolling 10-year average to 2015 (25 million cattle, 70 million sheep and 0.5 million goats) (Mayberry et al., 2018).. In 2030, producers will be even more attuned to the influence of genetic, environmental, technological and market factors on red meat production and will be able to:

- access the best information, enabling selection of livestock with multiple attributes to increase productivity and reduce methane emissions per kilogram of production
- select animal supplements, pastures, legumes and trees offering multiple economic and environmental benefits, enabling livestock to thrive in more extreme weather and climate conditions
- access more established markets for low and zero carbon red meat products and carbon credits.

Figure 1: Greenhouse gas emissions sources and sinks in the Australian red meat and livestock industry.

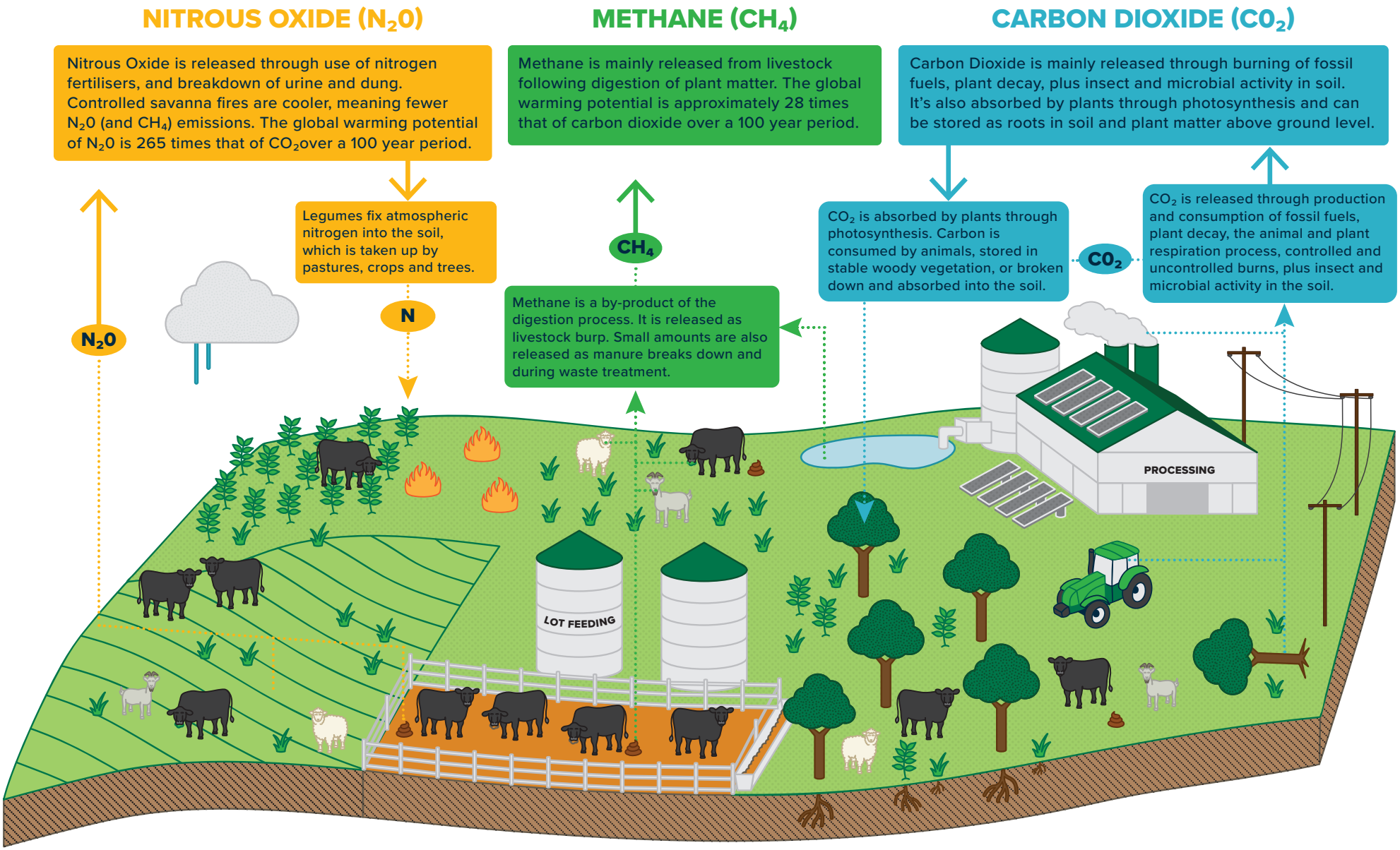
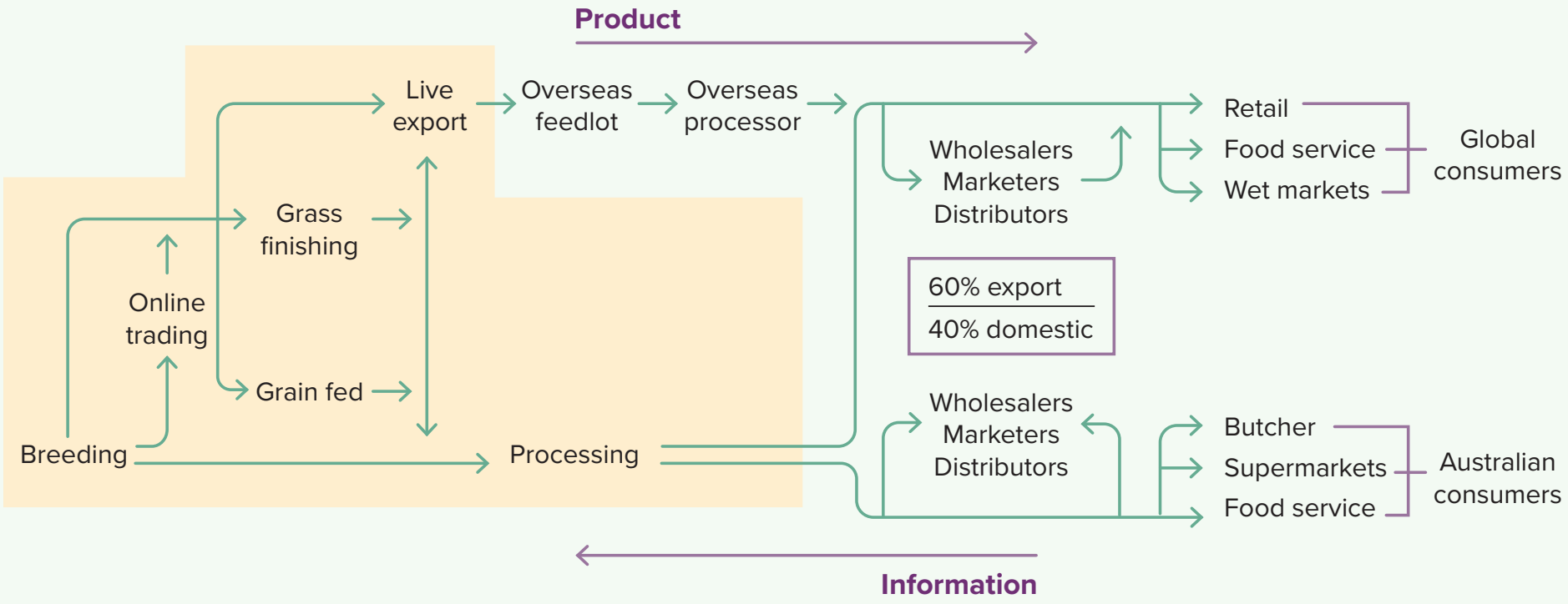


Figure 2: Scope boundary for the CN30 initiative within the Australian red meat supply chain. Areas covered in yellow reflect boundaries for emissions and carbon storage activities.



Source: Red Meat Advisory Council Red Meat 2030 document. Yellow highlighted area added by MLA.

