Australian Government

Department of Climate Change, Energy, the Environment and Water

Draft Voluntary Emissions Estimation and Reporting Guidelines for Agriculture, Fisheries and Forestry

Common Requirements Framework

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Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past and present.

Contents

1. Introduction

Understanding the greenhouse gas (GHG) emissions profile of a business is becoming increasingly important for agriculture, fisheries and forestry (AFF) industries. Demand for emissions data is expected to increase, driven by a range of factors including evolving market expectations, and supply chains and financial institutions seeking to monitor progress against voluntary climate commitments. Additionally, some large AFF entities may be required to report under Australia's mandatory climate-related financial disclosure regime as set out in the *Corporations Act 2001*.

Although GHG calculators are available to support estimating and reporting, stakeholders have raised concerns about inconsistent results, causing uncertainty about which calculators to use or how to begin.

The Australian Government has developed the voluntary GHG Emissions Estimation and Reporting Guidelines for Agriculture, Fisheries and Forestry (the Guidelines) to improve the quality and consistency of reporting and estimation methods – and, by extension, the tools entities rely on. Agricultural Innovation Australia's (AIA's) open-source code and Application Programming Interface (API) (in development) align with the methods outlined in these Guidelines.

The Guidelines comprise the Common Requirements Framework and the Methodological Guidance (including Land Use, Land Use Change and Forestry methods). This document, the Common Requirements Framework, sets out the core requirements for entities to estimate and report their GHG emission and removal in a consistent and transparent way. The Methodological Guidance describes the methods and emission factors for GHG estimation. While the Guidelines are voluntary, users wanting to claim compliance with them need to follow the specified requirements.

1.1 Context

GHG emissions from agriculture, fisheries and forestry

Agriculture and land management are major contributors to global climate change, primarily through emissions of methane (CH_4) from livestock and nitrous oxide (N_2O) from agricultural soils. Fisheries and aquaculture contribute a smaller but still significant share of emissions, largely associated with energy use, feed production, and nutrient management. In addition, practices such as vegetation clearing or tree planting affect carbon stocks in vegetation and soils and can cause emissions or removals of carbon dioxide (CO_2) from the atmosphere.

AFF industries also emit GHGs through the use of diesel, petrol, electricity and refrigerants used in land-based, marine and aquaculture operations. Additional emissions occur upstream through the production of inputs such as fertiliser, feed, energy, and chemicals. These upstream emissions form part of an entity's overall emissions profile. More information about emissions and removals produced through land based production activities, and what can be done to help reduce emissions can be found here. Information on energy efficiency within the fisheries and aquaculture sectors can be found here.

Reporting requirements and standards

A range of reporting standards have been introduced to inform industry, investors and policy makers about sources of emissions and how to target their emissions reduction efforts.

International

Australia reports its GHG emissions to the United Nations Framework Convention on Climate Change (UNFCCC) using rules designed by the Intergovernmental Panel on Climate Change (IPCC). Australia mostly uses country-specific methodologies and emissions factors in compiling its reports.

A range of additional international reporting standards align broadly with the IPCC Guidelines but are tailored to support entity-level GHG reporting. These include the Greenhouse Gas Protocol Corporate Accounting and Reporting, Corporate Value Chain (Scope 3) and Product Standards and the International Standards Organization14060s series.

These international GHG emissions estimation standards have been adopted by a range of jurisdictions, supply chains and financial institutions globally – including here in Australia.

Domestic

In Australia, the National Greenhouse and Energy Reporting (NGER) scheme requires companies that meet specific emissions or energy thresholds to report the GHG emissions associated with their energy production and consumption (such as use of diesel fuel for operations and transport) or industrial processes and waste. Reporting entities must use the prescribed calculation methods and emission factors set out in the *NGER (Measurement) Determination 2008* to ensure consistency and accuracy. However, the NGER scheme does not cover emissions associated with agricultural production (such as CH_4 emissions from livestock) or land management activities (such as vegetation clearing).

Separately, climate-related financial disclosure (CRFD) has been introduced under the *Corporations Act 2001*. CRFD requires entities that meet specific thresholds to disclose their GHG emissions as part of their annual reporting obligations. The Australian Accounting Standards Board (AASB) has issued the *Australian Sustainability Reporting Standard AASB S2 Climate-related Disclosures* (AASB S2), which requires reporting entities to measure[1] GHG emissions in accordance with the GHG Protocol Corporate Accounting and Reporting Standard (unless otherwise specified by a jurisdictional authority); and consider all 15 reporting categories of Scope 3 emissions outlined in the Corporate Value Chain (Scope 3) Standard.

Even if AFF businesses do not meet the formal reporting thresholds for CRFD, they could be asked to provide their GHG emissions data to supply chain and finance entities that are obligated to report their own Scope 3 emissions. Importantly, the *Corporations Act 2001* does not impose a direct regulatory requirement on third parties to supply data and information to CRFD reporting entities (see Sustainability reporting for small business | ASIC). Further information on CRFD can be found at the AASB and Department of Agriculture, Fisheries and Forestry websites.

[1] Note, the GHG Protocol does not provide 'physical measurement methods' but generic accounting and reporting rules.

1.2 The benefits of producing a GHG inventory

A GHG emissions inventory is a critical tool for understanding an entity's GHG emissions profile and developing effective climate change mitigation strategies. By compiling an inventory, businesses can:

- assess their exposure to GHG-related risks
- identify emissions reduction opportunities
- establish baseline data for tracking progress
- set reduction targets and monitor performance
- communicate results to stakeholders with confidence.

For AFF entities, inventories can also drive productivity and resource efficiency, supporting both environmental and economic outcomes.

A GHG inventory can be developed using existing farm management data and a GHG calculator that implements these Guidelines.

1.3 Purpose of the Guidelines

The Guidelines provide a nationally consistent framework and methods for estimating and reporting AFF entities' GHG emissions and removals.

The Guidelines are intended to:

- provide methods that are scientifically robust, appropriate for Australian production systems and environments, and can be applied at the entity level
- support AFF entities to estimate GHG emissions and removals for multiple reporting purposes
- support technical end users, including third party GHG emissions calculator and tool developers, agronomists and agricultural consultants, to understand and apply GHG emissions and removals estimation methods.

The Guidelines can be used in conjunction with other reporting frameworks where applicable.

The Guidelines have been designed to:

- **Align with the Australian National Greenhouse Accounts (NGA)**: Estimation methods are consistent with NGA methods, where relevant methods exist, and have been adapted for use at the entity level.
- **Build on existing standards and industry frameworks:** The Guidelines are designed to stand on their own. However, they draw on other international and domestic standards and frameworks including the Greenhouse Gas (GHG) Protocol, International Standards Organization (ISO) standards and the industry agreed *Common Approach to Sector-Level Greenhouse Gas Accounting for Australian Agriculture*[2]. The Guidelines refer to these standards and frameworks where relevant.
- **Provide practical methods**: The Guidelines aim to support AFF entities to obtain reliable and consistent estimates at a reasonable level of effort utilising commonly recorded data inputs. Entities can select from simple methods that use default values

[2] Sevenster M., Renouf M., Islam N., Cowie A., Eckard R., Hall M., Hirlam K., Laing A., Longbottom M., Longworth E., Ridoutt B., Wiedemann S. (2023). A Common Approach to Sector-Level GHG Accounting for Australian Agriculture; Methods and data guidance. CSIRO, Australia.

for ease of estimation, through to more complex methods requiring more detailed data, which provide a more accurate estimate but can be more complex to implement.

- **Enable data reuse**: The Guidelines support a 'collect once, use many times' principle for data. Where possible, the Guidelines support data used in farm, fishery or forestry management to be re-used for GHG estimation.

The Guidelines will be reviewed annually and updated as needed to respond to new research findings, changes in NGA methods, and user experience.

2. Using the Guidelines

The Guidelines provide principles and requirements for designing, developing, managing and reporting entity-level GHG inventories. They include requirements and guidance for determining organisational and reporting boundaries, estimating an entity's GHG emissions and removals, and preparing and reporting an entity's GHG inventory and assessing data quality. The Guidelines also provide guidance on calculating the emissions intensity of products using their entity-inventory data as a foundation.

AFF entities should use a GHG emissions calculator that acknowledges either its use of AIA's Environmental Accounting Platform Open-Source Code or its integration with AIA's API. Such calculators will lead AFF entities through the following steps to estimate GHG emissions and removals. AIA's open-source code and API align with the methods outlined in these Guidelines.

Question: Usability of Guidelines
While for many producers the Guidelines may not serve as an easy entry point to GHG emissions estimation, producers will be able to implement the Guidelines by using GHG emissions calculators aligned with the AIA EAP open-source code or API.

1A What features or supporting materials would help users apply the Guidelines?

2.1 Format of the Guidelines

The Guidelines comprise the following complementary documents.

- The **Common Requirements Framework** (this document) which provides the key principles, definitions and concepts for producing a GHG inventory. It provides requirements for, and high-level guidance on, establishing boundaries, selecting calculation approaches to estimate GHG emissions and removals, assessing data quality and reporting.
- **Methodological Guidance** which provides the specific equations, data sources, and calculation protocols needed to estimate emissions in a consistent and verifiable way for production emissions as well as Land Use, Land Use Change and Forestry

Use of terminology in the Guidelines

The Guidelines use the following terminology in specifying requirements that need to be followed to claim compliance with the Guidelines.

- 'Shall' indicates what is necessary to meet the minimum requirements of these Guidelines.
- 'Should' indicates a recommendation.
- 'May' indicates an optional aspect.

Comparison with GHG Protocol and International Standards Organization (ISO) Rules

Tables and footnotes are included throughout the Common Requirements Framework to indicate how each topic is treated by the GHG Protocol Initiative Standards and ISO Standards.

2.2 Emissions Scopes

Under the Guidelines, GHG emissions sources and sinks are categorised as direct (Scope 1) and indirect (Scope 2 and 3)[3]:

- **Scope 1 emissions** are *direct emissions or removals* from sources owned or controlled by the entity (e.g. from livestock, fuel combustion, on-site refrigeration).
- **Scope 2 emissions** are *indirect emissions* from the generation of purchased energy, such as electricity, steam, heat, or cooling consumed by the entity (e.g. emissions from the power station producing purchased electricity).
- **Scope 3 emissions** are *other indirect emissions* that occur in the value chain of the entity, both upstream and downstream. These arise from activities not owned or controlled by the entity but related to its operations (e.g. emissions associated with the production of purchased feed, fertiliser, packaging, freight transport of inputs).

2.3 Coverage and limitations of the Guidelines

Systems boundary

The Guidelines primarily focus on providing methods for estimating annual 'cradle-to-gate' emissions for different AFF production systems, based on their entity GHG inventory, and includes Scope 1 and 2 emissions and removals and relevant Scope 3 emissions. The 'cradle-to-gate' boundary in these Guidelines refers to the point immediately after primary production – such as the 'farm-gate', 'point-of-harvesting' or 'point-of-landing'. See Appendix A for sector-specific descriptions of cradle-to-gate boundaries.

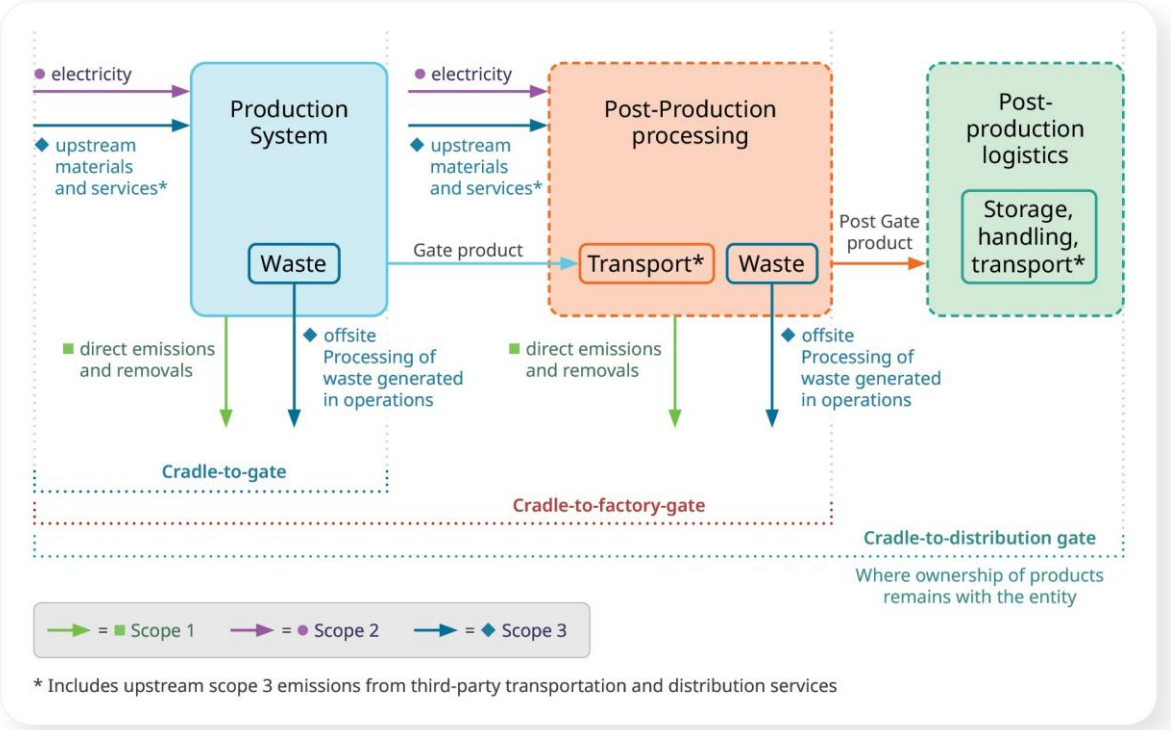
Some entities that undertake value-added processing within their operations (e.g. producing wine from grapes, cheese from milk, timber milling, or cooking prawns), or that have significant post-production storage, transport, or distribution activities, may choose to apply either a cradle-to-factory-gate boundary or a cradle-to-distribution-gate boundary. The cradle-to-distribution-gate boundary encompasses all emissions, including post-production logistics, up to the point where the product enters the distribution system outside the producer's financial or operational control (see Figure 1). Note, the transfer of product to customers or distribution may also occur at the farm-gate or factory-gate.

The Methodological Guidance (Chapter 2, Section 2.13) provides generic guidance for estimating the emissions occurring after the cradle-to- gate production system (as per Figure 1) including, storage, processing and packaging undertaken within the entity's operations and transportation and distribution (both Scope 1 and upstream Scope 3). The Guidelines do not provide methods for all possible post-production emissions activities. Entities who wish to apply a beyond production 'cradle-to-gate' system boundary might need to refer to other

[3] Note, the International Standards Organization does not use 'Scopes' terminology and has different categories for indirect and direct emissions. This website explains the differences.

methods (e.g. National Greenhouse and Energy Reporting scheme), or source Scope 3 emissions factors from suppliers or national and international databases.

Figure 1 Systems boundaries applied in the Guidelines



(Adapted from Sevenster et al. 2023)

Questions: Systems boundaries
2A Do the systems boundaries outlined in Figure 1 make sense for AFF entities?
2B Should the 'cradle-to-gate' be renamed to avoid confusion with the subsequent gates? If so, what name should it be given?

Scope 3 emissions source categories

The Scope 3 methods provide by the Guidelines (Table 1) rely on publicly available, default emission factors sourced from published literature and the Australian Life Cycle Inventory Database Initiative Carbon Emissions Factors (AusLCI CEF), which are free from licensing restrictions. Where emission factors are not publicly available, and/or where Scope 3 categories fall outside the system boundary defined in Figure 1, methods are not provided. As a result, the Guidance does not currently include methods for all Scope 3 categories, such as capital goods, business travel or employee commuting. Downstream Scope 3 emissions associated with product-use, end-of-life treatment and transport and distribution to end consumers are not within the scope of these Guidelines and are excluded. See Table 1.

Where additional categories or sources are assessed as being relevant and material to an entity's inventory, emissions may be estimated using emission factors from reputable national and international databases (e.g. Ecoinvent; UK Department of Environment, Food and Rural Affairs Emissions Factors), or from third-party verified supplier data[4].

[4] Supplier-provided life-cycle emission factors that have been third-party verified as conforming either to ISO 14067:2018 (carbon footprints of products) or the GHG Protocol Product Life Cycle Accounting and Reporting Standard.

