Methodological Document
AFOLU PROJECTS

BCR0015
Improved Livestock and Grazing Management

BioCarbon Cert®

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Table of contents

List of tables

Acronyms and abbreviations

AFOLU	Agriculture, Forestry and Other Land Use
AGB	Aboveground biomass
BAU	Business-as-usual
BGB	Belowground biomass
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
GHG	Greenhouse gas
GIS	Geographic Information System
IPCC	Intergovernmental Panel on Climate Change
MRV	Monitoring, reporting and verification
SOC	Soil organic carbon
QA/QC	Quality assurance and quality control

1 Introduction

This methodology provides a robust and comprehensive framework for quantifying greenhouse gas (GHG) emission reductions and removals resulting from improved and regenerative livestock and grazing management practices. It is structured to support project developers in demonstrating measurable, additional, and verifiable climate outcomes under the BioCarbon Standard.

Livestock production systems are a significant source of GHG emissions globally and represent a major component of national GHG inventories, particularly in regions where grazing-based systems dominate land use. According to FAO (2013), the livestock sector contributes approximately 14.5% of total anthropogenic GHG emissions, a figure that has been subject to ongoing methodological refinement in subsequent assessments (FAO, 2022; FAOSTAT, 2020) and presents significant mitigation potential across production systems (Henderson et al., 2015). The principal emission sources within this sector are enteric fermentation in ruminants, manure management, and land-use changes associated with pasture expansion. These systems are also widely recognized within Nationally Determined Contributions (NDCs) as priority sectors for climate change mitigation and adaptation, reflecting both their contribution to national emission profiles and the vulnerability of the communities that depend on them.

Regenerative and improved livestock management has emerged as an approach to simultaneously address climate change, land degradation, and declining productivity in grazing systems. These practices aim to restore key ecological processes, including nutrient cycling, water infiltration, vegetation dynamics, and, under appropriate conditions, soil organic carbon (SOC) accumulation, through adaptive grazing, stocking rate management, and reduced soil disturbance (Teague et al., 2016; Gerber et al., 2013). While the potential for SOC sequestration under improved grazing is recognized in the scientific literature (Machmuller et al., 2015; Connant et al., 2017; IPCC, 2019), outcomes are highly context-dependent and vary with climate, soil type, management history, and intensity of intervention. This methodology therefore applies conservative and site-specific quantification approaches rather than assuming universal sequestration rates.

Many livestock systems operate under conditions of high climatic variability, heterogeneous landscapes, and varying management intensity. In such contexts, conventional practices frequently lead to degraded grasslands, reduced soil fertility, and inefficient resource use (Herrero et al., 2016). This methodology is designed to be applicable across these diverse conditions, supporting the transition toward improved and regenerative systems that enhance productivity while delivering measurable climate benefits.

When properly implemented, regenerative livestock systems can reduce methane (CH_4) emissions from enteric fermentation and manure management, while contributing to increases in SOC stocks and improving system resilience (Gerber et al., 2013; Stanley et al., 2018). This dual mitigation pathway reflects the integrated nature of livestock systems under the Agriculture, Forestry and Other Land Use (AFOLU) sector, as defined in the IPCC Guidelines (IPCC, 2006; IPCC, 2019).

This methodology translates these principles into a quantifiable and verifiable framework, ensuring that all claimed emission reductions and removals are measurable, additional, conservative, and supported by robust monitoring, reporting, and verification (MRV) procedures. Eligible practices, including adaptive grazing, stocking rate management, forage improvement, and restoration of degraded grasslands, qualify under this methodology where they result in demonstrable GHG benefits.

The designation of a system or practice as “regenerative” shall not, in itself, constitute evidence of emission reductions, removals, or additionality. All outcomes shall be demonstrated through consistent and transparent quantification approaches aligned with internationally recognized methodologies, including the IPCC Guidelines for National GHG Inventories (IPCC, 2006; IPCC, 2019) and ISO 14064-2:2019.

This methodology adopts a net GHG accounting approach, whereby emission reductions and carbon removals are quantified in an integrated manner. Any increases in emissions attributable to project activities shall be fully accounted for, and only net GHG emission reductions and removals shall be eligible for crediting.

2 Objectives

The objective of this methodology is to provide a comprehensive, transparent, and scientifically robust framework for quantifying net greenhouse gas (GHG) emission reductions and removals resulting from improved and regenerative livestock and grazing management practices.

This methodology establishes procedures to:

(a) Identify the most plausible baseline reflecting existing livestock and land management practices;

(b) Ensure that emission reductions and removals are additional through regulatory, common practice, and barrier or investment tests;

(c) Quantify CH_4 emissions from enteric fermentation, CH_4 and N_2O emissions from manure management (where applicable), and CO_2 removals through increases in soil organic carbon (SOC) and, where relevant, biomass carbon;

(d) Account for all relevant emission sources and sinks, including any increases in emissions attributable to project activities;

(e) Identify and quantify emissions occurring outside the project boundary as a result of project activities;

(f) Ensure that carbon removals are subject to monitoring and risk management provisions to address potential reversals;

(g) Define consistent procedures for data collection, monitoring, and verification;

(h) Apply conservative assumptions to avoid overestimation of emission reductions and removals.

3 Scope

This methodology applies to the quantification of greenhouse gas (GHG) emission reductions and removals resulting from improved and regenerative livestock and grazing management practices.

The methodology covers livestock production systems in which project activities lead to measurable changes in:

(a) methane (CH_4) emissions from enteric fermentation;

(b) methane (CH_4) and nitrous oxide (N_2O) emissions from manure management, where relevant;

(c) soil organic carbon (SOC) stocks;

(d) carbon stocks in biomass, where included.

The methodology is applicable to livestock systems based on grazing, including extensive, semi-extensive, and mixed production systems, as well as systems undergoing transition toward improved management conditions.

Project activities under this methodology shall involve changes in livestock and grazing management practices that influence GHG emissions and/or carbon stocks at the project level. These may include, but are not limited to:

(a) grazing management adjustments;

(b) herd and stocking management;

(c) forage and pasture management;

(d) soil management practices;

(e) manure management practices.

The methodology is designed to be applicable across a wide range of environmental and management conditions, including systems with varying levels of management intensity, climatic variability, and land-use heterogeneity.

The methodology is not limited to technology-based interventions and applies primarily to management-driven mitigation approaches.

This methodology adopts a net GHG accounting approach, integrating both emission reductions and removals within a single framework. Only net GHG emission reductions and removals shall be eligible for crediting.

4 Version

This methodological document constitutes the Public Consultation Version 1.0 of BCR0015 – Improved Livestock and Grazing Management for Net GHG Emission Reductions and Removals.

This version is released for public consultation purposes only and does not enter into force until it is formally approved and published by BioCarbon Cert.

Following the public consultation process, BioCarbon Cert may revise this document to incorporate comments received from stakeholders. Only the final approved version, as published on the official BioCarbon Cert website, shall be considered valid for the registration of new projects under the BioCarbon Standard.

Until such approval and publication, project registration under this methodology shall not be permitted based on this consultation version.

5 Applicability conditions

5.1 General applicability

This methodology applies to project activities implemented in livestock production systems where measurable changes in livestock and grazing management practices result in greenhouse gas (GHG) emission reductions and/or removals.

Projects shall demonstrate a clear causal link between implemented management changes and observed GHG outcomes.

The methodology is applicable to grazing-based livestock systems, including:

(a) extensive grazing systems;

(b) semi-extensive and mixed livestock systems;

(c) integrated crop-livestock systems;

(d) systems undergoing transition toward improved management conditions.

5.2 Eligible project activities

Project activities shall involve verifiable changes in livestock and grazing management practices that result in:

(a) reductions in methane (CH_4) emissions from enteric fermentation and/or manure management; and/or

(b) increases in soil organic carbon (SOC) stocks.

Eligible activities may include, but are not limited to:

(a) implementation of rotational or adaptive grazing systems;

(b) adjustment of stocking rates;

(c) improvement of forage quality and composition;

(d) restoration of degraded grasslands;

(e) reduction of soil disturbance;

(f) improved manure management practices.

The implementation of technologies (e.g., anaerobic digesters) may be included but shall not be a requirement for applicability.

5.3 System characteristics

This methodology is applicable to livestock systems characterized by:

(a) variable management intensity;

(b) heterogeneous grazing patterns;

(c) variable productivity levels;

(d) limited or evolving levels of technical management;

(e) degraded or partially degraded grasslands.

These characteristics shall be documented and justified in the baseline scenario.

5.4 Climate and environmental conditions

Project activities may be implemented under a wide range of climatic and environmental conditions, including:

(a) tropical, temperate, and semi-arid systems;

(b) systems with seasonal or interannual climatic variability;

(c) drought-prone or water-limited environments.

Project holders shall demonstrate that observed GHG emission reductions and removals are attributable to changes in management practices and not solely to climatic variability.

5.5 Project scale and aggregation

This methodology may be applied to:

(a) individual livestock operations;

(b) grouped or aggregated project structures.

(c) Where aggregation is applied, project holders shall ensure:

(d) appropriate stratification of project areas;

(e) representativeness of sampling approaches;

(f) conservative estimation of GHG emission reductions and removals.

5.6 Applicability constraints

The following conditions shall apply:

(a) Projects shall demonstrate absolute net GHG emission reductions and/or removals;

(b) Improvements in emission intensity alone shall not be sufficient for crediting;

(c) Project activities shall not result in net increases in GHG emissions;

(d) Project activities shall be implemented and maintained throughout the crediting period;

(e) Conversion of natural ecosystems for the purpose of generating credits shall not be permitted.

5.7 Excluded activities

The following activities shall not be eligible under this methodology:

(a) activities based solely on the installation of a single technology without changes in management practices;

(b) systems where no measurable change in management practices can be demonstrated;

(c) activities resulting in unaccounted displacement of emissions (leakage).

6 Normative references

The following documents are normative references for the application of this methodology. For dated references, only the version cited applies. For undated references, the latest version shall apply.

