TERO.004 – CARBON REMOVAL IN AGRICULTURAL CROPS

VERSION 2.1

METHODOLOGY, AFOLU, CARBON STORED IN CROP

TERO CARBON AVALIAÇÕES E CERTIFICAÇÕES S.A.

IDENTIFICATION

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NAME	**Carbon Removal in Agricultural Crops**
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METHODOLOGY	TERO.004 – Carbon Removal in Agricultural Crops, v2.1
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STANDARD	Tero Carbon Avaliações e Certificações S.A. (contato@terocarbon.com)
SOLUTION	Nature-Based Solutions (NBS)
SECTOR	Agriculture, Forestry and Other Land Use (AFOLU)
TYPE	Carbon Stored in Crop
ASSET GENERATED	Verified Carbon Unit (VCU) - Carbon Credit Asset
PROJECT ACTIVITIES	Carbon Removal by Crops
GHG MITIGATION	Removal

LIST OF ACRONYMS

AFOLU	Agriculture, Forestry and Other Land Uses
AGB	Above-Ground Biomass
ALM	Agricultural Land Managemen
BAU	Business as usual
BGB	Below-Ground Biomass
BP	Buffer Pool
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRVE	Verified Emission Reduction or Removal Certificate (from the SBCE)
CS	Carbon Stock
DDW	Down Dead Wood
ER	External Reviewer
EUC	Emissions Unit Criteria
GHG	Greenhouse Gas
IBGE	Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*)
ICROA	International Carbon Reduction and Offsetting Alliance
IPCC	Intergovernmental Panel on Climate Change
KPI	Key Performance Indicator
LB	Leakage Belt
LRA	Legal Reserve Area
MHDI	Municipal Human Development Index
MUA	Multiple-Use Area
MRV	Measurement, Reporting, and Verification
NBS	Nature-based Solutions
NPR	Non-Permanence Risk

PA	Project Area
PB	Property Boundary
PDD	Project Design Document
PPA	Permanent Preservation Area
PRODES	Project for Monitoring Deforestation in the Legal Amazon by Satellite (*Projeto de Monitoramento do Desmatamento na Amazônia Legal por Satélite*)
QA/QC	Quality Assurance /Quality Control
RR	Reference Region
SBCE	Brazilian Greenhouse Gas Emissions Trading System (*Sistema Brasileiro de Comércio de Emissões de Gases de Efeito Estufa*)
SDG	Sustainable Development Goals
SOC	Soil Organic Carbon
VCU	Verified Carbon Unit - Carbon Credit Asset
VVB	Validation/Verification Body

LIST OF PROGRAMS

ID	NAME
DC.CER.001	Certification Program
DC.MET.001	Methodologies Program
DC.REG.001	Asset Program

LIST OF SUPPORTING DOCUMENTS

ID	NAME	SOLUTION
DC.COM.001	Definitions	All
DC.COM.003	Stakeholder Consultation Procedure	All
DC.GOV.001	Tero Carbon Governance Structure	All
DC.GOV.004	Grievance Management Procedure	All
DC.CER.002	Land Tenure Compliance Manual and Tero Carbon Seals for NBS Projects	NBS
DC.CER.003	Technical Guidelines for Carbon Quantification in AFOLU Projects	NBS
FR.CER.001	Project Scale Analysis Tool	All
FR.CER.002	Social and Environmental Safeguards Analysis Tool	All
FR.CER.003	Project Additionality Demonstration Tool	All
FR.CER.004	Non-Permanence Risk Analysis and Guarantee Mechanism Tool	NBS
FR.CER.005	Leakage Assessment and Management Tool for NBS VCU Projects	NBS
FR.CER.007	Acceptance Criteria Analysis Tool for Project Verification	All
TP.CER.004	[Template] Zero Deforestation Declaration	NBS
TP.CER.005	[Template] Leakage Risk Assessment and Negligibility Justification Form for Small-Scale NBS VCU Projects	NBS
Law n° 15.042/2024	Establishes the Brazilian Greenhouse Gas Emissions Trading System (SBCE)	All

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1. INTRODUCTION

The growing demand for effective solutions to mitigate climate change has driven the development of strategies based on the removal of greenhouse gases (GHG) through sustainable production systems. In the AFOLU (Agriculture, Forestry, and Other Land Use) sector, agricultural practices that promote carbon sequestration play a fundamental role in the transition to a low-carbon economy.

The **Carbon Removal in Agricultural Crops** methodology, developed under the NBS (Nature-Based Solutions) Program, provides technical guidelines to quantify and verify carbon stored in crops, resulting from the removal of atmospheric CO_2 through photosynthesis and biomass accumulation. The focus is to ensure that eligible projects can generate Verified Carbon Units (VCUs) with a high level of environmental integrity and transparency, following recognized standards and applying measurable, reportable, and verifiable (MRV) practices.