Table 1: Scope 3 emissions source categories currently included in Guidelines*

Method included	Method not provided
Upstream	
1.Purchased goods and services	2. Capital goods
3.Fuel and energy related activities	6. Business travel
4. Transportation and distribution[5]	7. Employee commuting
5. Waste generated in operations	8. Leased assets[6]
Downstream	
	9. Transportation and distribution
	10. Processing of sold products
	11. Use of sold products
	12. End-of-life treatment of sold products
	13. Downstream leased assets[4]
	14. Franchises
	15. Investments

*Categories numbered and listed as per GHG Protocol Value Chain (Scope 3) Standard

Land use, land use change and forestry (LULUCF)

For land use, land use change and forestry (LULUCF) related activities, the Guidelines provide methods for land clearing (including impacts on soil carbon), establishment of plantations, revegetation and human-induced regeneration, savanna fire management and perennial woody crops. These are not the only activities that can affect the carbon stocks relevant to LULUCF. Methods for other LULUCF activities, including soil management, are subject to further development. Entities seeking to report on these activities may use Method 3 approaches that meet the criteria outlined in Appendix D. See Section 6.1 for more information on Method 3 approaches. Some changes in carbon storage without evidence that they are caused by changes in management such as in remnant vegetation, or woody thickening, are considered outside the scope of the Guidelines.

Product emissions intensity

The Guidelines provide requirements and guidance for estimating a cradle-to-gate product emissions intensity primarily using entity inventory data that can be used for tracking improvements and business-to-business communication (see Chapter 10).

The estimates of product emissions intensity calculated using these Guidelines do not provide a full product carbon footprint (cradle-to-grave) lifecycle assessment. The estimates produced using these Guidelines are not suitable for applications such as eco-labelling or carbon neutrality claims. Entities should ensure the estimation method and documentation meet the requirements of specific programs or external stakeholders.

[5] Includes upstream scope 3 emissions from third-party transportation and distribution services related to: 1) inbound logistics – moving purchased goods from suppliers to the entity's operations; 2) internal transfers – transporting products between the entity's facilities; or 3) outbound logistics – delivering product to the distribution centre or customer when transport is paid for by the entity.

[6] Appendix B provides guidance on determining Scope 1 and Scope 3 emissions reporting responsibilities for *leased land* assets. Entities should obtain any relevant Scope 3 emissions data from the lessor or lessee (depending on the leasing arrangement).

Carbon crediting projects

The Guidelines are not intended to provide accounting methods for carbon crediting projects. GHG accounting provisions in carbon crediting schemes commonly include scheme-specific requirements, for example around additionality, baselines, permanence and discount factors. These accounting requirements are distinct from emissions estimation and reporting. See Chapter 9.6 for details on treatment of carbon credits within inventories.

Indirect land use change

Indirect land use change (iLUC) occurs when production of the product of interest displaces production of another product, and the demand for the displaced product leads to land use change elsewhere. These Guidelines do not cover estimation of iLUC.

Questions: Indirect Land Use Change (iLUC)
Quantifying iLUC is complex and subject to a high degree of uncertainty. It depends on global land-use dynamics, economic interactions, and long-term carbon fluxes, making attribution to a single entity challenging. For this reason, most accounting standards, including the GHG Protocol Land Sector and Removals Guidance and ISO 14067 treat estimation of iLUC as optional, rather than a required component of entity-level emissions inventories.

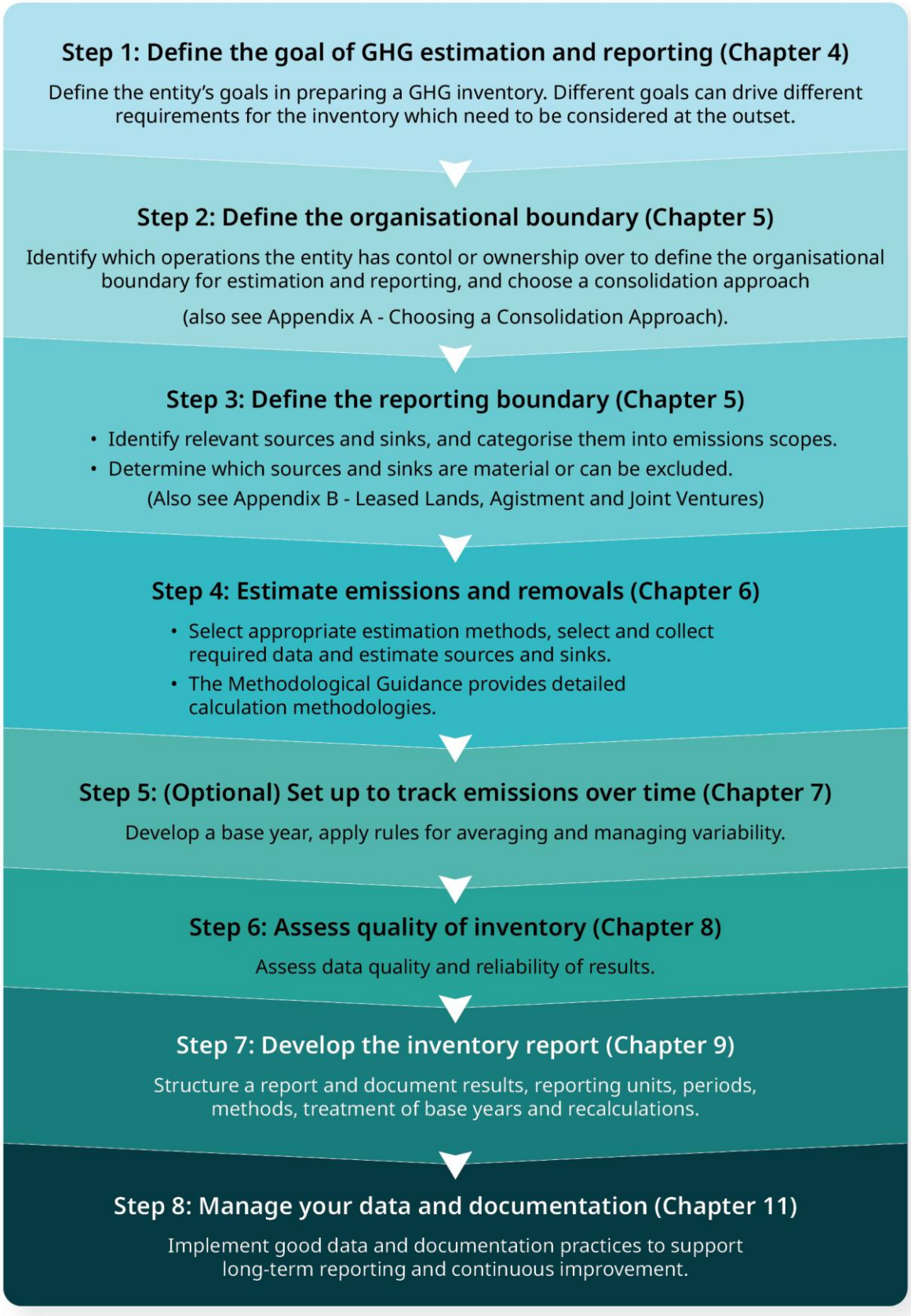
2C Should the Guidelines include guidance on quantifying iLUC?
2D If yes, why? What method would you recommend and should it be mandatory or optional?

Climate-Related Disclosure

Entities that are required to prepare climate-related disclosures under the *Corporations Act 2001* must comply with the specific reporting requirements set out in Climate-related Disclosures AASB S2 (AASB S2). An entity applying AASB S2 must ensure that it complies with the specific requirements set out in AASB S2. While the Guidelines will assist entities in quantifying their GHG emissions, they do not replace or modify the mandatory requirements in AASB S2.

2.4 Steps to develop a GHG inventory

The Common Requirements Framework guides entities through the steps needed to produce high quality and reliable inventories.



3. Principles for GHG inventories

A common set of principles underpins the preparation of GHG inventories to ensure they represent a true and fair account of an entity's emissions and removals. To produce a reliable and high-quality inventory it is best practice to consider all principles.

The principles below are in alignment with the GHG Protocol and ISO standards.

Relevance
Ensure the GHG inventory appropriately represents the GHG emissions and removals of the entity and serves the decision-making needs of end-users – both internal and external to the entity.

Completeness
Include all GHG emission and removals within the chosen inventory boundary to the extent practicable and relevant to the purpose of the inventory. Disclose and justify any specific exclusions.

Consistency
Use consistent methodologies to allow for meaningful comparisons of emissions and removals over time. Transparently document any changes to the data, inventory boundary, estimation methods, or any other relevant factors in the time series.

Accuracy
Use the best available data and methods to ensure GHG emissions and removal estimates are unbiased, uncertainties are reduced as far as practicable, and double counting is avoided – to achieve sufficient accuracy to enable users to make decisions with assurance as to the integrity of the reported information.

Transparency
Ensure all methods, data sources, assumptions, and decisions used in the inventory are clearly documented and explained.

4. Defining the goal of a GHG inventory

Before developing a GHG inventory, an entity should first define its intended goal or goals, as these will shape the estimation and reporting requirements. In many cases the inventory will need to be designed to serve multiple goals. For example, it could be used to:

- inform farm management, business planning and mitigation action planning
- comply with regulatory obligations such as Climate-related Disclosure
- fulfil supply chain or industry reporting requests or requirements including:
    - domestic or international market access requirements
    - reporting under the Science-Based Targets Initiative (SBTi)
    - contributions to industry-level emissions targets
    - participation in certification schemes
- align with financial services sector initiatives, such as the Australian Sustainable Finance Taxonomy.

These different goals can lead to different requirements for estimation and reporting. Key considerations include:

- **Estimate type**: whether the aim is to produce an entity-level inventory or to assess the emissions intensity for products.
- **Scope 3 emissions coverage**: the extent to which indirect emissions (e.g. upstream and downstream) are included and whether this is optional or mandatory.
- **Estimation method**: the methods that will be used in estimation – from simple methods using default data through to methods that demand more detailed farm specific data.
- **Estimation / reporting period**: the period over which emissions are estimated and reported – this could be annual (calendar or financial year).
- **Base year / period**: whether a base year / period needs to be established for tracking progress.
- **Data quality, documentation, and verification**: requirements for transparency, traceability, and assurance. For example, inventories intended for verification or assurance might require higher-resolution data and more comprehensive documentation.

To ensure development of an appropriate inventory to address a given goal, the questions at Table 2 are worth considering.

Table 2: Defining the goal of an inventory

Questions	Example answers	Actions or Considerations (depending on goal)
What is / are the primary goal(s)?	Farm planning	Follow the **Common Requirements Framework** to define the core requirements for producing an inventory. Consult industry specific guidance and use GHG calculators available through Rural and Regional Development Corporations (RDCs), including for information on emissions reduction strategies. Focus on identifying key emission sources and opportunities for mitigation within operations and improving data management.
	Climate-related financial disclosure	Requires reporting of scope 1, 2 and both upstream and downstream Scope 3. Check AASB S2 for requirements.
	Supply chain or financial services reporting requirements	Check third party data and reporting requirements, including required Scope 3 reporting categories and any specific traceability systems compliance.
Are you producing an entity inventory or undertaking a product emissions intensity assessment?	Entity inventory	Follow the **Common Requirements Framework (Chapters 1 -1 0).**
	Product emissions intensity	Consider whether input data need to be collected and emissions estimated at more granular level to support assignment of emissions to different products. Refer to **Chapter 10** for detailed guidance.
Will you be communicating	Customers	If external communication is intended, use the standard templates at **Appendix E and F** and / or apply any other required reporting standards.

Questions	Example answers	Actions or Considerations (depending on goal)
results to anyone outside of your entity?	Certifiers or regulators	If required for certification or regulation, follow documentation requirements at **Chapter 11** to ensure supporting documentation is in order.
Are there standards or frameworks you need to align with?	E.g. the Guidelines; GHG Protocol standards; ISO 14064; AASB S2	Map the Guidelines or other standards' requirements to your inventory design. Read the cues throughout these Guidelines to support conformance. Regardless of the standard or framework being applied, it should be applied consistently to all elements of inventory design.
Are you trying to track your emissions over time?	Yes	Determine if you will use a single-year or multi-year base period. Apply the Guidelines rules for calculating base years as set out in **Chapter 7**.

5. Defining boundaries

The next step in developing an entity-level GHG inventory is to define the organisational and reporting boundaries of the entity. These boundaries determine which emissions sources and sinks shall be included in the inventory.

5.1 Organisational boundary

The organisational boundary identifies the activities or facilities over which the entity has control. In the context of AFF production this can include land controlled by the entity and facilities such as dairies, packing sheds and cool rooms.

The organisational boundary reflects an entity's ownership and control structure and is represented through different consolidation approaches.

The entity shall apply a consolidation approach based on the following:

- Operational control
- Financial control
- Equity share.

The choice of consolidation approach - or combination of approaches – depends on the purpose of the inventory (e.g. specific reporting requirements). The consolidation approach reflects how the entity exercises ownership and control across its financial, legal, and operational arrangements for the purposes of emissions estimation.

When a facility is owned or controlled by several entities (such as a co-operative), these entities should adopt the same consolidation approach for that facility. The entity shall document and report which consolidation approach it applies.

The Guidelines do not make specific recommendations about which consolidation approach an entity should use; rather entities will need to consider a range of factors when selecting an approach and that selection should be based on the reporting entity's business goals.

Operational control approach

An entity has *operational control* if it has full authority to introduce and implement its operating policies, including those related to environmental performance, health and safety, and day-to-day management of activities. This control exists even if the entity does not have financial control or full ownership of the operations.

- It excludes facilities or assets where the entity does not have the ability to direct day-to-day operations, even if it has an ownership stake.
- The entity reports all material emissions and removals from operations under its *operational control*.

Financial control approach

An entity has *financial control* if it can direct the financial and operating policies of the operation, with a view to gaining economic benefit.

- This applies even if the entity does not have the ability to direct day-to-day operations, or the operations are not fully owned by the entity.
- The entity reports all material emissions and removals from operations under its *financial control*.

Equity share approach

Under the equity share approach, an entity reports emissions and removals in proportion to its ownership interests in the operations. This reflects the entity's economic interest, rather than operational or financial control.

- If it owns 40% of a joint venture or partnership, it reports 40% of the emissions from that operation
- If the entity owns 100% of the operations it reports all material emissions and removals associated with those operations.

More guidance on consolidation approaches is supplied at **Appendix B.**

Table 3: GHG Protocol Corporate Standard and ISO 14064-1:2018 rules for consolidation approach

GHG Protocol Corporate Standard	ISO 14064-1:2018
A reporting entity **shall** select and apply **one** consolidation approach (financial or operational control, or equity share).	ISO does not prescribe that a single consolidation approach must be chosen for defining the organisational boundary. Multiple approaches could be applied to reflect complex entity structures. However, the entity **must** define and justify how boundaries are drawn.

5.2 Reporting boundary

After defining the organisational boundary, the entity identifies GHG sources and sinks, that are relevant to its activities, operations, facilities, and value chain interactions, and classifies them as Scope 1, Scope 2, or Scope 3. This defines the entity's 'reporting boundary'[7].

[7] Note, the *reporting boundary* is termed the "*Operational Boundary*" under the GHG Protocol.

The entity should also determine if any relevant sources and sinks will not be estimated.

Identify relevant sources and sinks

All relevant sources and sinks shall be included within the entity's reporting boundary. The following emission sources and sinks are relevant to AFF entities.

- All sources and sinks from animal, crop or tree production in the entity's control (e.g. enteric fermentation; manure management; fertiliser use; management of livestock waste; crop residues to soils; or solid waste and wastewater treatment).
- Biogenic carbon stock changes from land use; or management of vegetation and soils.
- All emissions from stationary energy and fuels used in buildings, equipment, machinery, irrigation pumps or vehicles in the entity's control (e.g. natural gas used for heating or cooling, or liquid fuels used in generators or vehicles).
- All emissions associated with purchased energy (electricity, heat, steam or cooling) consumed by buildings, equipment, machinery or vehicles, irrigation in the entity's control.

Entities shall also assess all Scope 3 categories as outlined in the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard for relevance.

Scope 3 considerations

The Methodological Guidance currently provides estimation methods for a subset of upstream Scope 3 categories relevant to AFF production (see Table 1). Where other Scope 3 categories are assessed as relevant and material, entities shall estimate these emissions.

Establish if relevant sources and sinks will not be estimated

All relevant emissions sources or sinks shall be estimated and included within the GHG inventory unless:

- the sources or sinks are not considered material (see below for materiality considerations)
- it is not practicable or cost effective to collect data to estimate a source or sink
- a method for estimating a source or sink is unavailable (for Scope 3 sources see additional requirements below).