- Intergovernmental Panel on Climate Change (IPCC) (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use (AFOLU);
- Intergovernmental Panel on Climate Change (IPCC) (2019). 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories;
- ISO 14064-2:2019. Greenhouse gases — Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements;
- BCR Standard (latest version);
- BioCarbon Additionality Tool (latest version);
- BioCarbon MRV Tool (latest version);
- BioCarbon Leakage Tool (latest version);
- BioCarbon Uncertainty Tool (latest version);
- BioCarbon Avoiding Double Counting Tool (latest version);
- BioCarbon Sustainable Development Safeguards SDS (latest version).

Where inconsistencies arise between referenced documents, the requirements of the BioCarbon Standard shall prevail.

7 Terms and definitions

Absolute emissions

Total GHG emissions within the project boundary, expressed in tonnes of CO_2 equivalent (tCO_2e).

Additionality

The condition that emission reductions or removals would not have occurred in the absence of the project activity.

Baseline scenario

The most plausible scenario of livestock and land management practices that would occur in the absence of the project activity.

Carbon removals

The net transfer of carbon dioxide (CO_2) from the atmosphere into carbon pools, including soil and, where applicable, biomass.

Emission intensity

GHG emissions per unit of output (e.g., per unit of livestock product).

Emission intensity improvements alone shall not be sufficient for crediting.

Enteric methane (CH_4) emissions

Methane emissions produced by microbial fermentation of feed in the digestive system of livestock.

Greenhouse gas (GHG)

Gases that contribute to the greenhouse effect, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Grazing system

A livestock production system in which animals obtain a significant portion of their feed intake from grazing vegetation.

Leakage

The increase in GHG emissions outside the project boundary that occurs as a result of project activities.

Livestock and grazing management

The set of practices that regulate animal type, stocking rate, grazing distribution, timing, and intensity, as well as land and forage management, influencing greenhouse gas emissions and carbon stocks.

Manure management emissions

Greenhouse gas emissions resulting from the handling, storage, treatment, and application of livestock manure, including methane (CH_4) and nitrous oxide (N_2O), where applicable.

Monitoring

The systematic collection of data to quantify GHG emissions and removals.

Net GHG balance

The total balance of GHG emissions and removals, accounting for all relevant sources, sinks, leakage, and uncertainty deductions.

Net GHG emission reductions and removals

The net climate benefit calculated as the difference between GHG emissions and removals under the project scenario and the baseline scenario.

Permanence

The longevity of carbon storage and the risk that stored carbon may be released back to the atmosphere.

Project boundary

The spatial and operational limits within which project activities and associated GHG emissions and removals are accounted.

Project scenario

The scenario reflecting actual conditions and management practices implemented under the project activity.

Regenerative livestock and grazing management

Livestock and grazing management practices aimed at improving soil function, increasing soil organic carbon, enhancing ecosystem processes, and improving system resilience and productivity.

The designation of a system or practice as "regenerative" shall not, in itself, constitute evidence of greenhouse gas emission reductions, removals, or additionality.

Reporting period

The period over which GHG emission reductions and removals are quantified and reported.

Reversal

The release of previously stored carbon back into the atmosphere.

Soil organic carbon (SOC)

The carbon component of organic matter present in soil.

Stocking rate

The number of animals per unit area over a defined period.

8 Project boundaries

8.1 Carbon pools and sources of emissions

The project boundary shall include all significant greenhouse gas (GHG) sources, sinks, and reservoirs affected by project activities.

Project holders shall identify, include, or exclude carbon pools and emission sources in a transparent and conservative manner, consistent with IPCC guidance.

Only those sources and sinks that are expected to result in material changes due to project activities shall be included in the quantification of GHG emission reductions and removals.

Table 1. Carbon pools included in the project boundary

Carbon pool	Baseline scenario	Project scenario	Included?	Justification
Soil organic carbon (SOC)	Yes	Yes	Yes	Primary carbon pool affected by livestock and grazing management. SOC changes represent the main source of removals under this methodology.
Aboveground biomass	Optional	Optional	Optional	May be included where project activities (e.g., silvopastoral systems) result in measurable and significant changes.
Belowground biomass	Optional	Optional	Optional	May be included where relevant and where robust quantification methods are applied.
Dead wood	No	No	No	Not a significant carbon pool in grazing systems and subject to high variability.
Litter	No	No	No	High turnover rates; considered to be in equilibrium with carbon inputs and outputs.
Harvested wood products	No	No	No	Not relevant to livestock and grazing management activities.

Biomass carbon shall only be included where long-term stock changes can be demonstrated and are not subject to rapid turnover.

The selection of included and excluded sources and sinks shall ensure completeness, consistency, and conservativeness in accordance with IPCC principles.

Table 2. GHG sources included in the project boundary

Source category	Gas	Baseline scenario	Project scenario	Included?	Justification
Enteric fermentation	CH_4	Yes	Yes	Yes	Major emission source in livestock systems; affected by changes in animal management, diet, and productivity.
Manure management (storage and treatment)	CH_4	Yes	Yes	Yes	Significant source of emissions, particularly under anaerobic conditions.
Manure management (storage and treatment)	N_2O	Yes (if relevant)	Yes (if relevant)	Conditional	Included where project activities significantly alter grazing distribution or manure deposition patterns. Otherwise, may be conservatively excluded with justification.
Soil emissions	N_2O	Yes (if relevant)	Yes (if relevant)	Conditional	Included where emissions are expected to be material and can be quantified using IPCC methods.

Soil carbon stock changes	CO_2	Yes	Yes	Yes	Represents removals through SOC increase; central to the methodology.
Biomass carbon stock changes	CO_2	Optional	Optional	Optional	Included only where measurable and where no double counting occurs.

All included sources and sinks shall be quantified using methods consistent with IPCC Tier 2 or higher approaches, where applicable.

Table 3. Sources excluded from the project boundary

Source category	Gas	Baseline scenario	Project scenario	Included?	Justification
Livestock respiration	CO_2	Yes	Yes	No	Considered biogenic and part of the natural carbon cycle; excluded per IPCC guidance.
Manure deposited on pasture (direct emissions)	CH_4 / N_2O	Yes	Yes	Conditional	May be excluded where emissions are negligible or highly uncertain; inclusion subject to materiality assessment.
Fossil fuel use (minor operations)	CO_2	Yes	Yes	Conditional	Included only where emissions are material and attributable to project activities.
Other minor sources	All	Yes	Yes	No	Excluded where emissions are demonstrably negligible.

Table 4. Leakage sources considered outside the project boundary

Leakage source	Gas	Included?	Justification
Displacement of livestock	CH_4 / N_2O	Yes (if applicable)	May result in increased emissions outside the project boundary due to relocation of grazing pressure.
Changes in land use outside boundary	CO_2 / N_2O	Yes (if applicable)	May occur if project activities shift production or land management elsewhere.
Other indirect effects	All	Conditional	Included where material and attributable to project activities.

All included sources and sinks shall be quantified using IPCC Tier 2 or higher approaches, where applicable.

8.2 Spatial and temporal boundaries

8.2.1 Spatial boundary

The spatial boundary of the project shall include all areas where project activities are implemented and where greenhouse gas (GHG) emission reductions and removals occur.

The project boundary shall be clearly defined and georeferenced prior to validation and shall remain consistent throughout the crediting period, unless justified adjustments are made in accordance with the BioCarbon Standard.

8.3 Project area

The project area shall be the geographically defined area under the control of the project holder where livestock activities are implemented.

The project area shall include:

(a) all grazing lands where livestock management practices are modified;

(b) areas where soil organic carbon (SOC) changes are expected to occur;

(c) areas where manure management practices are affected by project activities;

(d) all strata defined for monitoring and quantification purposes.

(e) supported by spatial data and documented justification.

(f) legal and policy context affecting land use.

Project holders shall ensure that:

(a) the boundary is defined using geographic coordinates and mapped using appropriate spatial tools;

(b) all areas are uniquely identified and documented;

(c) boundary delineation is consistent with land tenure and management control;

(d) areas included in the project are under the control of the project holder or participating entities.

8.3.1 Excluded areas

Areas shall be excluded from the project boundary where:

(a) project activities are not implemented;

(b) data collection is not feasible or reliable;

(c) land is not under the control of the project holder;

(d) emissions or removals cannot be attributed to project activities.

8.3.2 Temporal boundary

The temporal boundary defines the period over which project activities are implemented and GHG emission reductions and removals are quantified.

8.3.2.1 Start date

The project start date shall be defined as the date on which the implementation of project activities begins, resulting in changes in livestock and grazing management practices.

8.3.2.2 Quantification period

The quantification period shall be defined in accordance with the BioCarbon Standard and shall be specified in the Project Document.

Project activities shall be implemented and maintained throughout the entire quantification period.

8.3.2.3 Monitoring period

GHG emission reductions and removals shall be quantified over defined monitoring periods.

Monitoring periods shall be:

(a) continuous and non-overlapping;

(b) of consistent duration;

(c) aligned with data collection and verification requirements.

8.3.2.4 Baseline period

The baseline period shall represent historical conditions prior to project implementation and shall be sufficient to characterize baseline management practices and variability.

The baseline period shall be defined in accordance with Section 12.

8.3.2.5 Permanence considerations

For carbon removals, particularly those associated with soil organic carbon, the temporal boundary shall consider:

(a) the duration of carbon storage;

(b) the risk of reversal;

(c) the need for ongoing monitoring and management.

9 Project activities

9.1 General description of project activities

Project activities shall consist of measurable changes in livestock and grazing management practices that lead to greenhouse gas (GHG) emission reductions and/or removals within the project boundary.

Activities shall be implemented in a manner that ensures a clear and demonstrable causal relationship between management changes and observed GHG emission reductions and/or removals.

9.2 Types of eligible project activities

Eligible project activities shall include management-based interventions that influence livestock emissions and/or carbon stocks.

These may include the following:

9.2.1 Grazing management

(a) Implementation of rotational or adaptive grazing systems;

(b) Adjustment of grazing intensity and timing;

(c) Establishment of rest and recovery periods;

(d) Redistribution of grazing pressure across the landscape.