The methodology was developed in line with the principles of integrity and best practices recognized internationally, including those established by the Intergovernmental Panel on Climate Change (IPCC) and aiming for alignment with the criteria of high-quality accreditation programs, such as the International Carbon Reduction and Offsetting Alliance (ICROA) Code of Best Practice and the Emissions Unit Criteria (EUCs) of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

Additionally, this methodology was prepared considering Law No. 15,042, of December 11, 2024, which establishes the Brazilian Greenhouse Gas Emissions Trading System (SBCE). The aim is thus to provide a technical framework that is not only robust for the voluntary market but can also facilitate the eventual accreditation of this methodology and the recognition of the Verified Emission Reduction or Removal Certificates (CRVEs) generated by projects that use it within the scope of the SBCE, as per Art. 25 and Art. 44 of the said Law.

This methodology is the intellectual property of Israel de Jesus Sampaio Filho, Cacilda Adélia Sampaio de Souza, Valdiek da Silva Menezes, Diego César Veloso Rezende, and Francisco Gasparetto Higuchi, and was developed and registered under the Tero Carbon “Methodologies Program (DC.MET.001)”. It **MUST** be used in conjunction with the Tero Programs (“Certification Program (DC.CER.001)”, “Methodologies Program (DC.MET.001)”, “Asset Program (DC.REG.001)”) and their complementary documents (Tools, Policies, Manuals, Procedures, and Templates). These documents provide mandatory and detailed requirements for crucial aspects such as additionality (FR.CER.003), land tenure compliance (DC.CER.002), non-permanence risk analysis and guarantee mechanisms (FR.CER.004), leakage assessment (FR.CER.005), application of social and environmental safeguards (FR.CER.002), stakeholder consultation

(DC.COM.003), and the validation and verification processes. This document and its application operate under the principles of the "Tero Carbon Governance Structure (DC.GOV.001)", aiming to ensure the environmental integrity and credibility of the generated VCUs.

2. SCOPE, ACCEPTANCE CRITERIA, AND ACTIVITIES

2.1. Scope

This methodology applies to AFOLU sector projects that promote carbon sequestration through biomass accumulation in long-duration perennial or semi-perennial agricultural crops (e.g., coffee, cocoa, perennial fruit trees, non-timber agricultural forestry). It focuses on the carbon stored in the living biomass of these crops throughout their productive lifecycle.

2.2. Acceptance Criteria

This methodology applies to projects that meet the following acceptance criteria:

i. **Land Tenure Compliance:** The project must be implemented on rural properties with proven land tenure regularity, according to the "Land Tenure Compliance Manual and Tero Carbon Seals for NBS Projects (DC.CER.002)", and may be privately or publicly owned.
ii. **Territorial Configuration:** The area can be contiguous or composed of multiple parcels, as long as it forms an ecological mosaic that ensures the connectivity and integrity of the biome.
iii. **Active Cropland:** The project area must be dedicated to continuous agricultural production with management practices aimed at increasing or maintaining the carbon stock in the crop biomass and/or soil.
iv. **Project Area Location and Additionality:** The Project Area (PA) should preferably be in areas already consolidated for agriculture, i.e., outside of Permanent Preservation Areas (PPAs) and Legal Reserve Areas (LRAs), unless the agricultural activity is part of a permitted and additional PPA/LRA recovery plan. The activities cannot result from legal requirements, court orders, or formal commitments, such as TACs or mandatory environmental compensations, and must demonstrate additionality according to the "Project Additionality Demonstration Tool (FR.CER.003)".
v. **Additional Social and Environmental Impacts:** In addition to direct carbon removal, the project must demonstrate, through clear and monitorable indicators (as per the "Social and Environmental Safeguards Analysis Tool

(FR.CER.002)"), the occurrence of at least two social and environmental co-benefits (SDGs, excluding SDG 13).

vi. **Compliance with Social and Environmental Safeguards:** The project must fully comply with the social and environmental safeguards established by the "Social and Environmental Safeguards Analysis Tool (FR.CER.002)".

vii. **Clear Identification of Key Roles:** The project must explicitly present the identification of the main parties responsible for its implementation (Lead Proponent, Developer, Generator, Implementer), as per the requirements of the "Certification Program (DC.CER.001)".

viii. Area Eligibility and Land Use History:

- The area where the project's perennial/semi-perennial crops will be planted or managed must have been legally converted to agricultural use or other non-forest uses before a cut-off date (e.g., December 31, 2008), or the proponent must demonstrate that the conversion after this date was legal and does not disqualify the project for carbon crediting. Evidence from historical satellite imagery or other verifiable records must be provided to prove the land use history.
- The land was not classified as "forest" (according to the IPCC definition or an applicable and justified national definition in the PDD) for a period of at least 5 to 10 years before the project start date, unless the project involves the reforestation of degraded areas where the perennial/semi-perennial crop is part of a recovery system. The justification for the specific "non-forest" period must be presented in the PDD.
- In the case of replacing a pre-existing agricultural crop (whether annual, a lower-biomass perennial, or pasture), the history of that crop must be documented to correctly establish the baseline.
- The area must not be under any current environmental embargo that prevents the planting or management of the proposed crops.
- If the project takes place in areas that were deforested after December 31, 2008, the proponent must present documentation proving the legality of the deforestation (e.g., valid environmental licenses at the time) and justify how the carbon project activity is additional and does not reward deforestation. Tero Carbon will critically assess such cases to avoid creating perverse incentives. Projects aiming for the SBCE should be aware that regulations may impose additional restrictions on areas with a recent history of deforestation.