Where relevant sources or sinks are not estimated for the reasons above, but those sources / sinks are, or are likely to be, material a data management plan should be developed, stating how the entity intends to obtain the necessary data for future reports.

If any source or sink is omitted, the entity shall:

- report what is being excluded
- justify the reason for exclusion – for example, impractical to measure, no calculation approach (method) provided, lack of data, or immaterial and unlikely to influence stakeholder decisions.

Materiality

A source or sink is considered to be material if omitting, misstating or obscuring it could reasonably be expected to influence decisions made by the end-user of the inventory.

Note: Some reporting standards apply threshold criteria for assessing materiality. If the entity inventory is being produced to address a third-party reporting need, it is advisable to check their requirements.

Table 4: Treatment of materiality in international GHG corporate reporting standards

	GHG Protocol Corporate Standard	ISO 14064 series
Materiality criteria	Encourages comprehensive reporting and leaves materiality judgements (including any quantitative thresholds) to the reporting entity, assurance provider or other reporting regimes. However, the GHG Protocol states that as a rule of thumb, an error is considered to be materially misleading if its value exceeds 5% of the total inventory. Note, this is not a mandatory threshold.	ISO 14064-1, ISO 14064-3, ISO 14067 don't set a fixed threshold, but an exclusion should not be made if its omission or misstatement could influence the decisions of stakeholders using the inventory (e.g. investors, regulators, customers).
Requirements	The exclusions are clearly documented and justified; and the exclusion does not affect the integrity or credibility of the report In order to express an opinion on data or information, a verifier would need to form a view on the materiality of all identified errors or uncertainties.	Clearly state what is excluded (e.g. a specific emission source, GHG type, process); the criteria / rationale used to justify the exclusion (e.g. unlikely to influence the end-users' decisions; lack of data; impractical to measure / no measurement methodology). For product emissions intensity, ISO 14067 requires that cut-off criterion/ thresholds for significance are used as basis for exclusion (and to be clearly documented).

Categorise emissions into Scopes

The entity shall classify relevant sources and sinks into Scopes.

The following questions in Table 5 are worth considering in defining your Reporting Boundary.

Table 5: Identifying your Reporting Boundary

Activity	Questions to Ask	Source/ activity	Scope
Production	What types of AFF production systems and land holdings are within the organisational boundary? What products or outputs are produced through the entity's activities? What are the major production stages and processes?	e.g. enteric fermentation; manure management	Scope 1

Activity	Questions to Ask	Source/ activity	Scope
Land management	Has there been any land use change on the land owned or managed by the entity in the past 20 years? Have tree-planting, revegetation activities been undertaken over areas >0.2 ha? Has there been any change to fire management practices to reduce the severity of late dry season burns?	e.g. clearing woody vegetation	Scope 1 biogenic carbon
Leased Assets and Agistment	Does the entity lease or lease out land or facilities? Does the entity host agisted stock or agist its own stock elsewhere? Who has operational control of leases or agisted stock for emissions accounting purposes? See **Appendix C** for information on classifying leased lands and agistment into Scopes.	e.g. enteric fermentation from agisted animals	Scope 1 or Scope 3
Facilities and Off-Farm Operations	Are post-harvest, storage, processing or transport facilities under the entity's control? Do these facilities contribute to Scope 1 or Scope 2 emissions?	e.g. purchased energy, refrigeration	Scope 1 or 2
Contracted and Outsourced Activities	Are key activities (e.g. harvesting, spraying) performed by third parties? Are contractors using the entity's fuel and equipment or their own?	e.g. fuel use	Scope 1 or 3
Water	What energy is used to pump or treat water (is it diesel or solar-powered)?	e.g. fuel use or purchased electricity	Scope 1 or 2
Purchased Energy	What activities use purchased electricity or other forms of purchased energy? Does the entity purchase renewable energy?	Energy use	Scope 2
Purchased Goods and Services	What purchased goods and services are essential to operations?	e.g. manufacture of fertilisers, feed, packaging, chemicals	Scope 3
Waste Generated in Operations	What types of waste are generated on-farm? How is this waste treated, stored, or disposed of by third parties?	e.g. disposal of packaging, animal carcasses	Scope 1 or 3

6. Estimating GHG emissions and removals

There are 3 basic steps to estimating GHG emissions and removals, which are described below. Detailed guidance on how to estimate GHG emissions and removals associated with specific sources and sinks applicable to AFF activities is provided in the Methodological Guidance.

AFF entities should use a GHG emissions calculator that acknowledges either its use of AIA's Environmental Accounting Platform Open-Source Code or its integration with AIA's API. Such

calculators will lead AFF entities through the following steps to estimate GHG emissions and removals.

6.1 Select the calculation method

GHG emissions or removals can be estimated in different ways, ranging from simple methods using emission factors or empirical relationships to process-based models and field measurements using highly specialised equipment. The Methodological Guidance allows entities to select the calculation method that best aligns with the desired levels of accuracy and data availability.

Calculation methods have been classified according to 3 Method levels[8]. In general, moving to the higher-level methods improves the accuracy of the estimates and reduces uncertainty. However, the increased complexity and additional data requirements can increase costs and resourcing requirements.

1. **Method 1** provides the minimum requirement for estimation. It requires some site-specific activity data (e.g. head of livestock, tonnes of fertiliser applied) and generally applies the emissions factors and calculation methods from the National Greenhouse Accounts for other input parameters.

2. **Method 2** is more complex, usually applying the same methodological approach as Method 1 (i.e. the same equations), but requires additional site-specific data. It also includes use of the NGA process-based Full Carbon Accounting Model (FullCAM) and the FullCAM-derived Savanna Carbon Accounting Model (SavCAM) for LULUCF activities.

3. **Method 3** is most demanding in terms of complexity and data requirements. Method 3 approaches use higher order estimation methods, including process-based models (other than FullCAM or SavCAM) and detailed measurement systems tailored to specific systems, often repeated over time, and driven by high-resolution activity data. Method 3 might be required to estimate the impacts of innovative activities that credibly reduce emissions, but which are not yet accommodated by the NGA (and therefore Method 1 or Method 2) methods (e.g. the use of nitrification inhibitors). The Guidelines do not currently provide Method 3 calculation approaches.

The entity should select and use the calculation method(s) that best align with available data and the entity's goal for compiling the GHG inventory (see Chapter 4). The entity may select different method levels for different sources and sinks. The entity shall document the methods applied and any changes in methods since its previous report.

Higher level methods can better reflect the impact of specific management activities on emissions. Some sources and sinks might only have one method option available in the Methodological Guidance.

Guidance on treatment of LULUCF activities is provided in Chapter 6.4; and Scope 2 emissions in Chapter 6.5.

[8] Note. The Method Levels in the Guidelines are not equivalent to IPCC 'Tiers', as used in the IPCC Guidelines for National Greenhouse Gas Inventories.

6.2 Collect data required for estimation

The chosen calculation method determines the activity data and other input data required.

The Methodological Guidance provides suggestions of suitable data sources, and guidance on data collection to support application of Method 1 and 2 calculation approaches.

The entity shall document the sources of data used to estimate GHG emissions and removals for the reporting period, for each source or sink.

It is not always feasible to collect high quality data for all relevant sources and sinks. Entities should prioritise data collection for key sources and sinks (those expected to contribute most to emissions or removals, or those showing largest change over time) and for parameters that have the greatest influence on emissions (e.g. animal numbers and liveweight gain, crop production, organic waste disposal to landfill, or fuel consumption for operations).

6.3 Calculate GHG emissions and removals

The entity shall calculate GHG emissions and removals in accordance with the method(s) selected. The entity shall estimate and report emissions and removals for the year in which the emissions or removal activity occurs (e.g. year of fertiliser application or land preparation). That is, management inputs should not be shared across multiple years.

Entities shall estimate and report emissions and removal by mass of gas and mass of carbon dioxide equivalents (CO_2-e).

Global Warming Potentials (GWP)

The mass of a GHG shall be multiplied by its GWP to calculate the mass in units of CO_2-e.

- Entities shall use 100-year GWP values (GWP_{100}) from an IPCC Assessment Report.
- Entities shall use GWPs from a single Assessment Report for any one inventory.
- Entities should use the same GWPs for the current inventory period and the base year to maintain consistency across time and scopes.

For consistency with the National Greenhouse Gas Inventory reporting rules under the Paris Agreement, and with the NGA and the National Greenhouse and Energy Reporting (NGER) scheme, entities should convert the mass of emissions to CO_2-e, using GWP_{100} as specified in the IPCC Fifth Assessment Report (AR5) (2014) as follows.

Table 6: Global Warming Potentials

Greenhouse Gas	AR5 GWP_{100}
CO_2 (carbon dioxide)	1
CH_4 (methane)	28
N_2O (nitrous oxide)	265
Synthetic GHG (e.g. refrigerants)	refer to latest NGA Factors

The AR5 GWP values are also used for the Scope 3 emission factors published in the AusLCI CEF. Where an entity uses a Scope 3 emission factor that has already been converted into CO_2-e using a different IPCC assessment report GWP_{100} value, the entity is not required to recalculate the emissions factor. Note the GHG Protocol Corporate Standard recommends use of the GWPs from the latest IPCC assessment report available at the reporting date (currently AR6). Under ISO 14064-1:2018, entities may report using GWP values from any IPCC assessment report.

6.4 Land use, land use change and forestry methods

Land management activities can result in emissions and removals of CO_2, and emissions of CH_4 and N_2O. Land use, land use change and forestry (LULUCF) activities such as land clearing, establishing plantations, revegetation/regeneration, and agricultural land management practices can all drive emissions or removals. Note, emissions or removals from natural causes are outside the scope of these Guidelines.

The estimation of emissions and removals from LULUCF activities at the entity level is a complex and evolving area. Entities shall estimate relevant LULUCF sources and sinks for which methods are provided in these Guidelines.

The Methodological Guidance provides methods for estimating:

- carbon stock changes in woody living and dead biomass due to land clearing, planting or regeneration, farm forestry, commercial plantations, savanna fire management and perennial woody crops
- carbon stock changes in soil organic carbon due to land clearing
- greenhouse gas emissions from biomass burning as part of land clearing, planting or regeneration, farm forestry, commercial plantations and savanna fire management
- greenhouse gas emissions from N mineralisation and leaching and runoff as part of land clearing.

Soil organic carbon (SOC) changes associated with other agricultural land management practices are not covered by the Methodological Guidance at present. SOC changes due to management actions are sensitive to initial SOC levels, soil type and climatic conditions, and SOC increases have a high risk of reversal. Accurately representing change in SOC typically requires extensive and expensive measurement or complex modelling. As such, no method 1 or 2 approach is included in these Guidelines. Entities that already collect data for carbon pools and activities outside the scope of these Guidelines, including baseline measurements of SOC, should retain these data in case they can be used under future iterations of the Guidelines.

Retaining mature remnant vegetation is not covered by the Methodological Guidance as carbon stocks in remnant vegetation are typically stable, and do not represent a significant sink. If an area has not been subject to management change or an activity included in the Methodological Guidance, carbon stocks are likely to be stable over time. If an entity is unable to find evidence of such activities when preparing the emissions inventory, the entity may assume that carbon stocks on the area have remained stable and, as such, should not be included in the inventory.

To prepare the emissions inventory for LULUCF activities:

1. Identify whether any of the activities covered by the Methodological Guidance have occurred on the entity's land up to 20 years prior to the first reporting year. This is because land-based activities can impact a land's carbon stocks long after the activity takes place.
2. Collect the evidence related to these activities required to model and estimate the emissions impact.
3. Map the areas in which the activities have taken place.
4. After the first reporting year, remap any activity areas as required. This might be necessary if the area has been impacted by wildfire or if land has been sold or purchased.
5. Model the activities using the appropriate modelling tool. Instructions for using these modelling tools are provided in the LULUCF Methodological Guidance.
6. Calculate emissions using the model's results and equations in the Methodological Guidance.

Questions: Alignment with the Greenhouse Gas Protocol Land Sector and Removals Standard
The Guidelines reflect our preliminary review of the Greenhouse Gas Protocol's Land Sector and Removals Standard (LSRS) released in January 2026.

The range of activities and sources in the LSRS is more extensive than the activities and sources currently provided by these Guidelines. In addition, the treatment of natural disturbance differs. Notable divergences are indicated in the LULUCF Methodological Guidance.

Some users might want further information on how the Guidelines align with the LSRS and how the Guidelines can and cannot be used to assist in compiling a report to meet the requirements of the LSRS. For example, users may want descriptions of how the activities included in the LULUCF Methodological Guidance relate to the LSRS's required and optional accounting categories and subcategories for land sector value chains (shown in Figure 4.1 of the LSRS).

6A Would you benefit from additional information on alignment and divergence between these Guidelines and the LSRS?
6B If so, on what areas should this additional information focus?

6.5 Scope 2 electricity emissions

There are 2 methods for estimating scope 2 emissions from purchased electricity:

- location-based method - uses the emissions intensity of the electricity grid in the state or territory in which the electricity was purchased

- market-based method - reflects an entity's voluntary purchases of renewable energy (with associated surrender of Renewable Energy Certificates), which are assigned an emissions factor of zero.

Scope 2 emissions from purchased electricity shall be estimated and reported using the location-based method. The entity may also estimate and report Scope 2 emissions using the market-based method. Note that the requirements for reporting of Scope 2 emissions vary between frameworks (see Table 7). Entities should check these requirements when determining which methods to apply.

The upstream scope 3 emissions associated with purchased electricity shall be estimated using the location-based method. If an entity has elected to report market-based Scope 2 emissions, then the associated scope 3 emissions shall also be estimated using the market-based method.

Table 7: Differences in approach to Scope 2 estimation and reporting requirements

GHG Protocol Scope 2 Guidance	Requires reporting of both the location- and market-based methods
NGER scheme	Require location-based method but market-based method may also be used and disclosed separately
ISO 14064-1:2018	Requires location-based method but market-based method may also be used and disclosed separately

7. Tracking emissions over time

If the entity intends to track emissions and removals over time or is required to report against a target that is based on a historical baseline, then the entity shall establish a **base year or base period** to provide a reference point for assessing change.

A base period is calculated as an average over multiple consecutive years and recommended for AFF entities whose operations are affected by seasonal variation and / or production cycles that extend over multiple years. Applying a multi-year average helps reduce the influence of year-to-year fluctuations creating a more representative reference point for tracking emissions and removals over time. In contrast, a single-year base year can be appropriate where annual variability is low and / or where production cycles do not extend over multiple years.

A suitable interval for quantifying a base period should ideally cover multiple production cycles and consider climatic cycles relevant to the location and production system. For example, a period of 3-5 years can be appropriate to establish a representative base period for tracking emissions and removals over time.

7.1 Establishing a base year or base period

To establish a base year or period the entity shall:

Step 1: Select the base year (or period)

- Choose a single year or contiguous multi-year period for which reliable data and data representative of normal operations are available.
    - If a corporate base year has already been established, centre the multi-year period on that year.

- If reliable or representative data are not available for past years, the entity may use its first GHG inventory period as its base year.
- Provide a clear rationale for the selected year or period.

Step 2: Estimate annual GHG emissions and removals and base period value

- Estimate the *annual* GHG emissions and removals (by gas and scope) for the base year, or for each year in the base period.
- If using a multi-year average calculate the mean of the annual totals to derive the base period value.
- Document data sources and methods used to estimate emissions and removals.

Step 3: Document outliers and data exclusions

- Document any extreme or non-representative events (e.g., droughts, fires, or market disruptions).
- Outliers should generally be included unless demonstrably non-representative of typical operations.
- If any data are excluded, document the exclusion criteria and, if relevant, describe the effect on the average.

If the entity changes its base year the entity shall disclose the reasons and implications for targets and trend analysis.

7.2 Recalculations

Recalculations of previous inventories ensures time series consistency when methodologies, emission factors, or entity boundaries change. Recalculations provide integrity in tracking GHG emissions trends and assessing progress against the base year or base period.

The entity shall consider the need for recalculations when substantial cumulative changes in emissions result from:

a) Methodological changes:
   - Relevant methods in the Methodological Guidance are revised.
   - Errors in previous calculations are identified.
   - The calculation approach used changes from lower to higher Method level.
   - The scope 2 methodology used changes from location-based to market-based.

b) Structural changes:
   - Changes to entity boundaries through acquisition, divestment, or outsourcing.
   - Changes to reporting boundaries affecting scope classification.
   - Discovery of previously unreported emission sources or sinks.