9.2.2 Herd management

(a) Adjustment of stocking rates;

(b) Optimization of herd structure and productivity;

(c) Improvement of animal health and performance;

(d) Reduction of unproductive animals.

9.2.3 Forage and pasture management

(a) Improvement of forage quality and digestibility;

(b) Introduction or promotion of improved or native pasture species;

(c) Restoration of degraded grasslands;

(d) Enhancement of ground cover and vegetation structure.

9.2.4 Soil management

(a) Reduction of soil disturbance;

(b) Practices that enhance soil organic matter accumulation;

(c) Improvement of soil structure and water retention capacity.

9.2.5 Manure management

(a) Changes in manure handling, storage, or treatment;

(b) Reduction of anaerobic conditions where appropriate;

(c) Improved distribution of manure in grazing systems;

(d) Implementation of manure management technologies, where applicable.

9.2.6 Silvopastoral and forest-integrated grazing systems

Controlled livestock grazing within forested or tree-based systems may be included where such practices:

(a) are managed in a manner that maintains or enhances ecosystem function;

(b) do not result in degradation of forest structure or carbon stocks;

(c) allow for natural regeneration and vegetation recovery;

(d) contribute to measurable GHG emission reductions and/or removals.

Uncontrolled or degrading grazing in forest ecosystems shall not be eligible under this methodology.

9.3 Conditions for eligibility of activities

Project activities shall meet the following conditions:

(a) Activities shall result in measurable changes relative to the baseline scenario;

(b) Activities shall influence at least one of the following components:

(c) enteric methane emissions;

(d) manure-related emissions;

(e) soil organic carbon stocks;

(f) Activities shall be implemented within the defined project boundary;

(g) Activities shall be maintained throughout the crediting period.

9.4 Excluded activities

The following shall not be considered eligible project activities:

(a) Activities that do not result in measurable changes in management practices;

(b) Activities that rely solely on changes in emission intensity without reducing absolute emissions;

(c) Activities that result in net increases in GHG emissions;

(d) Activities that cannot demonstrate a causal relationship between implementation and GHG outcomes.

9.5 Technology-based interventions

The implementation of technologies, including anaerobic digesters or other manure treatment systems, may be included as part of the project activity.

Such technologies shall be accounted for where they result in measurable GHG emission reductions.

However, the eligibility of a project under this methodology shall not depend on the implementation of any specific technology.

9.6 Documentation of project activities

Project holders shall document all implemented activities, including:

(a) type and description of practices;

(b) implementation timeline;

(c) spatial distribution of activities;

(d) changes relative to baseline conditions.

Documentation shall be sufficient to demonstrate the link between project activities and GHG emission reductions and removals.

10 Additionality

10.1 General requirement

Project activities shall demonstrate additionality in accordance with the BioCarbon Additionality Tool (latest version).

Project holders shall apply the tool to demonstrate that greenhouse gas (GHG) emission reductions and removals would not have occurred in the absence of the project activity.

10.2 Application of the Additionality Tool

The BioCarbon Additionality Tool shall be applied in full.

All required tests, including but not limited to regulatory surplus, common practice, and barrier or investment analysis, shall be conducted in accordance with the tool.

10.3 Sector-specific considerations

When applying the Additionality Tool to livestock systems, project holders shall consider:

(a) variability in management practices across production systems;

(b) differences in system intensities and productivity levels;

(c) the combined effect of multiple management practices rather than individual interventions;

(d) barriers specific to livestock systems, including financial, technical, and operational constraints.

10.4 Additionality for existing operations

Existing livestock operations with pre-existing emission reduction technologies (e.g., anaerobic digesters) may be eligible, provided that:

(a) additional GHG emission reductions or removals are demonstrated beyond the original project scope;

(b) continued additionality is justified;

(c) baseline conditions are appropriately updated.

10.5 Additionality safeguards

The following conditions shall apply:

(a) The classification of a system or practice as "regenerative" shall not constitute evidence of additionality;

(b) Improvements in emission intensity alone shall not be sufficient to demonstrate additionality;

(c) Project activities shall result in absolute net GHG emission reductions and/or removals.

11 Stratification, sampling and representativeness

11.1 General requirement

Project holders shall apply stratification and sampling approaches that ensure that greenhouse gas (GHG) emission reductions and removals are estimated in a representative and conservative manner.

Stratification and sampling shall be designed to capture spatial variability within the project boundary and reduce uncertainty in estimates.

11.2 Stratification of the project area

The project area shall be divided into homogeneous strata based on relevant characteristics that influence GHG emissions and removals.

Stratification shall consider, at a minimum:

(a) soil type;

(b) vegetation type and pasture condition;

(c) grazing management practices;

(d) stocking rates;

(e) climatic conditions.

Additional stratification criteria may be applied where relevant.

11.3 Definition of strata

Each stratum shall be defined as a relatively homogeneous unit in which:

(a) management practices are similar;

(b) environmental conditions are comparable;

(c) expected GHG responses are consistent.

Strata shall be clearly delineated and documented.

11.4 Stratification under heterogeneous conditions

Stratification shall explicitly account for high spatial variability and heterogeneity within the project area.

Project holders shall ensure that:

(a) stratification captures differences in management practices, ecological conditions, and productivity;

(b) each stratum is sufficiently homogeneous to support representative sampling;

(c) variability across strata is reflected in sampling design.

Where high heterogeneity exists, project holders shall:

(a) increase sampling density; or

(b) apply conservative assumptions and/or uncertainty deductions.

Stratification approaches shall be documented and justified.

11.5 Sampling design

Sampling shall be conducted using statistically sound methods to ensure representativeness at the project level, consistent with IPCC guidance on uncertainty and representativeness (IPCC, 2019).

Sampling design shall:

(a) be consistent with the type of parameter measured (e.g., SOC, livestock data);

(b) be sufficient to capture variability within each stratum;

(c) be documented and justified.

Where applicable, sampling shall be based on recognized statistical approaches. Sampling approaches shall ensure that results are statistically valid at a minimum 90% confidence level, unless otherwise justified. This requirement shall be consistent with the confidence level thresholds defined in the BioCarbon Conservative Approach and Uncertainty Management Tool.

11.6 Sample for soil organic carbon

Soil sampling shall be designed to:

(a) represent each defined stratum;

(b) capture spatial variability;

(c) allow for comparison between baseline and project conditions.

Sampling depth, frequency, and methodology shall be consistent with the requirements defined in the quantification section.

Sampling density shall be sufficient to ensure statistical representativeness of each stratum.

At a minimum, the number of sampling points per stratum shall be justified based on variability and shall be consistent with achieving statistically valid estimates, typically at a minimum confidence level of 90%.

Where variability is high, project holders shall increase sampling density or apply conservative adjustments to account for uncertainty.

Sampling design shall ensure comparability across monitoring periods and across participating units in aggregated projects.

11.7 Representativeness

Project holders shall demonstrate that sampling results are representative of the entire project area.

This shall be ensured by:

(a) adequate number of sampling points;

(b) appropriate distribution of samples across strata;

(c) consistency between sampled areas and total project area.

11.8 Aggregated projects

The sampling approach shall be applied consistently across monitoring periods.

For grouped or aggregated projects, project holders shall ensure that:

(a) participating units are appropriately stratified;

(b) sampling approaches are representative of all participating units;

(c) variability across units is adequately captured.

11.9 Conservativeness

Stratification and sampling approaches shall be applied conservatively to avoid overestimation of greenhouse gas (GHG) emission reductions and removals.

Where uncertainty exists in the definition of strata, sampling design, or representativeness, project holders shall apply conservative assumptions or increase sampling intensity to ensure robust estimation of results.

11.10 Documentation requirements

Project holders shall document:

(a) stratification criteria and methodology;

(b) sampling design and procedures;

(c) number and distribution of sampling points;

(d) justification of representativeness.

12 Baseline scenario

12.1 Baseline approach

The baseline scenario shall represent the most plausible set of livestock and grazing management practices that would occur in the absence of the project activity.

The baseline shall reflect actual conditions and practices within the project boundary and shall be established in a transparent and conservative manner. The baseline shall be set below business-as-usual (BAU) conditions.

The baseline scenario shall be determined using a continuation of current practices approach, unless an alternative approach is justified. Baseline shall not assume optimistic or speculative projections and baseline assumptions shall be consistent with observed historical trends unless justified otherwise.

Project holders shall demonstrate that the baseline scenario is plausible, credible, and supported by evidence.

The baseline shall reflect:

(a) existing livestock management practices;

(b) prevailing grazing and land management conditions;

(c) historical and current system performance.

12.2 Baseline components

The baseline scenario shall include, as applicable:

(a) enteric methane (CH_4) emissions based on livestock population and management;

(b) manure management emissions (CH_4 and N_2O, where applicable);

(c) soil organic carbon (SOC) trends under baseline management practices.

12.3 Baseline period

The baseline period shall represent conditions prior to the implementation of project activities and shall be sufficient to characterize variability in management practices and environmental conditions.

The baseline period shall be based on historical data representative of pre-project conditions.

Where historical data are available, the baseline period shall cover a minimum of three (3) consecutive years prior to the project start date.

Where significant interannual variability exists, a longer reference period shall be used to ensure that baseline conditions are representative and not biased by anomalous years.

Where less than three (3) years of historical data are available, project holders shall justify the selected baseline period and apply conservative assumptions.

The baseline period shall be justified and documented in the Project Document.

12.4 Baseline for soil organic carbon

Soil organic carbon (SOC) baseline conditions shall be established based on measured data and/or conservative assumptions reflecting baseline management practices.

Where baseline SOC trends indicate stable or increasing carbon stocks due to factors unrelated to the project activity, such increases shall be conservatively excluded from credited removals.

12.5 Flexible baseline data and conservative approach

Baseline data requirements shall be flexible and adapted to data availability, provided that conservativeness is ensured.

Where complete or high-resolution data are not available, project holders may use proxies, regional data, or default values, provided that:

(a) such proxies are scientifically justified and transparently documented;

(b) the use of proxies does not lead to overestimation of GHG emission reductions or removals;

(c) conservative assumptions are applied.