2.3. Activities

This methodology provides for the generation of carbon credits (removal) through the following activity:

I. **Carbon removal by perennial/semi-perennial crop biomass:** This activity consists of cultivating long-duration perennial or semi-perennial agricultural crops, such as coffee, cocoa, or other long-cycle tree/shrub crops, under proper management that enhances carbon removal from the atmosphere through photosynthesis and biomass accumulation. Sustainable cultivation practices are employed to optimize carbon capture and storage in the woody and foliar structure of these crops, contributing to climate change mitigation.

3. BASELINE

3.1. Selection of Project Activity Implementation Areas

The implementation area for the project activities, the Project Area (PA), must be geographically identified (**Figure 1**), along with the main geographical polygons of the rural property: Hydrography, Property Boundary (PB), Permanent Preservation Area (PPA); Multiple-Use Area (MUA), and Legal Reserve Area (LRA).

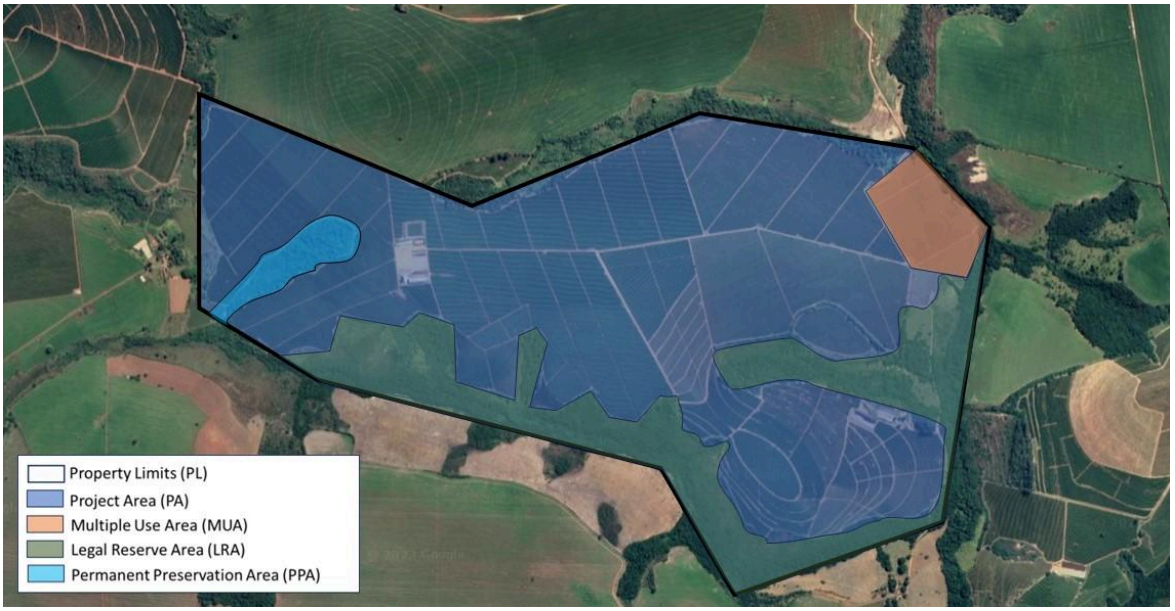

Figure 1. Map identifying the main geographical polygons of the project: Hydrography, Property Boundary (PB), Project Area (PA), Permanent Preservation Area (PPA); Multiple-Use Area (MUA), and Legal Reserve Area (LRA).

3.2. Selection of Carbon Pools Used in Carbon Stock Accounting

The project must indicate which carbon pools were used in the accounting of carbon stocks. **Table 1** presents the types of pools accepted by this methodology.

Table 1. Types of carbon pools accepted by the methodology.

POOL	ACRONYM	MANDATORY
Above-Ground Biomass	AGB	Yes
Below-Ground Biomass	BGB	Yes
Litter	Litter	No
Down Dead Wood	DDW	Optional
Soil Organic Carbon	SOC	Optional

Changes in Soil Organic Carbon (SOC), Litter, or Down Dead Wood (DDW) resulting from associated management practices are not accounted for under this methodology and must be addressed, if eligible, through the Agricultural Land Management (ALM) methodology (TERO.007) or another specific Tero methodology, ensuring no double counting and the additionality of each component.