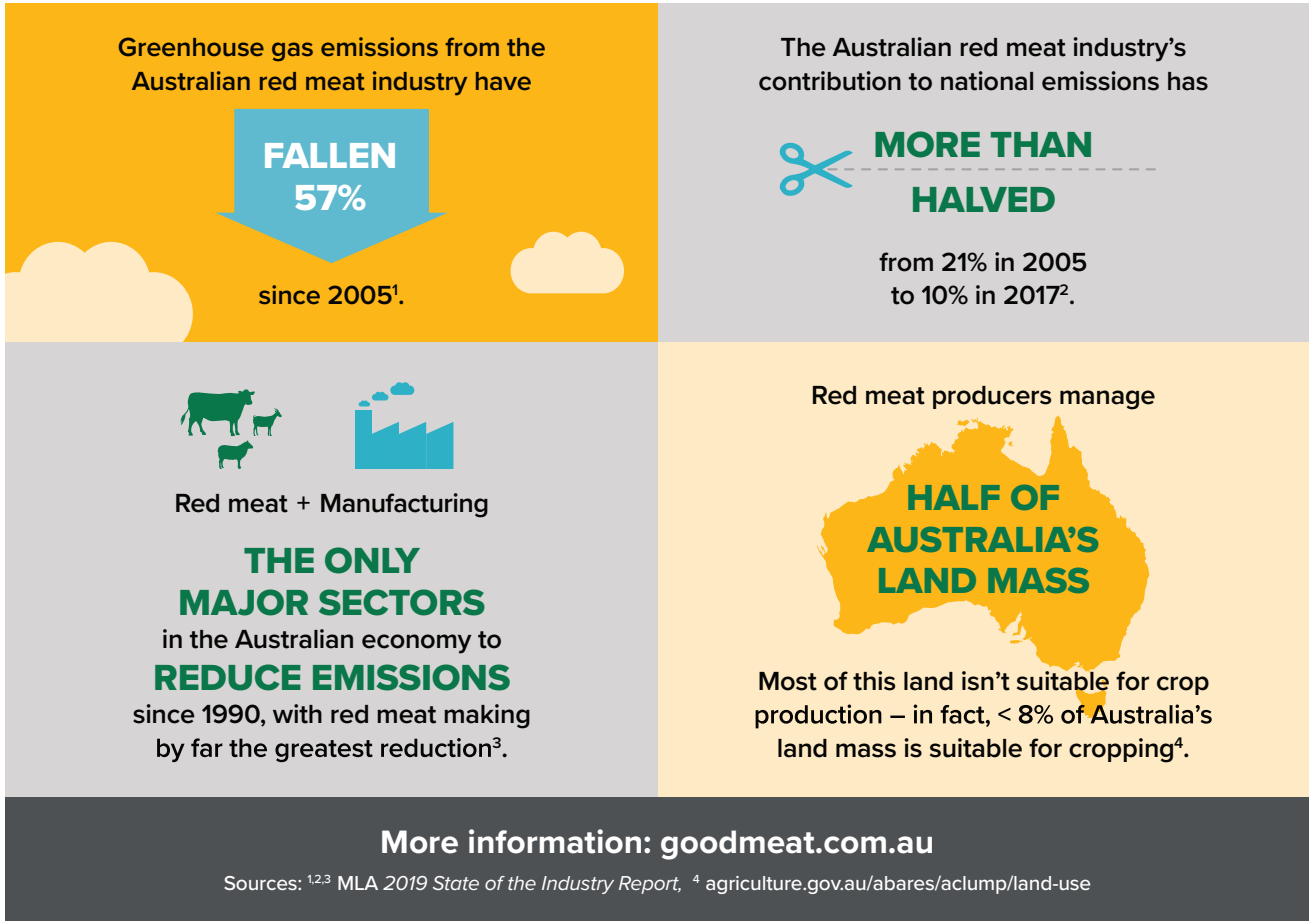
Where are we now?

According to analysis undertaken by CSIRO, the Australian red meat industry's proportion of national GHG emissions has reduced from 21% in 2005 to 10% (reported within the Agriculture sector, Figure 3) in 2017.

This means the industry's contribution to national GHG emissions has reduced substantially relative to baseline data. Since 2005, the red meat industry has reduced GHG emissions by 57% from 130.7 million tonnes of CO_2 equivalents (Mt CO_2-e) to 55.7 Mt CO_2-e in 2017. This means that, based on 2017 data, the industry needs to reduce and/or offset 55.7 Mt CO_2-e annually to achieve net zero GHG emissions on an annual basis.

The major sources of GHG emissions from the red meat industry include enteric fermentation (methane released during digestion) and land use change associated with red meat production. Reductions in GHG emissions to date are primarily due to changes in land use management, particularly a reduction in land clearing. (Appendix 2 details how emissions are calculated under the CN30 initiative.)

Figure 3: Summary of net GHG emissions from the Australian red meat industry.



Is the CN30 target achievable?

CSIRO has presented science-led pathways for the Australian red meat industry to achieve CN30 (Mayberry et al., 2018). With industry commitment, the right policy settings and new investment in research, development and adoption, CN30 is achievable.

Australian red meat businesses are among the most innovative in the world. A range of factors, such as our unique environment and markets, require businesses to continually adapt in order to thrive. Coupled with the fact the red meat industry is custodian of around half of Australia's land mass, an enormous and unique opportunity exists for the industry to be a large part of Australia's climate change solution.

Focused on the win-wins

Industry's approach to achieving the CN30 target is focused on delivering multiple benefits to stakeholders:

- Herd/flock management practices, genetic technologies, and novel animal feeds/supplements can both increase productivity and reduce enteric methane emissions.
- Legumes can raise animal and soil productivity and reduce enteric methane emissions.
- Increases in organic carbon storage in soils improves soil health and drought resilience, and removes carbon dioxide from the atmosphere.
- Appropriate integration of trees and shrubs into grazing management can improve carbon storage, animal health and welfare, and biodiversity.

Whether it's reducing net emissions, boosting productivity or developing new markets, industry's actions under the CN30 Roadmap will deliver multiple benefits aligned to stakeholder values.

Work areas paving the way to carbon neutrality

The following work areas are designed to create multiple benefits for industry and its stakeholders. The work areas are illustrated in Figure 4 and include:

1. Leadership building

2. GHG emissions avoidance

3. Carbon storage

4. Integrated management systems

Previous research investments form the basis of these work areas. These include the Reducing Emissions from Livestock Research Program (2009–2012), the National Livestock Methane Program (2012–2015), life cycle assessment research, and work led by CSIRO to determine the GHG mitigation potential of the Australian red meat production and processing sectors project (Mayberry et al., 2018).

Figure 4: Work areas and the desired benefits for industry.

1. Industry leadership

2. GHG emissions avoidance

- Grazing properties
- Feedlots
- Processing facilities

3. Carbon storage

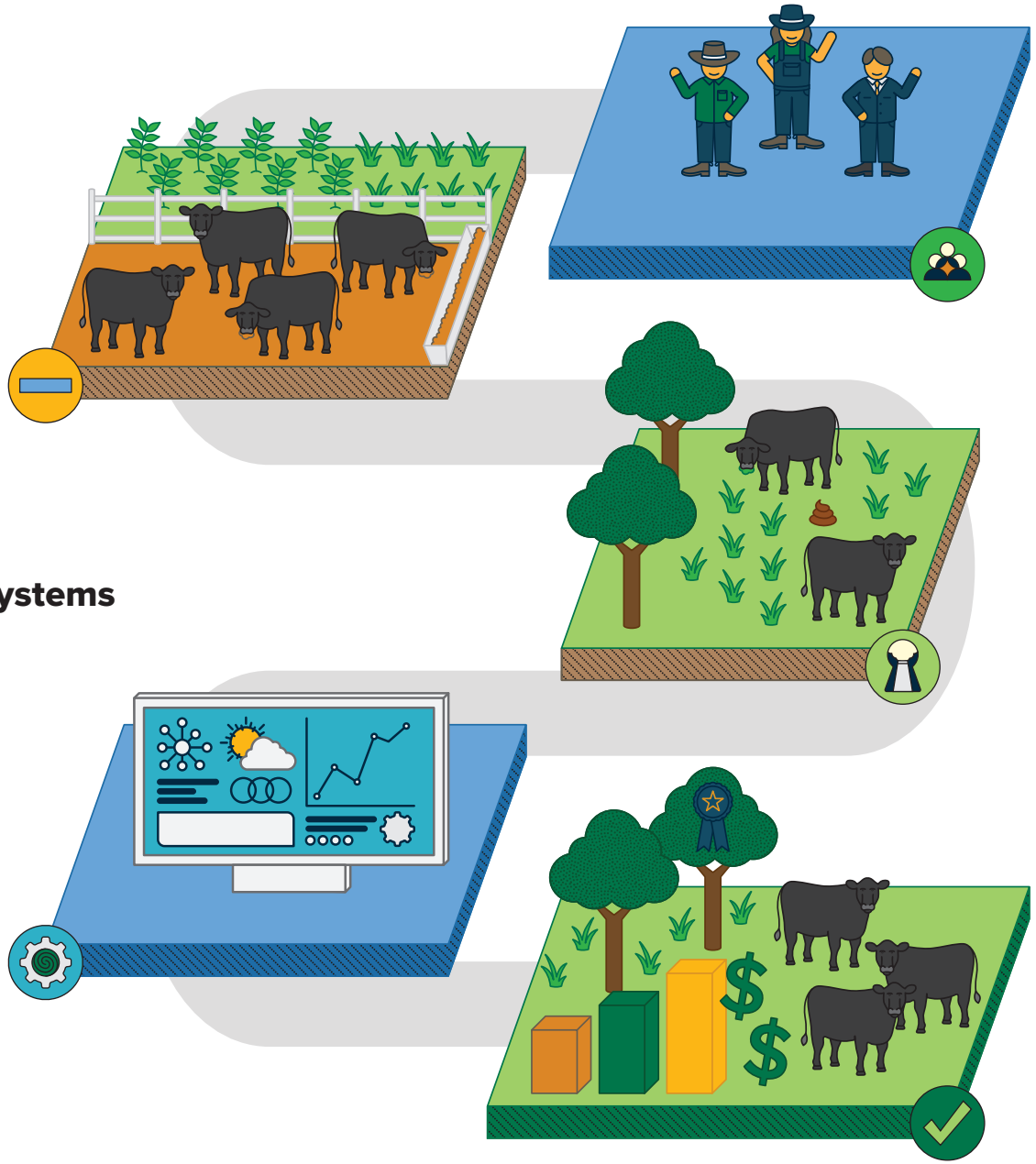
- Grazing properties

4. Integrated management systems

- Rapid adoption
- Carbon accounting
- Measurement & reporting

Multiple benefits

- Demonstrated environmental stewardship
- Increased profitability
- Increased animal productivity



WORK AREA 1

Leadership building

Objective:
To build leadership capacity and competency amongst industry stakeholders

Building leadership capability and competency across industry is vital to enabling the transition to a carbon neutral position by 2030. By investing in our people, industry will develop the skills and knowledge to adopt the technologies presented in the CN30 Roadmap. Partnerships with other research and industry bodies under this work area are important, as they will provide access to unique and transferable technology.