Where uncertainty in baseline data is high, project holders shall apply conservative adjustments, including:

(a) use of lower-bound estimates for baseline emissions;

(b) exclusion of uncertain baseline removals;

(c) application of uncertainty deductions where appropriate.

Where direct field data are not available, project holders may use regional data, benchmarks, or proxy values, provided that their use is justified and conservative.

The use of proxies shall be subject to the following conditions:

(a) Proxies shall be derived from sources representative of the project's geographic, climatic, and production context;

(b) Data sources shall be transparent, verifiable, and based on recognized datasets, scientific literature, or official statistics;

(c) Proxies shall not be selected in a manner that inflates baseline emissions or underestimates baseline carbon stocks;

(d) Where multiple proxy values are available, conservative values shall be selected;

(e) The use of proxies shall be clearly documented and justified in the Project Document.

Where uncertainty associated with proxies is significant, additional conservative adjustments or uncertainty deductions shall be applied.

12.6 Baseline consistency

The baseline scenario shall be applied consistently across all components of the methodology, including:

(a) emission sources;

(b) carbon pools;

(c) project boundary.

12.7 Baseline integrity

The baseline scenario shall not be constructed using assumptions, parameters, or modeling approaches that artificially inflate baseline emissions or underestimate baseline carbon stocks.

Project holders shall ensure that:

(a) baseline emissions are not overestimated relative to realistic business-as-usual conditions;

(b) baseline carbon stocks are not underestimated;

(c) assumptions are based on verifiable, evidence-based, and decision-relevant data;

(d) speculative, optimistic, or best-case projections are not used.

Where multiple plausible baseline scenarios exist, the selected baseline shall reflect a conservative and realistic representation of expected conditions in the absence of the project activity.

In cases of uncertainty, project holders shall apply conservative assumptions that result in lower estimated emission reductions or removals.

Any use of proxies, default values, or modeled data shall be justified and shall not introduce upward bias in credited mitigation outcomes.

12.8 Baseline for existing operations

For existing livestock operations, including those with pre-existing emission reduction technologies, the baseline shall reflect conditions that would occur in the absence of the project activity and any incremental improvements introduced by the project.

Baseline conditions shall be updated where necessary to ensure that credited GHG emission reductions and removals are not overestimated.

12.9 Baseline reassessment and dynamic validity

The baseline scenario shall remain valid only as long as the underlying conditions on which it was established continue to apply.

Project holders shall reassess the baseline scenario periodically and whenever material changes occur in the regulatory, technological, economic, or sectoral context that may affect the plausibility or conservativeness of the baseline.

At a minimum, baseline reassessment shall be conducted:

(a) at each renewal of the crediting period; and

(b) at intervals not exceeding five (5) years for AFOLU activities.

Where reassessment results in a change to baseline assumptions, parameters, or structure, the updated baseline shall be validated and applied prospectively.

The baseline scenario shall not be maintained where it no longer reflects realistic and credible conditions in the absence of the project activity.

13 Quantification of GHG emission reduction from project activities

13.1 General approach

Greenhouse gas (GHG) emission reductions and removals shall be quantified in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (AFOLU) and the 2019 Refinement, applying Tier 2 or higher approaches, where applicable.

Quantification shall be based on:

(a) direct measurement, where feasible;

(b) use of IPCC equations, parameters, and emission factors;

(c) conservative assumptions where data limitations exist.

GHG emissions and removals shall first be calculated in their original units (e.g., t CH_4, t N_2O, t CO_2), and converted to CO_2 equivalent (tCO_2e) only at the aggregation stage.

13.2 Quantification components

The following components shall be quantified:

(a) enteric methane (CH_4);

(b) manure management emissions (CH_4 and N_2O, where applicable);

(c) soil organic carbon (SOC) stock changes;

(d) biomass carbon stock changes, where included;

(e) leakage emissions;

(f) uncertainty deductions.

13.2.1 Enteric methane emissions

Enteric methane emissions shall be quantified using IPCC Volume 4, Chapter 10 (Livestock).

At a minimum, a Tier 2 approach shall be applied.

The general equation for quantifying enteric methane emissions is as follows:

$$CH_{4,enteric} = \sum \left(GE \times Y_m \times 365 \times \frac{1}{55.65} \right) \quad \text{Equation 1}$$

Where:

$CH_{4,enteric}$	=	enteric Methane emissions
GE	=	gross energy intake; MJ/head/day
Y_m	=	Methane conversion factor; %
55.65	=	energy content of Methane; MJ/kg CH_4

Parameters shall be derived from:

(a) livestock category;

(b) feed characteristics;

(c) production system.

13.2.2 Manure management emissions

Emissions from manure management shall be quantified using IPCC Volume 4, Chapter 10.

13.2.2.1 Methane emissions from manure

Methane emissions from manure shall be calculated as follows:

$$CH_{4,manuer} = \sum (VS \times B_0 \times MCF \times 365) \quad \text{Equation 2}$$

Where:

$CH_{4,manure}$	=	manure management emissions
VS	=	volatile solids; kg/head/day
B_0	=	maximum methane production capacity; m^3 CH_4/kg VS

MCF	=	methane conversion factor; %

13.2.2.2 Nitrous oxide emissions

Nitrous oxide emissions shall be quantified where material, using IPCC Volume 4, Chapter 10 and Chapter 11.

$$N_2O = \sum N \times EF \qquad \text{Equation 3}$$

Where:

N_2O	=	Nitrous oxide emissions
N	=	nitrogen excretion
EF	=	emission factor

Where uncertainty is high, conservative assumptions shall be applied.

13.2.3 Soil organic carbon (SOC)

Soil organic carbon (SOC) stock changes shall be quantified using IPCC Volume 4, Chapter 6 (Grassland) and a stock-change approach based on direct measurement.

Soil sampling shall be conducted using standardized and consistent protocols to ensure comparability across monitoring periods and project units.

At a minimum, soil sampling shall comply with the following requirements:

(a) Soil sampling depth shall be at least 0–30 cm. Deeper sampling (e.g., up to 100 cm) shall be applied where justified by the project context, soil characteristics, or expected carbon dynamics;

(b) The same sampling depth shall be maintained across monitoring periods unless a justified methodological adjustment is made;

(c) Soil organic carbon (SOC) shall be determined using recognized analytical methods, including dry combustion (preferred), Walkley-Black, or loss-on-ignition (LOI), provided that consistency is maintained over time;

(d) Bulk density shall be measured or appropriately estimated for each sampling event to ensure accurate stock calculations.

All methods applied shall be documented and consistently used throughout the monitoring period.

Model outputs may be used to support analysis, stratification, or plausibility assessment.

Model outputs shall not be used as a substitute for measured SOC stock changes.

SOC shall be re-measured at intervals sufficient to detect stock changes with statistical confidence, and in no case less frequently than once every five (5) years where removals are credited.

(a) Stock-change approach

$$\Delta C_{SOC} = C_{t2} - C_{t1} \quad \text{Equation 4}$$

Where:

ΔC_{SOC}	=	SOC stock change
C_{t1}	=	initial carbon stock
C_{t2}		final carbon stock

(b) Conversion to CO2

$$\Delta CO_{2,SOC} = \Delta C_{SOC} \times \frac{44}{12} \quad \text{Equation 5}$$

SOC stock changes eligible for crediting shall be determined through direct measurement, using a consistent stock-change approach.

Validated models may be used only as complementary tools for stratification, interpretation, plausibility assessment, or other supporting purposes, provided that they are supported by field data and do not substitute for the direct measurement of SOC stock changes.

13.2.4 Biomass carbon stock changes (optional)

Where included, biomass carbon stock changes shall be quantified using IPCC methods and shall not result in double counting.

13.2.5 Leakage

Leakage emissions shall be quantified using conservative approaches, including:

- displacement of livestock;
- changes in grazing pressure outside the boundary.

13.2.6 Conversion to CO2 equivalent

IPCC AR6 Global Warming Potentials (GWP100) shall be applied where conversion to CO_2e is required, in accordance with the latest IPCC guidance (IPCC, 2021).

$$CO_{2e} = CO_2 + (CH_4 \times 27.9) + (N_2O \times 273) \quad \text{Equation 6}$$

13.2.7 Net GHG emission reductions

$$ER = (BE - PE) - LE - U \quad \text{Equation 7}$$

Where:

ER	=	emission reductions
BE	=	baseline emissions
PE	=	project emissions
LE	=	leakage
U	=	uncertainty deduction

Only positive net values shall be eligible for crediting.

13.3 Baseline scenario emissions and removals

13.3.1 General approach

Baseline emissions and removals shall be quantified in accordance with the baseline scenario defined in Section 12.

Baseline emissions shall represent the greenhouse gas (GHG) emissions that would occur in the absence of the project activity.

Baseline removals shall reflect carbon stock changes under baseline management conditions.

All baseline components shall be estimated using methods consistent with the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (AFOLU) and the 2019 Refinement, applying Tier 2 or higher approaches, where applicable.

13.3.2 Baseline enteric methane emissions

Baseline enteric methane emissions shall be quantified using IPCC Volume 4, Chapter 10.

$$BE_{CH4,enteric,y} = \sum \left(GE \times Y_{m,bl} \times 365 \times \frac{1}{55.65} \right) \quad \text{Equation 8}$$

Where:

$BE_{CH4,enteric,y}$ = baseline enteric methane emissions in year y; t CH_4/year

GE = baseline gross energy intake; MJ/head/day

$Y_{m,bl}$ = baseline methane conversion factor; %

Baseline parameters shall reflect:

- baseline feed quality;
- livestock category;
- baseline productivity levels;
- baseline management practices.

13.3.3 Baseline manure management emissions

Baseline manure management emissions shall be quantified using IPCC Volume 4, Chapter 10.