The emission sources and greenhouse gases (GHG) considered in the accounting of carbon removal by the crop are described in **Table 2**.

Table 2. Emission sources and GHGs considered in the accounting of the carbon removal by crop activity.

STAGE	SOURCE	GAS	USED	JUSTIFICATION
Pre-project (BAU)	Emissions from the use of nitrogen fertilizers	CO_2	No	Conservatively excluded due to limitations of MRV tools.
		CH_4	No	
		N_2O	No	
	Fossil fuel combustion	CO_2	No	
		CH_4	No	
		N_2O	No	

STAGE	SOURCE	GAS	USED	JUSTIFICATION
Project Implementation	Burning of plant biomass	CO_2	Yes	If the project includes the burning of woody biomass as part of cultural practices for planting and harvesting, the resulting emissions must be accounted for.
		CH_4	No	Conservatively excluded due to limitations of MRV tools.
		N_2O	No	Conservatively excluded due to limitations of MRV tools.
	Emissions from the use of nitrogen fertilizers	CO_2	No	Conservatively excluded due to limitations of MRV tools.
		CH_4	No	Conservatively excluded due to limitations of MRV tools.
		N_2O	Yes	May represent a significant emission and, therefore, must be accounted for.
	Fossil fuel combustion	CO_2	Yes	If the harvesting of products from the crop involves the use of vehicles and machinery, the emissions generated by these operations must be accounted for.
		CH_4	No	Conservatively excluded due to limitations of MRV tools.
		N_2O	No	Conservatively excluded due to limitations of MRV tools.

3.3. Baseline Selection and Additionality Demonstration

The demonstration of additionality is a central pillar of carbon credit integrity, as required by standards like ICROA and CORSIA, and is a fundamental criterion for the accreditation of methodologies and projects under the SBCE (Art. 25, II and Art. 44 of Law No. 15,042/2024).

This methodology bases its additionality on the capacity of agricultural cultivation—exemplified by coffee—to promote the removal of greenhouse gases (GHG) and carbon accumulation, while driving socioeconomic development in strategic regions for Brazilian agribusiness. For example, coffee cultivation in the Cerrado of Minas Gerais illustrates the balance between agricultural production and environmental conservation, contributing to economic growth and job creation in rural areas. The Cerrado, recognized as one of the world's most biodiverse savannas, has been a significant agricultural frontier since the 1970s (IBGE, 2018).

Furthermore, agriculture not only ensures food supply and nutritional security but also creates job opportunities and strengthens the resilience of local communities. Municipalities with structured production chains, such as Patrocínio (MG), show more favorable socioeconomic indicators compared to less agriculturally active regions. For instance, official data (IBGE) indicate that the Municipal Human Development Index (MHDI) of Patrocínio is significantly higher than that of municipalities with less agricultural activity, such as those in the interior of Amazonas, showing lower economic vulnerability in these areas.

Additionally, sustainable agricultural practices help mitigate illegal deforestation. Recent information from PRODES[1] shows that municipalities with consolidated production chains have lower deforestation rates compared to areas with less agricultural structure. The use of techniques that favor carbon removal and soil conservation reduces the pressure for opening new areas, contributing to the preservation of local ecosystems.

Thus, the additionality of projects applying this methodology transcends carbon sequestration, encompassing socioeconomic, environmental, and food security benefits. Without the implementation of these projects, not only would the removed emissions not occur, but local communities would also lose essential opportunities for sustainable development, and natural areas would become more susceptible to unsustainable practices and illegal deforestation.

To demonstrate additionality, the Project Developer **MUST** fully apply the Tero Carbon “Project Additionality Demonstration Tool (FR.CER.003)”, following the appropriate flow and tests for the project's scale and type. The analysis must

[1] Information on deforestation can be obtained from systems such as PRODES (Project for Monitoring Deforestation in the Legal Amazon by Satellite) and monitoring platforms for other biomes, such as the Cerrado, made available by INPE (National Institute for Space Research) and other institutions. Example for the Cerrado: https://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/cerrado/increments

be particularly robust for projects aiming for recognition in the SBCE. The complete analysis, including all justifications and evidence, **MUST** be presented in the Project Design Document (PDD).

3.4. Baseline for Pre-existing Biomass Carbon Stock

To account for the net carbon removals by the project's perennial/semi-perennial agricultural crop, it is necessary to establish the carbon stock in the biomass that existed in the Project Area in the baseline scenario (i.e., before the implementation or management improvements of the project's crop). This scenario reflects the pre-existing land use (e.g., pasture, annual crop, bare soil, or a less productive perennial crop that will be replaced).

The baseline for the biomass carbon stock (`CS_BSL_Biomass_n`) must be constructed from the initial carbon stock in the pre-existing biomass (`CS_BSL_Biomass_0`) and projections of its evolution over time (`fCS_BSL_Biomass_n`) in the absence of the project.