The entity shall not recalculate its base-year GHG inventory to reflect changes in production levels or acquisition of operations that did not exist in the base year.

If significant cumulative changes are identified the entity:

- shall recalculate the base year or period
- should consider recalculating all previous GHG inventories in the time series if necessary to trend integrity.

When recalculations are undertaken, the entity shall:

- apply the updated methodology consistently to the base year or period and most recent inventory
- document the nature and rationale for recalculations and the recalculation methodology
- report both original and recalculated values for transparency

The entity shall develop, document and apply a base-year review and recalculation procedure to address significant cumulative changes in base-year emissions. To determine significance the entity should set significance thresholds (i.e. if they cause a change that exceeds x% of the base year or base period inventory). These Guidelines do not define significance thresholds. Once defined, the significance thresholds should be applied consistently over time.

8. Assessing the quality of the GHG inventory

GHG emissions and removals estimation is always subject to a degree of uncertainty. Uncertainty in estimation arises from both:

- the simplifications, assumptions, and approximations within a calculation or a process-based model used to estimate emissions
- the parameters / data used to calculate inventory (e.g. emission factors, activity data and other input data (e.g. feed composition).

In general, entities should focus on understanding and reducing uncertainty associated with the site-specific data they use for GHG emissions and removals estimation as this is generally within their immediate control.

Assessing data quality can:

- help an entity to understand where best to direct resources to improve the quality of the GHG inventory
- provide intended users of the GHG inventory with confidence in the estimates
- enable the quality of GHG inventories to be compared across years or entities.

The structured approach outlined conceptually in *Chapter 8.1 Data Quality Framework* provides a defensible, transparent foundation for assessing data quality.

8.1 Data quality framework

A qualitative assessment of the quality of activity and other input data, as well as scope 3 emission factors shall be undertaken using the data quality framework described below.

The purpose of this framework is to provide a transparent and consistent approach to assess the quality of data used in estimating GHG emissions and removals.

Data quality categories

The quality categories used in the data quality framework are set about below.

Temporal representativeness

Temporal representativeness denotes how well data reflect the time-period for which emissions or removals are being estimated.

Spatial representativeness

Spatial representativeness denotes the degree to which the data reflects the geographic location (or locations) of the entity's AFF activities (e.g. location specific, regional or national). For entity specific data, spatial partitioning of the data *within* the physical footprint of the entity is also considered (e.g. paddock-level or whole of entity level).

Sample size

The sample size denotes the comprehensiveness of the data collected. The data quality increases as the sample size used to the estimate the value increases

Scope 3 data quality

Scope 3 data quality denotes how representative, reliable, and specific the data are to the actual goods and services purchased, used, or sold – and therefore how much confidence can be placed in the resulting Scope 3 emission estimates.

Implementation

For each source and sink, and the associated data and scope 3 emissions factors, the entity shall provide data quality scores against the quality categories as detailed in the scoring framework – see Table 8.

Categories with higher values are deemed to have a higher quality than categories with lower values.

Implementation steps

Step 1: For each source and sink estimated as per Chapter 6, document the Method applied.

Step 2: Identify all data sources and Scope 3 emission factors, to be used in calculating GHG emissions and removals for the Method.

Step 3: Assess and record the data quality scores for each data input and data quality category. Note, not all data quality categories will be relevant for some data types.

Step 4: Follow the Reporting Guidance at Chapter 9, including documenting assumptions and sources to ensure transparency.

Step 5: Review and update annually to reflect improved data sources or methods.

An example data quality table is provided in the Reporting Template at **Appendix E**

Table 8: Data quality scoring framework

Quality score	Temporal representativeness [a]	Spatial representativeness [b]	Sample size	Scope 3 emissions factors
5	Data collected covers the time-period for which emissions are being estimated	Data covers specific entity location(s) with spatial partitioning or using stratified sampling within property	Data based on sample size of >90% (e.g. total annual fuel purchases)	
4	Data collected represents activities that occurred within 2 years of the time-period being assessed	Data covers specific entity location(s) without spatial partitioning within property	Data based on sample size of 51-90%	Verified data provided by supplier consistent with ISO14067:2018 or GHG Protocol Product Lifecycle Accounting and Reporting Standard
3	Data collected represents activities that occurred within 3 years of to the time-period being assessed	Data based on regional data from a government or industry database or survey	Data based on sample size of 21-50%	Regionally relevant product specific value from database developed using international best practice
2	Data collected represents activities that occurred within 4 years of the time-period being assessed	Data based on state data from a government or industry database or survey	Data based on sample size of <20% (e.g. liveweight measured for 10% of herd)	Nationally relevant product specific value from database developed using international best practice
1	Age of data unknown or data more than 4 years older than the time-period being reported	Data based on national data from a government or industry database or survey	Unknown (e.g. data based on national/state/regional data source)	Geographically generic product specific value from database developed using international best practice

(a) The data could include annual data or a mean of annual data representing activities that occurred in the time-period being assessed or within the specified number of years from time-period being assessed.

(b) Data without spatial partitioning would represent data for whole of entity or location. Data with spatial partitional might have data differentiated by paddock or management unit to account for data being differentiated by soil type or land use zones.

Questions: Scope 3 Emissions Factors
At present, unverified supplier emissions factors are not included in the Data Quality Framework and the option is not currently adopted in the Methodological Guidance.

8A: Should unverified supplier data be allowed?
8B: If yes, should criteria or other standards need to be met to allow their inclusion?
8C: If yes, what data quality ranking/s should unverified supplier emissions factors receive in the Data Quality Framework?

Refer to Methodological Guidance Chapters 14-15 Scope 2 & 3 for more information about Scope 3 data, methods and standards.

8.2 Quality assurance

The entity shall implement quality assurance procedures including:

- conducting internal review of calculations and data
- documenting review findings and corrections
- undertaking periodic assessment of data collection procedures.

All estimation methods and data used to generate a GHG inventory shall be documented and, where necessary, retained to allow a quality assurance or verification process to be conducted.

Additional data from independent sources should also be collected and retained to facilitate verification of activity data. Independent data that are collected to allow verification of activity data should be obtained from a recognised reputable source or where site-specific data are collected should be obtained using equipment that is calibrated according to a recognised standard.

9. Reporting

9.1 Required information and documentation

A complete emissions report provides sufficient information for informed decision-making and verification. Requirements can differ depending on the intended goal of the inventory. If reporting to a third party, the entity should check their requirements for reporting.

To meet the minimum requirement of these Guidelines, entities shall report the following.

a) Entity information:
   - reporting entity name and ABN
   - a summary business profile of the entity (e.g. AFF activity types, properties, localities)
   - organisational and reporting boundaries, including the consolidation approach used to set the organisational boundary
   - responsible person and contact information.

b) Summary information containing:
   - reporting period(s) covered
   - information on the base year or period (where relevant)
   - total mass of emissions by scope in metric tonnes of each reported gas
   - total mass of emissions by scope in metric tonnes of CO_2-e

- material changes in boundaries (e.g. due to entity restructure) or methods
- comparison with base year or previous reporting period (where relevant)
- significant events affecting emissions (e.g. bushfire, destocking in drought).

c) Detailed emissions and removals inventory:

- emissions and removals by scope, source or sink category, gas type, in mass of gas and CO_2-e
- biogenic carbon shall be reported separately from non-biogenic carbon
- method level applied for each source and sink estimated
- activity data for each source and sink estimated
- quality score for each method and data source
- disclosure of any omitted or excluded sources and sinks (see materiality for details of what shall be included).

d) Methodology documentation:

- version of Methodological Guidance applied
- details of any GHG calculation tools used
- data collection procedures
- quality assurance measures.

e) Details of any carbon credits as per Chapter 9.6.

The entity may report the inventory by geographic or operational unit where the entity operates multiple:

- properties or production sites
- enterprise types (e.g. cropping and livestock)
- management systems.

9.2 Reporting format

The entity shall:

- use reporting templates provided at **Appendix E**
- ensure units of measurement are provided for all quantitative data.

9.3 Frequency of reporting

The frequency of reporting depends on the goal of the inventory and third-party requirements.

Entities should review and update their GHG inventory annually. This can help entities to:

- identify additional emission sources from new activities
- keep on top of activity data, methods and emission factors, as required
- collate annual emissions data.

9.4 Reporting period

Single year

The entity shall use a single-year reporting period. This can be a 12-month period aligned with current financial reports, and can be a financial or calendar year, dependent on the goal of the inventory and any relevant third-party requirements.

When reporting, the entity should identify any significant seasonal variations or exceptional events affecting emissions during the reporting period.

Multi-year average

In addition to reporting for a single-year reporting period it is recommended that entities also report a multi-year average. Similarly to the rationale for setting a base period rather than a base year (Section 7), some production systems can have large interannual variability due to factors such as climate or production cycles. As such, a single year of data will often not be representative of an entity's normal operations.

Ideally, a multi-year average should cover multiple consecutive production cycles and consider climatic cycles relevant to the location and production system. A period of 3-5 years can be representative for tracking emissions and removals over time.

To report a multi-year average the entity shall:

Step 1: Select the multi-year period

- Define the number of contiguous years that will be averaged, in the same manner that a multi-year base period would be defined (as per Chapter 7.1).
- If a base period has been established the entity should apply the same number of years for the reporting year average.

Step 2: Calculate the multi-year average

- For each new reporting year, shift the period forward by one year and calculate the average.

Step 3: Document assumptions and exclusions

- Record the selected period and rationale for the choice
- Document any events excluded due to atypical events and justify the exclusion

9.5 Base year reporting

Where the entity has established a base year (or base period) the entity shall:

- report the base year (or base period) chosen and the rationale for the selection
- report the base year review and recalculation policy
- report the base year inventory in accordance with the requirements in Chapter 7.1
- explain and document the nature and rationale for any recalculations following Chapter 7.2
- report both the original and adjusted base year.

9.6 Treatment of carbon credits and renewable energy

Carbon credit projects

The greenhouse gas inventory totals reported by an entity shall reflect all emissions and removals occurring within the organisational boundary and shall not be adjusted through the use of carbon credits.

If a registered carbon credit project occurs within the organisational boundary:

- the entity shall report all emissions and removals arising from project areas and activities within the reporting boundary in the entity inventory, and for LULUCF activities, report spatial information on locations or areas subject to carbon credit projects within the entity reporting boundary
- when estimating emissions and removals from LULUCF activities, the entity shall quantify carbon stock changes across all relevant land areas and activities within the reporting boundary
- emissions reductions or removals that are eligible for the issuance of carbon credits under a crediting scheme shall additionally be reported separately from inventory totals.

The entity shall document project information as supplementary data (as per the reporting table at Appendix E):

- carbon crediting scheme (e.g. Australian Carbon Credit Unit (ACCU) Scheme), project methodology and crediting period
- area of land under the project (hectares)
- the project number and / or the Lot/DP (Deposited Plan) details of the land, where relevant
- credits generated (t CO_2-e) during the reporting period
- disposition of credits (sold, retained, or retired).

Purchased credits

Carbon credits generated outside the organisational boundary and purchased by the entity shall not be included in the GHG inventory but may be reported separately as per the reporting table for carbon crediting projects at Appendix E.

Renewable energy projects

If the entity has a large-scale renewable energy generation project within its organisational boundary it shall:

- report renewable energy produced on-site and exported as supplementary information
- not include emission reductions for renewable energy where certificates are created and sold.

10. Estimating the GHG intensity of products

Emissions data collected for the entity-level inventory can be used for calculating the cradle-to-gate GHG intensity of products. This estimate of product emissions intensity (expressed as GHG per unit of product) provides an indicative quantitative performance metric that organisations can use to monitor progress over time and communicate to internal and external stakeholders.

If entities wish to estimate product emission intensity, they shall follow the steps outlined below.

10.1 Method overview

These Guidelines employ a simplified attributional approach for calculating product emissions intensity, by attributing the entity's emissions from a production period to the products produced during that period.

Limitations

These Guidelines do not provide requirements and guidance for calculating the full carbon footprint of a product. The product carbon footprint calculated according to the GHG Protocol Product Life Cycle Accounting and Reporting Standard and ISO 14067 covers the whole product life cycle from cradle to end of product life. When applied consistently, these standards can be used to benchmark and compare the emission intensity of products between producers.

The estimated product emissions intensity calculated according to these Guidelines is a 'partial carbon footprint'. This is estimated using annual data collection and estimation (aggregated over the relevant production period if this is > 1 year). The results are only relevant to the entity and are not directly comparable with the emissions intensities of products produced by other entities.

GHG Protocol and ISO also recognise that AFF products can store biogenic carbon and require or allow separate reporting of this storage. The Guidelines only provide methods for tracking the biogenic carbon content in harvested wood products.

Due to these differences, entities should ensure the estimation method and documentation meet the requirements of specific programs or external stakeholders. See Section 2.3 for more detail on limitations.

Questions: Limitations of the emissions intensity method in these Guidelines
The approach for estimating product emissions intensity is designed to allow producers to reuse data collected for their annual entity-inventory. Once subdivision and allocation rules have been established, it is expected that product emissions intensities can be calculated with minimal additional data.

While this approach applies many of the principles from the GHG Protocol Product Life Cycle Accounting and Reporting Standard and ISO 14067, the emissions intensities produced under these Guidelines could be inconsistent with results generated using those standards.

10A Will the emissions intensities calculated using the Guidelines approach be useful for producers to track improvements over time and for business-to-business communication?
10B If not, what changes or additional guidance would make the approach more useful for these purposes?

Box 1: Attributional and consequential life cycle assessment (LCA)

There are 2 alternative approaches commonly applied in life cycle assessment: *attributional* and *consequential*.

In **attributional LCA**, the climate impacts of a product are estimated by summing the emissions and removals over the product's life cycle. Where multiple products are produced, allocation of emissions between products is based on characteristics such as energy content, mass or economic value. This approach is commonly used for GHG inventories and product reporting.

In **consequential LCA,** the climate impacts of a specific decision or change in the system as a whole are estimated. It is a form of scenario analysis that considers market effects and knock-on emissions impacts associated with production decisions. For example, the system-wide emissions impacts of the decision to produce more product, change a process, or avoid producing something. This requires more complex modelling than attributional LCA. Consequential approaches are most useful for policy analysis or decisions about interventions.

10.2 Steps for estimating product emission intensity

Step 1: Establish the system boundary

As a first step, entities should clearly define and document the system boundaries for the product emissions intensity analysis, specifying whether the assessment is cradle-to-gate or includes additional stages to the factory or distribution gates (see Figure 1 and / or Appendix A for guidance). It can be helpful for entities to begin with a cradle-to-gate analysis, particularly where multiple products are produced. This approach ensures accurate quantification of the emissions intensity of the raw products at the cradle-to-gate before incorporating additional stages. However, in cases where it is complex or onerous to partition fuel or energy use between the 'cradle-to-gate' and 'post-gate' boundaries, entities may choose to undertake a full analysis to whichever gate is appropriate for their production system.

Step 2: Identify and classify production system outputs

Agricultural, forestry, fisheries and aquaculture operations often produce more than one product. For example, grain growers commonly produce oilseeds or legume crops in addition to cereals; mixed farming systems produce both crops and livestock products; and fishing operations might catch a mix of species. The production of many agriculture, forestry, fisheries, and aquaculture commodities generates multiple outputs that can have subsequent uses.

Sharing emissions amongst different outputs is relatively straightforward when the inputs to each product can be easily separated, such as between irrigated cotton and livestock, where the inputs to each enterprise are quite distinct. Complexity arises when inputs are shared by multiple products, such as in a sheep grazing system producing both wool and meat, or where residues from one system become inputs to another (e.g. manure used as a fertiliser) or crop stubble used for grazing.

When multiple products are produced from shared input resources or processes, the entity's emissions shall be shared among the products to estimate the emissions intensity of each individual product.

The way outputs are classified – as main product, by-product, residual output or waste – determines whether emissions are allocated to them.