Whilst the first three work areas focus on providing the tools and mechanisms necessary for execution, the 'Leadership building' work area focuses on the other ingredients required to foster behaviour change and adoption of new practices.

Activities in this work area include:

1. Nurturing existing and developing new relationships with stakeholders to identify and develop industry leaders
2. Aligning relevant industry strategies and frameworks, such as *Red Meat 2030* and the Australian Beef and Sheep Sustainability Frameworks
3. Working with peak industry councils and government to set clear and stable policy mechanisms, underpinned by science-based evidence, that support research, development and adoption activities
4. Developing science communication initiatives for all stakeholders to ensure shared understanding of knowledge and technology
5. Developing capability building initiatives for industry.

Estimated R&D investment required:
$20M to June 2029.

Key stretch targets include:

1. Development of internationally recognised educational packages for industry and community
2. All relevant industry consultative committee members, peak industry council representatives and interested producers completed fit-for-purpose educational and development packages
3. International educational initiatives established to enable knowledge and technology transfer.

Figure 5: Summary of leadership building activities.

Nurturing existing and developing new relationships with stakeholders to identify and develop industry leaders

Aligning relevant industry strategies and frameworks, such as Red Meat 2030 and the Australian Beef Sustainability Framework

Working with Peak Industry Councils and Government to set clear and stable policy mechanisms underpinned by science-based evidence that support research, development and adoption activities

Developing science communication initiatives for all stakeholders

Developing capability building initiatives for industry

WORK AREA 2

GHG emissions avoidance

Objective:

To minimise emissions from grazing management, lot feeding and processing operations

This work area involves research, development and adoption of technologies that avoid carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) emissions from grazing management, lot feeding and processing. A summary of some of the GHG emissions associated with the red meat industry and the GHG emissions avoidance opportunities is shown in Figure 6.

Currently, 78% of livestock emissions are from pasture-raised beef, followed by 18% from sheepmeat, 4% from feedlots and <1% from goats (Mayberry et al., 2018). Most of these emissions are from enteric methane, which is gas exhaled by ruminants as a natural part of the digestion process and represents a loss in energy available for animal production. Recent advancements in technology for reducing enteric methane emissions are promising. Natural feed additives, such as marine macroalgae, have been shown to nearly eliminate enteric methane emissions under research trial conditions (Kinley, 2018). Practices that can improve animal productivity and reduce enteric methane emissions intensity include selective breeding and herd management to improve genetic performance, removing unproductive animals from the herd, improving weight for age at processing, and improvements in grazing diet quality through incorporation of legumes in pastures.

Technologies in this work area include:

1. Animal genetics and husbandry practices to increase production efficiency and reduce methane emissions intensity (per kg of production)
2. Livestock supplements that improve livestock productivity and lower enteric methane emissions
3. Pastures, shrubs and legumes that improve livestock productivity and lower enteric methane emissions
4. Equipment to capture and reuse methane from processing waste treatment
5. Energy efficiency and renewable energy technology to reduce carbon dioxide emissions from use of fossil fuels
6. Equipment to reduce nitrous oxide and methane emissions from manure management in lot feeding
7. Savanna burning management methods to avoid emissions of nitrous oxide and methane resulting from ''hot'' burns.

Estimated R&D investment required:
$95M to June 2029.

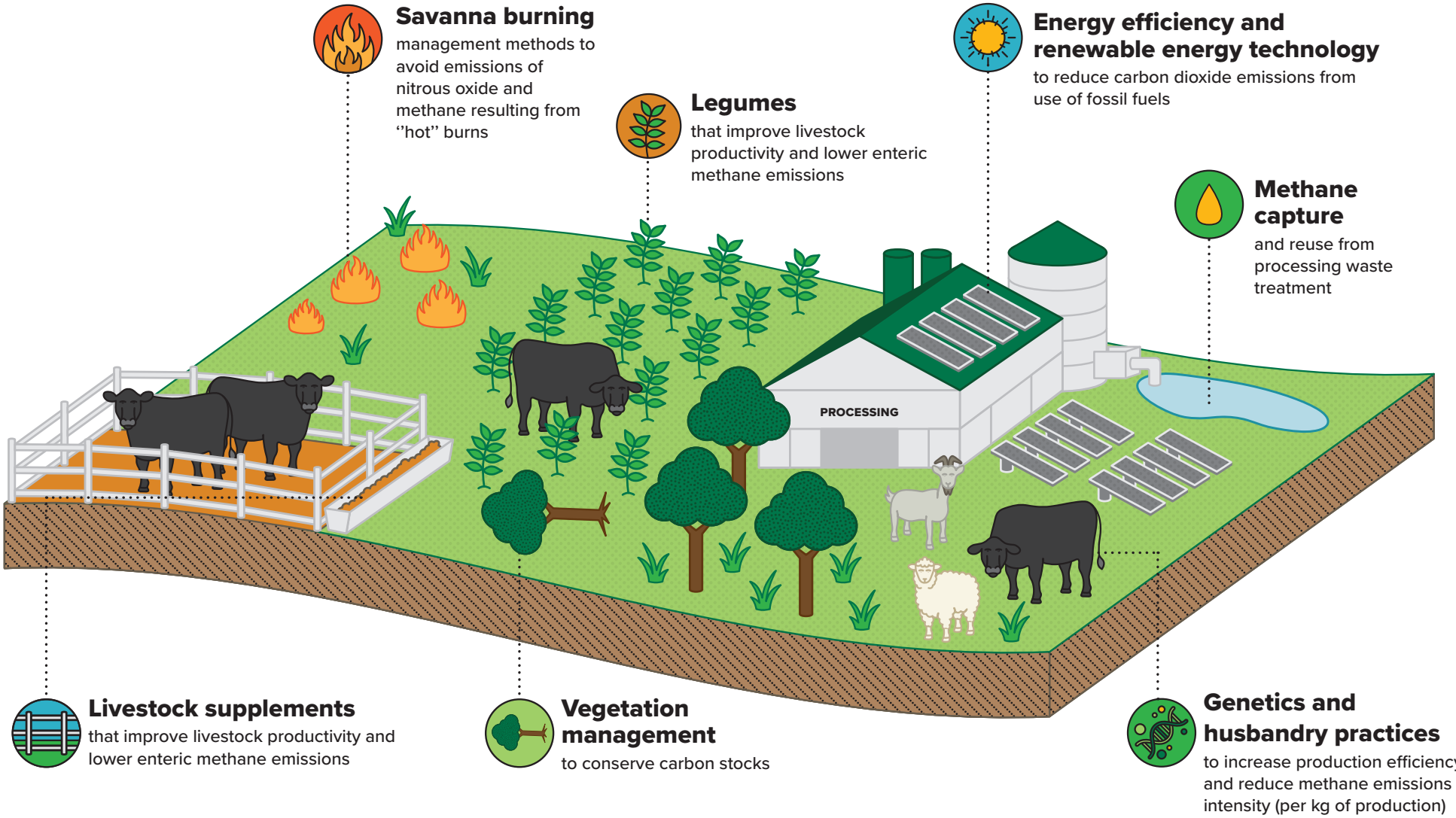
Key stretch targets include:

1. Livestock productivity in feedlots increased by 10% and enteric methane decreased by up to 90%
2. Livestock productivity in grazing management increased 5–10% and enteric methane decreased by 35–75% in 40% of the national herd and flock
3. 25 million hectares of new legume plantings established, increasing livestock productivity by 25% and reducing emissions intensity by 10–20%
4. Alternate energy sources such as biomass/biogas and solar energy provided at price parity with fossil fuels, allowing feedlots and processing facilities to switch away from fossil fuel use at scale
5. More than 40 million hectares of grazing land adopting savanna burning management methodologies.

Emissions avoidance target (based on 2017 emissions data):
50 Mt CO_2-e annually*.

*Goal could be lower if carbon storage (refer Work area 2) levels improve, which would offset emissions.

Figure 6: Technologies for avoiding GHG emissions from grazing properties, feedlots and processing facilities.



WORK AREA 3

Carbon storage

Objective:
To increase carbon storage in grazing lands

To achieve CN30, technologies that avoid GHG emissions and increase carbon storage in grazing lands are required. Increasing carbon storage can provide multiple benefits, including increased land and animal productivity, land remediation, increased biodiversity and improved water quality through reduced sediment run-off into waterways.

To meet the CN30 target, continued low levels of deforestation and appropriate revegetation activities will be required in some areas. However, revegetation activities will need to enable profitable red meat production, in accordance with the industry's Sustainability Frameworks.