If the project area was previously an annual crop, degraded pasture, or bare soil, the `CS_BSL_Biomass_0` and `fCS_BSL_Biomass_n` for perennial woody biomass are generally considered zero.

If the project area replaced an existing perennial/semi-perennial crop with a new one or improved management, CS_BSL_Biomass_0 is the stock of the previous crop, and `fCS_BSL_Biomass_n` reflects the dynamics of that previous crop without the project.

The developer must present evidence (land use history, imagery, local data) to justify the biomass baseline scenario. The approach must be conservative.

$$CS_{BSL\ Biomass\ n} = CS_{BSL\ Biomass\ 0} + fCS_{BSL\ Biomass\ n} - IC_{BSL\ Biomass\ n} \quad (1)$$

Where:

`CS_BSL_Biomass_n`	=	Baseline carbon stock in the biomass in the Project Area (PA) at the end of verification period "`n`" (tCO_2e).
`CS_BSL_Biomass_0`	=	Carbon stock in the pre-existing biomass in the PA at the start of the project (t_0) (in tCO_2e).
`fCS_BSL_Biomass_n`	=	Function representing the expected variation of the carbon stock in the pre-existing biomass over verification period "`n`" in the BAU scenario (in tCO_2e).

IC_BSL_Biomass_n	=	Confidence interval for the biomass baseline in period "n", applied to ensure conservatism.

3.5. Leakage

The assessment and accounting of leakage (LK_n) are mandatory for all removal projects in agricultural crops seeking to generate VCUs using this methodology. The Project Developer **MUST** fully apply the procedures and requirements established in the Tero Carbon "Leakage Assessment and Management Tool for NBS VCU Projects (FR.CER.005)".

The result of this analysis will be a Net Leakage (LK_n) value for each verification period "n", which will be used to adjust the project's net removals. The entire leakage assessment approach, along with assumptions, data sources, calculations, and results, **MUST** be fully presented, justified, and documented in the Project Design Document (PDD) for evaluation by the VVB. The continuous monitoring of leakage throughout the crediting period must follow the specifications in Section 6 of FR.CER.005.

Additionally, the assessment and mitigation of leakage is a fundamental integrity requirement for programs like ICROA (Criterion 5.5.2.b) and CORSIA (EUC 3.6), and an important principle for the credibility of CRVEs in the SBCE (Art. 2, XXXV of Law No. 15,042/2024 defines leakage).

3.6. Quantification of the Current Carbon Stock in the Project Area

The quantification of the current carbon stock in the crop biomass in the Project Area (CS_PROJ_Biomass_n) must be presented with a known confidence interval (CI). This methodology requires the use of the document "Technical Guidelines for Carbon Quantification in AFOLU Projects (DC.CER.003)" as the primary technical reference, especially the sections related to allometry for perennial/semi-perennial agricultural crops. Complementary methods or adaptations specific to the site or crop may be presented, provided they are technically and scientifically valid, transparently documented in the PDD, demonstrate equivalence or superiority in precision and conservatism, and are approved by the VVB and Tero Carbon.

3.7. Calculation of Net GHG Removals by the Project

The Net GHG Removals by the project's crop biomass in verification period "n" (NR_PROJ_Biomass_n) are calculated as the net increase in the biomass carbon stock, subtracting the project emissions associated with this

accumulation:

$$NR_{Biomass\ PROJ\ n} = \left(CS_{PROJ\ Biomass\ n} - CS_{BSL\ Biomass\ n}\right) - E_{PROJ\ Biomass\ n} \quad (2)$$

Where:

NR_Biomass_PROJ_n	=	Net GHG removals by the crop biomass in verification period "n", before leakage adjustment (in tCO_2e).
CS_PROJ_Biomass_n	=	Carbon stock in the project's crop biomass at the end of period "n" (in tCO_2e).
CS_BSL_Biomass_n	=	Carbon stock in the baseline (pre-existing) biomass at the end of period "n" (in tCO_2e), as per Equation 1.
E_PROJ_Biomass_n	=	GHG emissions from project activities that led to biomass accumulation during period "n" (in tCO_2e).

After calculating the Project's Net Removals (NR_PROJ_Biomass_n) and determining the project's Net Leakage (LK_n) according to the "Leakage Assessment and Management Tool for NBS VCU Projects (FR.CER.005)", the Net Removals Adjusted for Leakage (VCU_adj_LK_Biomass_n) are calculated:

$$VCU_{adj\ LK\ Biomass\ n} = MAX\left(0; NR_{PROJ\ Biomass\ n} - LK_n\right) \quad (2a)$$

Where:

VCU_adj_LK_Biomass_n	=	Net removals from the biomass activity in period "n", adjusted for leakage (in tCO_2e). This value will serve as the basis for calculating the increment and the buffer in Section 3.9.
NR_PROJ_Biomass_n	=	As per Equation 2.
LK_n	=	Total net leakage of the project in period "n", quantified as per FR.CER.005 (tCO_2e).