(a) Methane emissions from manure

$$BE_{CH4,manure,y} = \sum (VS_{bl} \times B_0 \times MCF_{bl} \times 365) \qquad \text{Equation 9}$$

Where:

$BE_{CH4,manure,y}$ = manure management baseline emissions

VS_{bl} = volatile solids under baseline conditions; kg/head/day

B_0 = maximum methane production capacity; m^3 CH_4/kg VS

MCF_{bl} = methane conversion factor under baseline system; %

Baseline manure management systems shall be clearly identified (e.g., pasture, lagoon, storage systems).

(b) Nitrous oxide emissions (where applicable)

Baseline nitrous oxide emissions shall be quantified where emissions are expected to be material and can be estimated using IPCC methods.

$$BE_{N2O,y} = \sum N_{bl} \times EF_{bl} \qquad \text{Equation 10}$$

Where:

$BE_{N2O,y}$ = Nitrous oxide emissions under baseline conditions

N_{bl} = nitrogen excretion under baseline conditions

EF_{bl} = emission factor under baseline conditions

Where uncertainty is high, conservative assumptions shall be applied.

13.3.4 Baseline soil organic carbon (SOC)

Baseline SOC shall represent carbon stock conditions under baseline management practices.

(a) Baseline SOC condition

Baseline SOC may be assumed to be:

- stable; or
- changing at a conservative rate based on available data.

(b) Baseline SOC treatment

Where baseline SOC is assumed to increase due to factors unrelated to the project activity, such increases shall be conservatively excluded from credited removals.

(c) Baseline SOC determination

Baseline SOC shall be determined using:

- measured data; and/or
- conservative assumptions consistent with baseline practices.

13.3.5 Baseline biomass carbon stock(optional)

Where biomass carbon stock is included, baseline biomass shall be conservatively estimated and shall not result in double counting with SOC.

13.3.6 Aggregation of baseline emissions

Baseline emissions shall be aggregated as follows:

$$BE_y = BE_{CH4,enteric,y} + BE_{CH4,manure,y} + BE_{N2O,y} \quad \text{Equation 11}$$

Baseline removals shall be accounted separately where applicable.

Baseline parameters shall be periodically reviewed where significant changes in underlying conditions occur.

13.4 Project scenario emissions and removals

13.4.1 General approach

Project scenario emissions and removals shall represent the actual greenhouse gas (GHG) emissions and carbon stock changes occurring as a result of project activities implemented within the project boundary.

Project emissions and removals shall be quantified using methods consistent with the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (AFOLU) and the 2019 Refinement, applying Tier 2 or higher approaches, where applicable.

All project scenario components shall reflect actual management practices, monitored data, and observed project conditions during the monitoring period.

13.4.2 Project enteric methane emissions

Project enteric methane emissions shall be quantified using IPCC Volume 4, Chapter 10.

$$PE_{CH4,enteric,y} = \sum \left(GE_p \times Y_{m,p} \times 365 \times \frac{1}{55.65} \right) \quad \text{Equation 12}$$

Where:

$PE_{CH4,enteric,y}$	=	project enteric methane emissions in year y; t CH_4/year
GE_p	=	project gross energy intake; MJ/head/day
$Y_{m,p}$	=	project methane conversion factor; %

Project parameters shall reflect:

- actual feed quality and digestibility;
- livestock category;
- actual productivity levels;
- actual herd and grazing management practices.

13.4.3 Project manure management emissions

Project manure management emissions shall be quantified using IPCC Volume 4, Chapter 10.

(a) Methane emissions from manure

$$PE_{CH4,manure,y} = \sum \left(VS_p \times B_0 \times MCF_p \times 365 \right) \quad \text{Equation 13}$$

Where:

$PE_{CH4,manure,y}$	=	manure management project emissions
VS_p	=	volatile solids under project conditions; kg/head/day
B_0	=	maximum methane production capacity; m³ CH_4/kg VS
MCF_{bl}	=	methane conversion factor under the project manure management system; %

Project manure management systems shall reflect actual practices implemented during the monitoring period.

(b) Nitrous oxide emissions (where applicable)

Project nitrous oxide emissions shall be quantified where emissions are expected to be material and can be estimated using IPCC methods.

$$PE_{N2O,y} = \sum N_p \times EF_p \quad \text{Equation 14}$$

Where:

$PE_{N2O,y}$	=	Nitrous oxide emissions under project conditions
N_p	=	nitrogen excretion under project conditions
EF_p	=	emission factor under project conditions

Project holders shall use monitored or conservatively estimated parameters consistent with actual manure management and soil management conditions.

13.4.4 Project soil organic carbon (SOC)

Project soil organic carbon (SOC) stock changes shall be quantified using IPCC Volume 4, Chapter 6 (Grassland) and a stock-change approach based on direct measurement.

Soil organic carbon (SOC) stock changes shall be quantified using a stock-change approach based on direct measurement.

Model outputs may be used to support analysis, stratification, or plausibility assessment.

Model outputs shall not be used as a substitute for measured SOC stock changes.

SOC shall be re-measured at intervals sufficient to detect stock changes with statistical confidence, and in no case less frequently than once every five (5) years where removals are credited, consistent with the time required to detect measurable changes in soil carbon stocks (Smith, 2004).

(a) Project SOC stock change

$$\Delta C_{SOC,p,y} = C_{t2} - C_{t1} \quad \text{Equation 15}$$

Where:

$\Delta C_{SOC,p,y}$	=	change in project SOC stocks during monitoring period y; tC/year
C_{t1}	=	initial measured SOC stock
C_{t2}	=	final measured SOC stock

(b) Conversion to CO_2

$$\Delta CO_{2,SOC,p,y} = \Delta C_{SOC,p,y} \times \frac{44}{12} \quad \text{Equation 16}$$

13.4.5 Project biomass carbon (optional)

Where biomass carbon stock is included, project biomass carbon stock changes shall be quantified using direct measurement and/or conservative estimation methods consistent with IPCC guidance.

Biomass carbon stock shall only be included where:

- long-term stock changes can be demonstrated;
- no double counting occurs with soil organic carbon or other carbon pools.

13.4.6 Aggregation of project emissions

Project emissions shall be aggregated as follows:

$$PE_y = PE_{CH4,enteric,y} + PE_{CH4,manure,y} + PE_{N2O,y} \quad \text{Equation 17}$$

Where:

PE_y = total project emissions in year y; tCO_2e/year

$PE_{CH4,enteric,y}$ = project methane emissions from enteric fermentation in year y; tCO_2e/year

$PE_{CH4,manure,y}$ = project methane emissions from manure management in year y; tCO_2e/year

$PE_{N2O,y}$ = project nitrous oxide emissions in year y; tCO_2e/year

Project removals shall be accounted separately where applicable.

13.4.7 Project scenario integrity requirements

Project scenario quantification shall meet the following requirements:

(a) all parameters shall reflect actual project conditions;

(b) monitored data shall be used wherever required by this methodology;

(c) assumptions shall be conservative where direct data are not available;

(d) improvements in emission intensity alone shall not be sufficient for crediting;

(e) project activities shall result in absolute net GHG emission reductions and/or removals.

13.4.8 Conservativeness

Project emissions and removals shall be estimated conservatively to avoid overestimation of GHG emission reductions and removals.

Where project activities increase animal numbers, productivity, or management intensity, all resulting changes in GHG emissions shall be fully accounted for.

13.4.9 Existing operations with pre-existing technologies

Existing livestock operations with pre-existing emission reduction technologies, including anaerobic digesters or other manure treatment systems, may be included in the project scenario, provided that:

(a) additional GHG emission reductions or removals are demonstrated beyond the original project scope;

(b) continued additionality is justified in accordance with the BioCarbon Additionality Tool;

(c) baseline conditions are appropriately updated.

Only incremental GHG benefits attributable to the project activity shall be eligible for crediting.

13.5 Leakage emissions

13.5.1 General requirement

Leakage emissions shall be identified, assessed, and, where material, quantified.

Leakage refers to any increase in greenhouse gas (GHG) emissions occurring outside the project boundary as a result of project activities.

Project holders shall apply conservative approaches to ensure that leakage is not underestimated and leakage shall be reassessed where material changes occur.

Leakage assessment shall be conducted in accordance with the BioCarbon Leakage Management Tool (latest version).

Project holders shall assess leakage risk using a structured approach consistent with the Tool, including the classification of leakage risk levels (e.g., low, medium, high) and the application of corresponding quantification or conservative treatment requirements.

The level of detail required for leakage quantification shall be proportional to the assessed risk level, ensuring that material leakage is quantified and immaterial leakage is conservatively addressed.

Where leakage is assessed as negligible, project holders may justify zero leakage, provided that such justification is consistent with the criteria established in the Leakage Management Tool and supported by verifiable evidence.

13.5.2 Sources of leakage

Potential leakage sources shall include, but are not limited to:

(a) displacement of livestock to areas outside the project boundary;

(b) redistribution of grazing pressure to non-project areas;

(c) changes in land use or management practices outside the project boundary;

(d) transfer of manure management practices outside the project boundary.

13.5.3 Identification of leakage

Project holders shall assess whether project activities are likely to result in leakage.

Leakage shall be considered material where:

(a) livestock numbers are reduced within the project boundary and displaced elsewhere;

(b) grazing pressure is shifted to non-project areas;

(c) management changes affect production outside the project boundary.

Leakage identification and classification shall be consistent with the criteria defined in the BioCarbon Leakage Management Tool.

13.5.4 Livestock mobility and displacement

Project holders shall assess the risk of leakage associated with livestock mobility and displacement of grazing activities.

Leakage shall be considered material where:

(a) livestock are moved outside the project boundary as a result of project activities;

(b) grazing pressure is redistributed to non-project areas;

(c) production is shifted to other locations.

Where such risks are identified, project holders shall:

(a) quantify leakage using conservative assumptions; or

(b) apply a conservative deduction factor where quantification is not feasible.

(c) Where no evidence of displacement exists, project holders may justify that leakage is negligible.

13.5.5 Quantification of leakage

Where leakage is identified as material, leakage emissions shall be quantified using conservative methods consistent with IPCC guidance.