Technologies in this work area include:

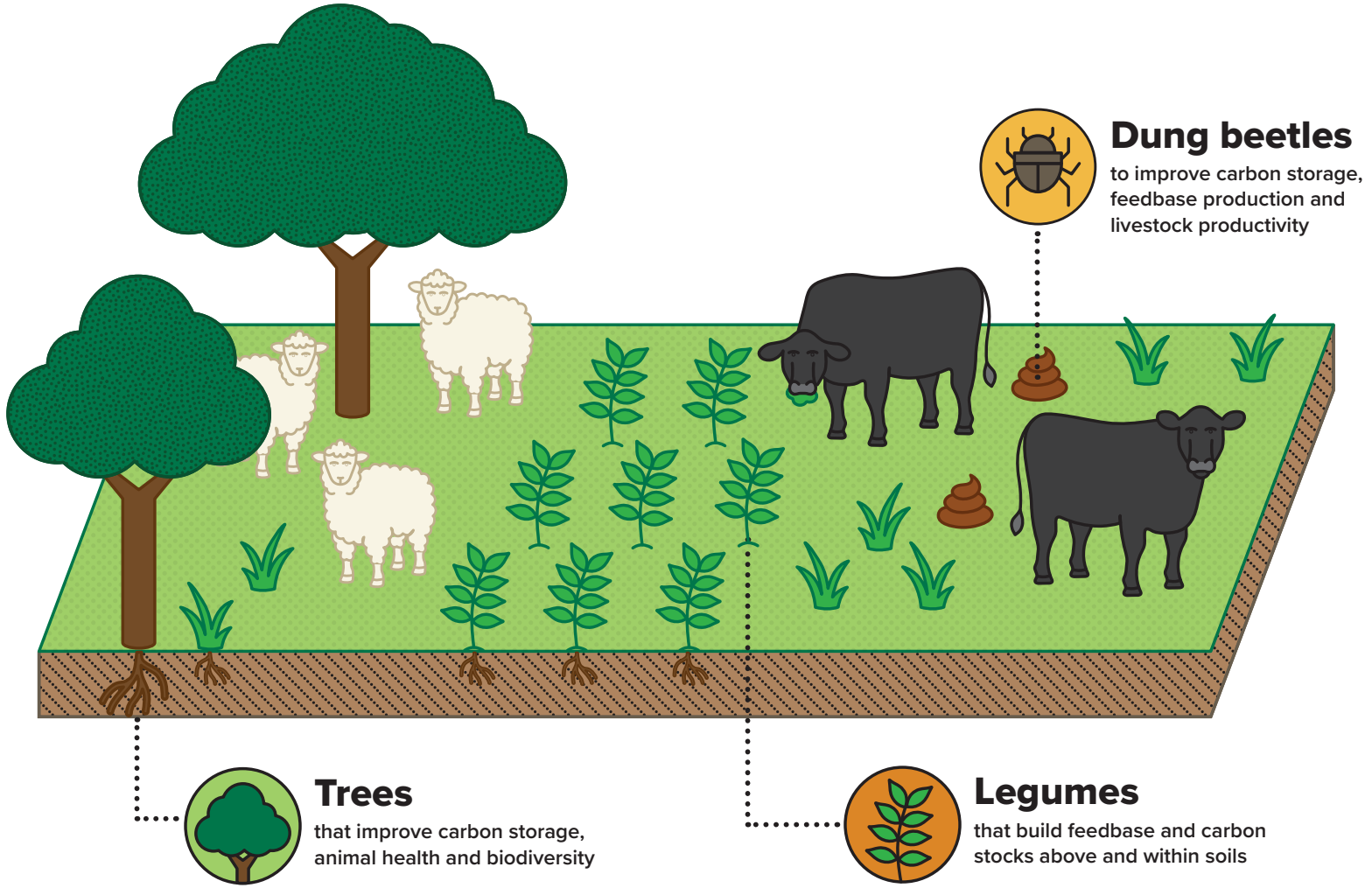
1. Legumes, pastures and shrubs that build feedbase and carbon stocks above and within soils
2. Trees and shrubs that improve carbon storage, animal health and biodiversity
3. Methods to optimise carbon storage in dead woody biomass in grazing lands
4. Methods to improve accounting of woody thickening in grazing lands
5. Dung beetles to improve carbon storage, feedbase production and livestock productivity.

Estimated R&D investment required:
$95M to June 2029.

Key stretch targets include:

1. 25 million hectares of new legume plantings established, storing soil carbon, boosting pasture productivity and livestock productivity
2. Soil carbon storage levels in 10 million hectares of grazing lands increased by 50–100kg CO_2-e/ha/year
3. Integration of shade clumps/lines and shelterbelts on 10 million hectares (southern Australia focus) of available 355 million hectares of land under grazing management nationally, increasing livestock productivity by 10% and storing more than 25 Mt CO_2-e emissions p.a.
4. Nationally accepted methods of regrowth control to maximise carbon storage without reducing livestock productivity.

Figure 7: Technologies for increasing carbon storage on-farm.



WORK AREA 4

Integrated management systems

Objective:

To drive adoption of technologies across the value chain

This work area involves activities that enable environmental, economic and social impact measurement, accounting and reporting (MAR) throughout the red meat value chain. This involves 'connecting the dots' and 'adding up the sum of the parts' from work areas 1 and 2 in order to strengthen the cumulative impact for industry and its stakeholders, as illustrated in Figure 8.

Activities in this work area include:

1. Technical and economic analysis of farming systems to determine appropriate combinations of emissions avoidance and carbon storage technologies and practices
2. Incorporating emissions avoidance and carbon storage practices into existing extension and adoption programs
3. Developing resources and tools to support adoption of emissions avoidance and carbon storage practices;
4. Linking outcomes from carbon farming projects into the National GHG Inventory (NGHGI)
5. Developing new scientific methodologies to generate carbon credits
6. Developing new measurement and reporting mechanisms to improve carbon accounting
7. Investigating new accounting metrics for GHGs from livestock.

Estimated R&D investment required:
$30M to June 2029.

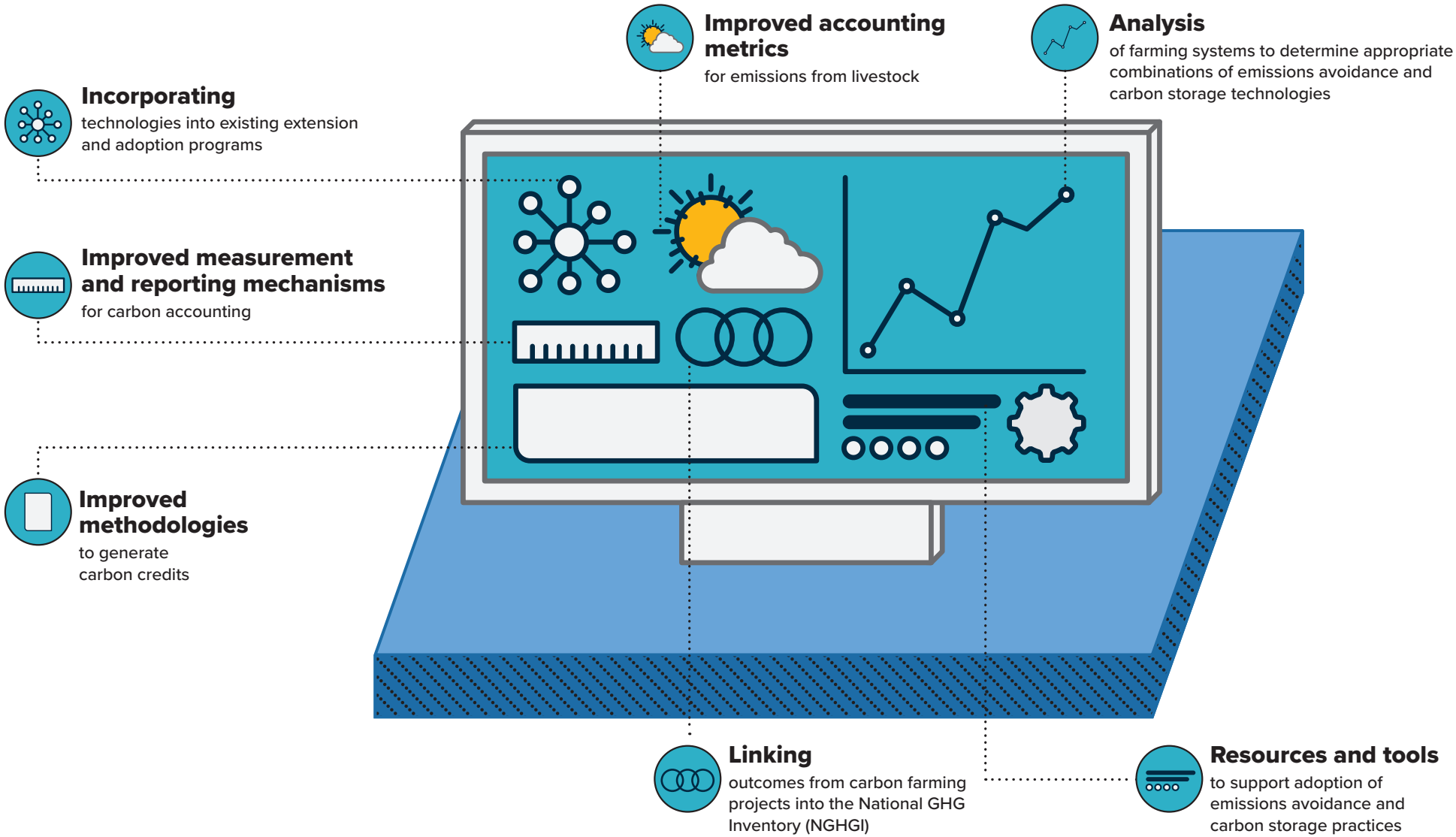
Key stretch targets include:

An established network of advisors working with 50% of producers, 100% of accredited feedlots and processors, using a carbon accounting tool to manage GHG emissions and business productivity

50% of red meat product traded through certified low or carbon neutral value chains

At least three new methodologies to generate carbon credits developed with links to the NGHGI (emphasis on feedlotting, legumes and supplements for grazing management).