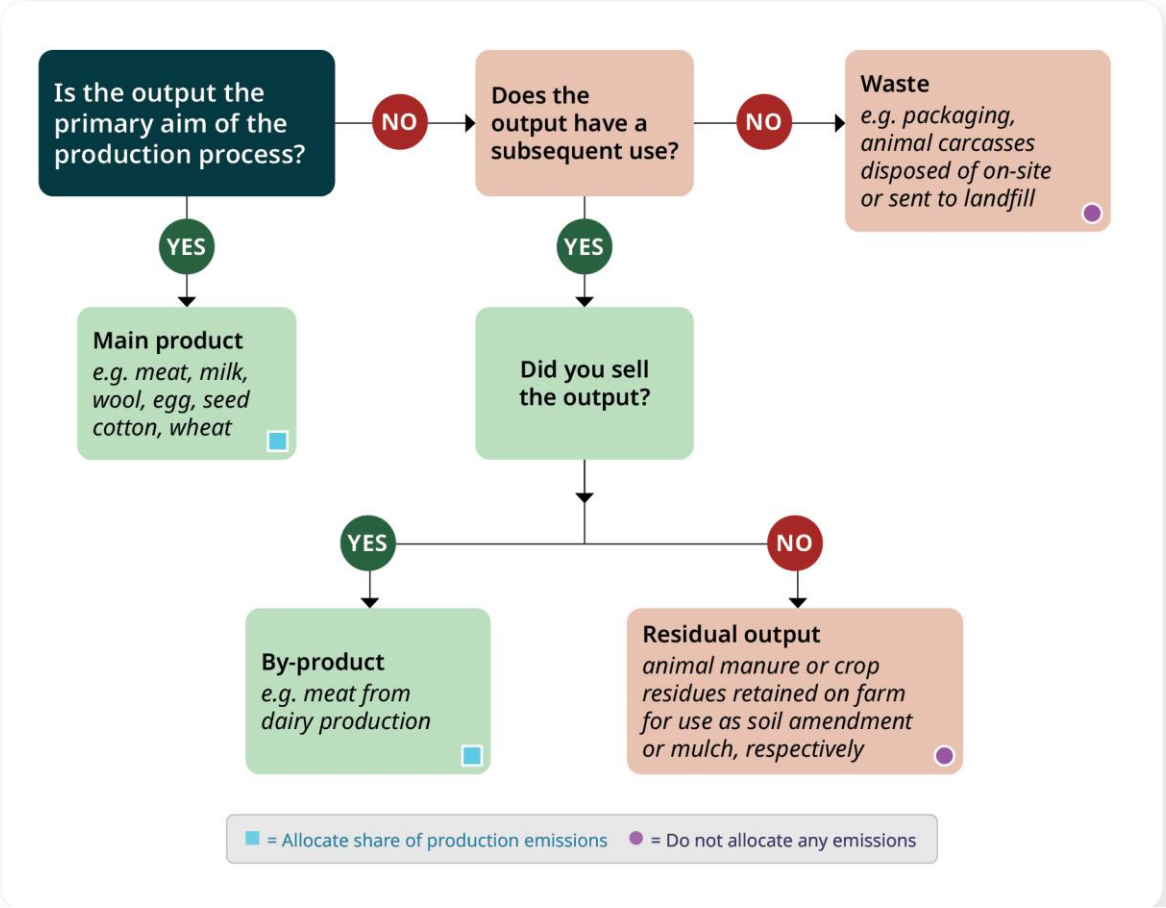
If the output is the primary aim of production, then it is classified as a *main product*. There may be more than one main product, such as meat and wool from sheep. If the output has a subsequent use *and* is sold, it is classified as a *by-product*[9]. If it has a subsequent use but is not sold, then it is classified as a *residual output*. If the output does not have a subsequent use, it is classified as *waste*. Residual outputs and waste are not allocated emissions. See Key Terms for definitions.

[9] Note, in some frameworks this is referred to as 'co-product'.

This approach to defining by-products and residual outputs reflects the principle that the outputs generating economic benefit to the producer should be assigned a share of emissions.

Entities shall identify all outputs from the production system and classify them as main products, by-products, residual outputs and wastes according to the decision tree at Figure 2.

Figure 2: Classifying outputs as main product, by-product, residual output or waste



Question: Classification of products

The decision tree in Figure 2 uses objective criteria to classify outputs into 4 categories: main product, by-product, residual output, and waste.

In this scheme, manure that is sold would be treated as a by-product, whereas manure that is reused on farm and not sold would be treated as a residual output.

10C Does the proposed product classification decision tree provide a clear and practical approach for distinguishing between main product, by-product, residual output, and waste?

Step 3: Identify units of analysis

The choice of analysis units for the emissions intensity calculation is a key decision, as it can standardise reporting and facilitate comparison as well as help inform farm management decisions. The relevant quantification reference for products that can fulfil different functions is called a declared unit**.** The declared unit is the unit by which the product is commonly sold at the farm gate, such as 1 kg seed cotton or 1 kg greasy wool. Declared units for common commodities are listed in Table 10.

Emissions intensity shall be expressed as kg CO_2-e per declared unit (unit of analysis), which is generally the unit of sale for that product type.

Table 10: Commonly used declared units for agricultural, forestry, fisheries and aquaculture commodities (cradle-to-gate unless otherwise specified)

Commodity	Declared unit
Milk	1kg fat-and-protein-corrected milk
Wool	1kg greasy wool
Pork	1kg live weight
Red meat	1kg live weight
Eggs	Per dozen eggs or 1kg eggs
Grains	1kg grain
Cotton	1kg seed cotton (cradle-to-gate kg cotton lint and kg seed (cradle-to-factory gate)
Sugarcane	1 tonne harvested sugarcane
Rice	1kg paddy rice
Vegetables	1kg fresh produce and/or $1 revenue generated
Fruit	1kg fresh produce and/or $1 revenue generated
Nuts	1kg fresh produce (hulled or unhulled) and/or $1 revenue generated
Vine fruit (table grapes, kiwi fruit & passionfruit)	1kg fresh fruit and/or $1 revenue generated
Wine grapes	1 kg grape (cradle-to-gate) 1 ML wine produced and packaged (cradle to factory gate)
Buffalo industry	1 head sent to slaughter & export and 1kg fat-and-protein-corrected milk
Deer meat	1 head sent to slaughter & export and 1kg velvet antler produced in the reporting year
Finfish[10]	1 kg weight harvested - whole 1 kg fillet (boneless)
Oysters	Per dozen or 1kg liveweight
Other Shellfish	1kg pre-package weight
Crustaceans (prawns, crabs)	Per kg liveweight (cradle to gate) per kg of peeled or processed meat (cradle-to- factory-gate))
Sawlogs	Per cubic metre (m^3)

Questions: Declared unit

Table 10 lists potential declared units for key AFF commodities when reporting cradle-to-gate emissions intensities.

10D Are the proposed declared unit in Table 10 appropriate for a cradle-to-gate system boundary?

10E Are there other standard units commonly used for cradle-to-factory-gate or cradle-to-distribution-gate that should be considered for inclusion?

[10] Also refer to https://www.frdc.com.au/fish-vol-30-2/calculating-seafoods-carbon-footprint

Step 4: Identify relevant processes

Based on the system boundary established in Step 1, entities shall determine which emissions and removals processes from the entity-level inventory are relevant for inclusion in the product emissions intensity calculations.

In most cases emissions associated with capital goods, corporate overhead activities, business travel and employee commuting do not make a material contribution to the product emissions intensity and may be excluded. An entity may choose to include these processes if they consider these processes to be relevant, such as where they support business objectives, present meaningful reduction opportunities or represent a relatively significant impact.

Emissions from land clearing and removals from revegetation or regeneration activities may be shared amongst products when applicable. Refer to Section 10.3 for guidance on the treatment of different LULUCF activities within product emissions intensity calculations.

Step 5: Select emissions allocation process

Entities should assign emissions to products in a production system with multiple outputs by applying the following hierarchy:

1. Where possible, subdivide production systems. Subdivision involves disaggregating a multi-output production system into subprocesses or stages so that inputs and emissions can be directly assigned to individual products. For example, tracking the amount of fertiliser applied to different crops - along with the associated Scope 1 and Scope 3 emissions. Subdivision generally provides the most accurate results.
2. Where subdivision is not possible (due to shared processes) or not feasible (due to data availability), apply an industry agreed allocation rule (if relevant)
3. Where subdivision is not feasible and there is no appropriate product category or industry-relevant allocation rule, allocate based on causal relationships. That is, allocate emissions amongst products in a manner that reflects why, and how, the emissions occurred based on the inputs, energy, or biological processes that bring each product into existence. For example, the metabolisable energy used to produce milk versus calves (pregnancy/growth). This approach reflects how the system generates emissions as it creates the products, rather than the static properties of the finished products.
4. Where causal relationships cannot be used as the basis for allocation, the physical properties of the finished products (such as product mass or energy content) or the economic value of the product may be used. These methods do not necessarily reflect how emissions are caused. Instead, they provide a consistent and practical way to divide emissions when a clear causal link cannot be demonstrated.

The choice of allocation method can significantly influence results. Allocation based on physical properties, such as mass-based allocation, can be misleading when products differ greatly in value or function. For example, cull ewes versus prime lambs or cotton lint versus cotton seed. Similarly, energy content is not an appropriate allocation factor when products are not both energy products, such as intercropped canola and chickpeas. Therefore, physical attribute allocation should only be used when products serve similar purposes in the market.

Economic allocation is often used because it reflects the rationale for implementing a multi-product production system and because it can be used for product mixes with diverse functions. Because agricultural commodity prices are often volatile, economic allocation

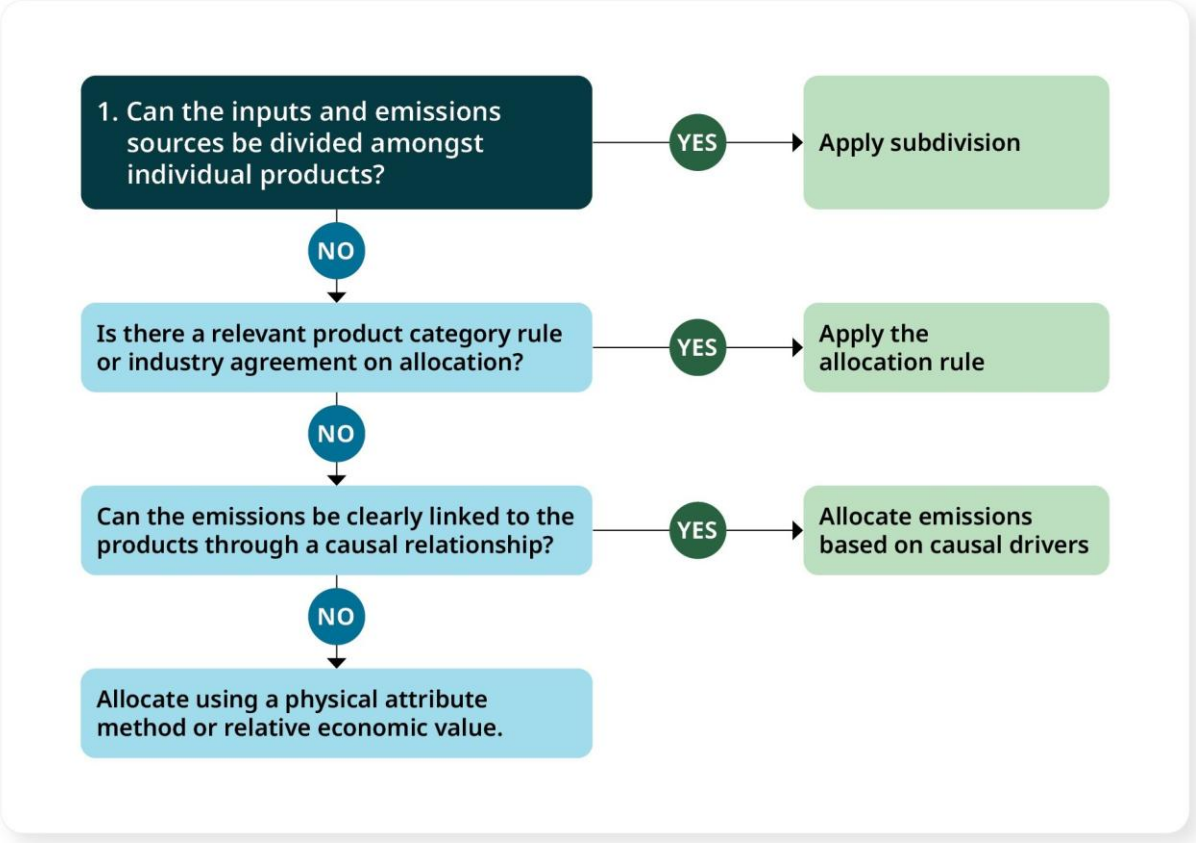
should be based on prices averaged over several years. When applying economic allocation, the emissions share for a product is determined by the ratio of its revenue to the total revenue for the activity. Note, mass balance is not preserved where economic (or energy) allocation is applied[11].

Agreed allocation approaches have been established for some production systems through participatory processes (e.g. International Dairy Federation). Where nationally agreed sector-specific allocation rules exist, these should be applied. Some schemes specify allocation rules that must be followed to access specific markets (e.g. EU Renewable Energy Directive). Where no relevant agreed rules are available, entities should undertake sensitivity analysis to assess how results respond to different allocation factors.

All allocation choices involve a degree of subjectivity. Entities shall document the chosen allocation method in their product emissions intensity calculation, including a justification for why the method and factors were chosen. Once selected, allocation rules should be applied consistently.

Use the decision tree at Figure 3 to determine the applicable approach for sharing emissions amongst products.

Figure 3: Decision tree for choosing allocation method



[11] Using economic or energy-based allocation creates a disconnect between the *actual physical flow* of materials and *the attributed environmental burden*.

The choice to subdivide or allocate determines the order of the next steps in calculating product emissions intensities.

- Where production systems and their processes can be subdivided, identify the relevant emissions sources for each product, collect the data, calculate inventory GHG emissions, and divide emissions by production quantity for each product
- If an allocation rule is applied to share emissions amongst the entity's outputs, collect the relevant data, calculate the inventory GHG emissions, distribute the emissions according to the allocation rule, and then divide the allocated emissions by the production quantity for each main product or by-product.

Step 6: Collect data and calculate emissions

Quantifying production

In most cases, the quantity of products produced should be based on sales records for the relevant production period. Where a portion of production is used on-farm – such as crops grown for livestock feed with only the surplus sold – the quantity of products is the amount harvested rather than the amount sold. Entities may also choose to estimate emissions intensity for on-farm production before the point of sale (e.g. emissions per unit of liveweight gain rather than per unit sold). This approach can support farm management decisions and help track the effectiveness of mitigation measures.

Quantifying the emissions

Emissions and removals data for each relevant process, as collected for the entity-level inventory, shall be shared amongst products in accordance with the rules established using Step 3 and the sector specific guidance in Section 10.3.

For multi-product systems, entities should maintain detailed records of inputs at the individual product-level (where this is possible) rather than at the entity level. Recording inputs applied to specific products – such as fuel use, fertiliser and herbicide applied or feed consumption – and using these data to estimate emissions ensures accurate assignment and minimises the need for allocations. Where product specific data are unavailable, entity-level data may be subdivided using representative values, such as fertiliser application rates (kg/ha) combined with the areas planted.

All emissions and removals should be converted to CO_2-e (where a conversion is required). Emissions and removals should then be summed across processes within each production stage to determine the total emissions from producing each product. Refer to Section 10.3 for treatment of LULUCF emissions and removals within product emissions intensity calculations.

Abatement for which carbon credits have been created shall not be included in product emissions intensity calculations. For example, if silvopastoral tree planting has generated carbon credits that have been sold, this removal shall not be included in the calculation of product emissions intensity of the cattle.

For transparency, product emissions intensities should be recorded both with and without emissions and removals from land clearing and revegetation/regeneration.

Calculate the emissions intensity

The emissions intensity is calculated by dividing the total emissions and removals associated with producing the product by the quantity of product produced during that period.

For products with multi-year production cycles (e.g. sugar cane, some livestock and aquaculture systems), emissions associated with specific products can occur across several years. To address this, annual emissions estimates are aggregated across the full production cycle, and emissions intensity is calculated using total production cycle emissions and total production cycle output. Similarly, for production cycles that are shorter than 12 months but straddle 2 years (for example, a sorghum crop sown in September that is harvested in March), the emissions are aggregated across the production cycle to determine the emissions relevant to that sorghum crop.

10.3 Sector specific guidance and other allocation considerations

Crop rotations

Each crop in the rotation shall be considered separately, with emissions attributed to each separate crop product type. This is important because some crops, such as canola, require higher levels of fertiliser and pesticides than others such as cereals. Emissions from residue decomposition, including during fallow periods, shall be attributed to the crop from which the residue was derived. Where crop stubble and manure are not sold, they are treated as residual outputs and not allocated a share of crop or livestock production emissions.