Quantification may be based on:

- changes in livestock population outside the project boundary;
- changes in grazing intensity;
- changes in manure management practices outside the boundary.

$$LE_y = \sum \left(LE_{CH_4,y} + LE_{N_2O,y} \right) \quad \text{Equation 18}$$

Where:

LE_y	=	total leakage emissions in year y; tCO_2e/year
$LE_{CH_4,y}$	=	leakage methane emissions in year y; tCH_4/year

$LE_{N_2O,y}$	=	leakage nitrous oxide emissions in year y; tN_2O/year

13.5.6 Sampling approach

Where project holders demonstrate that leakage is negligible, leakage emissions may be conservatively set to zero.

Justification shall be provided, demonstrating that:

(a) livestock activity is not displaced outside the project boundary;

(b) total production is not shifted to other areas;

(c) management changes do not result in indirect emissions.

13.5.7 Conservative assumptions

Where data are limited, project holders shall apply conservative assumptions, including:

(a) assuming partial displacement of livestock where uncertainty exists;

(b) applying conservative emission factors;

(c) using worst-case scenarios where appropriate.

13.5.8 Leakage deduction

Leakage emissions shall be deducted from total GHG emission reductions and removals:

$$ER_y = (BE_y - PE_y) - LE_y \qquad \text{Equation 19}$$

Where:

ER_y	=	net GHG emission reductions and removals in year y; tCO_2e/year
BE_y	=	baseline emissions in year y; tCO_2e/year
PE_y	=	project emissions in year y; tCO_2e/year
LE_y	=	leakage emissions in year y; tCO_2e/year

13.5.9 Leakage mitigation

Project holders shall implement measures to minimize leakage, including:

(a) maintaining livestock within the project boundary;

(b) avoiding displacement of production;

(c) implementing consistent management practices across participating units.

Leakage shall not be ignored where there is a reasonable risk of displacement of emissions.

13.6 Uncertainty

13.6.1 General requirement

Uncertainty associated with the estimation of greenhouse gas (GHG) emissions and removals shall be assessed and, where relevant, quantified.

Project holders shall apply conservative approaches to ensure that uncertainty does not lead to overestimation of GHG emission reductions and removals.

13.6.2 Sources of uncertainty

Sources of uncertainty may include, but are not limited to:

(a) variability in soil organic carbon (SOC) measurements;

(b) variability in livestock parameters (e.g., feed intake, animal weight);

(c) uncertainty in emission factors (e.g., methane conversion factors, nitrogen excretion);

(d) sampling error and spatial variability;

(e) limitations in data availability.

13.6.3 Quantification of uncertainty

Where feasible, uncertainty shall be quantified using statistical methods consistent with IPCC guidance (IPCC, 2019).

Quantification of uncertainty shall be conducted in accordance with the BioCarbon Conservative Approach and Uncertainty Management Tool (latest version).

Project holders shall apply the appropriate methodological approach defined in the Tool, including Tier 1 (error propagation) or Tier 2 (Monte Carlo simulation), depending on data availability, project complexity, and required level of accuracy.

Uncertainty assessment shall consider:

(a) variability within strata;

(b) sampling error;

(c) measurement error;

(d) model uncertainty, where models are used.

The selection of the approach shall be justified and documented.

13.6.4 Soil organic carbon uncertainty

Uncertainty associated with SOC measurements shall be explicitly assessed.

SOC uncertainty shall consider:

(a) spatial variability within strata;

(b) sampling density;

(c) laboratory measurement error;

(d) temporal variability.

Sampling design shall aim to reduce uncertainty to acceptable levels through appropriate stratification and sample size.

13.6.5 Conservative deduction

Uncertainty deductions shall be determined using the data quality and discounting approaches defined in the BioCarbon Conservative Approach and Uncertainty Management Tool.

Where uncertainty is quantified and exceeds the thresholds or conditions defined in the Tool, a conservative deduction shall be applied to greenhouse gas (GHG) emission reductions and removals.

Such deduction shall be applied prior to credit issuance and shall result in a reduction of the total net GHG emission reductions and removals eligible for crediting.

The uncertainty deduction shall be calculated as:

$$U_y = \mathrm{f}\left(U_{SOC}, U_{CH_4}, U_{N_2O}\right) \quad \text{Equation 20}$$

Where:

U_y	=	total uncertainty deduction in year y; tCO_2e/year
U_{SOC}	=	uncertainty associated with the estimation of soil organic carbon stock changes; tCO_2e/year or %

U_{CH_4}	=	uncertainty associated with the estimation of methane emissions, including enteric fermentation and manure management, as applicable; tCO_2e/year or %
U_{N_2O}	=	uncertainty associated with the estimation of nitrous oxide emissions, where applicable; tCO_2e/year or %

The functional form of $f(U_{SOC}, U_{CH_4}, U_{N_2O})$ shall be applied in accordance with the BioCarbon Conservative Approach and Uncertainty Management Tool and shall ensure conservative aggregation of uncertainty across emission sources and removals.

Where applicable, uncertainty deductions shall be determined using the data quality and discounting approaches defined in the BioCarbon Conservative Approach and Uncertainty Management Tool.

13.6.6 Application of uncertainty deductions

Uncertainty deductions shall be applied prior to credit issuance and shall reduce the total net GHG emission reductions and removals:

$$ER_y = (BE_y - PE_y) - LE_y - U_y \quad \text{Equation 21}$$

ER_y	=	net GHG emission reductions and removals in year y; tCO_2e/year
BE_y	=	baseline emissions in year y; tCO_2e/year
PE_y	=	project emissions in year y; tCO_2e/year
LE_y	=	leakage emissions in year y; tCO_2e/year
U_y	=	uncertainty deduction in year y; tCO_2e/year

In all cases, uncertainty shall be treated conservatively.

Where uncertainty cannot be reliably quantified, assumptions shall favor lower crediting outcomes.

13.7 Net GHG emission reductions and removals

13.7.1 General approach

Net greenhouse gas (GHG) emission reductions and removals shall be calculated as the difference between baseline emissions and removals and project emissions and removals, adjusted for leakage and uncertainty.

Only net positive GHG emission reductions and removals shall be eligible for crediting.

13.7.2 Net GHG emission reductions

$$ER_y = (BE_y - PE_y) - LE_y - U_y \quad \text{Equation 22}$$

Where:

ER_y	=	net GHG emission reductions and removals in year y; tCO_2e/year
BE_y	=	baseline emissions; tCO_2e/year
PE_y	=	project emissions; tCO_2e/year
LE_y	=	leakage emissions; tCO_2e/year
U_y	=	uncertainty deduction; tCO_2e/year

13.7.3 Calculation of baseline emissions

$$BE_y = BE_{CH4,enteric,y} + BE_{CH4,manure,y} + BE_{N2O,y} \quad \text{Equation 23}$$

13.7.4 Calculation of project emissions

$$PE_y = PE_{CH4,enteric,y} + PE_{CH4,manure,y} + PE_{N2O,y} \quad \text{Equation 24}$$

13.7.5 Calculation of project removals

$$PR_y = \Delta CO_{2,SOC,p,y} + \Delta CO_{2,Biomass,p,y} \quad \text{Equation 25}$$

Where:

PR_y = total project removals in year y; tCO_2e/year

13.7.6 Integrated net balance

Net GHG emission reductions and removals may also be expressed as:

$$ER_y = \left(BE_y - PE_y\right) + PR_y - LE_y - U_y \quad \text{Equation 26}$$

13.7.7 Conversion to CO_2 equivalent

All greenhouse gases shall be converted to CO_2 equivalent using IPCC AR6 Global Warming Potentials (GWP100):

$$CO_{2e} = CO_2 + (CH_4 \times 27.9) + (N_2O \times 273) \quad \text{Equation 27}$$

13.7.8 Eligibility for crediting

The following conditions shall apply:

- Only positive values of ERy shall be eligible for crediting;
- Where ERy≤0, no credits shall be issued;
- Emission reductions and removals shall be verified prior to issuance.

13.7.9 Integrity requirements

The following requirements shall apply:

(a) All sources and sinks shall be consistently accounted for across baseline and project scenarios;

(b) No double counting of emission reductions or removals shall occur;

(c) All parameters shall reflect actual project conditions or conservative assumptions;

(d) Emission intensity improvements alone shall not result in credit issuance;

(e) All increases in emissions attributable to project activities shall be fully accounted for.

13.7.10 Conservativeness

Net GHG emission reductions and removals shall reflect conservative assumptions applied throughout this methodology.

Where uncertainty exists, assumptions shall result in lower crediting outcomes.

14 Monitoring, reporting and verification (MRV)

14.1 General framework

The monitoring, reporting and verification (MRV) system shall ensure that all greenhouse gas (GHG) emission reductions and removals attributed to the project are quantifiable, traceable, and verifiable over time, in a manner consistent with the requirements of this methodology, the BioCarbon Standard, and internationally recognized guidance including IPCC.

The MRV system shall be designed as an integrated component of the project, directly linked to the quantification approach defined in Section 13. It shall not be treated as an independent or secondary process. All monitored data shall therefore correspond explicitly to the variables and parameters used in baseline and project scenario calculations.

Monitoring shall reflect actual project conditions and shall be capable of demonstrating, with sufficient confidence, that the observed emission reductions and removals are attributable to the implemented project activities.

14.2 Monitoring plan and system design

A monitoring plan shall be developed prior to validation and shall define the complete system for data collection, processing, storage, and reporting.

The monitoring plan shall establish a coherent data architecture, including the identification of all relevant parameters, the methods used for their measurement or estimation, and the procedures applied to ensure consistency across monitoring periods.

The monitoring system shall be designed to operate under real-world conditions, including contexts with limited data availability, while maintaining methodological rigor. Where direct measurement is not feasible, the use of proxies or default values may be permitted, provided that such approaches are justified and conservative.

The monitoring plan shall ensure that data collected over time are comparable, reproducible, and suitable for independent verification.

14.3 Monitoring of livestock systems and activity data

Monitoring shall capture the dynamic nature of livestock systems, recognizing that emissions are driven by changes in herd structure, productivity, feeding practices, and management conditions.

Project holders shall monitor livestock populations using categories consistent with IPCC guidance, ensuring that data reflect actual herd composition and are updated regularly. Where detailed data are not available, representative values may be used, provided that they are conservative and documented.