Confidence Interval (CI): All estimates of carbon stock and emissions/removals must be accompanied by their respective confidence intervals. Uncertainty propagation must be performed to determine the final CI of the `VCU_adj_LK_Biomass_n` estimate. The final value to be carried forward for the calculation of permanent credits (Section 3.9) **MUST** be the lower bound of the confidence interval (e.g., the 5th percentile for a 90% CI), ensuring the principle of conservatism.

3.8. Non-Permanence Risk and Guarantee Mechanisms

Ensuring the permanence of carbon removals in the biomass of perennial/semi-perennial crops is a fundamental requirement. Programs like ICROA (Criterion 5.3) and CORSIA (EUC 3.5) require mechanisms to address the non-permanence risk (reversal) of mitigations. The SBCE, through Art. 21, § 1, V of Law No. 15,042/2024, also provides for protection mechanisms against reversal of removals. For Carbon Removal in Agricultural Crops projects using this methodology, the mandatory mechanism to address Non-Permanence Risk (NPR) is the **Buffer Pool (BP)**.

The Project Developer **MUST** fully apply the procedures and requirements of the Tero Carbon "Non-Permanence Risk Analysis and Guarantee Mechanism Tool (FR.CER.004)". Specifically:

1. **Assess Non-Permanence Risk (`NPR_total`):** Use one of the options described in Section 4 of FR.CER.004 (Simplified or Detailed Approach) to calculate the project's NPR_total, considering the specific risks associated with the perennial/semi-perennial crop, management practices, and local context.
2. **Calculate the Contribution to the Buffer Pool:** Follow the procedures in Section 7 of FR.CER.004 to determine the permanent fraction ($\alpha = 1 - NPR_{buffer}$) and the quantity of VCUs (`Buffer_n`) to be allocated to the Buffer Pool, based on the assessed `NPR_total` (or another `NPR_buffer` option as per FR.CER.004).

The entire Non-Permanence Risk analysis, the assumptions, the calculations for the buffer contribution, and the risk monitoring plan must be fully presented and documented in the PDD.

3.9. Calculation of Generated Permanent Carbon Credits

The permanent VCUs generated in verification period "`n`" (`pVCU_Biomass_n`) by carbon removal in crop biomass are calculated using the Buffer Pool (BP) approach. To ensure that credits are issued only on the net and additional carbon sequestered, the methodology uses a "high-water mark" principle. This means that net removals in a period are only eligible for crediting if

they exceed the maximum stock already credited in any previous period.

First, the net increment of removals in period "n" eligible for crediting (ΔNR_Biomass_n) is calculated:

$$\Delta NR_{Biomass\ n} = MAX\left(0; VCU_{adj\ LK\ Biomass\ n} - CTOT_{REM\ Biomass\ max\ (n-1)}\right) \quad (3a)$$

Where:

ΔNR_Biomass_n	=	Net increment of removals in biomass in period "n" eligible for crediting (in tCO_2e). The MAX(0; ...) function ensures that if there is no increment (or if there is a biomass loss), the value will be zero, generating no credits.
VCU_adj_LK_Biomass_n	=	Net removals adjusted for leakage in period "n", after conservative application of the CI, as per Section 3.7 (tCO_2e). This is the total stock of net removals verified in the current period.
CTOT_REM_Biomass_max_n-1	=	The highest value of VCU_adj_LK_Biomass_n ever recorded and for which VCUs were issued in any previous verification period. For the first verification, CTOT_REM_Biomass_max_n-1 = 0.

Based on the net increment (ΔNR_Biomass_n), the permanent VCUs to be issued and the contribution to the Buffer Pool are calculated:

$$pVCU_{Biomass\ n} = \Delta NR_{Biomass\ n} \times \alpha_{Biomass} \quad (3b)$$

$$Buffer_{Biomass\ n} = \Delta NR_{Biomass\ n} \times \left(1 - \alpha_{Biomass}\right) \quad (3c)$$

Where:

pVCU_Biomass_n	=	Permanent VCUs generated by removal in biomass in verification period "n".
Buffer_Biomass_n	=	Contribution to the project's Buffer Pool in period "n".

$\alpha_{Biomass}$	=	Permanent fraction for the biomass component, calculated as (1 – NPR_buffer_Biomass), where NPR_buffer_Biomass is the Non-Permanence Risk applicable to the buffer, determined as per FR.CER.004.

After issuance, the value of CTOT_REM_Biomass_max for the next verification will be updated to the new maximum value achieved, i.e.: CTOT_REM_Biomass_max_n = MAX(CTOT_REM_Biomass_max_n-1; VCU_adj_LK_Biomass_n).