Legume crops in rotation

Legume crops are commonly sown in rotation with cereals and oilseeds. Legumes fix atmospheric nitrogen which is used by the plant. Decomposition of legume crop residues increases soil nitrogen (N) levels, thus potentially reducing the amount of synthetic fertiliser required by the subsequent crop, and therefore the scope 3 fertiliser emissions. In some LCA studies and databases, the legume crop is credited with an emissions reduction based on the estimated reduction in N fertiliser required by the subsequent cereal or oilseed crop. In these Guidelines, no credit shall be applied. The benefit of the legume, if any, will be shown as reduced emissions at the entity level, and reduced emissions intensity for the subsequent crop, if N fertiliser input is reduced.

Cover crops/green manure crops

Cover crops, also known as green manure crops, are planted to enhance soil organic matter levels and provide ground cover to avoid erosion. Often legumes are used as cover crops, and these can also contribute to enhancing soil N levels. As cover crops are not harvested for products, all emissions and removals shall be attributed to the subsequent cash crop, including N_2O emissions from decomposition of the cover crop's biomass.

Mixed farming

In mixed farming systems, where a pasture phase is incorporated into the crop rotation, increased soil N due to pasture legumes can reduce the amount of synthetic N fertiliser required by the subsequent crop or crops. Soil organic matter levels often increase under the pasture phase, increasing soil carbon levels and soil fertility, and subsequent crops benefit from a pest and disease break. After harvest of cash crops, livestock commonly graze crop stubble and spilled grain and deposit urine and dung, potentially reducing crop residue emissions. Livestock graze weeds during fallow periods, reducing requirements for herbicides and/or cultivation.

Consistent with the treatment of legumes and cover crops, no credit for reduced emissions is attributed to the livestock.

Enteric fermentation, (paddock) manure emissions and emissions from pasture establishment (e.g. fuel, scope 3 seed production) shall be attributed to the livestock system. Emissions from cropping activities, including spraying out or ploughing the pasture to prepare for cropping, shall be attributed to the cropping system.

Sheep meat and wool

Sheep breeds are either dual purpose – or grown primarily for meat as the main product with wool as a by-product – or vice versa. Allocation between sheep meat and wool should be based on a biophysical relationship, using protein mass allocation as recommended by Wiedemann et al. (2015)[12]. This assumes 18% of liveweight and 100% of clean fleece dry matter is protein.

Meat production

In meat production systems that do not have significant by-products, including grass-fed beef, feedlot beef, self-fleecing sheep and goats, all emissions in the reporting period should be attributed to liveweight sold during the reporting period.

Dairy

The main product of a dairy system is milk, and the by-products are surplus calves and culled cows. The International Dairy Federation (IDF) has determined that allocation between milk and meat shall be based on the relative energy requirement of milk production vs growth (IDF, 2022)[13].

Where dairy bulls are raised for beef, an energy-based allocation may be applied, following the IDF (2022) approach, as updated by Nemecek and Thoma (2020)[14], and further refined by Ineichen et al. (2022)[15].

Following IDF and (Livestock Environmental Assessment and Performance Partnership (LEAP) guidelines[16], manure and biogas produced from manure should be considered a 'residue' (herein called residual output). Therefore, manure is not allocated emissions from livestock production; only emissions from processing, transport and land application are attributed to the manure. The IDF guidelines also suggest that, alternatively, manure can be classified as waste (with no emissions attributed) or as a by-product, with a share of the emissions from livestock production allocated based on economic allocation. The LEAP guidelines provide an example of biophysical relationship for allocation between milk, meat and manure.

Cotton

When post-production processes for cotton are included in the system boundary, allocation between lint, seed and other by-products is based on economic allocation, consistent with the

[12] Wiedemann, S.G., Ledgard, S.F., Henry, B.K., Yan, M.J., Mao, N. and Russell, S.J., 2015. Application of life cycle assessment to sheep production systems: investigating co-production of wool and meat using case studies from major global producers. *The International Journal of Life Cycle Assessment*, 20(4), pp.463-476.

[13] IDF. 2022. The IDF global Carbon Footprint standard for the dairy sector. In: Bulletin of the IDF No. 520/2022. International Dairy Federation (ed.), Brussels.

[14] Nemecek, T. and Thoma, G. 2020. Allocation between milk and meat in dairy LCA critical discussion of the IDF's standard methodology Proceedings 12th International. Conference on Life Cycle Assessment of Food LCAFood2020. p 83-89, 13-16 October, Berlin, Germany.

[15] Ineichen,S., Schenker, U., Nemecek, T. and Reidy, B 2022. Allocation of environmental burdens in dairy systems: Expanding a biophysical approach for application to larger meat-to-milk ratios, Livestock Science, 261, 104955.

[16] FAO. 2016. Environmental performance of large ruminant supply chains: Guidelines for assessment. Livestock Environmental Assessment and Performance Partnership. FAO, Rome, Italy.

international industry life cycle assessment approach outlined by Cascale (2024)[17]. The Australian cotton industry applies an economic allocation of 83% to lint. This is not materially different from the internationally agreed allocation of 82.7%.

Perennial production systems

For perennial crops, such as sugar cane a farm generally comprises fields at different ages, managed such that each year the mature crop is harvested. Emissions intensity should be estimated by attributing all emissions in the production period to the products sold in that period.

Biomass residues and waste

Where crop stubble and manure have no subsequent use, they are treated as waste, and no emissions are allocated to them. Emissions from subsequent management of these waste materials, such as burning stubble or covering a manure pond, should be attributed to the products of the crop or livestock production system from which they originated. This reflects the principle that waste management emissions are attributed to the products of the production system. For example, emissions from on-farm manure handling – such as constructing a manure pond where biogas is captured and flared (not used as an energy source) – are attributed to the livestock products.

Crop stubble and manure can also serve as valuable resources. They might be applied as soil amendment to maintain soil health and nutrient cycling or used as feedstock for bioenergy and biochar. Where crops stubble or manure has a subsequent use or sold, they are defined as residual outputs or by-products – see Figure 2. In these cases, emissions associated with collection, transport and processing should also be attributed to the subsequent production system.

For example, if manure is:

- pelletised as an organic fertiliser, emissions from collection, transport and processing are allocated to the manure. These emissions are then included in the emissions intensity of the product to which the manure was applied as an input.
- applied on-farm, the emissions from use of manure as fertiliser are included in the entity's GHG inventory and assigned to the product(s) to which the manure is applied.
- digested to produce biogas for sale emissions from collection, transport and processing are shared to the biogas product.

Other example of potential AFF residues include tree bark, sawdust, shellfish shells, fish processing waste.

Infrequent inputs

For infrequent inputs, such as lime application, emissions from these sources should be distributed between products over a specified period. In these Guidelines, the period should be equivalent to the frequency at which the input is applied. The emission should be evenly distributed over the period (e.g. if lime is applied every 5 years emissions are divided by 5) and the annual amount allocated to the products in accordance the relevant allocation method.

[17] Cascale (2024) Industry Aligned LCA Methodology and Requirements for creating Cotton Fiber Datasets for the Higg Product Tools. 2024, Version: 1.0, Cascale (formerly Sustainable Apparel Coalition).

Note, the treatment of infrequent inputs in GHG product emissions intensity is distinct from treatment in an annual entity GHG inventory.

Capital goods

If an entity chooses to include capital good these emissions should be distributed evenly over a period equivalent to the service life of the capital goods and the annual amount allocated to the product in accordance the relevant allocation method.

Questions: Product category rules or industry allocation methods

10F Where noted, are the product category or allocation rules referenced in Section 10.3 appropriate for Australian production systems?
10G Are you aware of any other product category rules or industry preferred allocation methods that we should reference in the Guidelines?
10H If yes, please provide relevant references.

Land Use, Land Use Change and Forestry

Land clearing

All emissions associated with land clearing are attributable to products when the land-use change:

- results from human intervention with the intent of creating a product, and
- has occurred within 20 years of the assessment period.

This means that land clearing resulting from human intervention with the intent of creating a product occurring 21 years prior to the assessment period is not attributable to products.

Land clearing emissions and removals shall be distributed using a linear decline over 20 years, or over the duration of a single rotation or harvest cycle (whichever is the longer period).

Each year the annualised land clearing impacts shall be allocated across all products produced in that year, in proportion to the emissions-intensity allocation method selected for those products (see Section 10.6).

See the LULUCF Methodological Guidance (Appendix A2.6) for methods for estimating and amortising land clearing impacts.

Question: Treatment of land clearing impacts – distribution approach
The GHG Protocol Product Life Cycle Standard recommends distributing land-use change emissions evenly over a period of either 20 years, or the length of single harvest cycle or rotation (whichever is longer).

These Guidelines propose adopting a **20-year linear decline approach**. This method recognises that entities could have limited ability to identify land use change events that occurred within the past 20 years. A linear decline helps reduce the risk that emissions from historical land clearing are not appropriately assigned, either to the current entity's products or those of the previous landholder. That is, by requiring entities to assign more emissions to products produced closer to the date of the clearing, it reduces the chance that emissions go unassigned to any product in later years, for example if the land has changed ownership and records of the earlier clearing event are not maintained.

This approach also reduces the risk of under-accounting where land cleared for agriculture is subsequently taken out of production within 20 years of the clearing event.

10I Is the proposed 20-year linear approach for distributing land clearing emissions appropriate? Please explain your reasoning.

Revegetation (environmental plantings) and human-induced regeneration

Emissions and removals arising from revegetation activities (excluding plantings established for forestry) and from human-induced natural regeneration within an entity's reporting boundary may be assigned to products. Product emissions intensity estimates shall be reported with and without environmental plantings and human-induced regeneration.

Where vegetation is directly and physically integrated into a production system (for example, trees within a silvopasture system), subdivision can be used to assign emissions and removals to the harvested products.

Where physical subdivision of the system is not feasible, annual emission and removals shall be allocated across all products produced in that year in proportion to the emissions-intensity allocation method selected for those products (see Section 10.6).

Plantations, revegetation or human-induced natural regeneration activities that are part of an Australian Carbon Credit Units (ACCUs) scheme project (or any other carbon offset program) shall not be assigned to products.

Questions: Treatment of revegetation and human-induced natural regeneration
The Guidelines propose that emissions and removals from revegetation or human-induced natural regeneration activities occurring within an entity's reporting boundary may be assigned to products, with annual impacts distributed to products produced in that year using the applicable subdivision and allocation rules. However, if the activities were undertaken for the creation of carbon credits, the emissions and removals shall not be assigned to products.

Product emissions intensity results shall be reported both with and without these emissions and removals, so that the user of the data can elect to excluded them from the product emissions intensity.

10J Is this proposed approach appropriate?
10K Should any additional criteria or evidence requirements be included to support its application?

Additional requirements for assigning emissions and removals from revegetation activities to products could include permanence and ongoing monitoring requirements. The Guidelines propose that if assigning emissions and removals from revegetation activities to products, the entity shall:

- prepare a permanence plan explaining the steps undertaken and intended to be undertaken to ensure the permanence of the reported removals attributable to the revegetation activities
- adapt the permanence plan where necessary based on changing conditions and information gathered during monitoring
- continue preparing an annual inventory for the activity area, which includes:
    - conducting ongoing monitoring of the area in which revegetation is taking place to identify sequestration reversals

- estimating and reporting sequestration reversals as net CO_2 emissions.

If an entity cannot conduct ongoing monitoring of an area, the entity shall treat all previously reported removals as net CO_2 emissions.

10L Should these additional requirements for a permanence plan and ongoing monitoring be included?

Savanna fire management

Because the inventory method used to estimate emissions and removals from savanna fires does not distinguish between natural and human-induced fires, it is not possible to assign these impacts to specific products. Therefore, all emissions and removals associated with savanna fire management should be excluded from the emissions-intensity calculation.

Where relevant entities should document savanna fire management as an excluded process in their reporting.

Questions: Treatment of savanna fire management emissions and removals
The Guidelines propose that all emissions and removals associated with savanna fire management be excluded from emissions-intensity calculations, as there is no reliable method to attribute the impacts to human activity and therefore to products.

10M Is this proposed approach appropriate?
10N Can you suggest alternative approaches?

Perennial woody crops

Emissions and removals associated with changes in the woody carbon stocks due to the establishment and rotational replacement of perennial woody crops generally balance out over the full rotation period.

Questions: Treatment of perennial woody crops
Due to generally balancing out over the full rotation period, net changes in woody carbon stocks in perennial woody crops could be considered immaterial. If so, there would be grounds to exclude them from the emissions intensity calculation. Entities could then document this as an excluded process where relevant. However, some entities might wish to have the option to recognise the emissions and removals associated with their cropping activities.

10O Should entities have the option to include net emissions and removals from tree establishment and subsequent clearing?
10P Can you suggest alternative approaches?

Plantation forestry

Emissions and removals associated with changes in the woody carbon stocks due to the establishment and rotational replacement of plantation forests generally balance out over the full rotation period. These net changes are not considered material and can be excluded from the emissions intensity calculation.

Biogenic carbon stored in the harvested products may be reported separately as it can capture a large portion of the woody carbon stock, depending on the product destination.

Other emissions processes related to forestry activities (e.g. fuel use) should be assigned to products over the production period. In these Guidelines, the period should be at least one full rotation period.

Questions: Treatment of plantation products
The Guidelines propose that all emissions and removals from changes in woody carbon stock in plantation forestry be excluded from emissions-intensity calculations on the basis that the net change over the full rotation period generally balance out of the rotation period and are not considered material. Furthermore, biogenic carbon stored in the harvested products may be reported separately, potentially capturing a large portion of the woody carbon stock, depending on the product destinations. All other relevant emissions processes are to be assigned to products over one full rotation period.

10Q Is this proposed approach appropriate?
10R Can you suggest alternative approaches?

10.4 Reporting

For the emission intensity of products, entities shall report the following:

a) Summary information containing:
   - Production system type (e.g. dairy, mixed sheep and cropping, vegetables)
   - System boundary applied and definition of each stage included in the boundary
   - Outputs and their classification (main product, by-product, residue or waste) for each stage in the system boundary
   - Declared units for each product
   - Production cycle for each product
   - Averaging period used for reporting emissions intensity and basis for selection
   - GWP metric applied (e.g. GWP 100 IPCC AR5)

b) Emissions intensity (kg CO_2-e per declared unit) for each product (annual and average) with and without land clearing and revegetation/regeneration emissions and removals.

c) Total emissions and removals for each product with the following reported separately:
   - Emissions (excluding land clearing and revegetation/regeneration)
   - Emissions or removals from land clearing
   - Emissions and removals from regeneration and revegetation

d) Emissions and removals by process for each product and stage included in the system boundary

e) Removals for which carbon credits have been sold shall not be included in product emissions intensities

The following information shall be documented:

a) Excluded emissions and removals processes and justification for exclusion

b) Detailed information of the allocation approach including allocation fractions applied

c) Results of sensitivity analysis if undertaken

11. Good practice documentation management

Comprehensive documentation supports quality assurance and verification processes, and enables continuous improvement.

The entity shall maintain:

a) Data management records:
   - data collection procedures and responsibilities
   - primary data sources with collection dates
   - data validation and quality control processes
   - treatment of data gaps and estimates

b) Calculation records:
   - complete calculation worksheets or software outputs
   - emission factor selection rationale
   - provide clear audit trails from activity data to reported emissions

c) Change management documentation:
   - log of methodology changes
   - recalculation procedures and triggers
   - base year adjustment records
   - version control for calculation tools.

Entities should retain supporting documentation for a minimum of 5 years (note if reporting under the *Corporations Act 2001* documentation should be retained for 7 years – *see Sustainability reporting | ASIC*)).

Appendix A – Sector-specific cradle-to-gate boundaries

Note, this table shows typical boundaries applicable for each sector. The 'gate' in each case is the 'production system gate' (that is pre any post-production stages). It is acknowledged that many entities are responsible for additional production processes and may apply a boundary beyond 'the cradle-to-gate' boundary as defined here.

Sector	**Cradle-to-gate boundary**
Beef Pasture, Range, and Paddock	Farm-gate: represents the point at which a live animal or primary livestock product physically leaves the boundary of the agricultural holdings where production occurs.
Beef Feedlot	
Dairy	
Sheep	
Poultry	
Swine	
Other Livestock (buffalo, goats, deer, camels, alpacas, horses, mules/asses and emus/ostriches)	
Horticulture	Point of harvesting: represents the moment at which a horticultural or viticultural product is removed from the growing environment before post-harvest handling, storage or processing occurs.
Viticulture	
Sugar cane	Cradle-to-siding or roadside-delivery point: represents the point at which the cane is dropped off at a railway siding (common in Qld) or at a roadside delivery point (common in NSW) where a train or larger truck transports the cane to the mill.
Aquaculture and Fisheries	Point of landing: represents the moment at which aquaculture products are landed at the first receiving point (e.g. harvest vessel deck, cage-side platform, pond bank, or landing wharf), before post-harvest handling, transport or processing occurs.
Forestry	Forest-gate: represents from site establishment through to harvest and delivery of logs at the forest gate. At times, this could be to the mill gate - depending on the declared unit. The point of delivery at the mill represents the point at which harvested forest products are delivered to and accepted at the receiving gate or log yard of the first processing facility.