Figure 8: Activities that enable measurement, accounting and reporting throughout the Australian red meat value chain.



Staging of implementation activities

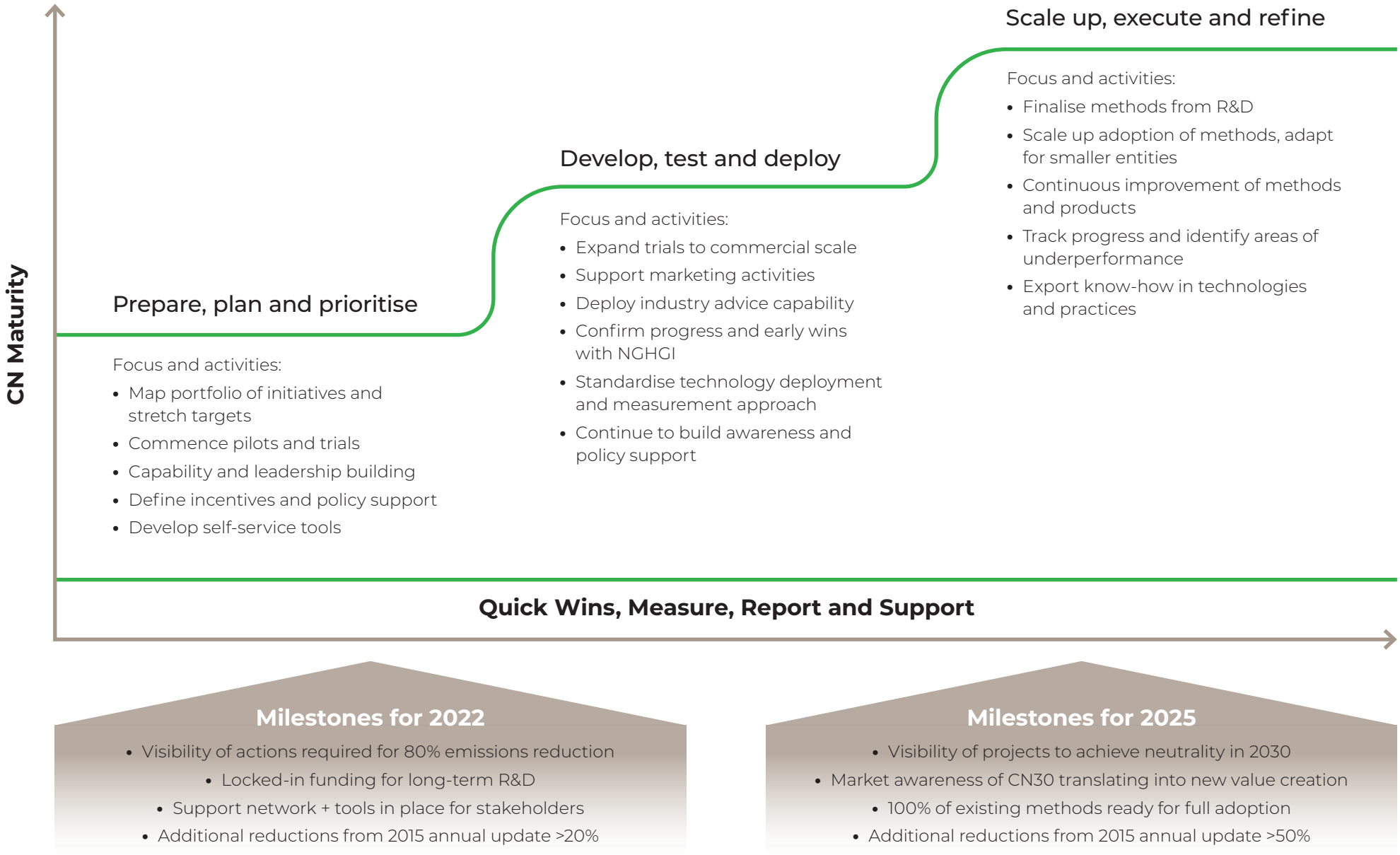
Achieving such an ambitious goal as CN30 requires careful preparation, planning and execution, in addition to the critical collaboration between industry stakeholders. There will be three main phases between now and 2030:

1. Prepare, plan and prioritise
2. Develop, test and deploy
3. Scale up, commercialise, execute and refine.

Activities from each phase will overlap to ensure continuous delivery of CN30 outcomes. Research, development, extension and adoption activities will be included in each of the three phases. A summary of the key activities that will be the focus of each stage are illustrated in Figure 9.

Whilst industry stakeholders acting together will be the primary mechanism for success, the need for collaboration across all areas, the necessity for uniform reporting, and the economies of scale generated by leveraging common support and capabilities will necessitate a focus on coordination efforts such as reporting, training and capability building during the first stage.

Figure 9: Staging of implementation activities.



Stakeholder engagement and collaboration

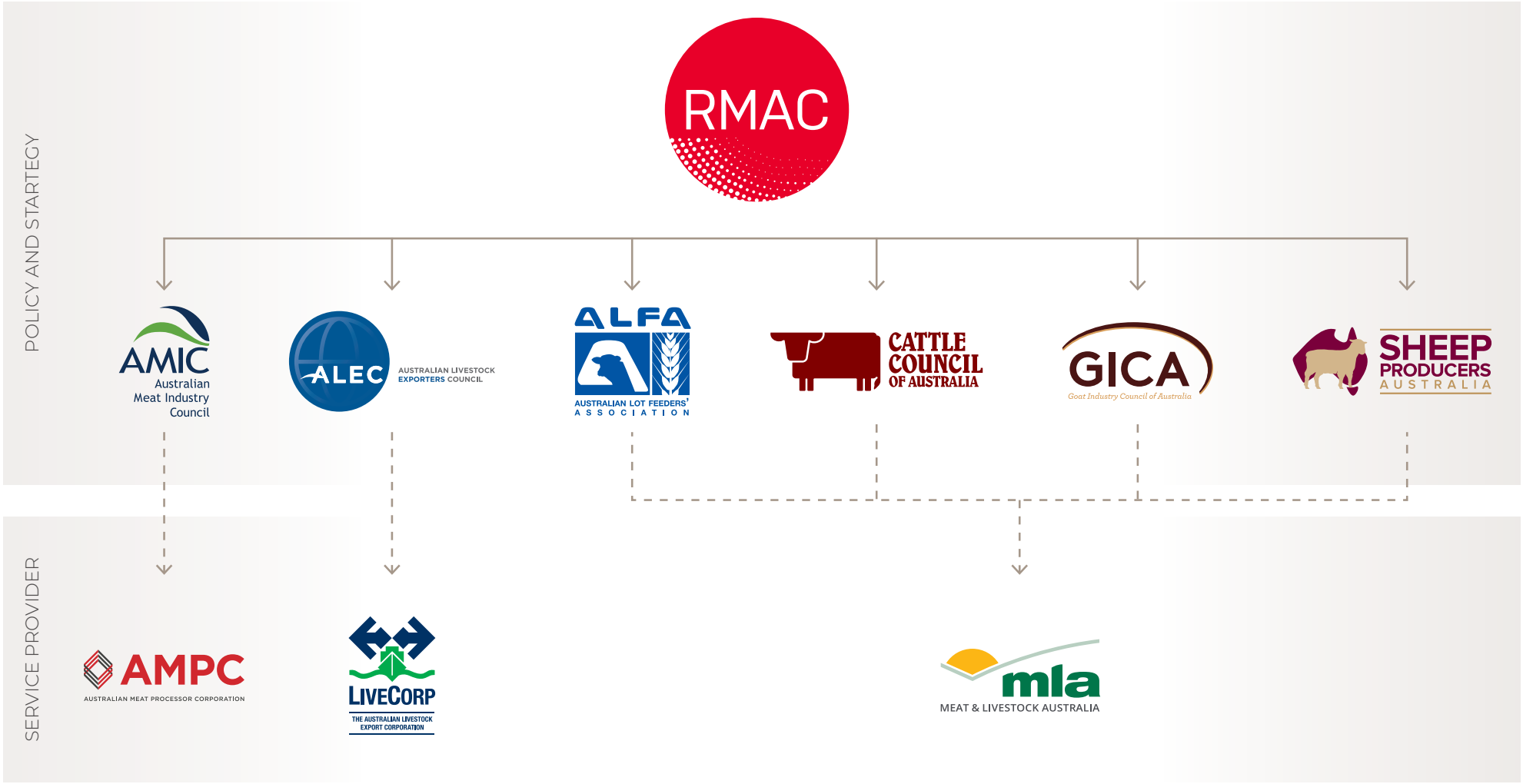
To achieve CN30, a collaborative effort across the value chain will be required.

Our red meat industry is supported and guided by research and development corporations and peak industry councils (Figure 10), many of which have explicit statements about their priorities and goals that align with the desired outcomes of CN30. The CN30 initiative supports achievement of these goals. Additional key stakeholders are included in Table 1.

Table 1. Industry stakeholders.

Stakeholders				
Customers: Buyers and sellers of Australian red meat and livestock from paddock to plate	**Consumers:** Diners and purchasers of Australian red meat	**Communities:** Societies, regions and cultures that Australian red meat businesses are part of and contribute be	**Government:** Federal and State government departments involved in carbon accounting, and industry regulation	**R&D and commercialisation partners:** Research organisations, consulting service providers, technology manufacturers

Figure 10: Key red meat industry stakeholders and partners.