Feed characteristics, productivity indicators, and grazing practices shall be monitored to the extent necessary to support the estimation of enteric methane emissions using Tier 2 or higher approaches. Given the known sensitivity of emission estimates to feed intake and digestibility, these parameters shall be treated with particular attention.

Monitoring shall also capture changes in stocking rates and grazing distribution, as these directly influence both emissions and soil carbon dynamics.

14.4 Monitoring of manure management systems

Monitoring shall reflect the actual manure management systems implemented under the project and any changes relative to baseline conditions.

This includes tracking the distribution of manure across management systems, as well as the operational conditions affecting methane and nitrous oxide emissions. Where direct measurement is not feasible, emission factors consistent with IPCC guidance shall be applied.

Given the variability of manure-related emissions depending on system type, climate, and management, project holders shall ensure that the selected parameters are representative of actual conditions.

14.5 Monitoring of soil organic carbon (SOC)

Soil organic carbon (SOC) monitoring shall be based on a measurement-driven approach, consistent with the stock-change method.

Sampling shall be conducted using a stratified design that reflects the heterogeneity of the project area. Sampling depth, frequency, and density shall be sufficient to detect changes in SOC stocks with an acceptable level of confidence.

SOC measurements shall be supported by documented field protocols, laboratory procedures, and data processing methods. Particular attention shall be given to ensuring consistency across monitoring periods, including the use of fixed sampling locations or statistically equivalent approaches.

Model outputs may be used to support interpretation, but shall not replace measured data. This is essential to ensure credibility and to avoid overestimation of removals.

Soil analyses shall be conducted by laboratories that demonstrate technical competence in soil carbon determination.

Laboratories shall be accredited under internationally recognized standards (e.g., ISO/IEC 17025) or, where accreditation is not available, shall demonstrate equivalent technical capacity, including validated analytical methods, quality control procedures, and documented calibration practices.

Project holders shall ensure that laboratory methods are consistently applied across monitoring periods and that analytical uncertainty is minimized and documented.

14.6 Data management, traceability and documentation

All monitored data shall be recorded, stored, and managed in a manner that ensures full traceability from raw data to reported results.

Data management systems shall allow reconstruction of calculations and verification of all reported values. This includes maintaining records of data sources, assumptions, processing steps, and any adjustments applied.

Data shall be retained for a period sufficient to allow validation, verification, and potential re-assessment, consistent with the requirements of the BioCarbon Standard.

14.7 Quality assurance and quality control (QA/QC)

Project holders shall implement quality assurance and quality control (QA/QC) procedures consistent with IPCC good practice.

These procedures shall ensure that data are internally consistent, complete, and free from systematic errors. QA/QC shall include verification of data integrity, cross-checking of key parameters, and periodic review of monitoring procedures.

Where inconsistencies or errors are identified, corrective actions shall be implemented and documented.

The monitoring system shall evolve over time, incorporating improvements as additional data become available or as methodological refinements are introduced.

14.8 Reporting

Monitoring results shall be documented in monitoring reports that transparently present all relevant information required to assess GHG emission reductions and removals.

Reports shall include a clear description of project activities, monitored data, calculation procedures, assumptions, and any deviations from the monitoring plan.

All results shall be presented in a manner that allows independent replication and verification.

14.9 Verification

All reported GHG emission reductions and removals shall be subject to independent verification by an accredited validation and verification body.

Verification shall assess whether the monitoring system has been implemented in accordance with this methodology, whether data are reliable and complete, and whether calculations are accurate and conservative.

The verification process shall ensure that credited emission reductions and removals are credible, transparent, and consistent with the requirements of the BioCarbon Standard.

Validation and verification activities shall be conducted by qualified personnel with demonstrated expertise in livestock systems, soil carbon assessment, and greenhouse gas accounting.

Verification teams shall collectively possess competencies relevant to the project context, including:

livestock production systems and grazing management;

soil sampling and soil carbon measurement;

application of IPCC methodologies and emission factors;

statistical sampling and uncertainty assessment.

Verification bodies shall ensure that personnel involved in field assessments are appropriately trained and competent to evaluate project implementation, monitoring systems, and data integrity.

14.10 Aggregated and grouped projects

For grouped or aggregated projects, the monitoring system shall ensure representativeness across all participating units.

Sampling and data collection approaches shall capture variability across the project population, and aggregation procedures shall be consistent with the stratification framework defined in Section 11.

The monitoring system shall ensure that results are representative at the project level and that no bias is introduced through aggregation.

14.11 Measurement hierarchy and conservativeness

Project holders shall apply a hierarchical approach to data collection, prioritizing direct measurement where feasible, followed by project-specific estimation methods, and finally conservative default values where direct data are not reasonably available.

All monitored parameters shall be consistent with the quantification equations and methodological assumptions applied under this methodology.

Where proxies, modeled values, or default factors are used, project holders shall justify their applicability and demonstrate that their use does not result in overestimation of greenhouse gas emission reductions or removals.

Monitoring data shall be traceable, reproducible, and suitable for independent verification.

14.12 Dynamic conditions and recalculation requirements

Monitoring systems shall be capable of capturing material changes in project conditions over time.

Where significant changes in herd composition, grazing intensity, land management practices, or climate-related conditions occur, project holders shall evaluate whether such changes affect the validity of assumptions, parameters, or calculations applied under this methodology.

Where such changes are determined to be material, project holders shall update relevant calculations, including project emissions, leakage, uncertainty, and, where applicable, baseline validity.

Any such updates shall be transparently documented and reflected in subsequent monitoring reports.

14.13 Data and parameters monitored

Where data limitations exist, assumptions shall be selected to avoid overestimation of GHG emission reductions and removals. Conservative approaches shall be applied consistently across all components of the MRV system.

Table 5. Data and parameters available at validation

Data / Parameter	Description	Unit	Source of data	Measurement / Estimation method	Frequency	QA/QC and comments
A proj	Total project area included in the project boundary	ha	GIS, cadastral records, field verification	Measured and documented through geospatial analysis	At validation and updated if boundary changes	Shall be consistent with the project boundary and stratification records
A str,i	Area of stratum *i*	ha	GIS, remote sensing, field validation	Measured through stratification process	At validation and updated if strata are revised	Shall sum to total project area
LU BL	Baseline land use and management condition	n/a	Historical records, field surveys, remote sensing	Documented based on observed pre-project conditions	At validation and reassessed as required	Shall be evidence-based and consistent with baseline scenario
LS cat	Livestock categories included in the project	n/a	Farm records, surveys, census data	Defined according to IPCC livestock categories	At validation and updated if	Shall be consistently applied across quantification

Data / Parameter	Description	Unit	Source of data	Measurement / Estimation method	Frequency	QA/QC and comments
					categories change	and monitoring
N BL,j	Baseline number of animals in category *j*	head	Farm records, census, surveys	Estimated using representative baseline data	At validation	Shall be justified and traceable
SR BL	Baseline stocking rate	LU/ha or head/ha	Farm records, field surveys	Calculated from herd and grazing area data	At validation	Shall be representative of baseline conditions
MM BL,j	Baseline manure management system for category *j*	n/a	Farm records, field observation	Identified according to IPCC manure management categories	At validation	Shall reflect actual baseline management
SOC t0,i	Initial soil organic carbon stock in stratum *i*	t C/ha	Field sampling and laboratory analysis	Measured using project sampling design	At validation	Shall be based on representative stratified sampling
BD i	Bulk density in stratum *i*	g/cm³ or t/m³	Field sampling and laboratory analysis	Measured	At validation and when resampling SOC	Shall be consistent with SOC stock calculations
D SOC	Soil sampling depth	cm	Monitoring protocol	Fixed measurement depth	At validation	Shall remain consistent across monitoring periods unless justified
EF grid	Grid emission factor, where relevant	tCO$_2$e/MWh	Official national source or approved factor	Selected according to applicable BioCarbon rules	At validation and updated when required	Only applicable if electricity-related emissions are included
EF fuel,n	Emission factor for fossil fuel type *n*	tCO$_2$e/unit	Official national data or approved default	Selected from recognized source	At validation and updated if needed	Shall be conservative where multiple sources exist
Dist route,k	Relevant transport distance for route *k*	km	GIS, transport logs, maps	Measured or conservatively estimated	At validation and updated if routes materially change	Shall reflect realistic transport pathways

Data / Parameter	Description	Unit	Source of data	Measurement / Estimation method	Frequency	QA/QC and comments
$Leak_{risk}$	Initial leakage risk characterization	n/a	Project assessment	Assessed qualitatively and/or quantitatively	At validation	Shall be consistent with leakage management provisions
Rev_{risk}	Initial reversal risk characterization	n/a	Project assessment	Assessed using applicable BioCarbon risk tool	At validation	Relevant where removals are credited

Table 6. Data and parameters monitored

Data / Parameter	Description	Unit	Source of data	Measurement / Estimation method	Monitoring frequency	QA/QC and comments
$N_{PJ,j,y}$	Number of animals in project year *y* for category *j*	head	Farm records, surveys, herd inventories	Measured or recorded	At least annually	Shall be consistent with herd records and cross-checked where possible
$SR_{PJ,y}$	Project stocking rate in year *y*	LU/ha or head/ha	Farm records, grazing records	Calculated	At least annually	Shall reflect actual grazing pressure
$GE_{PJ,j,y}$	Gross energy intake for livestock category *j* in year y	MJ/head/day	Feed data, productivity data, IPCC equations	Estimated using Tier 2 approach	At each monitoring period	Assumptions shall be documented and conservative
$Ym_{PJ,j,y}$	Methane conversion factor for livestock category *j* in year y	%	IPCC defaults or country-specific data	Estimated	At each monitoring period	Shall be selected consistently with IPCC guidance
$VS_{PJ,j,y}$	Volatile solids excretion for livestock category *j* in year y	kg DM/head/day	IPCC equations, feed and animal data	Estimated	At each monitoring period	Shall be transparently documented
$MM_{PJ,j,y}$	Manure management system applied in year y	n/a	Field observation, farm records	Recorded	At least annually	Any change in system shall be documented
$MCF_{PJ,j,y}$	Methane conversion factor for	%	IPCC defaults or project-	Estimated	At each monitoring period	Shall reflect actual manure