Appendix B - Choosing a consolidation approach

Rules of thumb

1. If the entity controls operations day-to-day, *operational control* could be an appropriate choice.
2. If the entity's business interests consolidate financially (that is there is financial control across the scope of all businesses), *financial control* could be an appropriate choice.
3. If the entity is an investor, with partial stakes in operations and financial arrangements, *equity control* could be an appropriate choice.
4. ISO supports multiple consolidation approaches to be applied within a single entity's inventory, recognising that complex organisations can have different operational or ownership structures across activities or assets. Therefore, an entity may legitimately apply different consolidation approaches for different parts of the inventory. Once the approach to consolidation has been determined (whether mixed or a singular approach) the approach shall be maintained consistently over time.
5. Under the GHG Protocol Corporate Standard, where more than one consolidation approach is applied for different reporting purposes, separate GHG inventories shall be prepared for each approach.
6. Where uncertainty exists regarding the application of consolidation approaches, the entity should consider whether the selected consolidation method(s) enables the comprehensive capture of all material GHG sources and sinks over which the entity has ownership, control, or influence. This approach supports the principles of completeness and transparency and strengthens conformance with assurance and verification requirements.

Case study: Broadmeadow Farms Pty Ltd

Broadmeadow Farms Pty Ltd is a family-run enterprise with diversified agricultural operations. The core cropping business is wholly owned and operated under the Broadmeadow Farms ABN. The family also operates livestock enterprises through the Daly Family Trust and holds a 20% equity share in a Grain Storage Co-operative.

Business profile:

1. **Broadmeadow Farms Pty Ltd** – cropping operations 100% owned. Main business.
2. **Daly Family Trust Pty Ltd** – livestock operations *operationally* controlled by Broadmeadow Farms. Financial decisions are made by a Trustee (not related to Broadmeadow Farms). Separate ABN to Broadmeadow Farms.
3. **Grain Storage Co-operative** – 20% equity share. Separate ABN to Broadmeadow Farms.

Although the 3 entities are legally distinct, they are operationally and strategically interconnected and ultimately Broadmeadow Farms is the beneficiary of all their operations.

Applying a consolidation approach under ISO 14064-1 rules

Under ISO 14064-1:2018, *Broadmeadow Farms* shall select a consolidation approach (or combination of approaches) that best represents its control or influence over emissions and removals.

ISO allows the use of multiple consolidation approaches – as long as the rationale is transparent, consistent over time, and avoids double counting.

Table 1 explains a rationale for Broadmeadow Farms combining *operational control* for its wholly owned and managed entities, with *equity share* for the Grain Storage Co-operative minority holding. This mixed approach ensures completeness, capturing all material sources and sinks where the business has ownership, control, or influence.

Table 1: Broadmeadow Farms consolidation approach under ISO rules

Entity	Rationale	Inventory inclusion
Broadmeadow Farms Pty Ltd (cropping)	100% owned and managed with both *financial and operational control*.	100% of emissions and removals included
Daly Family Trust (livestock)	*Operationally* controlled by Broadmeadow Farms, though financial control sits with the trustee. Inclusion justified under *operational control*.	100% of emissions and removals included
Grain Storage Co-operative (20% share)	No operational or financial control, but 20% ownership stake provides partial responsibility. Included under **equity share**.	20% of emissions and removals included

Applying a consolidation approach under the GHG Protocol Corporate Standard

Entities shall select one approach for consistency across the corporate inventory but can describe *equity-based supplementary disclosures* if needed.

The following table explains the rationale for Broadmeadow Farms selecting the *operational control* approach under the GHG Protocol rules.

Table 2: Broadmeadow Farms consolidation approach under ISO rules

Entity	Rationale	Inventory inclusion
Broadmeadow Farms Pty Ltd (cropping)	Operated and managed by Broadmeadow	100% of emissions and removals included
Daly Family Trust (livestock)	Operated by Broadmeadow Farms, day-to-day control exercised by same management	100% of emissions and removals included
Grain Storage Co-operative (20% share)	No operational control	Excluded (but may be reported separately as an investment or scope 3 category)

Appendix C - Leased lands and agistment

Leases

Under revised Australian Accounting Standards Boards AASB standards (AASB 16 Leases) almost all leases are now treated as financial (capital) leases by the lessee. This means that right-of-use arrangements for leased assets in the agricultural sector (e.g. land, machinery, or buildings) are recognised on the *lessee's* balance sheet, and the lessee *controls the use of the asset* for the lease term and bears the associated risks and rewards.

As such, *the party who has control over the activities / operations* that generate emissions or removals is responsible for reporting Scope 1. Typically, this will be the lessee in most agricultural lease arrangements – as follows:

Lessee: The lessee generally has both *financial and operational control* of the leased asset. They determine how the leased asset is managed and bear the economic benefits and risks of its use. They report emissions or removals from the use of the leased asset as Scope 1.

Lessor: Retains legal ownership of the asset but typically has no operational control once the lease is in place. The lessor, where relevant may report *Scope 3 (downstream leased-asset)* emissions associated with the lessee's use of the asset. However, if the lessor is directing land use change on leased land then the lessor retains Scope 1 reporting responsibility and the lessee would treat as Scope 3.

See Table 1 for more guidance.

Table 1 - Scope 1 or Scope 3 reporting responsibilities for lessees and lessors on leased lands

Consolidation approach	Responsibilities	Lessee activities	Example sources / sinks	Lessee treatment	Lessor's treatment
Operational or financial control	Lessee manages the land	Grazing or cropping operations	Enteric CH_4, manure N_2O, soil N_2O (fertiliser, grazing)	Scope 1 – Lessee reports as direct emissions	Scope 3 (downstream) – Lessor reports as indirect emissions
Operational or financial control	Lessee initiates and implements the land use change	Land use change (initiated by lessee) - e.g. clearing woody vegetation	Vegetation clearing or planting	Scope 1 (LULUCF) – Lessee reports as direct emissions.	Scope 3 (downstream) – Lessor reports as indirect emissions
Operational or financial control	Lessor directs (or implements) land use change	Land use change *directed by the lessor* (e.g. clearing required pre-lease)	Vegetation clearing or planting	Scope 3 (upstream) – Lessee reports emissions as indirect emissions.	Scope 1 (LULUCF) – Lessor reports as direct emissions.
Equity share	Joint management	Share farming or joint operation (e.g. grazing or cropping) on leased lands	All relevant agricultural and land-use sources in proportion to equity share.	Scope 1 (pro-rata) – Report share of total emissions and removals from land use.	Scope 1 (pro-rata) – Report share of ownership or retained equity.

Agistment

In these Guidelines, reporting responsibility for Scope 1 versus Scope 3 emissions from agisted stock depends on who exercises operational control and receives the most financial benefit from the agisted livestock's performance.

Note, under the GHG Protocol Agricultural Guidance, the landholder always assumes Scope 1 emissions reporting responsibilities regardless of who maintains operational or financial control of the animals. If required to report using GHG Protocol, an entity could either choose to follow the GHG Protocol Agricultural Guidance rules, or transparently document the treatment of agisted animals in line with the rules below.

In the case where equity-share is selected as the consolidation approach, or operation or financial control is unclear, Scope 1 reporting responsibilities shall be assumed by the livestock owner.

Agistment in Australia typically falls into one of 2 broad scenarios. Either:

- the landholder takes primary responsibility for management and performance of agisted stock; or
- the livestock owner continues to manage the stock and their performance on the landholder's land.

Scenario 1 – operational control of livestock maintained by the landholder

In this scenario, the landholder takes primary responsibility for day-to-day management of the agisted stock and is financially rewarded for their performance.

Because the landholder is operationally responsible for the agisted stock, they are responsible for reporting Scope 1 livestock emissions (enteric and manure), along with any land-use, land-use change, and forestry (LULUCF) emissions or removals associated with the property.

Typical indicators of this scenario include:

- The landholder makes daily management decisions about feeding, breeding, veterinary care, and animal movements.
- The landholder accepts production risk, such as changes in mortality or growth rates.
- The landholder is financially rewarded for herd performance, for example, being paid per kilogram of liveweight gain rather than a simple pasture-lease fee.

Rules

Scope 1 livestock emissions: If the landholder manages the stock *as if they were their own*, they are deemed to have operational or financial control and therefore shall include the emissions in their Scope 1 inventory.

Scope 3 Livestock emissions: The livestock owner shall report the enteric and manure emissions as part of their Scope 3 emissions.

Scope 1 LULUCF emissions: The landholder shall report LULUCF emissions or removals associated with the property as their Scope 1.

Scenario 2 – operational control of livestock maintained by the livestock owner

In this scenario, the livestock owner retains management control over the agisted animals and receives the economic benefits from animal performance (e.g. does not pay the landholder for kilogram of liveweight gain).

The landholder only provides access to feed and water, and general supervision of the property. The livestock owner is deemed to have operational and financial control of the agisted animals and shall therefore report 100% of enteric and manure emissions as their Scope 1 emissions. Any land use, land use change, and forestry (LULUCF) emissions or removals associated with the property would be reported as the landholder's Scope 1 emissions.

Typical indicators of this scenario include:

- the livestock owner retains the production risk (e.g. animal health, weight gain, or losses)
- the livestock owner makes all financial and management decisions about the herd
- the landholder's role is limited to providing pasture or agistment facilities, without directing herd management or benefiting from performance.

Rules

Scope 1 livestock emissions: If the livestock owner retains day-to-day management and receives the primary economic benefit from livestock performance, the livestock owner shall report all enteric and manure Scope 1 emissions associated with the agisted livestock.

Scope 3 Livestock emissions: The landholder's role is limited to providing access to feed or water, or general oversight, without directing management or benefiting financially from herd performance. The landholder shall report the enteric and manure emissions from agisted livestock as their Scope 3 emissions.

Scope 1 LULUCF emissions: The landholder shall report LULUCF emissions or removals associated with the property as their Scope 1.

Table 2 provides example scenarios for agistment and Scope 1 or 3 reporting responsibilities.

Table 2: Agistment scenarios

Scenario and Activity	Livestock Owner Reporting Responsibility	Landholder Reporting Responsibility	Notes on consolidation approach
Short-term agistment, livestock owned by farmer, no land management changes; no landholder management of animals (other than presence on land)	Scope 1	Scope 3: may optionally disclose animal emissions	Livestock owner retains operational & financial control of herd. Landholder provides feed/water access.
Long-term / managed agistment where *landholder* makes animal management decisions	Scope 3 (under other Upstream Leased Assets)	Scope 1	Landholder effectively controls herd operations and bears production risk.
Agistment fee tied to animal performance (custom feeding)	Scope 3 (under other Upstream Leased Assets)	Scope 1	Landholder effectively controls herd operations and bears production risk.
Landholder clears land / sows pasture for agistment	No obligation to report emissions	Scope 1	Landholder exercises operational control of land. LUC emissions split proportionally only if equity shared.
Landholder applies fertiliser / irrigates	No obligation to report emissions	Scope 1	Landholder's direct emissions.

Appendix D - Criteria for applying Method 3 approaches

This appendix provides draft proposed rules and criteria for Method 3 approaches for consultation purposes.

If an entity chooses to use a Method 3 approach, the entity shall document the approach and rationale for its selection, including information to demonstrate that the approach yields accurate, consistent and reproducible results (e.g. provide uncertainty ranges or confidence levels). To ensure Method 3 approaches are robust and credible, they shall meet a set of minimum criteria as described below.

Method 3 approaches shall either be:

1. **Consistent with a method published in a peer reviewed scientific journal**[18]**.** The study from which the method has been taken shall be relevant to the context (e.g. farming system, environment) in which it is being used to estimate GHG emissions or removals. For example, a method for estimating emissions reductions associated with a feed supplement that is derived from confinement fed animals cannot be applied to a pasture-based system. This requirement ensures that only methods that are applicable to the system being assessed are used.

2. **Consistent with a methodology from a carbon crediting program that has International Carbon Reduction and Offset Alliance (ICROA) accreditation.** The system to which the methodology is applied shall be an eligible system under that methodology.

In addition, data used for Method 3 approaches shall be:

1. **Compliant with domestic or international measurement standards.** Where a Method 3 approach relies upon the direct measurement of a GHG in the field, compliance with a relevant domestic or internationally recognised standard shall be demonstrated for the period during which measurements were taken. This requirement is to ensure the approach yields accurate, consistent and reproducible results.

2. **Accredited laboratory**. Where a Method 3 approach uses data from laboratory analysis, documentation shall be provided that the laboratory was accredited by a relevant internationally or domestically recognised standard for the analysis performed at the time of analysis (e.g. ISO 17025 – General Laboratory Accreditation; National Association of Testing Authorities). The analysis method and any sample preparation shall be consistent with those used in published literature, be fit for purpose and reported.

[18] A scientific journal shall be classified as a level 1 or 2 journal on the Norwegian Register For Scientific Journals, Series and Publishers (kanalregister.hkdir.no/en)

Appendix E – Entity Inventory Reporting Template

Note *blue italicised text* in boxes throughout the Reporting Template is example text only.

Entity information

Entity name and ABN/s	
Business profile and structure	[Outline type of operation] *e.g. mixed farming system producing grain, legumes and sheep meat and wool.*
Organisational boundary approach	☐ Operational control ☐ Financial control ☐ Equity share
Property locations	*E.g. 3 properties in Victoria Wimmera and Mallee*
Production types and areas	*E.g. Property 1: Wimmera. Area (e.g. #ha) under each production type. Lot and DP identifiers.*
Conditions experienced during reporting period or any material changes in boundary	[List significant events affecting emissions (e.g. bushfire, destocking in drought, stage in production cycle)]
Entity contact	[name and contact details]

Summary information

Reporting year	*2025 (e.g. financial reporting year; calendar year)*
Reporting period (if relevant)	*2020-2025*
Reporting year - net emissions (a)(b)	t/CO_2-e
Reporting period – net emissions (if relevant)	t/CO_2-e
Base year (or period) (if relevant)	
Base year (or period) – net emissions	t/CO_2-e
GWP metric source	*GWP100 - IPCC AR5*
GHG calculator used (if applicable)	

(a) Land management activities can lead to both emissions and removals of biogenic CO_2. These are summed to give net biogenic CO_2. Net removals should be reported as a negative value. Net in this context does refer to adjustments for purchased or sold carbon credits.

(b) Entity may present separate net emissions estimates when applying the market-based scope 2 method or the HWP approach, or when adjustments are required for generated and sold ACCUs. Any such separate estimates shall be clearly distinguished and identified in the reporting.

Emissions and removals by source and sink category

Scope	Source / Sink Category	Gas	Method	Mass of gas (t)	GWP	Net Emissions (t CO_2-e) [(a)]
Scope 1 emissions						
Scope 1	*e.g. enteric fermentation (sheep)*	*CH_4*	*1*	*45*	*28*	*1260*
Scope 1	*manure management*	*N_2O*	*2*	*3.2*	*265*	*848*
Scope 1	*fuel combustion*	*CO_2*	*1*	*160*	*1*	*160*
Scope 1 total						***2108***
Scope 2 emissions						
Location-based	*purchased electricity*	*CO_2-e*	NA	*420*	*n/a*	***420***
Scope 3 emissions						
Scope 3	*purchased feed*	*CO_2-e*	1	*380*	*n/a*	*380*
Scope 3	*purchased seeds & fertilisers*	*CO_2-e*	1	*160*	*n/a*	*160*
Scope 3	*upstream fuel*	*CO_2-e*	1	*95*	*n/a*	*95*
Scope 3 total						***635***
Biogenic CO_2 [(a)]						
Scope 1	*Land clearing*	*Biogenic CO_2*	*2*	*520*	*1*	*520*
Scope 1	*Revegetation*	*Biogenic CO_2*	2	*-1240*	*1*	*-1240*
Biogenic CO_2 total						***-720***

(a) Land management activities can lead to both emissions and removals of biogenic CO_2. These are combined to present net totals. Net removals should be reported as a negative value. Net in this context does not refer to adjustments for purchased or sold carbon credits. Biogenic carbon totals should not be netted with fossil carbon emissions.