Stakeholder Action Plan

Achieving CN30 will require effort by many industry stakeholders. The CN30 Roadmap is built with the following stakeholders in mind:

- industry (peak industry councils, state farming organisations, producers, feedlots, processors and retailers)
- customers, consumers and communities
- governments
- partners (such as other agricultural research and development corporations, research organisations and private sector solution providers).

Not all activities described in the CN30 Roadmap will require action from all stakeholders, however each stakeholder should be able to understand and take on relevant activities now or in the near future. The key recommended actions to be undertaken across the four work areas under the CN30 initiative are shown in Table 2.

Whilst some industry participants will focus more on some work areas, as can be seen in Table 2, success will require a real collaborative effort and communication between all involved, in all work areas, as most actions are complementary.

A more detailed list of the actions required in each work area, and the relevant stakeholders who will need to contribute to those actions, is provided in Table 3. This list represents the current view of initial actions and will be updated over time. Similarly, the stretch targets for these actions will evolve and become more granular over time.

Table 2: Summary of action plan. Success requires stakeholder engagement in nearly all work areas.

		Key actions		Industry	Customers and consumers	Government	MLA and Partners
CN30	Net emissions reduction	 **GHG emissions avoidance**	• Participate in trials, invest in emissions reduction projects • Develop policy settings that support emission reduction R&D, scientific methodology development and projects • Develop supplements and forages to avoid enteric methane emissions and improve productivity • Develop technology to avoid methane emissions from waste management at processing facilities • Develop technology to reduce N_2O and CH_4 emissions from manure management and fertiliser use for fodder crop production • Optimise savanna burning management practices	X		X	X
		 **Carbon storage**	• Participate in trials, invest in carbon storage projects • Optimise land and vegetation management for increased carbon storage • Develop policy settings that support carbon storage R&D, scientific methodology development and projects • Develop new legumes, pastures and shrubs to build feedbase and carbon stocks • Improve integration of trees and shrubs for improved carbon storage, animal health and biodiversity • Optimise vegetation regrowth management and carbon storage in dead woody biomass • Investigate carbon storage increases from dung beetle activity	X		X	X
	Support and enablement	 **Integrated management systems**	• Invest in baseline and annual carbon assessments, develop property plans • Develop carbon accounting tools for industry to manage GHG emissions and business productivity • Develop resources and tools to support rapid adoption of emissions avoidance and carbon storage practices • Investigate new GHG accounting metrics and enhancements to the NGHGI • Link outcomes from carbon farming projects into the NGHGI	X	X	X	X
		 **Leadership building**	• Attend capability development and training events • Nurture and develop relationships between all stakeholders to identify and develop industry leaders • Align relevant industry strategies and frameworks, such as Red Meat 2030 and the Sustainability Frameworks • Work with government to set clear and stable policy mechanisms, underpinned by science-based evidence • Increase science-based communication and awareness of carbon neutrality position of the Australian red meat industry	X	X	X	X

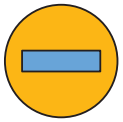
Table 3. Stakeholder Action Plan.

WORK AREA 1

Leadership building

Industry actions	Customer, community and consumer actions	Government actions	Partner actions (including MLA)	Stretch targets
• Attend capability development and training at all levels. For management, ensure employees receive training and information • Provide active and visible recognition and support to industry leaders • Facilitate the sharing of best practices across the industry	• Foster constructive debate and knowledge of the red meat industry and carbon neutrality in Australia • Increase science-based communication and awareness of carbon neutrality position of the Australian red meat industry	• Provide active and visible recognition and support to industry leaders • Invest in capability and knowledge building of the red meat industry and carbon neutrality in all relevant government areas	• Nurture existing and develop new relationships with stakeholders to identify and develop industry leaders • Align relevant industry strategies and frameworks, such as Red Meat 2030 and the Australian Beef Sustainability Framework • Work with industry bodies and government to set clear and stable policy mechanisms, underpinned by science-based evidence that supports research, development and adoption activities • Increase science-based communication and awareness of carbon neutrality position of the Australian red meat industry • Develop capability and knowledge-building tools and measures	• Develop internationally recognised educational packages for industry and community • All relevant industry consultative committee members, peak industry council representatives and a limited number of interested producers complete fit-for-purpose educational and development packages • International educational initiatives established to enable knowledge and technology transfer

WORK AREA 2



GHG Emissions avoidance

Industry actions	Customer, community and consumer actions	Government actions	Partner actions (including MLA)	Stretch targets
• Participate in commercial-scale trials of new technology and practices • Invest in launching emissions reduction projects according to methods provided, that can be accounted for at industry level • Invest in emissions reduction projects and share best practice and reporting with the rest of the industry • Provide continuous feedback to other actors in the value chain on the effectiveness of methods and tools offered, as well as possible improvements	• Support producers that invest in emissions reduction • Support the government to adopt policy supportive of the industry and carbon neutrality change • Raise awareness of the CN30 Roadmap and improvement in carbon neutrality to increase support among consumers and communities	• Invest in scientific methodology development within relevant government department(s), informed by findings generated from R&D undertaken by industry and private sector partners • Work with industry to provide policy settings that support emissions reduction R&D, scientific methodology development and projects	• Continual improvement in animal genetics and husbandry practices to increase production efficiency and reduce methane emission intensity • Develop technology to mitigate enteric methane emissions from livestock, such as supplements that can be easily adopted in lot feeding and grazing management • Assess new pastures, shrubs and legumes, as well as supplements, for grazing management, that offer co-benefits of livestock productivity and lower enteric methane emissions • Develop technology to avoid methane emissions from waste management at processing facilities • Develop energy efficiency or renewable energy technology to reduce CO_2 emissions from use of fossil fuels • Develop technology to reduce nitrous oxide and methane emissions from manure management and nitrous oxide emissions from fertiliser use in fodder crop production • Continual enhancement to scientific knowledge of savanna burning management, to avoid emissions of methane and nitrous oxide resulting from fire	• Livestock productivity in feedlots increased by 10% and enteric methane decreased by up to 90% • Livestock productivity in grazing management increased by 5–10% and enteric methane decreased by 35–75% in 40% of the national herd and flock • 25 million hectares of new legume plantings established, increasing livestock productivity by 25% and reducing emissions intensity by 10–20% • Alternate fuels such as biomass/biogas and solar energy provided at price parity with fossil fuels, allowing feedlots and processing facilities to switch away from fossil fuel use at scale • More than 40 million hectares of grazing land adopting savanna burning management methodologies

WORK AREA 3

Carbon storage

Industry actions	Customer, community and consumer actions	Government actions	Partner actions (including MLA)	Stretch targets
• Participate in commercial-scale trials of new technology and practices • Invest in launching carbon storage projects • Develop property plans • Optimise land and vegetation management for increased carbon storage	• Support producers that invest in increased carbon storage • Support the government to adopt policy supportive of the industry and carbon neutrality change • Raise awareness of the CN30 Roadmap and improvement in carbon neutrality to increase support among consumers and communities	• Invest in scientific methodology development within relevant government department(s), informed by findings generated from R&D undertaken by industry and private sector partners • Work with industry to provide policy settings that support carbon storage R&D, scientific methodology development and projects	• Develop new legumes, pastures and shrubs to build feedbase and carbon stocks • Advance soil carbon sequestration methods and measurement technology • Improve integration of trees and shrubs for improved carbon storage, animal health and biodiversity • Optimise vegetation regrowth management • Optimise carbon storage in dead woody biomass • Improve accounting of woody thickening in NGHGI • Investigate carbon storage increases from dung beetle activity in grazing lands	• 25 million hectares of new legume plantings established, storing soil carbon, boosting pasture productivity and livestock productivity • Soil carbon storage levels in 10 million hectares of grazing lands increased by 50–100kg CO_2-e/ha/year • Integration of shade clumps/lines and shelterbelts on 10 million hectares (southern Australia focus) of available 355 million hectares of land under grazing management nationally, increase livestock productivity by 10% and store more than 25 Mt CO_2-e emissions p.a. • Investigate alternative means of regrowth control to maximise carbon storage without reducing livestock productivity

WORK AREA 4

Integrated management systems

Industry actions	Customer, community and consumer actions	Government actions	Partner actions (including MLA)	Stretch targets
• Invest in baseline carbon assessments and annual monitoring for carbon accounts • Develop property plans that holistically target emissions and storage, and the continuous execution of the associated projects • Incorporate GHG accounting in commercial transactions	• Incorporate GHG accounting in commercial transactions • Facilitate the establishment of a market demand for carbon neutral or carbon reduced products (nationally and globally)	• Invest in scientific methodology development within relevant government department(s), informed by findings generated from R&D undertaken by industry and private sector partners • Work with industry to provide supportive policy settings • Work with industry and partners to evolve the NGHGI and improve representativeness, timeliness and accuracy of data collection, analysis and reporting • Develop accounting mechanisms for carbon storage sources that are currently inadequately accounted for, such as changes in grass carbon stocks, woody thickening and shelter belts • Investigate new accounting metrics for GHGs from the red meat industry	• Technical and economic analysis of grazing, lot feeding and processing systems to determine appropriate combinations of emissions avoidance and carbon storage technologies and practices • Incorporate emissions avoidance and carbon storage practices into existing extension and adoption platforms • Advance soil carbon sequestration measurement technology • Develop resources and tools required to support rapid adoption of emissions avoidance and carbon storage practices across the red meat value chain • Develop carbon accounting tools for industry to manage GHG emissions and business productivity, and support property planning and assessment • Link outcomes from carbon farming projects into the NGHGI • Program office support and leadership for the CN30 portfolio of projects	• An established network of advisors working with 50% of producers, 100% of accredited feedlots and processors, using a carbon accounting tool to manage GHG emissions and business productivity • 50% of red meat product traded through certified low or carbon neutral value chains • At least three new methodologies of generating carbon credits or carbon credit equivalents developed, with links to the NGHGI – emphasis will be on feedlotting, legumes and supplements for grazing management