3.10. Definition of Project Scale

The project's scale (Small or Large-Scale) **MUST** be determined using the Tero Carbon "Project Scale Analysis Tool (FR.CER.001)", based on the annual estimate of pVCU_Biomass_n generation. The scale classification and its justification **MUST** be presented in the PDD.

3.11. Project Start Date and Retroactivity

The Project Start Date (t_0) is defined by the Project Developer in the Project Design Document (PDD). Projects using this TERO.004 methodology may have a retroactive t_0.

The ability to credit retroactive removals is a feature of some carbon programs. However, for compliance with schemes like CORSIA, there may be restrictions on the eligibility of very old vintages. Developers should be aware of the specific requirements of the markets their credits are intended for. Within the SBCE, the regulation may establish specific rules on retroactivity for CRVEs.

For VCUs to be issued for periods prior to the project's validation date, the Developer **MUST** fully comply with the Measurement, Reporting, and Verification (MRV) evidence requirements for the entire claimed retroactive period. These requirements are detailed in the Tero Carbon "Certification Program (DC.CER.001)" and include, but are not limited to, the presentation of robust and auditable evidence for:

- The performance of an initial crop biomass inventory (or equivalent, as per Section 3.6 of this methodology and the "Technical Guidelines for Carbon Quantification in AFOLU Projects (DC.CER.003)") before or at the t_0 date, to establish the baseline stock.

- The maintenance of the agricultural area conditions and the implementation of the project's management practices since t_0 (e.g., planting/cycle dates, crop(s), cultivated area, inputs, etc.).
- Effective governance over the project area by the proponent since `t_0`.
- The demonstration of project additionality, valid for the entire period since `t_0`, according to the "Project Additionality Demonstration Tool (FR.CER.003)".
- Continuous compliance with social and environmental safeguards (as per the "Social and Environmental Safeguards Analysis Tool (FR.CER.002)") since `t_0`.
- Valid and uninterrupted land tenure compliance since t_0 (as per the "Land Tenure Compliance Manual and Tero Carbon Seals for NBS Projects (DC.CER.002)").

The maximum retroactivity period allowed for the first issuance of VCUs is defined in the "Certification Program (DC.CER.001)" (currently **15 years** prior to the PDD submission date for validation). The absence of robust and verifiable evidence for any of the requirements for the retroactive period will result in the inability to issue VCUs for that period. The final decision on the acceptance of the retroactive period and the presented evidence rests with Tero Carbon, based on the VVB's assessment.

4.MONITORING PROCEDURE

4.1. Monitoring Plan

The Project Developer **MUST** prepare and implement a detailed Monitoring Plan, which will be an integral part of the Project Design Document (PDD). This plan is fundamental to ensure the quality, traceability, transparency, and integrity of the project's results over time, to verify continued compliance with the requirements of this methodology and the Tero Programs, and to meet the Measurement, Reporting, and Verification (MRV) standards required by high-integrity markets and the SBCE (Art. 2, XVIII of Law No. 15,042/2024).

The Monitoring Plan **MUST** cover, at a minimum, the following components, with explicit references to the applicable Tero tools and procedures:

1. **Maintenance of Project Acceptance Criteria:**
    - Procedures to continuously verify that all project eligibility criteria (defined in Section 2.2 of this methodology) and commitments made (e.g., "[Template] Zero Deforestation Declaration (TP.CER.004)", if applicable to the area's context) remain valid.

2. **Monitoring of Carbon Stock in Crop Biomass (`CS_PROJ_Biomass_n`):**

   - Parameters to be monitored for the perennial/semi-perennial crops: Effectively cultivated area, crop type, age, management practices, planting density, DBH/BD, plant height, and other parameters necessary for the allometric equations or growth models used.
   - Biomass/carbon sampling and quantification methodology: According to the "Technical Guidelines for Carbon Quantification in AFOLU Projects (DC.CER.003)", including sampling design (permanent plots), measurement frequency (e.g., annual or biennial, depending on the crop's growth rate), and QA/QC procedures.
   - Procedures for the periodic recalculation of carbon stocks in biomass.

3. **Monitoring of Project Emissions Associated with Biomass (`E_PROJ_Biomass_n`):**

   - Identification and quantification of GHG emission sources directly resulting from the planting and management activities of the perennial/semi-perennial crop that lead to biomass accumulation (e.g., fuel use in machinery for soil preparation, planting, pruning; emissions from seedling production if significant and within the boundaries). Quantification methodologies as per IPCC or other approved sources. If the project also accounts for emission reductions from management (EMIS) under the TERO.007-ALM methodology or another, ensure no double counting of these emissions.

4. **Monitoring of Leakage (`LK_n`):**

   - Application of the monitoring requirements of the "Leakage Assessment and Management Tool for NBS VCU Projects (FR.CER.005)", according to the project's scale.