Totals by gas

Gas	Scope 1 (t)	Scope 2 (t)	Scope 3 (t)	Total (t)	GWP	Net Emissions (t CO_2-e) [(a)]
Non-biogenic CO_2	160	420	635	1215	1	1215
Biogenic CO_2 [(a)]	-720			-720	1	-720
CH_4	45			45	28	1260
N_2O	3.2			3.2	265	848
Other gases						
Other gases						
TOTAL						**2603**

(a) Land management activities can lead to both emissions and removals of biogenic CO_2. These are combined to present net totals. Net removals should be reported as a negative value. Net in this context does not refer to adjustments for purchased or sold carbon credits.

Market-based Scope 2 estimate (if relevant)

Type	Unit	Amount	Source / evidence
Scope 2 (Market-based)	t CO_2-e-		
Amount of electricity purchased from the grid	kWh		Retailer invoice
Eligible Renewable Energy Certificates (RECs) voluntarily surrendered (includes Green Power and large-scale generation certificates)	MWh		Clean Energy Regulator (CER) REC registry / retailer invoice
Eligible RECs issued for electricity produced and consumed on site (included LGCs)	MWh		CER REC registry
Renewable power percentage under the Large-scale Renewable Energy Target	%		CER
Residual mix factor for state	kg CO_2-e/MWh		NGA factors
Supplementary information			

Type	Unit	Amount	Source / evidence
Eligible RECs issued for electricity produced exported	MWh		CER REC registry

Emissions sources and sink categories excluded in this inventory

Scope	Source / sink category not estimated	Gas type/s	Reason for exclusion	Estimated quantitative impact on inventory (if possible)
Scope 3	*Purchased goods mineral salt licks*	*CO_2-e*	*Impractical to measure; inadequate data / EFs to calculate*	Unquantified
			[e.g. impractical to measure, no measurement methodology, lack of data, not material and unlikely to influence stakeholder decisions]	

Land Use, Land Use Change and Forestry (biogenic carbon)

Lot and Deposited Plan number	Area (ha)	Date of event	Activity type	Method	Total Emissions/Removals (t CO_2-e)
			e.g. Vegetation clearance (VC)		
			e.g. Increasing tree biomass by reducing severity of late dry season burns		

Carbon credits (if relevant)

Credit status	Type	Lot / DP identifiers (where relevant)	Credits (t CO_2-e)	Crediting scheme	Credit registry & ID	Credit Retirement date
Generated and retired	On site project – plantation			*[e.g. ACCU]*		
Generated and sold	On site project – plantation					
Purchased	Unknown					

Methods and data quality

Scope	Source or sink	Estimation method	Activity data or input parameter	Data source	Data quality rating Temporal	Data quality rating Spatial	Data quality rating Sample size	Data quality rating Scope 3 EF
1	*e.g. enteric fermentation – grazing sheep*	*Method 2*	*Number of animals in each class*	*Farm records – full herd muster from 18 months ago*	*3*	*4*	*5*	*n/a*
			DMD and DMA	*Default state value*	*1*	*2*	*1*	*n/a*
			Liveweight gain	*Optiweigh data from one paddock (<20% of herd) monitored over 12 months of reporting period*	*5*	*4*	*2*	*n/a*
1	*Fertiliser use (non-irrigated pasture)*	*Method 1*	*Amount of fertiliser applied*	*Farm data records (management software) on application rates (not estimates) for all paddocks*	*5*	*4*	*5*	*n/a*

Scope	Source or sink	Estimation method	Activity data or input parameter	Data source	Data quality rating Temporal	Data quality rating Spatial	Data quality rating Sample size	Data quality rating Scope 3 EF
1	*Crop residue management*	*Method 1*	*Annual production of crop (tonnes)*	*Yield map on a field basis from calibrated yield monitor on header for reporting year*	*5*	*4*	*5*	*n/a*
			Crop attributes	*Default national value from Method 1*	*1*	*1*	*1*	*n/a*
2	*Purchased energy*	*Location Method*	*kW electricity consumption*	*Quarterly consumption and supply invoices for all metered points*	*5*	*n/a*	*5*	*n/a*
3	*Purchased fertiliser*	*Method 2*	*kg of fertiliser used*	*Purchase invoices for reporting year.*	*5*	*5*	*5*	*n/a*
			Emissions factor	*Supplier-reported EFs.*	*n/a*	*n/a*	*n/a*	*4*
1	*Woody carbon stocks*	*Method 2*	*Date of regeneration*	*Site photography*	*4*	*4*	*1*	*n/a*
			Area of regeneration	*Satellite imagery*	5	5	5	n/a

Appendix F – Product Emissions Intensity Reporting Template

Entity name	*e.g. Broadmeadows Farm*
Production system type	*e.g. Annual crop / Perennial tree crop / Dairy / Poultry / Aquaculture Prawns/ Mixed*
Year	*e.g. 2025*
System boundary (defined gate)	*[if gate varies between main products provide detail in Output classification table]* *Cradle-to-gate (farm gate) - Includes all emission and removal processes from primary production system to the farm gate including storage of milk prior to collection*
GWP Framework applied	*e.g. GWP100 - IPCC AR5*

Output classification

Output	Classification	System boundary stage	Production Cycle	Averaging period for reporting (if applied)	Basis for average period selection	Notes (include gate definition if differs between main products)
Wheat	*Main product*	*Cradle-to-gate*	*1 year*	*3 years*	*Cover full crop rotation cycle*	*Wheat grown in 3-year rotation with chickpeas*
Chickpeas	*Main product*	*Cradle-to-gate*	*1 year*	*3 years*	*Cover full crop rotation cycle*	*As above*
Sheep meat	*Main product*	*Cradle-to-gate*	*1 year*	*5 years*	*Manage interannual variability*	
Wool	*By-product*	*Cradle-to-gate*	*1 year*	*5 years*	*Manage interannual variability*	
Manure sold as organic fertiliser	*By-product*	*Cradle-to-gate*	*1 year*	*5 years*	*Manage interannual variability*	
Manure and crop residue disposed of on-site	*Waste*	*Cradle-to-gate*	*1 year*	*NA*	*NA*	

Emission intensity of products

[For reporting averaged emission intensity create a separate table with production quantities and emissions and removal columns removed]

Product / Output	Output Type	Declared unit (DU)	Annual Production Quantity	Quantity Unit	Emissions or removals Land clearing [a]	Emissions or removals Reveg and Regen [a]	Emissions (excl. A & B)	Total emissions and removals [a]	Total Emission Intensity incl. A&B	Emission Intensity excl. B)	Emission Intensity excl. A&B
					A	B	C	A+B+C	(A+B+C)/DU	(A+C)/DU	C/DU
					(t CO2-e) ()				kg CO_2-e / declared unit		
Wheat grain	*Main*	*kg grain*		*t*							
Wheat straw (baled)	*By-product or Residue*	*kg straw*		*t*							
Sheep meat	*Main*	*kg liveweight*		*t*							
Wool	*By-product*	*kg greasy wool*		*t*							
Manure (sold as organic fertiliser)	*By-product*	*kg manure*		*t*	*NA*	*NA*					

(a) Removals should be expressed as a negative number

Emissions and removals by process

[Prepare separate table for each stage if applicable. Add additional columns if multiple main products, by-products or residues]

System boundary stage	*Eg Cradle-to-gate, gate-to-factory gate, gate-to-point-of-first-sale*

Process (module)	Scope	Main Product Emissions (t CO_2e)	Main Product Emissions (t CO_2e)	By-product Emissions (t CO_2e)	Residue Emissions (t CO_2e)	Sub-division / allocation	Method [additional info reference #]
		Wheat	*Meat*	*Wool*	*Manure*		
Enteric Fermentation	*Scope 1*				*NA*	*Allocation*	*Allocated to meat and wool (physical) [1]*
Manure management	*Scope 1*				*NA*	*Allocation*	*Allocated to meat and wool (physical) [1]*
Inorganic Fertiliser	*Scope 1*				*NA*	*Subdivision and allocation*	*Subdivision wheat and sheep based on production system specific data [2]. Sheep emissions allocated to meat and wool [1]*
Organic Fertiliser	*Scope 1*				*NA*	*Allocation*	*Manure deposited on pastures. Emissions allocated to meat and wool [1]*
Fuel use	*Scope 1*					*Subdivision and allocation*	*Subdivision wheat, sheep and manure based on representative data [3]. Sheep emissions allocated to meat and wool [1]*
Land Use Change - Land clearing	*Scope 1*				*NA*	*Subdivision and allocation*	*Subdivision wheat and sheep based on purpose of clearing [4]. Sheep emissions then allocated to meat and wool) [1]*
Purchased energy	*Scope 2*					*Subdivision*	*Electricity for wool shed assigned to wool based on meter data [5]*
Purchased feed	*Scope 3*				*NA*	*Allocation*	*Allocated to meat and wool [1]*
Purchased fertiliser	*Scope 3*				*NA*	*Subdivision and allocation*	*Subdivision wheat and sheep based on fertiliser use [2]. Sheep emissions allocated to meat and wool) [1]*
Upstream fuel emissions	*Scope 3*					*Subdivision and allocation*	*As per fuel use*
Upstream freight (purchased goods)	*Scope 3*				*NA*	*Subdivision and allocation*	*Subdivision wheat and sheep based on purpose of purchased products [6]. Sheep emissions allocated to meat and wool [1]*

Process (module)	Scope	Main Product Emissions (t CO_2e)	Main Product Emissions (t CO_2e)	By-product Emissions (t CO_2e)	Residue Emissions (t CO_2e)	Sub-division / allocation	Method [additional info reference #]
		Wheat	*Meat*	*Wool*	*Manure*		
Upstream purchased electricity	*Scope 3*					*Subdivision*	*As per purchased electricity*
Total							

Additional information on allocation methods

Reference #	Products/ production system	Process (module)	Method	Basis for allocation	Source	Other Evidence
1	*Sheep meat and wool*	*General*	*Allocation - Physical*	*Relative mass of protein in liveweight (18% protein) and clean wool (100% protein)*	*Product category rule - Australia*	
2	*Wheat and sheep production*	*Purchased fertiliser and fertiliser use*	*Subdivision – Production system specific data*	*Fertiliser emissions estimated separately for sheep and cropping paddocks*	*Fertiliser application data collected a paddock level*	*Farm records*
3	*Wheat and sheep production and manure*	*Fuel Use*	*Subdivision – Representative data*	*Ratio of fuel use for crop and sheep management activities*	*fuel use rules of thumb for different management practices derived from farm records*	*Management activities undertaken (e.g. cultivation, spraying, harvesting, mustering, transport of goods) for different production systems from farm records*

Processes excluded in each stage

[Prepare separate table for each stage if applicable]

System boundary stage	*E.g. Cradle-to-gate, gate-to-factory gate, gate-to-point-of-first-sale*
Products	*E.g. Sheep meat (main product) and wool (by-product)*

Process	Scope	Reason
Purchased good X	*Scope 3*	*Data not available to estimate emissions*
Purchased service X	*Scope 3*	*Emissions assessed as not material*
Capital goods	*Scope 3*	*Not required - emissions deems as not material*
Employee travel	*Scope 3*	*Not required - emissions deems as not material*
Business travel	*Scope 3*	*Not required - emissions deems as not material*

Allocation methods sensitivity analysis (if applicable)

Method tested	Allocation fractions	Emissions per declared unit change (%)	Comment
Base method			
Alternative 1			
Alternative 2			

Questions: Reporting templates

AF1 Do the reporting templates at Appendix E and Appendix F capture the right GHG emissions information for Australian production systems?
AF2 Do you have suggestions for improvement? Please state the name of the table when making suggestions.

Appendix G- Key terms

Note: Key terms can be defined differently across standards and frameworks. Users of these Guidelines should verify definitions against the specific requirements applicable to their reporting needs.

Term	Definition
Activity data	Quantitative measure of an activity over a specified period, that results in *GHG emissions* or *removals*. Examples: numbers of livestock and their liveweight gain; tonnes of fertiliser applied; litres of fuel used.
Anthropogenic	Caused or influenced by people, either directly or indirectly *(as opposed to non-anthropogenic or natural processes)*
Biogenic carbon	Carbon that is contained in or derived from biomass. Biogenic carbon is quantified and disclosed separately from non-biogenic carbon emissions.
By-product	An output that has economic value but is not the primary product that the entity seeks to produce e.g. surplus calves from a dairy or culled-for-age ewes
Carbon credit	A tradeable instrument (certificate) representing a reduction, removal or avoidance of one metric tonne of *carbon dioxide equivalents (tCO_2-e)* that has been achieved relative to a baseline.
Carbon dioxide equivalent (CO_2-e)	A standard unit for comparing emissions of different greenhouse gases by expressing them as the amount of CO_2 that would have the same warming effect over a set period (usually 100 years).
Emission factor	A representative value that quantifies the GHG *emissions* or *removals* per unit of an activity. Emission factors are often based on a sample of measurement data, averaged to develop a representative rate of emission for a given activity level under a given set of operating conditions. Example: kg methane (CH_4) per animal per day.
Emissions intensity	The quantity of *emissions* per unit of product. Emissions intensity can be expressed per unit of total mass, mass of protein or energy, or economic value of production. Example: kg CO_2-e per kg meat
Entity	A defined organisation or operational unit that is responsible for, and reports, greenhouse gas emissions (as defined by the operational boundary).
Global warming potential (GWP)	A factor describing the radiative forcing impact (on the atmosphere) of one unit of a given GHG relative to one unit of CO2. The GWP represents the *combined effect* of: • the differing times that GHGs remain in the atmosphere • and their different effectiveness in causing radiative forcing (that is, in heating the Earth's atmosphere).

Term	Definition
	GWP is measured in units of carbon dioxide equivalents (CO_2-e). The most common time horizon is 100 years (GWP100).
Greenhouse gas (GHG)	Gases that absorb and emit radiation causing the greenhouse effect. These gases include the 7 greenhouse gases listed in the Kyoto Protocol—carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); nitrogen trifluoride (NF_3); perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). GHGs differ in their potency as a GHG and their atmospheric lifetime.
Land use, land use change and forestry (LULUCF)	GHG inventory sector encompassing emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change, and forestry activities. This includes activities such as afforestation, reforestation, deforestation, forest management, land management.
Main product	An output with economic value that is the primary product the entity seeks to produce e.g. milk from a dairy
Method	The procedures for measurement and estimation of *GHG emissions* and *removals*.
Mitigation	Human intervention to reduce the sources or enhance the sinks of greenhouse gases.
National Greenhouse Accounts (NGA)	Australia's National Greenhouse Accounts provide detailed estimates of the nation's greenhouse gas (GHG) emissions, including where they come from and how they change over time. The NGA methods for estimating GHG emissions and removals provide the foundation for these Guidelines. Published by the Department of Climate Change, Energy, the Environment and Water (DCCEEW).
National Greenhouse and Energy Reporting (NGER) scheme	The National Greenhouse and Energy Reporting (NGER) scheme is a single national framework for reporting company information about: • greenhouse gas emissions • energy production • energy consumption. Facilities producing annual emissions over 25 kt CO_2-e, or corporate groups with emissions over 50 kt CO_2-e, are required to undertake NGER reporting.
Removal	Removal of greenhouse gases and/or their precursors from the atmosphere by a sink (storing them in plants, soils, oceans, or engineered systems (like carbon capture and storage).
Residual output	An output with no economic value, but which has a subsequent use and that is not intentionally managed as part of the production process. E.g. feedlot manure, poultry litter, crop stubble. Residual outputs become by-products if they are sold.
Science-based targets initiative (SBTi)	An initiative that aims to support companies to set *GHG emission* reduction and *net zero* targets in line with climate science and *Paris Agreement* goals.

Term	Definition
Sink	A reservoir, process, or mechanism that removes a greenhouse gas, an aerosol, or a precursor of a greenhouse gas from the atmosphere.
Soil carbon **Soil organic carbon**	*Carbon* present in the soil carbon pool. Soil carbon usually refers to soil organic carbon. Soil organic carbon is derived from *biomass*, such as leaf litter, dead roots and manure. Carbon constitutes about 50% of the dry mass of soil organic matter. In alkaline soils, carbon can also be present as soil inorganic carbon, e.g., as carbonate.
Source	A process, activity or mechanism that releases a *GHG*, an aerosol or a precursor to a GHG into the atmosphere.
Waste	An output that requires disposal, such as silage wrap.