Glossary of terms

GHG	Greenhouse gas. A gas that absorbs infrared radiation.
CN30	Carbon Neutral by 2030. Industry's commitment to be carbon neutral by 2030.
NGHGI	National Greenhouse Gas Inventory. Compilation of Australia's emissions data.
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
N_2O	Nitrous oxide
CH_4	Methane
GWP	Global Warming Potential
Carbon neutral	State of zero net emissions of greenhouse gases into the environment. Achieved when the amount of carbon stored in soils and vegetation is equal to or greater than the amount of CO_2-e emitted to the atmosphere.
Climate change	A change in climate patterns (typically temperature and/or rainfall) over a decadal time frame.
Feedlot/lot feeding	An intensive form of animal production where groups of animals are placed in yards or enclosures of a minimum size consistent with animal health and comfort. These animals are fed high quality feed rations to achieve optimal rates of live weight gain.
Grazing management	The total process of organising livestock to make the best use of the pastures grown, or managing the frequency and intensity with which livestock graze pasture.

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Appendices

1. Our industry at a glance

Our industry has always played a critical role in Australia's economic success and social fabric. In 2018–19 Australia's red meat and livestock industry contributed $AUD28.5 billion in domestic and export sales, and supported a combined workforce of 405,000 people. Our supply chain is complex, comprising 80,000 businesses serving over 100 markets globally and domestically.

Find out more about the Australian red meat industry at: **mla.com.au/about-mla/the-red-meat-industry/**

The red meat industry, via its peak industry council, the Red Meat Advisory Council (RMAC), recently released its plan for the coming decade, *Red Meat 2030* (*RM2030*). The plan outlines a shared vision of 'doubling the value of Australian red meat sales by 2030 as the trusted source of the highest quality protein[1]'.

It is a unifying plan with the purpose of:

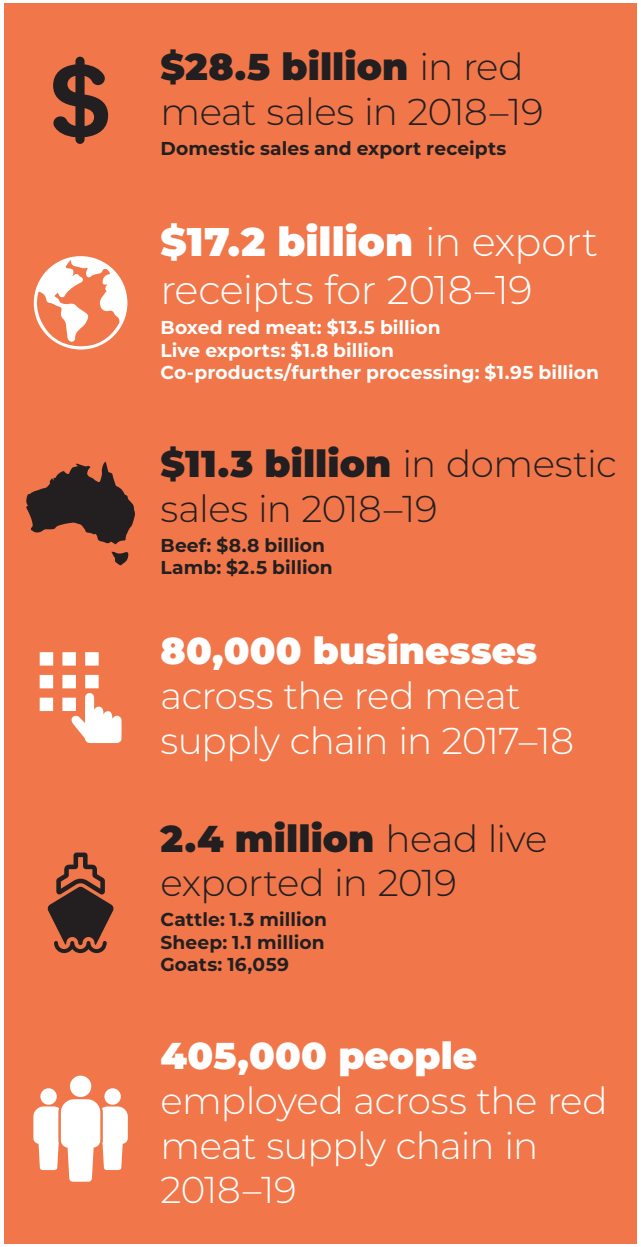
- identifying whole-of-industry priorities
- supporting our people to deliver priorities
- informing our research and development activities
- placing our customers and consumers at the centre of everything we do
- coordinating industry investment and advocacy
- enabling industry to adapt to a changing world.

Under the auspices of *RM2030*, MLA has developed its *Strategic Plan 2025*[2], designed to direct its investments in research, development, adoption and marketing activities to support the industry to reach its vision and achieve its objectives under *RM2030*. The industry has set some ambitious aspirational goals[3]. These include:

- becoming world leaders in agricultural environmental management and stewardship practices
- becoming carbon neutral by 2030
- doubling the percentage of project funding for extension
- the red meat industry will become an employer of choice.

The industry is describing sustainability credentials under its Beef and Sheep Sustainability Frameworks. The Australian Beef Sustainability Framework (the ABSF) and the Sheep Sustainability Framework (currently being finalised) contain a series of indictors that enable progress tracking and continual improvement against key areas of sustainable development. To maintain an international perspective, the industry also works within global sustainability frameworks such as the Global Roundtable for Sustainable Beef (GRSB).

Figure 11: Australian red meat and livestock industry at a glance.



1 rmac.com.au/misp2030-staging/wp-content/uploads/2019/10/RedMeat2030.pdf
2 mla.com.au/globalassets/mla-corporate/about-mla/documents
3 redmeat2030.com.au/wp-content/uploads/2019/10/What-will-sucess-look-like_.pdf

2. Calculating GHG emissions from red meat

Emissions are calculated using the most recent published data from the United Nations Framework Convention on Climate Change (UNFCCC) Australian National GHG Inventory (NGHGI). The NGHGI reports Australia's emissions annually from 1990 to present[4]. In keeping with Australia's international GHG emission reduction commitments, the year 2005 was set as the baseline year for the CN30 initiative.

The NGHGI reports GHG emissions as total carbon dioxide equivalent (CO_2-e) and amount of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) for each sector of the economy. The Australian red meat industry has adopted the NGHGI as the primary reference data source to track and report its progress towards a carbon neutral position in 2030.

Relevant independent research organisations prepare the industry's annual carbon account. Emissions are calculated based on values reported in the NGHGI, and the Australian Government provides access to detailed datasets not publicly available for download. Additional data on processing is sourced from the Australian Meat Processor Corporation (AMPC) and life cycle assessment studies commissioned by MLA. Supplementary data on livestock numbers and commodities are obtained from the Australian Bureau of Statistics (ABS) and Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). Whilst the scope of the CN30 target does not employ a full 'life cycle' approach, and thus omits emissions from some components, such as purchased inputs of fertiliser and feed, these impacts are relatively small and rigorous data is difficult to obtain cost-effectively. The omission of this data is not deemed by the CSIRO to have a significant impact on the annual carbon account outcome.

At the time of writing, Australia's UNFCCC national inventory reporting is two years behind, however the Federal Government's quarterly publications contain up-to-date information on emissions. The Australian Government reviews the data and methodology underpinning the NGHGI each year. Improvements to the NGHGI are applied retrospectively, so emissions for historic years are recalculated each year to reflect changes to the accounting methodology.

Figure 12: Percentage contribution to national GHG emissions in 2017 by Australian economic sector (NGHGI) (DoEE, 2019b).

[4] industry.gov.au/topic/data-and-publications/greenhouse-gas

Table 4: GHG emissions (Mt CO_2-e) from the Australian red meat industry by source. Categories are consistent with those used in the NGHGI. Values in bold italics are sector sub-totals. Note that at the time of writing there is a two-year reporting lag in the NGHGI (DoEE, 2019a).

Source of GHG emissions		2005	2015	2016	2017
Agriculture		***47.84***	***45.57***	***45.26***	***46.82***
	Enteric fermentation	41.36	38.84	38.40	39.80
	Manure management	0.75	0.84	0.85	0.85
	Agricultural soils	5.28	5.31	5.43	5.54
	Field burning agricultural residues	0.01	0.01	0.01	0.02
	Liming and urea	0.44	0.56	0.56	0.61
Land use, land use change and forestry		***79.98***	***17.57***	***11.93***	***6.25***
	Cropland	0.16	0.04	-0.02	-0.05
	Grassland	98.51	43.94	47.19	40.70
	Forestland	-18.69	-26.42	-35.24	-34.40
Energy		***2.91***	***2.77***	***2.57***	***2.65***
TOTAL red meat		**130.73**	**65.91**	**59.76**	**55.72**
% total national emissions		21.4	12.4	11.3	10.4

Table 5: Livestock numbers and red meat production. Data from the NGHGI activity tables and ABS annual statistics (ABS, 2019).