Data / Parameter	Description	Unit	Source of data	Measurement / Estimation method	Monitoring frequency	QA/QC and comments
	manure management		specific data			management system
$Nex_{PJ,j,y}$	Nitrogen excretion for livestock category *j* in year *y*	kg N/head/year	IPCC equations, feed/protein data	Estimated	At each monitoring period	Required where N_2O is quantified
$EF_{N2O,PJ,j,y}$	N_2O emission factor under project conditions	kg N_2O-N/kg N	IPCC or approved factor	Estimated	At each monitoring period	Shall be conservatively selected
$SOC_{t,y,i}$	Soil organic carbon stock in stratum *i* at monitoring time *t*	t C/ha	Field sampling and laboratory analysis	Measured	Periodically, consistent with methodology	Shall use the same or statistically equivalent sampling design
$BD_{t,y,i}$	Bulk density at monitoring time *t* in stratum *i*	g/cm³ or t/m³	Field sampling	Measured	Whenever SOC is re-measured	Shall support consistent stock calculations
$Act_{impl,y}$	Implementation status of project activities in year *y*	n/a	Field records, activity logs	Recorded	Continuous / at each monitoring period	Shall document actual implementation of grazing and soil management interventions
$Grazing_{mgmt,y}$	Grazing management conditions in year *y*	n/a	Grazing plans, field records, interviews	Recorded and verified	At least annually	Shall document rotational grazing, rest periods, pasture recovery, or other relevant practices
$Feed_{char,y}$	Relevant feed characteristics used for enteric calculations	n/a	Feed records, lab analysis, conservative assumptions	Measured or estimated	At each monitoring period	Shall be sufficient to support GE and Ym estimates
$Fuel_{cons,n,y}$	Fossil fuel consumption by source *n* in year *y*	L, kg, or GJ	Invoices, meters, logs	Measured	At each monitoring period	Shall be traceable and reconciled where feasible

Data / Parameter	Description	Unit	Source of data	Measurement / Estimation method	Monitoring frequency	QA/QC and comments
Elec cons,y	Electricity consumption attributable to project activities	MWh	Utility bills, meters	Measured	At each monitoring period	Relevant where project emissions include electricity use
Trans mass,k, y	Mass transported along route *k* in year *y*	t	Transport records	Measured or recorded	At each monitoring period	Relevant if transport emissions are included
Trans dist,k,y	Distance transported along route *k* in year *y*	km	GIS, delivery records, logs	Measured or conservatively estimated	At each monitoring period	Changes in route shall be documented
Leak event,y	Evidence of leakage event in year *y*	n/a	Field assessment, production records, surveys	Recorded and assessed	At each monitoring period	Shall include livestock displacement or grazing redistribution outside the boundary
Rev event,y	Evidence of reversal event in year *y*	n/a	Field assessment, SOC monitoring, incident records	Recorded and assessed	At each monitoring period	Relevant where removals are credited
U param,y	Parameters required for uncertainty assessment	n/a	Sampling and calculation records	Calculated	At each monitoring period	Shall be sufficient to apply the BioCarbon Uncertainty Tool

15 Permanence and reversal risk management

15.1 General principle

Project activities shall ensure that all greenhouse gas (GHG) emission reductions and removals credited under this methodology are durable over time and not subject to material risk of reversal.

Permanence shall be assessed in relation to the nature of the mitigation outcome. Emission reductions associated with avoided or reduced emissions shall be considered inherently permanent, provided that they are not subject to subsequent displacement or reversal. Permanence shall be reassessed periodically.

Removals associated with increases in soil organic carbon (SOC) or biomass carbon stocks shall be subject to permanence risk assessment and management.

The classification and treatment of permanence risks shall be consistent with the BioCarbon Permanence and Risk Management Tool.

15.2 Nature of permanence in livestock systems

In livestock and grazing systems, permanence is primarily associated with the stability of soil organic carbon (SOC) and, where applicable, biomass carbon stocks.

SOC sequestration shall be understood as a dynamic and reversible process influenced by management practices, climatic variability, and land-use changes.

Project holders shall therefore demonstrate that the practices implemented under the project are capable of maintaining or increasing carbon stocks over time, and that risks of reversal are identified, assessed, and managed.

15.3 Identification of reversal risks

Project holders shall identify all relevant risks that may lead to a reversal of credited carbon removals.

Such risks may arise from changes in land management, climatic conditions, institutional factors, or socio-economic drivers that affect the continuity of project activities.

Particular attention shall be given to risks associated with:

(a) discontinuation of improved grazing or soil management practices;

(b) increases in grazing pressure or changes in stocking rates;

(c) land-use change or conversion of managed land;

(d) extreme climatic events, including droughts, fires, or floods;

(e) degradation processes affecting soil carbon stability.

The identification of risks shall be context-specific and supported by available evidence.

15.4 Risk assessment

Project holders shall assess the likelihood and potential magnitude of identified reversal risks using a structured and transparent approach.

The assessment of reversal risk shall be conducted in accordance with the BioCarbon Permanence and Risk Management Tool (latest version).

Project holders shall apply the risk classification framework defined in the Tool, including the quantification of reversal risk and the determination of corresponding buffer contributions.

Risk assessment shall distinguish between different types of reversal risks, including those arising from management practices, environmental conditions, and external factors, consistent with the categories defined in the Tool.

The assessment shall consider both the probability of occurrence and the expected impact on carbon stocks.

Where appropriate, project holders shall apply the BioCarbon Permanence and Risk Management Tool to quantify and classify reversal risk.

The outcome of the risk assessment shall inform the application of risk mitigation measures and, where applicable, the contribution to a buffer or reserve mechanism.

15.5 Risk mitigation measures

Project holders shall implement measures to reduce the likelihood and impact of reversal risks.

These measures shall be integrated into project design and operation and may include:

(a) adoption of stable and resilient grazing management systems;

(b) maintenance of appropriate stocking rates;

(c) long-term management commitments and contractual arrangements;

(d) capacity building and technical support for participating entities;

(e) adaptive management practices to respond to climatic variability.

Risk mitigation measures shall be documented and monitored as part of the MRV system.

15.6 Buffer and risk compensation

Where carbon removals are credited, a portion of the verified emission reductions and removals shall be set aside in a buffer or reserve to address the risk of reversal.

The buffer contribution shall be determined based on the outcome of the risk assessment and in accordance with the BioCarbon Permanence and Risk Management Tool.

The buffer shall serve as a mechanism to compensate for any verified reversals that occur during the crediting period or monitoring period, ensuring the environmental integrity of issued credits.

Buffer contributions shall be determined based on the quantified reversal risk in accordance with the BioCarbon Permanence and Risk Management Tool and shall reflect the level of risk associated with the project activity.

15.7 Monitoring of permanence

Project holders shall monitor conditions relevant to permanence as part of the monitoring system.

Monitoring shall include the assessment of:

(a) continued implementation of project activities;

(b) stability or change in SOC and biomass carbon stocks;

(c) occurrence of events that may lead to reversals.

Where a reversal is detected, project holders shall quantify its impact and report it in accordance with the BioCarbon Standard.

15.8 Treatment of reversals

In the event of a verified reversal, the corresponding quantity of GHG emission reductions or removals shall be cancelled or compensated through the buffer mechanism.

Reversals shall be accounted for in a transparent and conservative manner, ensuring that no over-crediting occurs.

15.9 Long-term integrity

Project activities shall be designed to promote long-term maintenance of carbon stocks beyond the crediting period.

Project holders shall demonstrate that management practices are likely to continue over time and that the project contributes to sustained improvements in land management systems.

The long-term integrity of credited mitigation outcomes shall be supported by consistent monitoring, adaptive management, and alignment with broader land-use and development objectives.

16 Uncertainty assessment and conservative adjustment

Uncertainty associated with greenhouse gas (GHG) emission reductions and removals shall be addressed throughout this methodology, including in the design of sampling approaches, parameter selection, and quantification procedures.

Project holders shall ensure that all sources of uncertainty are identified, assessed, and treated conservatively to avoid overestimation of mitigation outcomes.

Where uncertainty cannot be reduced through improved data collection or methodological refinement, conservative assumptions shall be applied.

Where required, uncertainty deductions shall be applied in accordance with the BioCarbon Uncertainty Assessment Tool.

The application of uncertainty adjustments shall be consistent with the principles of transparency, conservativeness, and avoidance of double counting of risk across baseline, leakage, and uncertainty components.

17 Quality Assurance and Quality Control (QA/QC)

Project holders shall implement quality assurance and quality control (QA/QC) procedures to ensure the integrity, consistency, and reliability of all data used for the quantification of greenhouse gas (GHG) emission reductions and removals.

QA/QC procedures shall ensure that:

(a) monitored data are internally consistent and complete;

(b) data sources are verified and traceable;

(c) calculations are reproducible and free from systematic errors.

QA/QC shall be integrated within the monitoring system and applied throughout data collection, processing, and reporting.

Where inconsistencies or errors are identified, corrective actions shall be implemented and documented in monitoring reports.

18 Document status and publication format

18.1 Document status

This methodological document constitutes the public consultation version of BCR0015 – Improved Livestock and Grazing Management under the BioCarbon Standard.

This version is released exclusively for public consultation purposes and does not enter into force until it is formally approved and published by BioCarbon Cert.

Project registration, validation, or credit issuance shall not be permitted under this version.

18.2 Version and applicability

Following the public consultation process, BioCarbon Cert may revise this document to incorporate stakeholder feedback, technical adjustments, or alignment with updated program requirements.

Only the final approved version, as published on the official BioCarbon Standard website, shall be considered valid for the implementation of project activities.

18.3 Publication format

The approved version of this methodology shall be published in an official, controlled format and made publicly available.

19 Bibliographic references

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Version 1.0 Public Consultation	April 15, 2026	Initial version – Document submitted for public consultation