5. **Monitoring of Non-Permanence Risk (NPR) and the Buffer Pool (BP):**

   - Continuous monitoring of the risk factors (internal and external) identified in the NPR analysis (as per the "Non-Permanence Risk Analysis and Guarantee Mechanism Tool (FR.CER.004)").
   - Procedures for detecting, recording, and reporting to Tero Carbon any reversal events (e.g., crop loss due to an extreme event impacting accumulated biomass, change in management practice that reduces the stock). Reversal compensation mechanisms must be triggered as per FR.CER.004 and aligned with SBCE requirements for reversal protection.
   - Monitoring of management practices that ensure the permanence of the removed carbon and the integrity of the areas contributing to the Buffer Pool.

6. **Monitoring of Social and Environmental Safeguards and Co-benefits:**
    - Implementation and monitoring of the effectiveness of risk mitigation measures.
    - Monitoring of the Key Performance Indicators (KPIs) for the mandatory and claimed co-benefits, according to the "Social and Environmental Safeguards Analysis Tool (FR.CER.002)".
7. **Monitoring of Land Tenure Compliance:**
    - Procedures to ensure the maintenance of land tenure regularity, according to the "Land Tenure Compliance Manual and Tero Carbon Seals for NBS Projects (DC.CER.002)".
8. **Monitoring of Stakeholder Engagement:**
    - Maintenance of communication channels and recording of interactions, according to the "Stakeholder Consultation Procedure (DC.COM.003)" and "Grievance Management Procedure (DC.GOV.004)".

For each parameter, the Plan must specify: variable, unit, collection/calculation methodology, frequency, responsible party, and QA/QC. The PDD must indicate what is mandatory for validation and the data expected for verifications.

4.2. Monitoring Methodology and Quality

As part of the monitoring procedure, the project developer must establish a clear and replicable methodology for data collection, analysis, and reporting, ensuring that the processes are auditable and consistent across verification cycles. The plan should describe the tools, technologies, and frequencies used for monitoring, as well as identify the responsibilities of the involved parties. It is also necessary for the developer to adopt measures to ensure data quality, including internal audits, control procedures, and detailed records of all monitored activities.

4.3. Period Between Verifications

The period between verifications must be defined by the developer in the Monitoring Plan, considering the nature of the project and the frequency required to ensure the quality and traceability of the results. However, this interval must not exceed three years, to ensure that the collected data remains up-to-date and consistent with the project's reality. Ideally, it is recommended that verifications be conducted annually, allowing for continuous monitoring of the project's

performance, rapid identification of deviations, and implementation of corrective actions when necessary.

4.4. Monitoring Report

For each monitoring period, when requesting a verification, the project developer must submit a comprehensive Monitoring Report. This report must present the quantified results of net emissions, clearly indicating the carbon credits requested for the crediting period. In addition to the written document, the developer must also provide spreadsheets and supporting information available in the "Acceptance Criteria Analysis Tool for Project Verification" (FR.CER.007). This documentation ensures that all data and calculations are transparent, auditable, and consistent with the project's monitoring and verification requirements.

5. REVIEW OF THIS METHODOLOGY

This methodology (**TERO.004 – Carbon Removal in Agricultural Crops**) will be reviewed periodically by Tero Carbon in collaboration with the methodology authors or at the initiative of Tero Carbon, according to the procedures established in the "Methodologies Program" (DC.MET.001). Reviews may occur, at a minimum, every **5 years**, or sooner, if necessary, to:

a. Incorporate relevant scientific and technical advances for carbon quantification in agricultural crops, including new allometric equations, soil sampling methods, or assessment of permanence risks in agricultural systems.
b. Reflect significant changes in national policies, regulations (such as the evolution of the SBCE regulation) or international ones, or in market requirements, including those of accreditation schemes like ICROA and CORSIA.
c. Accommodate consistent and constructive feedback from Project Developers, VVBs, experts, and other stakeholders, obtained through Tero Carbon's formal channels.
d. Correct any inconsistencies, ambiguities, or errors identified.
e. Ensure continuous alignment with the Tero Programs and their complementary documents.

Substantial revisions will follow the full process of the "Methodologies Program (DC.MET.001)". Minor revisions may have a simplified process. Tero

Carbon reserves the right to suspend or deactivate this methodology as detailed in the "Methodologies Program".

VERSION HISTORY

VERSION	DATE	NOTES
2.1	06/16/2025	Complete alignment with Tero Programs v2.1. Leakage and Non-Permanence Risk (NPR) become mandatory, with Buffer Pool (BP) as the mandatory mechanism for this removal methodology, referencing Tero Tools. Detailed and integrated Monitoring Plan. Retroactivity section added. Mandatory references to Tero Tools for Additionality, Stock Estimation, Scale, Safeguards, and Land Tenure Compliance. Focus on integrity and preparation for ICROA/CORSIA and SBCE.
2.0	04/02/2025	Version with substantial updates to the methodology structure, including name change and update to the baseline calculation.
1.0	01/30/2024	Initial version approved by the Directorate and launched for public consultation.