	2005	2015	2016	2017
Beef				
Total beef cattle[1] (million head)	25.2	24.6	24.3	24.9
Annual feedlot turn-off (million annual equivalents[2])	0.82	0.93	0.94	0.94
Beef produced (million tonnes)	2.06	2.51	2.10	2.13
Sheepmeat				
Total sheep (million head)	100.7	70.9	70.9	75.7
Lamb and mutton produced (million tonnes)	0.62	0.71	0.69	0.70

[1] Includes animals in feedlots, excludes dairy cattle.
[2] Number of animals adjusted for days on feed.

The majority of emissions attributed to red meat in 2017 were from on-farm sources (91.7%), particularly enteric methane, as shown in Table 6. Land-use emissions associated with feedlots (6.1%) and processing (2.2%) were small in comparison.

Table 6: GHG emissions (Mt CO_2-e) from farm, feedlot and processing. Data adapted from the NGHGI activity tables and ABS annual statistics (ABS, 2019).

	2005	2015	2016	2017
Farm	126.28	61.17	55.24	51.09
Feedlot	3.01	3.34	3.32	3.40
Processing	1.45	1.39	1.20	1.22

Summary of methods used to calculate emissions from the Australian red meat sector. Emissions categories are consistent with the UNFCCC Australian National Greenhouse Gas Inventory.

Emissions source	Allocation to red meat
Energy	
Energy	General energy use in feedlots is calculated based on energy required per 1,000 head per day and data from the Australian Government on number of cattle in feedlots and days on feed. Energy used for feed milling and delivery is calculated based on energy required per tonne of feed and feed intake. On-farm energy use for beef cattle is calculated based on tonnes of dry matter intake, number of animals and feed intake. On-farm energy use for sheep is calculated based on energy per 1000 ewes joined and number of breeding ewes, then attributed to either meat or wool production based on a protein mass allocation method. Greenhouse gas emissions from energy use in feedlots and on-farm are calculated based on energy content and emissions factors of electricity, gas, petrol and diesel. Energy use from processing is calculated based on reported emissions per tonne red meat, proportion of emissions attributed to energy consumption, and volume of meat produced.
Agriculture	
Enteric fermentation	All emissions from beef cattle feedlot, beef cattle pasture and goats are reported directly from the NGHGI. Emissions from sheep are corrected for meat–wool co-production. Emissions from all other livestock are excluded.
Manure management	All emissions from beef cattle feedlot, beef cattle pasture and goats are reported directly from the NGHGI. Emissions from sheep are corrected for meat–wool co-production. Emissions from all other livestock are excluded.
Agricultural soils	Direct emissions from animal waste applied to soils (beef cattle feedlot) are reported directly from the NGHGI. Direct and indirect emissions from urine and dung from beef cattle and goats are reported directly from the NGHGI. Emissions from sheep are corrected for meat-wool co-production. Emissions from all other livestock are excluded. Direct and indirect emissions from cropland are included based on the proportion of cropland required to supply feedlots. This proportion is calculated using the total area of cropland and area of cropland required to supply feedlots. The area of cropland required to supply feedlots is calculated based on animal numbers, days on feed and feed intake using data from the NGHGI. Direct and indirect emissions from irrigated pasture are calculated based on the proportion of irrigated pasture used for beef and sheepmeat production. The area of irrigated pasture used for sheep production is corrected for meat–wool co-production. The area of non-irrigated pasture cannot be disaggregated at the time of writing, so all emissions from non-irrigated pasture are included.
Field burning of agricultural residues	Emissions are included based on the proportion of cropland required to supply feedlots, as described for *agricultural soils*.

Liming	The proportion of emissions attributed to red meat is calculated based on the proportion of lime and dolomite used for beef and sheep farming compared to other agricultural sectors. Volume of lime used for sheep farming is corrected for meat-wool co-production.
Urea application	The proportion of emissions attributed to red meat is calculated based on the proportion of urea fertiliser used for beef and sheep farming compared to other agricultural sectors. Volume of urea fertiliser used for sheep farming is corrected for meat-wool co-production.
Land use, land-use change, and forestry (LULUCF)	
Forestland	Emissions from forestland remaining forestland are calculated based on area of forestland available for grazing management (excludes plantations, harvested forests, areas protected for biodiversity and conservation). All emissions from grassland converted to forestland are attributed to the red meat industry, as there is no accepted means to disaggregate by other land uses at the time of writing.
Cropland	Emissions from cropland remaining cropland and forestland converted to cropland are attributed to the red meat industry based on the proportion of cropland required to supply feedlots.
Grassland	The proportion of emissions from grassland remaining grassland is allocated to the red meat industry based on pasture intake of cattle and sheep, using unpublished data from the Australian Government and Dairy Australia. All emissions from forestland converted to grassland are attributed to the red meat industry.

Changes to 2017 inventory

Revisions to the UNFCCC Australian National GHG Inventory (NGHGI) methods and activity data have affected previously published estimates of total national GHG emissions and emissions attributed to the red meat sector (Table 7). Total national emissions reported in 2005, 2015 and 2016 are higher in the 2017 release compared to the 2016 inventory. Total emissions attributed to red meat increased from the 2016 dataset. However, there was little change to the proportion of national emissions attributed to red meat production, and a downward trend in emissions occurred from 2016 to 2017.

Recalculations and improvements to the 2017 inventory are described in chapter 10 of the national inventory report (Department of the Environment and Energy, 2019b). Changes of most relevance when considering emissions from the red meat sector are:

- improvements to the method to estimate emissions from fire, dieback and soil carbon in agricultural lands – this has led to an increase in estimated emissions from land use and land-use change
- revision of livestock numbers and distribution have caused small changes to total emissions from enteric methane and manure.

There are likely to be further revisions to livestock numbers in future releases.

Table 7: Total national emissions and emissions attributed to the Australian red meat sector (Mt CO_2-e) calculated using data from the 2015, 2016 and 2017 national inventories.

Year	Inventory Release		
	2015	2016	2017
Total national emissions			
2005	597.4	604.7	610.6
2015	525.6	517.2	531.6
2016	-	525.0	530.4
Emissions from red meat			
2005	124.1	129.3	130.7
2015	68.6	55.5	65.9
2016	-	54.8	59.8
% emissions attributed to red meat			
2005	20.8	21.4	21.4
2015	13.1	10.7	12.4
2016	-	10.4	11.3

Alternative GWP and GTP metrics

GHG emissions from the red meat sector include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). CH_4 and N_2O are typically expressed as CO_2 equivalents (CO_2-e), which describes the amount of CO_2 that would result in an equivalent climate impact (Lynch, 2019). There are several different CO_2-e metrics that can be expressed over different timescales; usually 20 or 100 years (Table 8). Global Warming Potential (GWP) is the most widespread CO_2-e and is a measure of how much energy a greenhouse gas traps in the atmosphere in a given time period relative to CO_2. The most common alternative metric, Global Temperature change Potential (GTP), is a measure of global temperature change at the end of a given time period relative to CO_2.

Table 8: Global Warming Potential (GWP) and Global Temperature change Potential (GTP) of methane and nitrous oxide (Myhre et al., 2013). Note a new metric, known as GWP*, is under investigation at the time of writing and may feature in future CN30 annual updates.

	Greenhouse gas	
	CH_4	N_2O
GWP_{100} values used by 2017 inventory	25	298
GWP_{20}	84	264
GWP_{100} values likely to be used in the inventory from 2018 onwards	28	265
GTP_{20}	67	277
GTP_{100}	4	234

The 2017 UNFCCC Australian National GHG Inventory (NGHGI) uses a GWP_{100} CO_2-e of 25 for CH_4 and 298 for N_2O (Department of the Environment and Energy, 2019a). The Australian Government will likely use the GWP_{100} values of 28 for CH_4 and 265 for N_2O in inventories starting from 2018 (Rob Sturgiss, pers comm). This is yet to be confirmed at the time of writing this document. Changes to CO_2-e metrics will be applied retrospectively to previous inventories and will affect the reporting on GHG emissions from the red meat industry.

The red meat industry uses the current GWP values to be consistent with the 2017 NGHGI (25 for CH_4 and 298 for N_2O). A change in GWP values from 25 to 28 for CH_4 and 298 to 265 for N_2O (from current values to GWP_{100} as per Table 8) increases the reported total national GHG emissions and the estimated GHG emissions from the red meat industry (Table 9). The increase in the proportion of national emissions attributed to red meat production is only small. Using GTP instead of GWP reduces the proportion of emissions associated with the red meat sector. Across both GWP and GTP, using a shorter time period (20 rather than 100 years) increases both total national emissions and the proportion of emissions from red meat.

Table 9: GHG emissions in 2005 and 2017 calculated using different CO_2-e metrics.

	Total national emissions (Mt CO_2-e)		Emissions from red meat (Mt CO_2-e)		% national emissions from red meat	
	2005	2017	2005	2017	2005	2017
Current GWP_{100} used by inventory	610.6	534.7	130.7	55.7	21.4	10.4
GWP_{20}	886.2	791.9	245.1	158.6	27.7	20.0
GWP_{100} likely to be used in future inventories	615.4	533.2	135.6	60.1	22.0	11.3
GTP_{20}	805.0	714.4	212.3	129.0	26.4	18.1
GTP_{100}	496.7	419.7	87.8	17.1	17.7	4.1